XIIth AATM Congress

(XIIth Annual Conference of Asian Association of Transfusion Medicine)

Asian Association of Transfusion Medicine

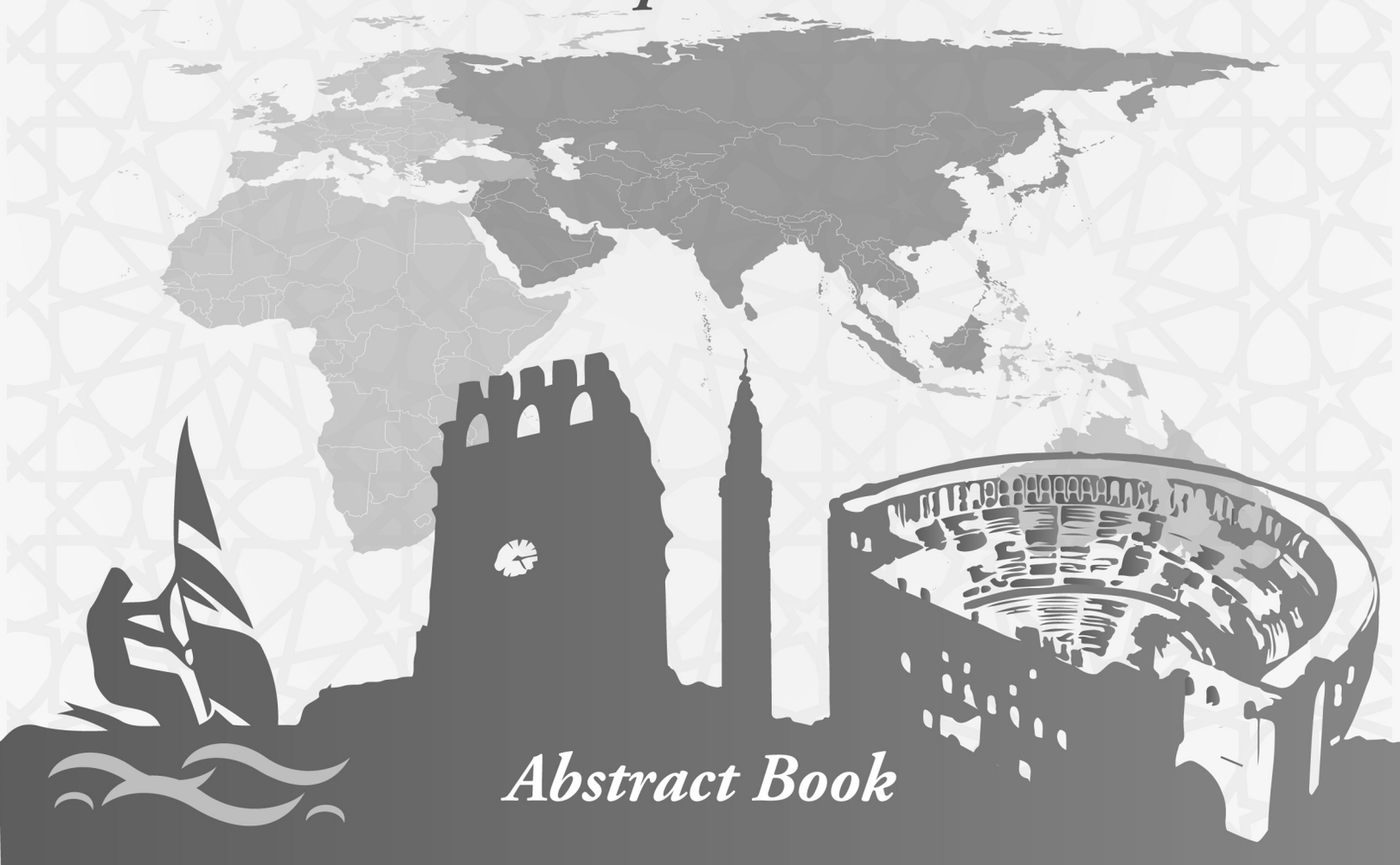
20th Blood Banks & Transfusion Society of Turkey

IXth BBTST Congress

(IXth National Congress of Blood Banking & Transfusion Centers of Turkey)

Maritim Pine Beach Resort Hotel Antalya / Turkey

2-6 April 2016



Abstract Book

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Prof. Dr. Tevfik Yavuz	Balıkesir Üniversitesi Tıp Fakültesi Mikrobiyoloji AD, Çağış Kampüsü, Balıkesir, Turkey
Uzm. Bio. Mehmet Yay	Erciyes Üniversitesi Tıp Fakültesi, Kan Merkezi, Kayseri, Turkey
Prof. Dr. Rüçhan Yazan Sertöz	Ege Üniversitesi Tıp Fakültesi Mikrobiyoloji ve Klinik Mikrobiyoloji AD, İzmir, Turkey
Dr. Murat Yazıcı	TKHK Sağlık Tesisleri Daire Başkanı, Ankara, Turkey
Dr. Turan Yazmalar	Samsun Mehmet Aydın E.A.H. Samsun, Turkey
Prof. Dr. Şadi Yenen	İstanbul Üniversitesi İstanbul Tıp Fakültesi, Mikrobiyoloji ve Klinik Mikrobiyoloji AD, İstanbul, Turkey
Prof. Dr. İdil Yenicesu	Gazi Üniversitesi Tıp Fakültesi Pediatrik Hematoloji BD, Ankara, Turkey
Dr. Rebecca Yeung	Director Market Development, CERUS Asia Pacific
Hem. Gönül Yıldırım	Türk Kızılayı Ege Bölge Kan Merkezi, İzmir, Turkey
Prof. Dr. Fatma Meriç Yılmaz	S.B. Ankara Numune E.A.H. Tıbbi Biyokimya Kliniği, Ankara, Turkey
Hem. Kıymet Yılmaz	Acıbadem Sağlık Grubu Hastaneleri Hemşirelik Hizmetleri Gelişim Departmanı, Eğitim ve Gelişim Hemşiresi, İstanbul, Turkey
Uzm. Dr. Sevinç Yılmaz	Türkiye Yüksek İhtisas E.A.H. Sıhhıye, Ankara, Turkey

Esteemed Members of the Family of Blood Banking and Transfusion Medicine;

We are all excited, proud and happy to be celebrating the 20th anniversary of the establishment of **Blood Banking and Transfusion Society of Turkey (BBTST)** that was established in 1996 so as to contribute to the lack of education and knowledge in the field of Blood Banking and Transfusion Medicine in our country by realizing this issue.

- 8 national congresses
- 18 national courses
- 106 national symposia
- 30 national training panels
- 1 international congress
- 5 international training panels
- 4 international workshops were organized in the last 20 years with your contribution and participation.

Contributions were provided for many legislative activities including, in particular, the Blood Law and the National Guidelines on Blood and Blood Products and many publications on this subject were translated into our language.

BBTST has had a new achievement in its 20th year of establishment as it will organize the **XIIth Annual Conference of Asian Association of Transfusion Medicine (AATM)** together with our **IXth National Congress of Blood Banking and Transfusion Centers of Turkey** to be organized in 2016.

The joint congress is of special importance to share with international community the knowledge and experience that we have gained in our country in the field of Blood Banking and Transfusion in the last 20 years through presentations in the congress. Attending the courses of leading scientists in the field of Blood Banking and Transfusion Medicine throughout our congress will significantly contribute to us.

Since the date of establishment, BBTST has been in close cooperation and coordination with the Ministry of Health of the Republic of Turkey which is the National Health Authority of our country and the Turkish Red Crescent which is our national blood supply institution. In this congress, it is of great importance to share with international community the important developments that have been made by these 2 national institutions in the field of Blood Banking and Transfusion Medicine in recent years.

We hope to organize a congress that is beneficial for our country and international community and will leave behind a good memory just like the VIIIrd European Regional Congress of International Society of Blood Transfusion organized by us in 2003.

Sincerely,

Dr. Ramazan Uluhan
General Secretary of BBTST

Prof. Dr. Gürol Emekdaş
President of BBTST

Editors

Ramazan Uluhan
N. Nuri Solaz
Yasemin Heper

2 APRIL 2016, SATURDAY

HALL B2

OPENING CEREMONY	16:00 - 18:00	**OPENING CEREMONY**
COFFEE BREAK GİRGİN	18:00 - 18:30	GİRGİN **COFFEE BREAK**
OPENING CONFERENCE **MILESTONES IN THE PROGRESS JOURNEY OF BLOOD BANKING** Gamal Gabra (UK)	18:30 - 19:15	**OPENING CONFERENCE** **MILESTONES IN THE PROGRESS JOURNEY OF BLOOD BANKING** Gamal Gabra (UK)
SOCIAL PROGRAMME	21:30 - 24:00	**SOCIAL PROGRAMME**

3 APRIL 2016, SUNDAY

HALL B2

SCIENTIFIC PROGRAM

COUNTRY PRESENTATION	08:30 - 10:00	**COUNTRY PRESENTATION**
Chairs: Ananda Gunasekara (Sri Lanka) Nabajyoti Choudhury (India)		**Chairs:** Ananda Gunasekara (Sri Lanka) Nabajyoti Choudhury (India)
AFGHANISTAN Ahmad Masoud		**AFGHANISTAN** Ahmad Masoud
BANGLADESH Ashadul Islam		**BANGLADESH** Ashadul Islam
BHUTAN Mahrukh Getshen		**BHUTAN** Mahrukh Getshen
IRAN AA Poufatullah		**IRAN** AA Poufatullah
INDIA Nidhi Mehta		**INDIA** Nidhi Mehta
MONGOLIA Namjil Erdenebayar		**MONGOLIA** Namjil Erdenebayar
MALDIVES A B Milza		**MALDIVES** A B Milza
COFFEE BREAK GİRGİN	10:00 - 10:30	GİRGİN **COFFEE BREAK**
COUNTRY PRESENTATION	10:30 - 12:00	**COUNTRY PRESENTATION**
Chairs: Ananda Gunasekara (Sri Lanka) Nabajyoti Choudhury (India)		**Chairs:** Ananda Gunasekara (Sri Lanka) Nabajyoti Choudhury (India)
NEPAL Manita Rajkarnikar		**NEPAL** Manita Rajkarnikar
PAKISTAN Farukh Hassan		**PAKISTAN** Farukh Hassan
SRI LANKA Indica de Silva		**SRI LANKA** Indica de Silva
TURKEY N. Nuri Solaz		**TURKEY** N. Nuri Solaz
Impact of AATM Fellowship Program Mahrukh Getshen (Bhutan) **Impact of AATM - III Wet Workshops** Jim Perkins (USA) **Changes in BTS in AATM Member Countries** Nabajyoti Choudhury (India)		**Impact of AATM Fellowship Program** Mahrukh Getshen (Bhutan) **Impact of AATM - III Wet Workshops** Jim Perkins (USA) **Changes in BTS in AATM Member Countries** Nabajyoti Choudhury (India)
GENERAL DISCUSSION		**GENERAL DISCUSSION**
SATELLITE SYMPOSIA BIO-RAD	12:00 - 12:45	BIO-RAD **SATELLITE SYMPOSIA**
LUNCH	12:45 - 14:00	**LUNCH**

SCIENTIFIC PROGRAM

3 APRIL 2016, SUNDAY

SCIENTIFIC PROGRAM

HALL B2		HALL B1
SESSION 1		**SESSION 2**
IMMUNOHAEMATOLOGY		**CERUS SYMPOSIUM ON PATHOGEN INACTIVATION**
Chairs: Gülsüm Özet (Turkey) SR Joshi (India) **Panelist of Discussion:** Sneh Lata Gupta (India) Sue Johnsons (USA)		**Chairs:** Rüçhan Yazan Sertöz (Turkey) Harprit Singh (India) **Panelist of Discussion:** Amit Shesthra (Nepal) Anil Disanayake (Sri Lanka) Graeme Woodfield (New Zealand)
GENETICS OF BLOOD GROUP ANTIGENS Duran Canatan (Turkey)	14:00 - 14:20	**PATHOGEN INACTIVATION: TODAY & FUTURE** Rebecca Yeung (CERUS Asia Pacific)
HOW TO RESOLVE ANTIBODY PROBLEMS? WHICH TESTS DO WE HAVE? Davut Albayrak (Turkey)	14:20 - 14:40	**DIFFERENT ALGORİTHMS FOR BLOOD DONOR SCREENING TESTS** RN Makroo (India)
PROBLEMS RELATED WITH BLOOD GROUPING AND CROSSMATCHING Güçhan Alanoğlu (Turkey)	14:40 - 15:00	**WHICH TYPE OF SAFETY PRECAUTIONS: DONOR SELECTION, SCREENING PROCEDURES OR VIRAL INACTIVATION?** Nabajyoti Choudhury (India)
PANEL DISCUSSION	15:00 - 15:30	**PANEL DISCUSSION**
COFFEE BREAK	15:30 - 16:00	**COFFEE BREAK**
SESSION 3 **BLOOD GROUPS**		**SESSION 4** **BLOOD DONORS**
Chairs: Serhan Sakarya (Turkey) C. Shivram (India)		**Chairs:** Arif Kapuağası (Turkey) Fatma Meriç Yılmaz (Turkey) **Panelist of Discussion:** Fardous Ara (Bangladesh) Ismail Quadri (India) VP Gupta (India)
RARE BLOOD PHENOTYPE: ETHINIC VARIATION AND CURRENT SITUATION OF RARE DONOR REGISTRY IN ASIA Hülya Bilgen (Turkey)	16:00 - 16:20	**TÜRKÖK PROJECT: FROM THE VIEW OF MINISTRY OF HEALTH** Medine Hasçuhadar (Turkey)
PARTIAL D AND WEAK D: PICKING UP THE RHESUS PIECES Sue Johnsons (USA)	16:20 - 16:40	**TÜRKÖK PROJECT, DONOR REGISTRY** Şenay Canpolat (Turkey)
NON-INVASIVE PRENATAL METHODS FOR FETAL RhD GENOTYPING Özgür Çoğulu (Turkey)	16:40 - 17:00	**SOCIAL MEDIA AFFECTS (PROS & CONS)** Metin Kalender (Turkey)
MOLECULAR TECHNICS IN BLOOD GROUPING, SEROLOGIC AND MOLECULAR TEST DISCREPANCIES L. Tufan Kumaş (Turkey)	17:00 - 17:30	**PANEL DISCUSSION**
Annual General Body Meeting of AATM (Hall B1)	17:30 - 18:30	**Annual General Body Meeting of AATM** (Hall B1)
Social Activity - Evening Movie Matinee Dikkat Kan Aranıyor (Hall A1 - A2)	18:30 - 19:30	**Social Activity - Evening Movie Matinee** Dikkat Kan Aranıyor (Hall A1 - A2)
SOCIAL PROGRAMME	21:30 - 24:00	**SOCIAL PROGRAMME**

SCIENTIFIC PROGRAM

4 APRIL 2016, MONDAY

SCIENTIFIC PROGRAM

HALL B2

SESSION 5		SESSION 5
AABB Plenary Session (Introduction/ Accreditation/ Cellular Therapy)		**AABB Plenary Session (Introduction/ Accreditation/ Cellular Therapy)**
Chairs: Farrukh Hasan (Pakistan) Mahmut Bayık (Turkey)		**Chairs:** Farrukh Hasan (Pakistan) Mahmut Bayık (Turkey)
MESENCHYMAL STROMAL CELLS: ARE THEY READY FOR CLINICAL USE? AN UPDATE Naynesh Kamani (AABB)	08:30 - 09:00	**MESENCHYMAL STROMAL CELLS: ARE THEY READY FOR CLINICAL USE? AN UPDATE** Naynesh Kamani (AABB)
AABB 2016: MEETING THE CHALLENGES IN BLOOD BANKING AND TRANSFUSION MEDICINE? Sue Johnsons (USA)	09:00 - 09:30	**AABB 2016: MEETING THE CHALLENGES IN BLOOD BANKING AND TRANSFUSION MEDICINE?** Sue Johnsons (USA)
CT INITIATIVES AT AABB: STANDARDS, ACCREDITATION AND EDUCATION Naynesh Kamani (AABB)	09:30 - 10:00	**CT INITIATIVES AT AABB: STANDARDS, ACCREDITATION AND EDUCATION** Naynesh Kamani (AABB)
COFFEE BREAK Ortho Clinical Diagnostics	10:00 - 10:30	Ortho Clinical Diagnostics **COFFEE BREAK**

HALL B2		HALL B1
SESSION 6		**SESSION 7**
EDUCATION IN TM & QUALITY MANAGEMENT FOR BLOOD BANKS		**BLOOD COMPONENTS & PLASMA FRACTIONATION**
Chairs: Şeyda Keskin (Turkey) Cevdet Erdöl (Turkey)		**Chairs:** Deelip Wani (India) Ashadul Islam (Bangladesh)
WHAT TYPE OF STANDARDS? NATIONAL OR REGIONAL OR INTERNATIONAL? Ayla Yavuz (Turkey)	10:30 - 10:50	**COMPONENT PRODUCTION: HOW MANY, WHEN & WHY?** Sadhna Mangwana (India)
RISK ANALIYSIS & RISK MANAGEMENT FOR BLOOD BANKS Esra Karakoç (Turkey)	10:50 - 11:10	**PLASMA COLLECTION AND USAGE (PREPARATION FOR FRACTINATION)** Harprit Singh (India)
MEDICAL GRADUATE & POST GRADUATE EDUCATION Graeme Woodfield (New Zealand)	11:10 - 11:30	**LAST TEN YEARS IN PLASMA FRACTINATION** Ranjit Ajmani (India)
EDUCATION FOR NURSES & TECHNICIANS: N. Nuri Solaz (Turkey)	11:30 - 12:00	**THE IMPLEMENTATION & PROGRESS OF PLASMA FRACTIONATION IN TURKEY** Ünal Ertuğrul (Turkey)
SATELLITE SYMPOSIA (Hall B2) Roche	12:00 - 12:45	Roche **SATELLITE SYMPOSIA** (Hall B2)
LUNCH	12:45 - 14:00	**LUNCH**

SCIENTIFIC PROGRAM

4 APRIL 2016, MONDAY

SCIENTIFIC PROGRAM

HALL B2		HALL B1
SESSION 8		**SESSION 9**
PATIENT BLOOD MANAGEMENT		**HAEMOVIGILANCE**
Chairs: Yasemin Heper (Turkey) Brian McCleland (UK)		**Chairs:** Faten Moftah (Egypt) İlhan Birinci (Turkey) **Panelist of Discussion:** Janaki Senevirathne (Sri Lanka) Tamanna Afroz (Bangladesh)
CASE STUDIES Nil Banu Pelit (Turkey)	14:00 - 14:20	**HAEMOVIGILANCE: JUST THE BASICS** Mustafa Nuri Günçıkan (Turkey)
WHY? Reha Masatlı (Turkey)	14:20 - 14:40	**IMPLEMENTATION OF NATIONAL HAEMOVIGILANCE SYSTEM** Meral Sönmezoğlu (Turkey)
WHAT & HOW? Fevzi Toraman (Turkey)	14:40 - 15:00	**HAEMOVIGILANCE - ONLY PART OF THE STORY** James T. Perkins (USA)
CASE STUDIES Ertan Özyurt (Turkey)	15:00 - 15:30	**PANEL DISCUSSION**
COFFEE BREAK amphi	15:30 - 16:00	amphi **COFFEE BREAK**
SESSION 10		**SESSION 11**
APHERESIS TECHNOLOGIES		**STEM CELL COLLECTION & CELLULAR THERAPIES**
Chairs: Nafiz Koçak (Turkey) Mazharul Hoque (Bangladesh) **Panelist of Discussion:** Atul Kulkarni (India) Zubaida Nasreen (Bangladesh)		**Chairs:** Mahmut Bayık (Turkey) Şükrü Cin (Turkey) **Panelist of Discussion:** Smita Joshi (India) Syeda Masooma Rehman (Bangladesh) İndika de Alwis (Sri Lanka)
POOLED VERSUS APHERESIS PLATELET CONCENTRATES Mehmet Yay (Turkey)	16:00 - 16:20	**CELLULAR MANIPULATIONS IN HAEMATOPOIETIC STEM CELL TRANSPLANTATION** Ercüment Ovalı (Turkey)
IT TECHNOLOGIES FOR APHERESIS MACHINES F. Yüce Ayhan (Turkey)	16:20 - 16:40	
THERAPEUTIC EFFICACY OF GRANULOCYTE APHERESIS Ekrem Ünal (Turkey)	16:40 - 17:00	**EXTRACORPOREAL PHOTOPHERESIS** Gülyüz Öztürk (Turkey)
VALIDATION PROCESS OF APHERESIS INSTRUMENTS Servet Uluer Biçeroğlu (Turkey)	17:00 - 17:20	**PANEL DISCUSSION**
ORAL PRESENTATIONS **Chairs:** Tevfik Yavuz (Turkey) Rukiye Berkem (Turkey) VP Gupta (India) OP-01, OP-02, OP-03, OP-04, OP-05, OP-06, OP-07, OP-08, OP-09, OP-10	17:30 - 18:30	**ORAL PRESENTATIONS** **Chairs:** Şükran Köse (Turkey) Dilek Çolak (Turkey) Sheikh Daud Adnan (Bangladesh) OP-11, OP-12, OP-13, OP-15, OP-16, OP-17, OP-18, OP-19, OP-20
Social Activity - Quiz Show Metin Uca İle Passaparola (Hall B1)	18:30 - 19:30	**Social Activity - Quiz Show** Metin Uca İle Passaparola (Hall B1)
SOCIAL PROGRAMME	21:30 - 24:00	**SOCIAL PROGRAMME**

SCIENTIFIC PROGRAM

5 APRIL 2016, TUESDAY

SCIENTIFIC PROGRAM

HALL B2

SESSION 12		SESSION 12
ISBT; PATIENT BLOOD MANAGEMENT / CLINICAL TRANSFUSION		**ISBT; PATIENT BLOOD MANAGEMENT / CLINICAL TRANSFUSION**
Chairs: Mahrukh Getshen (Bhutan) Gürol Emekdaş (Turkey)	08:30 - 10:00	**Chairs:** Mahrukh Getshen (Bhutan) Gürol Emekdaş (Turkey)
HB TRIGGERS AND SINGLE-UNIT TRANSFUSION Astrid Norgaard (Denmark)	08:30 - 09:00	**HB TRIGGERS AND SINGLE-UNIT TRANSFUSION** Astrid Norgaard (Denmark)
USE OF TRANSFUSION ALTERNATIVES IN ELECTIVE ORTHOPAEDIC SURGERY Cynthia So-Osman (The Netherlands)	09:00 - 09:30	**USE OF TRANSFUSION ALTERNATIVES IN ELECTIVE ORTHOPAEDIC SURGERY** Cynthia So-Osman (The Netherlands)
IMPLEMENTATION OF PBM IN THE UK Rebecca Gerrard (UK)	09:30 - 10:00	**IMPLEMENTATION OF PBM IN THE UK** Rebecca Gerrard (UK)
COFFEE BREAK mikromed	10:00 - 10:30	mikromed **COFFEE BREAK**

HALL B2 / HALL B1

SESSION 13		SESSION 14
BLOOD BANK REGULATIONS		**TTI & BLOOD SCREENING (ISBT)**
Chairs: Şadi Yenen (Turkey) RS Gupta (India) **Panelist of Discussion:** Shafiual Hasan Samuel (Bangladesh) RN Makroo (India) Nasim Sadat Husseini (Iran)		**Chairs:** Aynur Eren Topkaya (Turkey) Salih Türkoğlu (Turkey) **Panelist of Discussion:** Abdul Milza Muhsin (Maldives) Ahmad Masoud (Afghanistan) Mostafa Moghaddam (Iran)
COUNTRY MODELS Mahendra Singh Chauhan (India)	10:30 - 10:50	**STATUS OF TTI SCREENING & BLOOD SAFETY IN AATM COUNTRIES** Anil Disanayake (India)
BLOOD BANK REGULATORY FRAME WORK IN ASIAN COUNTRIES Sangeeta Pathak (India)	10:50 - 11:10	**YIELD OF NAT: DATAS & NAT ALGORITHM IN TURKEY** Levent Hayat (Turkey)
COST, PRICE & BUDGETS IN BLOOD BANKS Amit Agrawal (India)	11:10 - 11:30	**DOES TESTING KIT SENSITIVE ENOUGH TO PICK UP LOCAL VARIANT OF INFECTION MARKERS?** Ankit Mathur (India)
PANEL DISCUSSION	11:30 - 12:00	**WAY FORWARD TO BRING BLOOD SAFETY FROM TTI TRANSMISSION** Zhu Ming (China)
LUNCH	12:00 - 14:00	**LUNCH**

SCIENTIFIC PROGRAM

5 APRIL 2016, TUESDAY

SCIENTIFIC PROGRAM

HALL B2		HALL B1
SESSION 15		**SESSION 16**
TRANSFUSION REACTIONS		**TRANSFUSION PRACTICES**
Chairs: Okan Töre (Turkey) Faruk Aydın (Turkey) **Panelist of Discussion:** Saurav Gupta (India) Hemonta K Belo (Bangladesh)		**Chairs:** Ramazan Uluhan (Turkey) Ananda Gunasekara (Sri Lanka) **Panelist of Discussion:** Ahmad Masoud (Afghanistan) Zahid Hasan Ansari (Pakistan) James T. Perkins (USA)
WHAT ARE THE ADVANTAGES AND DISADVANTAGES OF UNIVERSAL LEUKOREDUCTION Berrin Uzun (Turkey)	14:00 - 14:20	**MASSIVE TRANSFUSION** Nil Güler (Turkey)
CURRENT STATUS OF BACTERIAL CONTAMINATION OF BLOOD COMPONENTS İ. Yaşar Avcı (Turkey)	14:20 - 14:40	**BLOOD TRANSFUSION PRACTICES IN PREGNANCY & NEWBORN PERIOD** Ece Gül İbrişim (Turkey)
TRIM: IMPORTANCE AND PREVENTIVE STRATEGIES S. Haldun Bal (Turkey)	14:40 - 15:00	**BLOOD BANKS WORKING WITH TRANSPLANTATION CLINICS** Nurhilal Büyükkurt (Turkey)
PANEL DISCUSSION	15:00 - 15:30	**PANEL DISCUSSION**
COFFEE BREAK mikromed	15:30 - 16:00	mikromed **COFFEE BREAK**
CLOSING CEREMONY (Hall B2)	16:00 - 17:00	**CLOSING CEREMONY** (Hall B2)
GALA DINNER	20:30 - 24:00	**GALA DINNER**

SCIENTIFIC PROGRAM

B1 ve B2 Salonlarında Simultane çeviri yapılacaktır.
There will be simultaneous translation (English - Turkish) at B1 & B2 Halls.

2 NİSAN 2016, CUMARTESİ

SALON B2

KURS PROGRAMI

16:00 - 18:00	**AÇILIŞ TÖRENİ**
18:00 - 18:30	**KAHVE ARASI** GİRGİN
18:30 - 19:15	**AÇILIŞ KONFERANSI** **KAN BANKACILIĞI'NIN İLERLEME SÜRECİNDEKİ KİLOMETRE TAŞLARI** Gamal Gabra
21:30 - 24:00	**SOSYAL PROGRAM**

KURS PROGRAMI

3 NİSAN 2016, PAZAR

SALON A1-A2

KURS PROGRAMI

09:00 - 10:00	**KURSA GİRİŞ VE ÖN DEĞERLENDİRME** **KURS BAŞKANI:** Yasemin Heper **KURS EKİBİ:** F. Yüce Ayhan, S. Haldun Bal, R. Aytaç Çetinkaya, Yasemin Heper, Eylem Karataş, L. Tufan Kumaş, Kamuran Şanlı
10:00 - 10:30	**KAHVE ARASI** GİRGİN
10:30 - 12:00	**TARİHÇE:** F. Yüce Ayhan **BAĞIŞÇI TANIMLARI, BAĞIŞÇI KAZANIM PROGRAMLARI, BAĞIŞÇI SEÇİMİ, FLEBOTOMİ, BAĞIŞÇI REAKSİYONLARI:** R. Aytaç Çetinkaya, Kamuran Şanlı
12:00 - 12:45	**UYDU SEMPOZYUMU** (Salon B2) BIO-RAD
12:45 - 14:00	**ÖĞLE YEMEĞİ**
14:00 - 15:30	**KAN BİLEŞENLERİ, HAZIRLANMASI, SAKLANMASI, TAŞINMASI, AFEREZ, TRANSFÜZYON ENDİKASYONLARI, ÖZELLİKLİ BİLEŞENLER** S. Haldun Bal, R. Aytaç Çetinkaya
15:30 - 16:00	**KAHVE ARASI**
16:00 - 17:30	**TRANSFÜZYONLA BULAŞAN ENFEKSİYONLAR:** Yasemin Heper **KAN BANKACILIĞINDA TARAMA VE DOĞRULAMA TESTLERİ, ALGORİTMALAR:** Eylem Karataş
18:00 - 19:30	**SOSYAL AKTİVİTE - AKŞAM MATİNESİ** Dikkat Kan Aranıyor (Salon A1 - A2)
21:30 - 24:00	**SOSYAL PROGRAM**

KURS PROGRAMI

4 NİSAN 2016, PAZARTESİ

KURS PROGRAMI

SALON A1-A2

09:00 - 10:00	**İMMUNOHEMATOLOJİYE GİRİŞ:** S. Haldun Bal **İMMUNOHEMATOLOJİK TESTLERİN PRENSİPLERİ:** L. Tufan Kumaş
10:00 - 10:30	**KAHVE ARASI** Ortho Clinical Diagnostics
10:30 - 12:00	**İMMUNOHEMATOLOJİK TESTLER - I** **ABO/Rh KAN GRUPLARI, FORWARD-REVERSE GRUPLAMA, UYUMSUZ OLGULARDA YAKLAŞIM:** L. Tufan Kumaş
12:00 - 12:45	**UYDU SEMPOZYUMU** (Salon B2) Roche
12:45 - 14:00	**ÖĞLE YEMEĞİ**
14:00 - 15:30	**İMMUNOHEMATOLOJİK TESTLER - II** **MİNÖR GRUPLAR, ÇAPRAZ KARŞILAŞTIRMA, ANTİGLOBULİN TESTLER,** **ÖZEL DURUMLARDA ÇÖZÜMLER:** L. Tufan Kumaş
15:30 - 16:00	**KAHVE ARASI**
16:00 - 17:30	**TRANSFÜZYON UYGULAMALARI ERİŞKİN, PEDİATRİK VE İNTRAUTERİN TRANSFÜZYON MASİF, OTOLOG TRANSFÜZYON:** Yasemin Heper, Eylem Karataş
	TRANSFÜZYON KOMPLİKASYONLARI (İMMÜN-NONİMMÜN) VE TRANSFÜZYON KOMPLİKASYONLARINA LABORATUVAR YAKLAŞIM: S. Haldun Bal, L. Tufan Kumaş
17:30 - 18:30	**SÖZLÜ BİLDİRİLER** (Salon B1-B2)
	OP-01, OP-02, OP-03, OP-04, OP-05, OP-06, OP-07, OP-08, OP-09, OP-10 (Salon B2) OP-11, OP-12, OP-13, OP-15, OP-16, OP-17, OP-18, OP-19, OP-20 (Salon B1)
18:30 - 19:30	**SOSYAL AKTİVİTE - METİN UCA İLE PASSAPAROLA** (Salon B1)
21:30 - 24:00	**SOSYAL PROGRAM**

KURS PROGRAMI

5 NİSAN 2016, SALI

KURS PROGRAMI

SALON A1-A2

09:00 - 10:00	**BİYOGÜVENLİK: Kamuran Şanlı**
10:00 - 10:30	**KAHVE ARASI**
10:30 - 12:00	**KALİTE YÖNETİMİ:** F. Yüce Ayhan, S. Haldun Bal, R. Aytaç Çetinkaya, Yasemin Heper, Eylem Karataş, L. Tufan Kumaş, Kamuran Şanlı **HEMOVİJİLANS:** F. Yüce Ayhan
12:00 - 14:00	**ÖĞLE YEMEĞİ**
14:00 - 15:30	**KAN MERKEZLERİNİN YAPISI, YÖNETİMİ ve MEVZUAT: KANUN, YÖNETMELİK VE REHBERE GÖRE YAPILANMA, PERSONEL, ALT YAPI, DONANIM, DOKÜMANTASYON, KAYIT, DENETİM, HASTANE TRANSFÜZYON KOMİTELERİ:** F. Yüce Ayhan, R. Aytaç Çetinkaya, Yasemin Heper, L. Tufan Kumaş, Kamuran Şanlı **KAPANIŞ ve DEĞERLENDİRME**
15:30 - 16:00	**KAHVE ARASI**
16:00 - 17:00	**KONGRE ve KURS'UN DEĞERLENDİRİLMESİ** (Salon B2)
20:30 - 24:00	**GALA YEMEĞİ**

KURS PROGRAMI

Kurs programının dili Türkçe'dir.

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** We could not receive this abstract from related speaker. Because of that this abstract had not been published in Abstract Book.*

MILESTONES IN THE PROGRESS JOURNEY OF BLOOD BANKING

Gamal GABRA

The history of blood banking has been a long journey of change that brought us where we are now. It also continues to point at the progress that will take place in the future.

This review is not intended to indulge in scientific details, but rather an attempt to trace important corner stones erected over the years into a solid build up of knowledge and information that we are witnessing in modern transfusion practice.

The early "Blood bank" started as a side room next to the ward in clinical care facilities, where physicians collected blood, from individually recruited volunteers to support patients requiring blood transfusion. Panels or lists of blood donors were established early last century in several countries when the need for blood was established during the 1st world war.

Changing skills and demography of transfusion practitioners

Transfusion medicine practitioners have, over one generation, gone through considerable changes on many fronts and at several levels. New sophisticated "transfusion practitioners", "transfusion safety officers" and "nurse practitioners" have now replaced the "Blood Transfusion Orderly" of the Second World War.

Through training and quality management, a new breed of specialists in transfusion practice is gradually replacing many of the functions of the early blood bank physician. Nurses are now capable to take responsibilities for blood collection and donor care. They also participate in hospital clinical transfusion practice in a variety of ways including prescribing blood and components, monitoring clinical bedside transfusion and reporting adverse effects and reactions.

As a result of the introduction and development of wide ranging automated laboratory procedures the complement of laboratory scientific staffing has been reduced substantially. In parallel with centralisation of component production a large number of drivers on blood transport vans have become indispensible for distribution between blood establishment, hospital blood banks and regional stock holding units.

Transfusion infection risks

The use of PCR amplification and sequencing techniques have maximised the effectiveness of screening and testing procedures. Introduction of very sensitive solid phase systems in screening tests has reduced transfusion-transmitted infections and made transfusion much safer than ten years back.

Automated identification of specimens, products, staff, donors, patients and procedures improved standardisation

and reliable documentation of most operational laboratory activities and clinical transfusion practice.

Robotic technology has been adapted to blood transfusion laboratory procedures and is now widely used for delivery of samples and reagents for immunohaematology testing of blood donations for transfusion transmissible infections.

The newer automated machines have proved to be robust and require less maintenance than the older models. Long gone are the hand held pipettes and the extensive bench space needed in high output blood centres.

Epidemiological monitoring, research and horizon scanning for potential risk of transfusion transmissible infections continues as a basic strategy to maintain the safety of the blood supply worldwide. The spreading Zika epidemic is currently monitored very closely to ensure that it does not affect the safety of transfusion.

Blood collection and processing

The use of glass bottles for blood collection and storage was associated with several complications including clotting, haemolysis, air embolism, microbial contamination and pyrogenic febrile reactions. The development of the plastic blood bag that started in the forties is a good example for the contribution of industry to the improvement and safety of transfusion practice. An important clinical trial was conducted during the Korean War early in 1950 and blood bags were gradually introduced for use. FDA approval was obtained in 1963.

Development of cold chain storage equipment with wide range of temperatures was successfully introduced for quality assured use in blood centres. The use of glycerol and other cryo-protectants allowed reaching below zero levels for freezing and recovery of products including plasma, red cells, platelets and stem cells.

Automated “intelligent” whole blood processing systems simplified many labour intensive manual procedures and achieved reliable standards for component preparations. The use of new apheresis machines allowed selective multi-component collection from individual donors. An approach that created options for optimal use of donor resources to maintain effective use of bloodstocks.

The early methods of pasteurisation of plasma for viral inactivation have over the years been superseded by solvent detergent treatment and heat treatment of plasma derivatives. Filtration has also been successfully introduced for viral reduction of infective agents including Nano filtration for prions that are responsible for vCJD.

Riboflavin and ultraviolet irradiation are increasingly used for viral inactivation of blood and blood products. This process disrupts the DNA structures in white cells and reduces the infectivity of viral and parasitic agents in blood components.

A recent controlled trial was conducted in Ghana and reported in March 2016, using Riboflavin treated blood units. It showed reduced post transfusion malarial transmission compared to using untreated blood. This may represent excellent news for transfusion Transmitted Malaria (TTM) in many parts of the world.

	Treated		Untreated	
Number of patients	28		37	
TTM	3	10.7 %	13	31.5 %

Quality and governance

The extended clinical and manufacturing role of blood services forced them to become accountable for continued improvement of their operational standards. Most blood transfusion facilities adopted the principles of clinical governance by creating an environment for good laboratory practice in testing and processing of blood and clinical haemotherapy.

The role of computers to improve blood safety and traceability has been substantial. The use of electronic control points at critical steps in the process (e.g.: release of final product; bedside verification of patient identification), can be much enhanced.

Bar coding and the widely used ISBT128 has facilitated consistent standardised identification, storage, exchange and retrieval of valuable data for blood transfusion operational activities. In addition a wide range of information can be made available to support effective use of blood and more efficient operational management of blood transfusion services in general.

Cellular therapy and other medical products of human origin

Preparation of red cells and platelets can now be considered routine activities of the past. The new era of stem cell transplantation started with early reports from the USA and Japan of transfusion related graft versus host disease. This clinical finding was tamed and developed further into controlled valuable therapeutic tools in stem cell transplantation for life saving treatment of many serious conditions.

Bone marrow harvesting and stem cell separation by apheresis from circulation or by collection from cord blood constitute an important main stay for modern management of haematological malignancies, genetic disorders and other life threatening conditions.

The blood banking skills, accumulated over the years, constitute the scientific and operational foundation for establishing a new array of medical products of human origin (MPHO) and making use during this future technological and scientific journey of the high manufacturing standards and the ethical values that were elaborated and developed during the previous phase of blood banking.

All these developments could not have been achieved without the joint effort of industry and the vision of the men and women in blood banks and blood centres lately known in Europe as “Blood Establishments”. They worked together in unison to improve the quality of therapeutic care for patients requiring blood, its components, derivatives and the recently developed stem cell products, tissues and organs.

Role of professional groups

International transfusion medicine groups are able to see and understand the globally different cultures and needs. By working together they provided the basis for cooperation, transfer of best practice and experience. This was evident as a professional necessity at the international level by the two main international professional groups headed by the AABB and the ISBT. They were established in 1947 and 1935 respectively.

International professional associations in general can enhance good practice and standards at regional and national levels. One of the major contributions of these international groups was to establish the humanitarian and

ethical standards of blood donation and blood transfusion. These efforts were pioneered earlier by the Red Cross and expressed in the resolution of the 17th international Red Cross Conference, in 1948 in Stockholm recommending that:

1. Blood should be donated freely and supplied free of charge
2. Red Cross Societies should urge the organisation of national transfusion services
3. Red Cross Societies should cooperate with their respective governments
4. There should be cooperation with ISBT, particularly regarding standardisation of methods and equipment

The ISBT Code of Ethics formulated in 1980 has been a landmark internationally respected document. It was revised later and adopted by the ISBT general assembly in July 12th 2000. It was later supported by a detailed WHO technical declaration in November 2001.

Regional professional groups

Regional groups are Informal professionally lead interventions that can, in the medium term, reduce diversity and drive improvement through sharing best practice and influencing national policies and decision-making. They are primarily bottom-up, grass root interventions, driven by professionals to assure quality and safety in transfusion practice.

These interventions in return provide the international well-established organisations with opportunities to have a more active and coordinated regional role to help establish safer transfusion services and promote good transfusion practices at regional levels, at a stage where it is difficult to mandate a single approach to quality of transfusion practice, as what has happened in countries of the European Union.

They provide regional opportunities for continued education by conducting educational courses for those who are not able or are intimidated to attend and participate in international activities and meetings. They also help to overcome regional isolation of transfusion medicine practitioners. The European School of Transfusion Medicine (ESTM) is one example that has already proved to be of value to assist transfusion medicine workers in East and Central Europe.

Members of three regional groups are participating in this meeting. The Arab Transfusion Medicine Forum (ATMF), the Anatolian Blood Days (ABD) and the Asian Association of Transfusion Medicine (AATM). It is the coming together of transfusion medicine professionals from many countries, hosted by the Blood Banking and Transfusion Society of Turkey (BBTST).

Our meeting is an example of international cooperation, at its best, that will no doubt encourage continued advance on the journey that started years ago on the road of development and progress. We can now, together, start to explore newer future horizons with a wider range of Medical Products of Human Origin (MPHO).

CURRENT STATUS IN BHUTAN

Mahrukh GETSHEN

Introduction:

Bhutan is one of the youngest democratic countries in the world. It is situated in the Eastern Himalayas with 60% of the country under forest cover and mountainous terrain which poses challenges to road accessibility and delivery of essential services like the health. It is divided into 3 regions and 20 districts for governance purpose. Health and education services are provided free of cost by the Royal Government of Bhutan (RGoB) to all the citizens and residents in the country.

The health system comprises of basic health units (BHUs), district hospitals, 2 regional referral hospitals and one national JDW, Referral Hospital in the capital city.

Vital statistics:

Capital: Thimphu
Total area: 38,394 kms
Total population: 6, 91,141 (2005 national census)
Total hospital beds: 1078

Blood Transfusion Service (BTS) in Bhutan comprises of:

• Blood Safety Program(BSP) is one of the listed programs in the Health Care and Diagnostic Division, Department of the Medical Services, MoH. It is run by a Program Officer and its functions are strategic planning and work plan implementation; co-ordination with other health related programs and NBTS; project management; monitoring and data management.

• National Blood Transfusion Service: a total of 27 government owned hospital based blood centers exist. The National Blood Center (NBC) is headed by a transfusion specialist, and run by diploma and degree laboratory technologists and general MLTs. The rest of centers are operated by laboratory technicians as a unit of the clinical laboratory. Routine day to day activities are under the respective hospital administration to which blood center is a part of. There are no private or NGO run blood centers.

• Though not part of the BTS, the National Public Health Reference laboratory housed at the new Royal Center for Disease Control in the capital works in collaboration with BTS to provide with confirmatory testing of Transfusion Transmissible Infections (TTIs), conducting National External Quality Assessment Schemes in TTIs and evaluation of test kits for screening of blood for infectious disease markers.

Major changes in BTS observed since past 5 years:

1. Management:

• Blood Safety program has become an active program in the MoH.

• A full time focal point has been appointed as the Program Officer to manage and monitor program related activities of BTS in the country.

• This has lead to improved efficiency and timely implementation of the program activities; improved coordination between NBTS and Program.

• There has been marked improvement in the overall management of the program with less responsibility on the part of Head of National Blood Centre to look into managerial part of the program and provide only technical expertise and guidance to the Program.

2. Blood donations:

• The donor profile has markedly changed in last 5 years. The number of blood units collected from voluntary donors has increased in last five years. Compared to 2010 where in VNRBD was 56%, in 2014it has increased to 71% VNRBD with less reliance on family /replacement donations.

• This has been possible due to the blood centers conducting mobile donation camps at regular intervals.

• The BSP and blood centers have been conducting various educational, motivational and advocacy programs. As a result, many organizations-government and non-government have come forward to hold blood drives. Many corporates have taken up blood donation as one of their Corporate Social Responsibilities. The highlight is the sponsoring of the WBDD celebration by the Bank of Bhutan for the last three years. High schools and colleges have been holding regular drives as part of their social activities. Religious monasteries have also been engaged in such activities.

• The number of regular and repeat donors has increased especially at the NBC and 2 RRBCs with better retention strategies.

3. Improvement in test methods:

• More and more blood centers are adhering to the national standards in immunohematolgy tests. More number of centres has shifted to tube method from earlier slide method for ABO and Rh blood grouping. From the reports of NEQAS in BGS in 2014, 80% of the centers were found to be carrying out by test tube method.

• Crossmatching is done by test tube method in 100 % blood centers.

• In the last 2 years, 2 regional blood centers have also started antibody detection test though antibody identification and red cell phenotyping is carried out by NBC only.

• 2 regional blood centers have also started screening infectious markers using ELISA assays with increase in throughput.

4. Blood component and clinical use of blood:

• The blood component preparation has begun in 2 regional centers and component therapy has been encouraged.

• Increase in Random Donor Platelets preparation especially at NBC by almost 40 % due to increased requirement and consumption. JDWNRH has observed a changing pattern of diseases requiring blood transfusions to chronic, non communicable ones like cancers, chronic kidney and liver diseases, aplastic anemia etc. Also the

other component preparation(PRC) has risen by 20 to 30%

National data 2014:

- Total blood collection: 9375 units
- HIV prevalence in donated units =0.07%
- HBV prevalence in donated units =0.76%
- HCV prevalence in donated units =0.29%
- Syphilis prevalence in donated units=0.9%
- Total number of blood and components transfused=10,067
- Number of Whole Blood units consumed: 3660 =36%
- Number of PRC units consumed: 4936 =49%
- Number random donor PC consumed: 854 =9%
- Number of FFP units consumed: 617 =6%

Update on National blood Center,Thimphu
Data of 2014 versus 2015

Data on	2014	2015
Total units of whole blood collected	3725	3852
VNRBD	3478(93%)	3627 (94%)
WB units collected from Replacement donors	247 (7%)	225 (6%)
HIV prevalence in donated units	0.1%	0.05%
HBV prevalence in donated units	0.53%	0. 67%
HCV prevalence in donated units	0.37%	0.18%
Syphilis prevalence in donated units	0.67%	0.46%
Total number of blood and components transfused	4754	5193
Number of Whole Blood units consumed	192=4%	106 =3%
Number of PRC units consumed:	3489=73%	3280 =63%
Number random donor PC consumed	671=14%	1067 =20%
Number of FFP units consumed:	402=8%	740=14%
Total number of adverse blood transfusion events and reactions	35	35

NBC's collaborators:

- Pacific Paramedical Training Center, New Zealand
- National Reference Laboratory , Australia
- National Standards Bureau ,Thimphu
- TTK Rotary Blood bank, India
- Regional Testing Center, Medanta-The Medicity, India
- National Institute of Biologicals, India

Significant Events at NBC in the year 2015

1. A total of 30(thirty) blood donation camps conducted in and around Thimphu in 2015.

2. World Blood donor Day observed on 14 June 2015 with the Theme "Thank You for Saving my Life" in partnership with MoH and Bank Of Bhutan.

3. Few important blood donation camps conducted by various organizations in 2015 are:

• Visit of the Lions Club International President to the NBB and blood donation camp organized by Lions Club members of Druk Thimphu on 24th August.

• Royal Bhutan Police celebrating their Raising Day by donating blood on29th September.

• Trongsa Penlop Thuendrel Club constituted by the Alumni of Trongsa Poenlop Scholarship donated blood on 4th June to commemorate Her Majesty's Birthday.

• The women of the Kussung Women Association (RBG) Thimphu commemorated the Royal Wedding Anniversary by donating blood on 13th October.

• Blood donation camp at UN House to commemorate the UN Day on 24th October

• Bhutan Australia Alumni Association members donated blood on 31st October.

4. Visit by an ISO expert Mr Hans Peter fielded in by Bhutan Standards Bureau to conduct an assessment of laboratory and blood bank for future accreditation to ISO 15189 in April 2015.

5. Visit of the team of two senior officials in December 2015 from National Institute of Biological Noida and AIIMS Delhi, India to discuss with NBB & MoH to initiate the Hemo-Vigilance Program for Bhutan in collaboration with Hemo-Vigilance Program of India.

6. A hands on training on Column Agglutination technology conducted by Ortho Clinical Diagnostics (OCD) team in mid December.

7. Ongoing training of interns, PG students and laboratory technologists and technicians

National Achievements in 2014:

• VNRBD improved from 63% in 2013 to 71% at country level and from 90% in 2013 to 94% at NBC in 2014.

• NBC & NRL, Bhutan successfully conducted NEQAS in BGS and TTIs respectively with 95% participation of blood centers. Successful participation of NBC in IEQAS with PPTC New Zealand and NRL, Australia

• Blood Transfusion Advisory Committee constituted

• Blood and Blood Product Regulation of Bhutan endorsed by Bhutan's Medicines Board.

• Bhutan selected for WHO/OFID project Phase II (2014-2016)

• NBC staff Ms Galem underwent a three weeks fellowship training in blood banking at TTK Rotary Blood Bank Bangalore, India sponsored by Asian Association of Transfusion Medicine.

• The mobile app "Dial 4 Blood" developed in collaboration with NBC and an IT team was declared the winner app during an open competition of app development organized by G2 C. Its function is for 'Crowd Sourcing blood' in times of urgent blood needs of the blood banks in the country.
Currently its being pilot tested at NBC.

Activities supported by AATM

3 NBC staff underwent 2 to 4 weeks AATM fellowship in QMS at TTK Blood Center, Bangalore, India in last 3 years.

1 of the 3 staff trained has been posted to the regional blood center and has been applying the knowledge and skills learnt during the fellowship program.

The other 2 are at NBC involved in documentation and quality control activities of the QAP at NBC. They have shown higher degree of confidence in their day to day work and shouldering additional responsibilities in QA activities.

Future Plans:

1. Review and revise the national Blood Policy, 2007
2. Finalize the national strategic plan for BTS.
3. Create a website for BTS
4. National blood system strengthening with effective quality management, haemovigilance and robust data management systems
5. Upscale advocacy and general awareness activities to promote 100% VNRBD by 2020.
6. Upgrade Immunohematology technology to Column Agglutination technology from tube method at NBC.
7. Include participation of 2 regional blood centers in IEQAS.
8. Continue NEQAS in BGS and TTIs.
9. Enforce blood regulations by 2016.

Challenges:

• Increasing blood needs and demands for blood components at bigger centers
• Manual documentation of processes and procedures which time consuming, leading to errors and inefficient for proper data management
• Need for a collaboration with a regional referral center for seeking advice for problematic immunohematologic cases.

CURRENT STATUS IN IRAN

Ali Akbar POURFATHOLLAH

Introduction:

Iranian Blood Transfusion Organization (IBTO) is a centrally coordinated and managed Blood Transfusion Service (BTS), which 100% of its blood establishments are community-based.

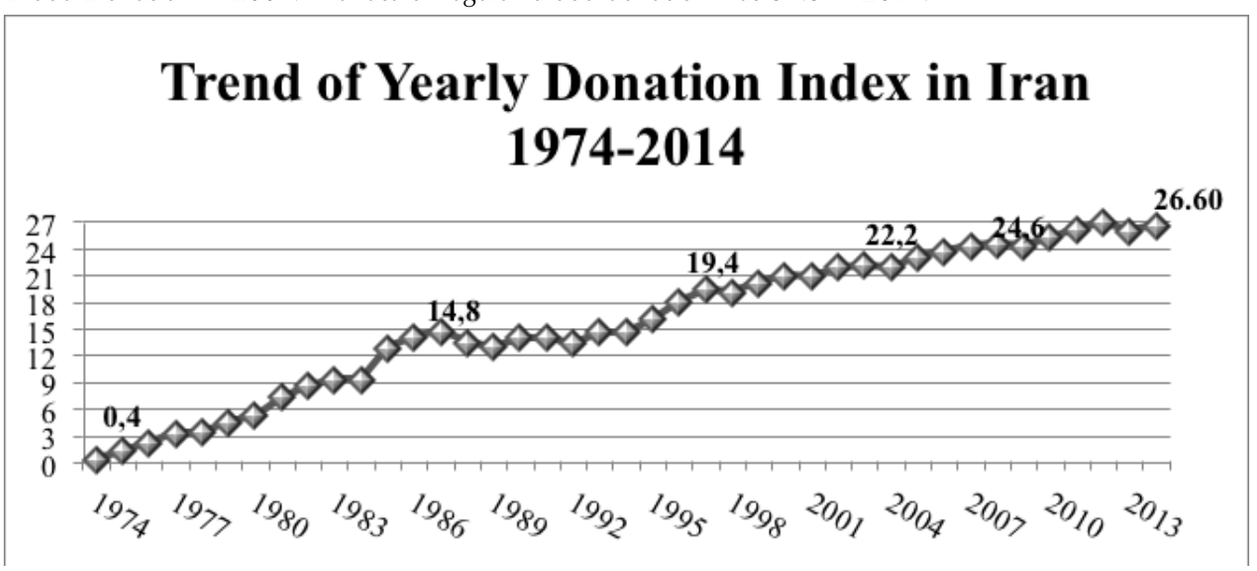
IBTO is managed administratively by Iranian government. Till 2015, all blood products were distributed free of charge to all private and public hospitals and IBTO was fully supported by the government. In 2015, based on the efforts made by IBTO through optimization of blood usage, most of the blood components incorporated into pricing framework. According to the decision made by Iranian government, insures have to reimburse the costs related to the processing. As a result, it is planned to obtain 30% of the costs of BTS 's operation from cost recovery system.

In 2014, 2,071,031 of blood donations were collected in the whole country. Given the fact that Iran's total population was 78,143,644 million, the rate of blood donation per 1000 population was 26.6 in 2014.

Totally, there are 693 hospital blood banks in Iran. Currently, blood donation sites are 207 that 116 of them are blood collection centres, 31 are blood collection and preparation centres and 60 are main blood centres . All blood donation sites are governmental.

These fixed blood centers collect 80% of blood, and the rest is collected by the mobile teams in work places, educational institutes and cities which are not served by fixed sites. Only one blood center located in the headquarters performs stem cell collection and therapeutic procedures.

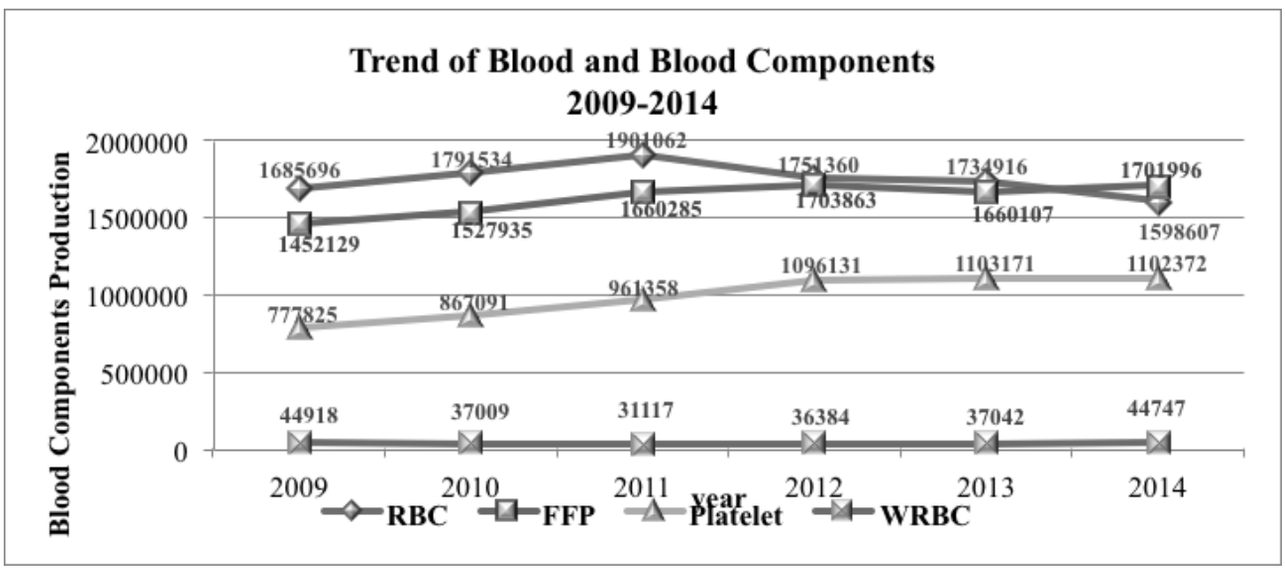
Iran is the first country in Eastern Mediterranean Region (EMR) which reached 100% Voluntary Non-remunerated Blood Donation in 2007. The rate of regular blood donation was 51.5 in 2014.



Blood Components

More than 98% of blood units are separated into components including RBC, FFP, Cryoppt, CPP, Platelet and WRBC. Totally, 91 blood centers prepare blood components in Iran. From 2009 to 2014, there had been 17 % increase in FFP production and 41% increase in platelet production.

Iran is self-sufficient in cellular blood components. In addition, 100% of albumin, 100% of intravenous immune globulin (IVIG), 100% of Factor IX (FIX) and 15% of Factor (FVIII) demands are met through voluntary non-remunerated blood donation.



Out of 693 blood banks in Iran, 161 (23%) ,471 (67%) and 61 (10%) perform blood grouping by slides, column agglutination and test tube respectively. All blood banks do cross match by test tubes.

Totally 65 blood banks in Iran perform anti-body screening tests. (of which 40 centers are located in Tehran and 25 out of Tehran).

Plasma Fractionation:

In 2004, Iran initiated a contract fractionation programme with 40,000 liters of recovered plasma. This figure has been increased up to 200.000 liters in 2015. In addition, in eight private centers which are under the supervision of Iranian Blood Transfusion Organization (IBTO) and Iranian Food and Drug Administration, other 200,000 liters of plasmapheresis is produced to be used in contract fractionation programme. Totally, the volume of plasma sent for fractionation is 400,000 liters now.

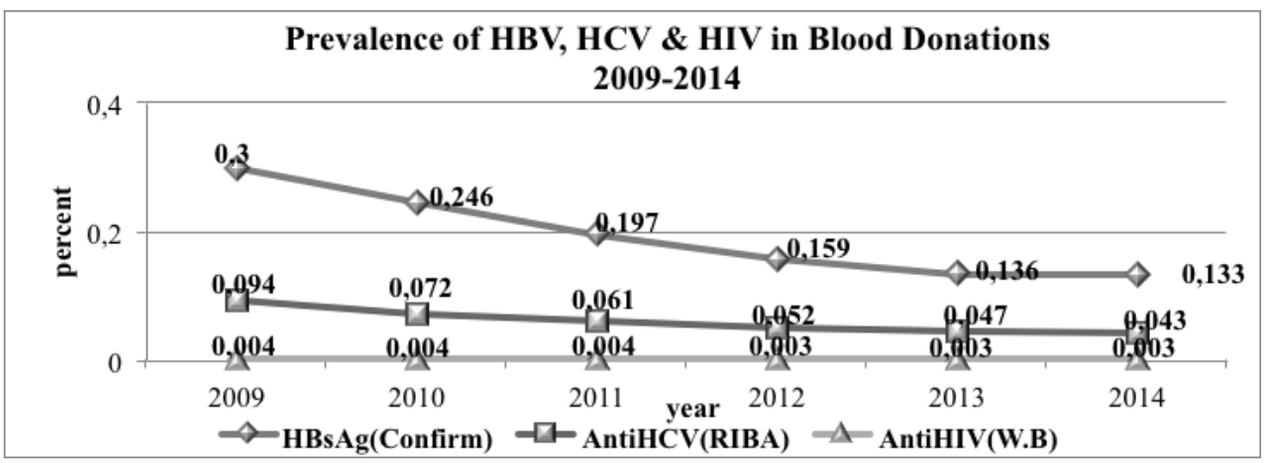
According to WHO report, in 2011, Iran managed to save more than 11 million US$ by meeting the 100% of IVIG , 100% of FIX , 40% of Albumin and 15% of FVIII market's share through contract fractionation. Considering that 100% of Albumin now is being produced through contract fractionation, the rate of direct saving is estimated to has reached to 17 million US$.

Blood Safety

In Iran, 100% of donated blood is screened for HIV, HCV, HBV and Syphilis. However, only 20% of blood is screened for HTLV I/II. Screening of donated blood for Hepatitis B surface antigen (HBs-Ag) has become mandatory since the establishment of IBTO in 1974. Screening of blood units for HIV and HCV has started since 1989 and 1996, respectively.

The prevalence rate of HBV and HCV and HIV in blood donors was 0.133 %, 0.043% and 0.003% in 2014 respectively. The prevalence rate of Syphilis and HTLV I/II was 0.0019% and 0.067 in 2013. There had been 0.16%, 0.02% and 0.001% reduction in the prevalence rate of HBV, HCV and HIV from 2009 to 2014.

The prevalence of HIV and HCV among blood donors is almost 10 times lower than general population. (0·003 vs 0·03% and 0·043 vs 0·5%, respectively). This indicates the effectiveness of safety measures applied in IBTO.



In Iran, HIV, HCV , HBV and HTLV I/II tests are done by ELISA. IBTO uses rapid tests for Syphilis. NAT and pathogen inactivation are not currently used in Iran. In previous years, we have done NAT test for selective donors in pilot studies and its planned to run NAT tests in near future.

Proficiency tests (EQAS) are done in 34 blood centers in Iran. Totally, 91 blood centers are accredited by ISO.

Education:

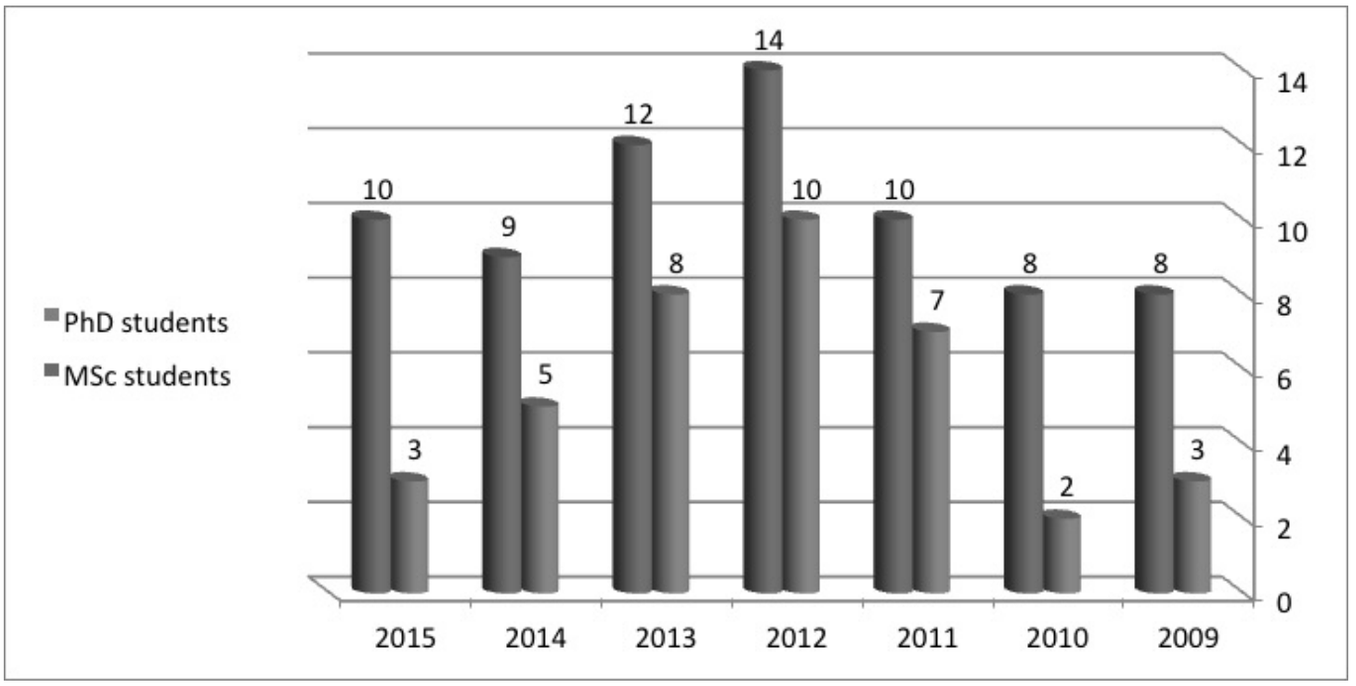
One of the most important goals that IBTO pursues through its education and training programs is to make all related staff informed and trained on the most recent specialized scientific activities and developments in the fields of transfusion medicine and transfusion science.

IBTO regularly conducts education programmers for clinicians on rational use of blood. In 2014, in 167 hospitals that under the heamovigilance system, 9127 nurses (74%), 2001 physicians(50%) and 752 technicians of blood banks (80%) were trained on rational clinical use of blood.

IBTO also conducts refreshing course for doctors who deal with blood donors on annual basis.

In addition, High Institute for Research and Education on Transfusion Medicine educates students at MSc and PhD level in the discipline of Hematology and Blood Banking.

The number of admitted MSc and PhD students in the discipline of Hematology and Blood Banking



Blood usage:

Since 2014, IBTO started to collect the number of blood units used in 612 hospitals which are under haemovigilance system. From 2014 to 2015, there has been 40 % increase in the usage of RBC, 20% decrease in Plasma products and 28 % increase in platelet usage.

Man- Power Development

In last five years, there has been considerable development in man-power in the country including:

1) Haemovigilance system

Iranian Blood transfusion Organization has implemented a Mandatory Transfusion Transmitted Injuries Surveillance System (TTISS) to monitor adverse transfusion events (ATEs) since 2009. Till 2016, the system has been established in 612 hospitals (about 73 %of Iranian hospitals) and more than 6332 adverse reactions have been reported. The establishment of this system in all Iranian hospitals is on the agenda for the next coming years.

2) Institute for Research and Education on Transfusion Medicine (IRETM)

IRETM was established in 2008. The most important goals of IRETM that pursues through its research and education activities are to make all the staff involved in technical affairs in all blood centres across the country informed on the most recent improvements and scientific developments in the fields of transfusion medicine and transfusion sciences. IRETM benefits the contribution of 37 full time faculty members formed within scientific groups of Immunohematology, Hematology, Immunology, Microbiology, Biochemistry, Medical Biotechnology, and Pathology. So far, more than 400 research projects have been approved and conducted by Research Department of IRETM; a wide range of faculty members and IBTO experts and staff have been actively participating in the projects. Add to it, the publication of 35 specialty books and publication of about 500 articles in scientific journals (ISI- and PubMed-indexed).

3) Centre for Innovation

The Centre for Innovation of IBTO was established on 23 February 2015 . The Centre is a complete miniature of a “transfusion chain” from vein to vein, with all the standard operating procedures (SOPs) and equipment used by IBTO and hospitals. The Centre is the unique of its kind in the Middle East and Eastern Mediterranean region. The main goal of the center is to be used as a training centre for both national and international applicants.

4) Iranian National Cord Blood Bank and Iranian Stem Cell Donor Registry

Iranian National Cord Blood Bank was established in May 2010. It is a public blood bank with the mission of providing stem cells for patients. From November 2010 to 2012, UCBs were collected from 5 hospitals of Tehran. All the collection, processing, testing, cryopreservation and storage procedures were done according to standard operation procedures.

Iranian Stem Cell Donor Registry is a governmental organization that operates under the supervision of IBTO . It is established in 2009 to help patients in need of haematopoietic stem cell Transplant. Currently 3600 blood donors are registered in the center.

CURRENT STATUS IN INDIA

Nidhi MEHTA

INTRODUCTION

The Republic of India is the seventh largest country by area, geographically located in South Asia, and the second-most populated democratic country with over 1.2 billion people. Blood services were disorganized in earlier days where the hospitals used to draw blood from donors and would issue the products tested/untested as per need of the hour.

The 1st Blood Bank was established in March, 1942 at the All India Institute of Hygiene & Public Health, Calcutta. In those days Blood was collected in glass bottles which were sterilized by autoclaving and ACD was used as preservative and blood was stored for 3 weeks. The current scenario paints a picture which reflects the growth in Transfusion Medicine. The Transfusion Medicine can be divided into hospital based and community-oriented, standalone systems. There are a total of 2760 blood banks in India, out of which 69% are Hospital based centres and 31% are community-oriented stand-alone blood banks. Out of the total blood banks, 42% is under government control, 18.4% under private-setups, 12% are nonprofit organizations, and 1.4% under Red Cross.

The financial support has also changed with the change in administrative control. While 50% of BTS operation is government supported, 32% of the operation is a shared responsibility of government and the private organizations and 18% have reported to be on cost recovery basis. Regional Blood Transfusion Centres have been established in different states of India which are supplying to 6-8 Blood storage centres. 1200 Blood Banks prepares components. 680 – 700 perform apheresis and 25-30 performs stem cell collection & therapeutic procedures.

BLOOD DONATION

Social workers in various sectors maintain a list of willing prospective blood donors prior to the individual setup of Blood banks. Pioneers of the field contributed largely in developing the voluntary blood services of our country, which started with the organization of first National Seminar & Workshop, on Blood Donor Motivation held at Calcutta in January 1985 with the participation of blood bankers and donor motivators from all over the country, along with a few experts from abroad. The first National Guidebook on Blood Donor Motivation saw the light of the day in June 1990.

Currently -10 million units of blood is collected annually. Voluntary blood donation (VBD), including family blood donors, has reached to 84 % in 2013-14 from baseline of 54.4% while replacement donors constitute 16% of the total number. 40-45%% of the collected blood comes from various blood drives that are organized by various corporate setups and NGOs every year.

Currently, a growing need is for platelets and this change is reflected in increasing number in platelet donation.

BLOOD BAG MANUFACTURE

Partnering with Sree Chitra Tirunal Institute for Medical Sciences and Technology (known then as the Chitra Medical Centre), Penpol started production in its factory in Trivandrum, Kerala, on 26th March 1987, with TTK Pharma as its sole sales agent. In 1989, the company achieved some significant milestones like sending out its first export shipment, and setting up its R&D division. Currently there are multiple indigenous manufactures of Blood bags like J Mitra. HLL etc.

INFECTIOUS DISEASE TESTING

ELISA machines and HIV test kits were supplied to 138 blood banks throughout the country since HIV test has been made mandatory in 1988. The prevalence of Transfusion Transmitted Infections (TTIs) has been estimated as follows: HIV - **0.3**%; HBV - **1.1**%; HCV - **0.4**%; Syphilis - **0.4**%.

Currently blood banks use Chromatographic strips, ELISA (différent generations) and Chemiluminiscence for TTI testing. Only 4% Blood Banks are reported to use Nucleic Acid Technology as a testing protocol.

IMMUNOHAEMATOLOGY

The Blood Group Reference Centre (BGRC) was started in 1957 due to active interest shown by Indian Council of Medical Research (ICMR) in the field of blood banking. The functions entrusted to BGRC were few but of national importance.

- To train the people in methodology of blood grouping and blood banking.
- To prepare and supply standard blood grouping reagents.
- To work as a reference centre for the unsolved problems of cross matching.
- To prepare and maintain a list of rare bloods and conduct research in this unknown field in the country at that time.

On 5th February 2008, ICMR decided to give the Institute a national status and renamed it as "National Institute of Immunohaematology".

The rarest blood group in India is Bombay phenoyype which was discovered in 1952 amongst three unrelated individuals in Mumbai by Bhende *et al.*, an important event in the field of immune-hematology which changed the scope of Blood Banking.

All Blood Banks in India are currently capable of performing blood grouping, out of which 40-50% use the test tube method while 10-20% are capable of performing Column Agglutination. <5% of the blood banks are capable of RBC antibody detection whereas <1% are capable to identify the detected antibodies.

ROLE OF GOVERNMENT AGENCY

National AIDS Committee was constituted in the Ministry of Health and Family Welfare, in 1986, following the detection of the first AIDS case in the country.

In 1992 India's first National AIDS Control Programme (1992-1999) was launched, and National AIDS Control Organisation (NACO) was constituted to implement the programme.

1986-1992 (DGHS) Till 1992, the bulk of funds for AIDS-related projects were used:

* Improving blood testing facilities in blood banks
* 62 Surveillance facilities were set up.
* 154 Zonal Blood Testing Centres (ZBTC) were set up.

Many government agencies in field of Blood transfusion in India such as FDA, NACO, and NATIONAL BLOOD TRANSFUSION COUNCIL are working together and their roles are complimentary in order to improve the quality of Blood Transfusion Services. .

LICENSING OF BLOOD BANKS

On public interest litigation, the Supreme Court delivered a historic judgement on January 4, 1996.

1. Establish National Blood Transfusion Council – 23rd May 1996
2. Banning of Professional Blood Donors – 1st January 1998
3. Compulsory Licensing of Blood Banks
4. Framing of National Blood Policy – April 2002

World Health Organisation directed that replacement blood donor system be phased out and abolished by 2005. Action plan for Blood safety was published in 2003

National Blood policy came in force in 2002 with following objectives

1. To reiterate firmly the Govt. commitment to provide safe and adequate quantity of blood, blood components and blood products.
2. To make available adequate resources to develop and reorganise the blood transfusion services in the entire country.
3. To make latest technology available for operating the blood transfusion services and ensure its functioning in an updated manner.
4. To launch extensive awareness programmes for donor information, education, motivation, recruitment and retention in order to ensure adequate availability of safe blood.
5. To encourage appropriate clinical use of blood and blood products.
6. To strengthen the manpower through human resource development.
7. To encourage Research & Development in the field of Transfusion Medicine and related technology. 8. To take adequate regulatory and legislative steps for monitoring and evaluation of blood transfusion services and to take steps to eliminate profiteering in blood banks.

EDUCATION AND TRAINING

In the early years Blood Bank meetings were clubbed with Association of Physicians of India which is a professional body of consultant physicians formed in 1944 mainly to provide a common forum to the Physicians of India to meet and to share experience and research observations in the field of Medicine. It's members are physicians with postgraduate qualifications in different specialties. ISHBT was then constituted to have independent meetings for Blood Transfusion and Hematology.

ISBTI is a Non Profit Voluntary Organization operating at National Level. Registered under the Societies Registration Act XXI of 1860 by the Registrar of the Societies, Chandigarh on December 28, 1973, it functions as a

National body for blood transfusion chapter for scientific advancement and research including up gradation & maintenance of safe blood transfusion services in the country.

ISTM the Indian Society of Transfusion Medicine was constituted in 2011 which serves as a platform for scientific discussions, exchanges, deliberations, exchange of ideas, teaching and raining with regards to Transfusion Medicine pertaining to Indian context.

Looking at the boom of growth in Indian Blood Banking, need for fresh eyes and leadership has become prominent. For this reason alone, 17 centers have been identified across the country as training centers to impart training on all aspects of Blood Transfusion Services involving Blood Bank Medical Officers, Technicians, Counselors, Nurses, Clinicians, Donor Motivators and Programme Officers of SACS. The training programme will aim to strengthen the inter- and intra-regional collaboration between NACO and its Collaborating Centers, national Blood transfusion services, education and training instiutions and NGOSs in order to support and strengthen the national capacity in education. Courses in Transfusion Medicine have started in various institutes:

Diploma in Immuno-Haematology and Blood Transfusion	1 centre	5 seats
MD-Transfusion Medicine	8 centres-	12
MD - Immuno Haematology & Blood Transfusion	27 centres	54 seats

HEMOVIGILANCE PROGRAMME IN INDIA

Launched on 10th December 2012 in 90 medical colleges, it is a centralized programme initiated to monitor transfusion reactions and create awareness amongst health care professionals. Currently 279 centres, located in blood banks, medical colleges/institutions, govt./ private hospitals are enrolled under HvPI and as of yet, 3394 Adverse Transfusion Reaction Reports have been reported. Haemovigilance Programme of India is one of the Mandate' s of NIB as per its bye-laws 3.4.1 as approved by the Governing Body of the Institute chaired by Secretary (Health & F.W.)/ Chairman, Governing Body of NIB.

NATIONAL DONOR VIGILANCE PROGRAMME

Launched as a national level initiative at Science city, Kolkata on World Blood Donor Day – 14th June 2015 with the aim to improve donor safety and satisfaction through monitoring, analysing and researching adverse events Provide evidence based support for improvement in the Blood Donation Process in order to increase donation frequency while reducing the number of adverse events.

NEWER TECHNOLOGIES

Blood Irradiation

Though irradiation of blood and cellular blood products is necessary for centres undertaking treatment of cancer patients and bone marrow transplantations, less than ten per cent of healthcare institutions in India are having blood irradiators. According to international standard for blood banking and transfusion services, blood and blood products must be irradiated. However, the National Blood Policy does not mention about blood irradiation. Many healthcare institutions cannot afford to install blood irradiator because they don't have an economically feasible project to install it. Proper planning of manpower, resources and logistics are required to install a blood irradiator.

NAT

NAT testing has been started in few centers in India, but it is not a mandatory screening test for TTIs as per Drug and Cosmetics Act, 1940 and the rules therein. Major barriers in implementing routine NAT testing in India is its high cost and lack of technical expertise in most of the blood centers.

Pathogen Inactivation

These PIT imply a proactive, more generalized approach against multiple new and (re-)emerging pathogens, which perpetually challenge the safety of the blood supply and will become an serious alternative to a repetitive implementation of new screening tests.

Photopheresis

Extracorporeal photopheresis is one of several secondary therapies which have shown promise in the clinical setting. While the procedure itself has been around for over 20 years, our understanding of the mechanisms from which therapeutic benefits are seen, and the population they are seen in, remains limited. ECP has reached our country and in 2 corporate hospitals are in process of standardization and validation.

ACCREDITATION

Accreditations have proven to be a great source in Quality Check. There are 66 Blood Banks in India which has been recognized and accreditated by NABH Accreditation Program for blood Banks.

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CURRENT STATUS IN MONGOLIA

Namjil ERDENEBAYAR

Mongolia located in the heart of Central Asia between Russian Federation and the Republic of China. 1,564,100 sqr km, 19th and the most sparsely populated independent largest country in the world and 3,027,582 people with the density of 1.9 people/sqr km. The average altitude of 1,580 m above sea level and semi-desert and plains, mountains in the west and southwest, Gobi desert in the south and southeast, taiga forests and lakes in the north. The capital city name is Ulaanbaatar. More than half of Mongolia's population lives in Ulaanbaatar.

The Ministry of Health and Sports, encouraging the Blood Service in order to approve and implement the principles, guidelines related to the blood safety and ensuring professional methods for activities of implementing the Mongolian Government policy. National blood service consisted of 26 hospital-based blood banks in 21 aimags and 1 stand-alone (National Center for Transfusion Medicine) in Ulaanbaatar, are centrally coordinated and managed by 100% government. The Blood banks which is a specialized professional service that deals with producing safe and ample blood supplies to local and private hospitals throughout Mongolia as well as continually managing, guiding and embracing all Hospital Blood banks. Blood Banks provide the hospitals in rural areas with necessary blood and blood products and specialized management and guidance for soum level.

The National center for transfusion medicine /NCTM/ operates with in the term of the national blood policy and Mongolian Health legislation to promote uniform implementation of standards and consistency in the quality and safe blood and blood products. The NCTM is responsible for organizing, advising, reporting and uniform implementation of standards and consistency, government policy, program, laws, and Orders of improving blood and blood products supply, and blood safety. The NCTM guides and manages all 26 Blood Banks' functions and central organization of specialized training, production, research and development. Essential functions of the NCTM includes strategic and operational planning, donor recruitment, blood collection and preparation, provision of sufficient resource, coordination and management to ensure an adequate supply of blood and blood products and safe clinical transfusion, one of the main functions is to conduct specialized training for blood service among the hospital staff and medical doctors, and to conduct training ensuring safe blood procedures for pre- and post-graduate students.

The Donor Law was approved in 2012 by the Great Khural (Parliament) of Mongolia. The Government policy on "Improving provision and supply with safe blood and blood products" was approved in 2007 by the Great Khural. The Plan of Action for 2008-2015 to implement the Government policy for improvement of provision with safe blood and blood products was approved in 2008 by article 111 of Government Resolution

Objectives of the Plan of Action for 2008-2015 to implement the Government policy for improvement of provision with safe blood and blood products was approved in 2008 by article 111 of Government Resolution to provide equally safe, sufficient and quality blood and blood products to all hospitals, to provide safe and ample blood supply in large quantity in times of major disaster, to expand donor activity along with international standard and increase participation of health organization, government and non-government organizations, entities,

collections and population in training and promotional activity, to introduce advanced technology for screening, processing, storing and transporting donor blood and blood products and to support improving blood safety and blood supply of the National Center for Transfusion Medicine, Regional Diagnosing Center, Blood Banks beside the aimag and the district's health organizations and collaboration with foreign and international organizations from the Government. In the framework 41 activitiesin 5 objectives of the Plan of Action for 2008-2015successfully implemented.

In Mongolia since 2004 celebrates World Blood Donor Day as tradition, NCTM and Mongolian Red Cross Society co-work to celebrate WBDD under the annual theme of WHO. The activities from co-operation of NCTM and Mongolian Red Cross Society is focusing on enlargement donor recruitment, activation and inspiration of donors.

For statistical indicators, 2011-2015 collected 20700 to 30396 units of whole blood and components. In 2011 only stand-alone (NCTM) performed apheresis, by 2015 two hospital-based blood banks and one stand-alone were performed apheresis. 2011- 2015 number of family replacement donors decreased 3.2 to 0.6 percent and regular donors increased by 41.4 percent 2011- 2015. For distribution of 100 percent voluntary nonremunerated blood donors in Mongolia. But in the registration 99.4 percent is voluntary nonremunerated and 0.6 percent is the family replacement.Because, in some case, thatlack of rare blood groups suggesting to members of family of recipient donate voluntary.

New donors increased by 60.7 percent and regular donors increased by 41.4 percent 2011- 2015. Blood production increased by 26 percent 2011- 2015. Starts emergency resource of fresh frozen plasma preparing each year. 14 types of blood products prepared by 2015. 2011-2015 whole blood products decreased from 0.2 percent to 0.1 percent and components products increased up to 99.9 percent. In 2014 implemented apheresis and cytapheresis technology by blood collection. 2011-2015, rational usage units of components increased from 54670 to 62822. All 27 blood banks testing blood grouping, cross matching by slide/tiles, test tube, and column agglutination. And only stand-alone (NCTM) has red blood cell antibody detection and identification as of 2015. In all Blood service testing 100 percent transfusion-transmitted infection (TTI) such as HIV, HBV, HCV by ELISA. In 2012 implemented new technology NAT in NCTM. By 2015 elimination with TTI such as HIV, HBV, HCV decreased from 10.4 percent to 7.2 percent.

The NCTM involves in the External Quality Assurance Services (EQAS) for Donor Infectious Disease Testing conducted by the National Reference Laboratories, Australia and the Reference Laboratory for Transfusion medicine at the NCTM was established several years ago and has built intensive relationships with other national reference laboratories. NCTM involving regularly in the EQAS program. Laboratories of 26 Blood Banks in aimags have been involving in the EQAS program since 2010. The Linear bar coding electronic information system has been introduced in the workflow (daily work) of the National Center for Transfusion Medicine since 2013.

Each year graduated 50-100 clinicians and other appropriate staffs by the short time training program about blood safety and rational use of blood, who working at the clinic. And each year graduated about 14 doctors or technicians by postgraduate degree for doctors and nurses/technicians by Transfusion Medicine. Regular refresher's course doctors and nurses/technicians per year (average no) 2-4 persons. In these years number of related surveys conducted according to the topics donor recruitment, hemovigilance, TTI, production and blood bank administration (for instance screening HTLV-1/2, CMV, and Occult HBV etc).

In the framework of renewing the legislation environment and ensuring the blood safety, planning to confirm new

National program for expanding the voluntary non-remunerated blood donations by the State Government of Mongolia in 2016. In addition planning to expand foreign affair, especially highlight the regional cooperation for sharing experiences and best practices for blood donor recruitment and retention in 2016. In the framework of National program for improving the donor recruitment and retention will be developed the donor training and advertising activities and will be increased the capability of the human resource.

In 2016 new Blood center's building construction process ending and will be ready to serve in the 2nd quarter of this year. With the new Blood center implementing many new technologies such as pathogen inactivation etc. Further, finding the way to implement small batch sized plasma fractionation technology. "Asian Rare Blood Joint Seminar" by the National Center for Transfusion Medicine, Mongolia (country chapter of AATM) and Shanghai Blood Center (WHO Collaborating Center) will be hosted in Ulaanbaatar in August 2016. The objective of the seminar is to understanding the challenges and barriers in provision of rare blood for patient and identification on strategies for promoting the rare blood supply in Asia.

CURRENT STATUS IN NEPAL

Manita RAJKARNIKAR

Background

Blood Transfusion Service of Nepal Red Cross Society was established in the year 1966 i.e. 3 years after the inception of the Society itself. During the initial years the service was available only for the people of Kathmandu but over the years blood banks have been established in **101 places of 68 districts** of the country.

In the initial years the service was made possible through collection of blood from professional donors but since 1982 collection of blood was emphasized from voluntary non-remunerated donors only. In the meanwhile serious efforts were made and are being made to collect blood from institutionalized sectors like colleges, universities, industries, clubs, governmental and non governmental offices. Today, blood is collected mostly from these sectors through routine motivational and collection campaigns but motivated individuals are also significant donors. The blood collection mobile teams routinely visit these institutions in the valley and in the outskirts of Kathmandu Valley to collect blood. Sometimes these teams also spread out to other adjoining districts for the same purpose. With the expansion of health services, establishments of medical colleges, government and private hospitals and Nursing homes the demand of blood is rapidly going up not only in the Valley but also in the districts.

Government of Nepal, in it's policy declaration of 1991, has mandated Nepal Red Cross Society as the sole authority in conducting blood program in Nepal. Therefore, a great responsibility has fallen on the Society and to prove its capability, it is systematically strengthening itself with resources available nationally and exploring resource possibilities internationally. The Kathmandu-based Central Blood transfusion service , so far being the only referral centre for the whole country, has been planning not only to upgrade the Centre but also in upgrading regional blood centers of Biratnagar, Pokhara, Nepalgunj and Chitwan. It is also considering the possibilities of upgrading the Dharan and Dhangadhi district blood centres in view of the establishments there of major hospitals and coverage area. As it stands today, there are 23 district level blood banks, emergency units in 37 and 36 hospital units of the blood service in the country.

Service Delivery

During this reporting period Nepal Red Cross had collected 217,160 units of blood throughout the country and supplied 311,330 units of blood to the needy patients. .Blood collection is voluntary based and there is no professional blood donation. 2200 units of blood were supplied in free of charge to earthquake affected patients.

Total 1000 units of blood and blood component were provided to Thalassemia society in subsidized charge. Total1100 units of blood and blood components were provided to hemophilia society in subsidized charge. Blood cold chain system is effectively implemented for the transportation of blood and blood product to maintain the quality of blood.

There was a National and International cooperation and coordination effort for enhancement of quality system of blood collection, testing and processing. Project base support from Nepal government National Bureau of Blood Transfusion Service, National Center for AIDS and STD control, Luxembourg Red Cross, Australian Embassy, Global Advisory Panel , British Red Cross for the scaling up of quality system of blood transfusion service with the supply of blood bank equipment to CBTS and district level blood centers. These supports are very much effective to upgrade the quality service in blood centers. Total 3,428 mobile blood collection camps were organized by different institutions/organizations. Total 1012 mobile camps were organized by different organizations/institutions in the Kathmandu Valley with the technical support of CBTS. In Central Blood Transfusion Service 69,309 units of blood were collected and supplied more than 100,000 units. Among that 9,706 units of blood were collected from female donors and 59,603 units of blood from male donors.

Laboratory Investigations

Blood Service is providing safe blood and blood - products to the needy patients all collected blood is routinely tested for HIV, HBsAg, HCV, Syphilis besides grouping, cross-matching and anti-D antibody identification and titration in the Centers. Blood products like plasma, packed red cells, platelets, cryo-precipitates, platelet rich plasma are also produced in Kathmandu, all regional centers and some of the district centers providing services to the patients of hemophilia and other blood diseases. Due to the Blood Component production technology is sensitive and expensive; this facility is available in limited blood centers but in near future some other districts are also going to provide this service. After testing for Transfusion Transmissible Infections all reactive cases are further processed for Blood Donor counseling (pre and post donation) are done. This is targeted for the wellbeing of donor health status and confirmatory detection of HIV, Hepatitis 'B' & 'C' and Syphilis.

Blood component facility

In 10 centers are with blood component facility and one hospital is having apheresis facility. Around 50% of collected units are processed in blood components as Packed Red Cells, Plasma, platelets and cryo. Still around 50% of collected units are used as whole blood. There is a plan to use more component products in near future with a plan to expand component facility in more districts. In the country there is only one apheresis machine available in one of the Hospital.

Blood collection and Male/ Female blood donor Ratio

The Nepal Red Cross Society, as stated above, was able to collect 217,160 units of blood during the period which was an increment of about 8% over the collection of the previous year. Among that Male blood donors are 84.5 % and female 15.5 %.

Trainings and orientation programs

Total 1,680 people were participated in blood donation motivation and interaction program held in 31 different organizations in this period. Orientation programs were organized for doctors and paramedics, altogether 225 were participated in 6 orientation program on clinical use of blood and blood products in different hospitals.

Annual meetings and collaboration for the trainings

An annual meeting held at Kathmandu for the review of national blood program. 58 representatives were

involved in the meeting from different regional, district and hospital blood centers. Total 42 technicians from different blood centers were trained in quality management of blood transfusion service training, supported by WHO and Nepal Government Ministry of Health and population,

Blood Group Percentage

Blood group percentage of blood donors are as follows:

Blood Group	**National**		**In Kathmandu**	
	% of Positive	*% of Negative*	*% of Positive*	*% of Negative*
A	26.82	0.73	29.39	0.83
B	27.82	0.84	27.42	0.62
O	29.92	0.93	28.59	0.87
AB	12.68	0.26	11.94	0.34
Total	**97.24**	**2.76**	**97.34**	**2.66**

No. of HIV, Hepatitis 'B' & 'C' and Syphilis Detected in the Collected Blood during the Period

SN	*Centers*	*HIV*	*Hepatitis B*	*Hepatitis C*	*Syphilis*
1.	Central Blood Transfusion Centre	21	192	224	360
2.	Regional Blood Transfusion Centre	13	151	56	115
3.	District/Emergency Blood Transfusion Centre	27	227	119	260
4.	Hospital Blood Transfusion Unit	7	47	23	25
	Total	68	617	422	760
	% of positivity in Kathmandu Valley	0.03	0.26	0.31	0.50
	Total Positive Percentage nationwide	0.03	0.31	0.21	0.38

"Give Blood Save life"

CURRENT STATUS IN PAKISTAN

Farrukh HASAN

Estimated population: 180 million
No. Blood Banks: 800 Blood Banks
Blood Collection per annum: around 1.2 million
Country requirement: 3.2 million bags / year
Low average age of donors: 22 years.
Voluntary non-remunerated donations: 300000 = 10%
Family/replacement donations: 2700000 = 90%
Paid donations: 0%
Female donation: 3.77%

Current System Architecture

1830 Blood banks (<1200 in Punjab Province), Mostly Hospital Blood Banks
20 % Public Sector (including Armed Forces)
Private Sector and NGO 80 % contribution in total,

Predominant in the provinces of Punjab and Sindh. There are mainly, Hospital based blood banks and stand-alone blood banks.

These are diverse in terms of functions and capacities from donor mobilization only to the entire v2v transfusion chain.

The major contributors to management of thalassaemia patients are BDOs which include university based organizations . Major contributors to the voluntary blood donor pool in Pakistan through their donor motivation and mobilization programmes.

National Blood Policy and Strategic Framework 2014-20

Developed in 2002 with support from WHO EMRO and GIZ. Revised in 2008 and 2014.NBP proposed to establish a coordinated National Blood Transfusion Program consistent with the international recommendations to ensure safe blood.

Future System Architecture

System Reform being implemented by the Safe Blood Transfusion Programme, Pakistan based on a centralized model.

In the current phase of the SBT project (completing Nov 2014), 10 RBCs and 60 affiliated HBBs would be constructed/refurbished In the first phase, the model will contribute approximately 20% to the sector in terms of blood supply Quality Management Systems Wide diversity Existence of ISO certified institutions on the one hand, Lack of even basic quality control measures on the other hand.

Potential importance of Blood Transfusion Authorities (for mandatory licensing) and Pakistan National Accreditation Council (for accreditation).

Blood Processing and Testing prevalence is as follows.

HIV = 0.04%, HCV = 3.7%, HBV = 2.5%, Syphilis = 1.01% and Malaria = 0.3%

Most blood transfused as 'Whole Blood' (62%) till the widespread occurrence of the dengue epidemic.

Diversity in the methods and techniques for transfusion transmittable infectious disease testing.

Gold standard methods (e.g NAT testing) available in a few centres. Intermittent supply of screening kits (commonest scenario) compromises blood safety at the other end of the spectrum.

First CUB guidelines (Published in 1999)

Clinical governance-Hospital Transfusion Committees existing and functional in a few centres Current strategy Revision of CUB guidelines by a Task Force comprising all stakeholders (including clinicians, haematologists, CPSP, PMDC, PSH).

Establishment of Hospital Transfusion Committees for clinical governance: Terms of Reference developed, information sharing about existing HTCs through workshops and monthly SPTP newsletter, plan for their actual institution is under process.

Haemovigilance

Concept relatively new in Pakistan .Centralized haemovigilance does not exist.

Current strategy

Blood Transfusion Authorities would also be given the mandate to elaborate haemovigilance rules. Hospital Transfusion Committees would be responsible for transmitting Haemovigilance related information to BTAs.

'Pakistan Haemovigilance Network (PNH)' (to be supported by the INH): national baseline survey, reporting system PNH would encourage and assist in the formation of HTCs all over the country. The HTC will collect haemovigilance data from their respective centers and report to PHN. PHN would compile Annual Reports, which would help in policy making, planning and blood safety improvement.

Management Information System

The concept of coherent, reliable data recording and management only beginning to be understood and

implemented In most cases, some data recorded manually but not utilized for management decisions. It is being worked upon.

Current strategy: introduction of nation-wide BT MIS, functional brief for MIS developed.

Sustainability of Reforms There are development Plans for the future centralized systems.

Public-private partnerships

SAATM has been playing some limited role in bringing the Public / private sectors together and also promoting the awareness, educational and service campaign.

Most of the hematologists country wide are its members and feel comfortable to sit on a common platform.

CURRENT STATUS IN TURKEY

N. Nuri SOLAZ

Based on 2015 statistics Turkey has 77 695 904 population. Annual population increase is 1.04 %, 70.5 % of the population lives in cities. Almost half of the population is younger than 28.3 years. 66.5 % of the population is between 15 - 64 years old. Depending on 2013 statistics average life expectancy is 73,7 years for men and 79.4 years for women.

First Blood Banking & Transfusion Medicine (BB&TM) activities started at Istanbul University Medical School at early 1920 ies. Due to donor supply problems Turkish Red Crescent decided to be involved in Blood Banking activities and declared this at 1953 during annual congress. First public blood banks were opened at 1957 by Turkish Red Crescent in Ankara and Istanbul. First Blood law was issued at 1983 and private blood banks were closed, paid donation was banned. This law was updated at 2007. A group of dedicated doctors who were involved in the field of BB&TM decided to support BB&TM activities by a civilian initiative and established a national blood society; "Blood Banks and Transfusion Society of Turkey (*BBTST*)" at 1996.

The main strategy of BBTST defined as below listed topics;

a) education of blood bank and clinical staff which is directly related on staff competence and improve BB&TM quality management

b) establishing close collaboration with the national health authority

c) establishing official and academic education programs

d) collaborating among national and international organizations, agencies and institutions involved in the safety of blood products and transfusion practice.

BBTST organised 18 national courses, 8 national congresses, and 200 symposiums 30 national education sessions all around Turkey with the collaboration of MoH Since 1997. VIII European Congress of International Society of Blood Transfusion was organised at 2003 in Istanbul by BBTST. BBTST has been organizing annual international workshops under the name of "Anatolian Blood Days" since 2011 with the collaboration of Turkish Blood Foundation.

Ministry of Health (MoH) is the "national authority" on BB%TM likewise other medical aspects in Turkey. Turkey has had mixed Blood Banking since 2002 when MoH announced new "National Blood Policy" as "regionalisation". Although MoH appointed TRC as a main national blood supplier still there are "temporary blood banks" run by university hospitals and MoH training hospitals. TRC collects almost 80% of national blood donation annually. Each year around 2 500 000 units of blood are donated. Donor deferral rate is around 6,5 – 10 %. Around 10% of collected bloods are destroyed due to positive serological test results and etc. Apheresis service has been available in Turkey since late 1980 ies. Around 250 apheresis machines from all major manufacturers are in service and annual platelet apheresis is around 75 000 units in Turkey. Since early 1990's blood irradiation is available in Turkey not only in major metropoles but also in other cities.

There are 368 blood facilities in Turkey (regional blood centers, blood donation centers and transfusion centers) which collect blood. There are more than 1 500 institutions where blood transfusion is performed legally (hospitals, special medical centers, etc.). Cost of blood products are annually issued by Ministry of Finance. Blood transfusion costs are completely reimbursed by state owned Social Security Agency.

Blood donation is "voluntary non-remunerated" by law. Turkey has had first "National Blood and Blood Products Guidelines" since 2009 and all BB&TM activities are run according to this national guidelines.

Each unit of donated blood should get below listed tests;
a) Blood group typing since 1921
b) VDRL since 1950's
c) HBsAg since 1973
d) Anti-HIV ½ since 1983
e) Anti – HCV since 1996
TRC has started to screen each donated blood by NAT for HBV, HBC and HIV since 2014.

Frequencies of seropositive microbiological tests are as below table;

Test Type	Frequency
VDRL	0,11 %
HBsAg	1,99 %
Anti-HIV$^{1/2}$;	0,12 %
Anti – HCV	0,45%

Distribution of blood group typing in Turkey is as below table;

Blood Type	Frequency
A Rh +	38%
A Rh -	5%
B Rh +	14%
B Rh -	2%
AB +	7%
AB -	1%
O +	29%
O -	4%

BB&TM is not an independent medical speciality in Turkey and there is no specialisation education on BB&TM. A Master education program is available for medical doctors as a post graduate training on BB&TM. MoH has accredited training courses for medical doctors and non MD medical staff since 2001.

Finally; blood transfusion is safe enough in Turkey because;

- Basic equipment for safe blood supply is available all around the country.

- Well trained basic manpower for blood supply is available all around the country.
- Automation, quality control, Haemovigiliance, etc. advanced topics of Blood Banking is initiated all around the country.

GENETICS OF BLOOD GROUP ANTIGENS

Duran CANATAN

Background: Blood group antigens present on the cell membrane of red blood cells (RBC), platelets and neutrophils can be defined either serologically or predicted based on the genotypes of genes encoding for antigens.(**1,2**) Use of molecular testing in clinical laboratories requires knowledge of the molecular basis of blood group antigens and the availability of suitable genotyping methods. Many of the serologically determined RBC antigens are related to single nucleotide polymorphisms (SNPs) which result in a single amino acid change in RBC antigens. (**3,4**) Molecular events other than SNPs in the antigen coding region of the gene may also give rise to blood group antigens or affect antigen expression. A wide variety of molecular events generate blood group antigen diversity. These include; missense mutation (the most common), non sense mutation, mutation of motifs involved in transcription, altenative splicing, deletion of a gene exon(s) or nucleotid(s), insertion of exon(s) or nucleotid(s),alternate initation, chromosome translocation, single crossover, gene conversion and other gene rearrangements. Some examples of blood groups are showed at Table 1.(**1,5**)

Blood groups antigen and genes: At present, thirty-five red cell blood group systems, seventeen human platelet antigens and eleven neutrophil antigens are known. Thirty-five red cell blood group systems and more than 300 antigens have been described on the surface of human red cells within 44 genes and 1568 alleles.(**1,6,7**) Red cell groups antigen genes have been summarized at Table 2.(**8**)

Platelet antigens and neutrophil antigens are summarized Table 3 and Table 4.(**1**)

The methods of genotyping: Since the first blood group gene cloning in the early 1990s, knowledge on the molecular basis of most red blood cell, platelet and neutrophil antigens brought the possibility of using nucleotide-based techniques to predict phenotype.(**9**)

Red cell antigen genotyping has many applications in blood donor testing, as well as in various diagnostic settings. Genotyping results can therefore be used as a reliable adjunct to serologic testing and will become increasingly used in red cell antigen assignment.The majority of genes encoding either proteins that carry blood group antigens or transferases that attack blood group specified carbonhydrates have been cloned and molecular bases associated with many cell surface markers on red blood cells (RBCs), platelets and neuthropils have been determined. Thus, it is possible to perform molecular analysis for these inherited allels. Such analysis include allele spesific PCR amplification (AS-PCR) and PCR amplification followed by restriction enzyme digestion, restriction fragment length polymorphism (RFLP).(**1,9**)

The methods of PCR were developed in 2000s, as real-time PCR(RT-PCR) assays for high-throughput human blood antigen typing (**10**), single base extension in multiplex PCR blood group genotyping (**11**), PCR-ELISA for high-throughput blood group genotyping. (**12**)

Recently, several groups have developed multiplex-polymerase chain reaction SNaPshot assays to determine single nucleotide polymorphisms (SNPs) in blood group genes with the purpose of identifying clinically relevant antigens and rare alleles. (**13**) As an alternative to phenotyping, large-scale DNA-based assays, which are feasible for high-throughput donor red blood cell typing were developed for determination of blood group polymorphisms. (**14**)

Development and validation of a fully automated platform for extended blood group genotyping. Targets amplified by multiplex PCR were hybridized on the chip, and a revelation step allowed the simultaneous identification of up to twenty four blood group antigens, leading to the determination of extended genotypes.(**6**)

A multiplex polymerase chain reaction assay was designed for typing thirthy five RBC antigens in six reaction mixes. The study shows that in practice, this high-throughput genotyping assay is feasible, fast and provides reliable results. Compared to serological testing, this molecular approach is also very cost-efficient. (**15**)

Approaches to determination of a full profile of blood group genotypes are single nucleotide variant (SNV) mapping by DNA microarray and massively parallel sequencing, with respect to blood group genotyping. The most frequent genetic change associated with blood group antigens are SNVs. (**7**)

Indications of genotyping:(4)
Indications for Non-RHD Genotyping

- Serological antigen typing/phenotyping cannot be determined due to chronic transfusion requirement (eg. Thalassemia major, Blackfan Diamond anemia).
- Serologically complex patients - with multiple or unidentified antibodies who require ongoing transfusion support.
- Patients with autoimmune hemolytic anemia and/or with a positive DAT (in spite of chemical treatment), and circulating autoantibody.
- Patients with a suspected alloantibody against an antigen for which no commercial antisera is available (eg. Possible anti-Doa).
- Select patients with variable or null reactivity using serological methods when a variant allele is suspected (eg. Sickle cell anemia).

Indications for RHD Genotyping

- Prenatal patients with discrepant, weak or inconclusive serological RhD testing results where RHD genotyping may modify their blood product or Rh Immune Globulin (RhIG) requirements. For example: prenatal patients with weak or discrepant RhD serology may be Weak D type 1, 2 or 3 and would not require RhIG.
- Patients likely to require chronic transfusion, or with complex transfusion needs, where RHD genotyping may modify their blood product requirements.
- Patients who likely require transfusion with an anti-D who appear serologically D positive.

Clinical Applications genotyping in transfusion practice:(1)
Red cell blood groups:

1. Identification of fetus at risk for anemia of the neonate (hemolytic disease of the newborn)(HDN),
2. Determination of presence or absence of blood group alleles in recently transfused patients,
3. Determination of blood group alleles when patients' RBCs are coated with immunglobulin,
4. Resolution of A, B, and D typing discrepancies,
5. Screening for antigen negative blood donors,
6. RHD Zygosity,
7. Situations where genotype and phenotype do not agree.

Platelet Blood groups:

1. Identification a fetüs at risk for alloimmune thrombocytopenia,
2. Genotyping when appropriate antisera are not available,

3. Determination of genotypes in thrombocytopenic patients,
4. Platelet panels for antibody investigations,
5. Screening for antigen negative platelet donors,

Neutrophil blood groups:

1. Immune neutrophenia
2. Transfusion related acute lung injury(TRALI)

Table 1: Molecular events that give rise to blood group antigens and phenotypes(5)

Molecular events	**Blood Group Systems**
Gene conversion or recombination events	MNs, Rh, Ch/Rg
Duplication of an exon	Gerbich
Deletion of a gene, exon, or nucleotide (s)	ABO, Rh, MNS,Kel,Duffy, Dombrock
Insertion of a nucleotide (s)	Rh, Colton
Single nucleotide substitutions	Most blood group systems

Table 2:Red Blood Cell system genes(8)

ISBT System Name (Number)	**Gene Name ISBT (HGNC)***	**Gene Name Location**	**Gene Product and Component Name [CD Number]**	**Associated Blood Group Antigens [Null phenotype]**
ABO (001)	*ABO (ABO)*	9q34.2	Glycosyltransferase, carbohydrate	A; B; A,B; A1 [Group O]
MNS (002)	*MNS (GYP*A GYP*B GYP*E)*	4q31.21 [CD235a] [CD235b]	Glycophorin A(GPA) + 38 more Glycophorin B (GPB)	M, N, S, s, U, He,Mi^{a},Vw [En(a-); U-; M^{k}M^{k}]
P1PK (003)	*P1 (4GALT)*	22q13.2	Glycosyltransferase, carbohydrate	P1, P^{k}
RH (004)	*RH (RHD RHCE)*	1p36.11	RhD [CD240D] RhCE[CD240CE]	D, G, Tar C, E, c, e, V, Rh17 +43 more [Rh null]
Lutheran (005)	*LU (LU)*	19q13.32	Lutheran glycoprotein; B-cell adhesion molecule [CD239]	Lu^{a} Lu^{b}, Lu3, Lu4, Au^{a},Au^{b} +14more [Recessive Lu (a-b-)]

Kell (006)	*KEL* *(KEL)*	7q34 [CD238]	Kell glycoprotein	K,k,Kp^{a}, Kp^{b}, Ku, Js^{a},Js^{b} +25 more [K$_{o}$ or K null]
Lewis (007)	*LE* *(FUT3)*	19p13.3	Fucosyltransferase, Carbohydrate (Adsorbed from plasma)	Le^{a}, Le^{b}, Le^{ab}, Le^{bh}, ALe^{b},BLe^{b} [Le (a-b-)]
Duffy (008)	*FY* *(DARC)*	1q23.2	Duffy glycoprotein [CD234]	Fy^{a}, Fy^{b}, Fy3, Fy5, Fy6 [Fy(a-b-)]
Kidd (009)	*JK (SLC14A1)*	18q12.3	Human urea transporter (HUT) Kidd glycoprotein	Jk^{a}, Jk^{b}, Jk3 [Jk(a-b-)]
Diego (010)	*DI* *(SLC4A1)*	17q21.31	Band 3, Anion Exchanger 1 [CD233	Di^{a}, Di^{b}, Wr^{a}, Wr^{b}, Wd^{a}, Rb^{a} + 16 more
Yt (011)	*YT* *(ACHE)*	7q22	Acetylcholinesterase	Yt^{a}, Yt^{b}
Xg (012)	*XG (XG)* *(MIC2)*	Xp22.33 Yp11.3	Xg^{a} glycoprotein CD99(MIC2 product)	Xg^{a} CD99
Scianna (013)	*SC* *(ERMAP)*	1p34.2	ERMAP	Sc1, Sc2, Sc3, Rd+3 more [Sc:-1,-2,-3]
Dombrock (014)	*CO* *(ART4)*	12p12.3	Do glycoprotein; ART 4 [CD297]	Do^{a}, Do^{b}, Gy^{a}, Hy, Jo^{a} +2 more [Gy(a-)]
Colton (015)	*CO* *(AQP1)*	7p14	Aquaporin 1 (AQP1)	Co^{a}, Co^{b}, Co3, Co4 [Co(a-b-)]
Landsteiner- Wiener (016)	*LW* *(ICAM4)*	19p13.2	Lw glycoprotein İntracellular adhesion molecule 4 (ICAM4) [CD242]	LW^{a}, LW^{ab}, LW^{b} [LW(a-b-)]
Chido/Rodgers (017)	*CH/RG (C4A,* *CAB)*	6p21.32	Complement component: C4A; C4B	Ch1, Ch2, Rg1 +6 more [Ch-Rg-]
H (018)	*H* *(FUT1)*	19q13.33	Fucosyltransferase, carbonydrate [CD173]	H [Bombay (0 h)]
Kx (019)	*XK* *(XK)*	Xp21.1	XK glycoprotein	Kx [Mcleod phenotype]

Gerbich (020)	*GE (GYPC)*	2q14.3 [CD236]	Glycophorin C (GPC) [Leach phenotype] Glycophorin D (GPD)	Ge2, Ge3, Ge4 +8 more
Cromer (021)	*CROM (CD55)*	1q32.2	DAF [CD55]	Cr^{a}, Tc^{a}, Tc^{b}, Tc ^{c},Dr ^{a},Es ^{a}, IFC +9 MORE [Inab Phenotype]
Knops (022)	*KN (CR1)*	1q32.2	CR1 [CD35]	Kn ^{a}, Kn ^{b}, McC ^{a}, SI ^{a}, Yk ^{a} +4 more
Indian (023)	*IN (CD44)*	11p13	Hermes Antigen[CD44]	In ^{a}, In ^{b} +2 more
Ok (024)	*OK (BSG)*	19p13.3	Neurothelin,basigin [CD147]	Ok ^{a}, OKGV, OKGM
Raph (025)	*RAPH (CD151)*	11p15.5	CD151	MER2 [Raph-]
JMH (026)	*JMH (SEMA7A)*	15q24.1	Semaphorin 7A (CD108)	JMH + 5 more [JMH-]
I (027)	*IGNT (GCNT2)*	6p24.2	Glucosaminyltransferase, carbonhydrate	I [I-or i adult]
Globoside (028)	*GLOB (3GALT3 or GaINAcT1)*	3q26.1	Transferase, carbonhydrate (Gb_4, globoside)	P [P-]
Gill (029)	*GIL (AQP3)*	9p13.3	Aquaporin 3 (AQP3)	GILL [GIL-]
Rh-associated Glycoprotein (030)	*RHAG*	6p21-qter	Rh-associated glycoprotein [CD241]	Duclos,Ol^{a},DSLK $^{\neq}$ [Rh null(regulator type)][37]

* ISBT: International Society Blood Transfusion HGNC: Human Gene Nomenclature Commitee. ERMAP: Erythroid Membrane Associated Protein

Table 3: Platelets system genes(1)

Platelet system Classical	Platelet system ISBT*	Gen Name ISBT*	Gen Name HGM*	Alleles for molecular protocols given
Bil/Zav	HPA-5	GP1A	ITGA2	GP1A1/GP1A2
Sil	HPA-13	GP1A	ITGA2	GP1A1/GP1A3
Ko	HPA-2	GP1BA	GP1BA	GP1BA1/ GP1BA2
Ly	HPA-12	GP1BB	GP1BB	GP1BB1/ GP1BB2
Bak/Lck	HPA-3	GP2B	ITGA2B	GP2B1/ GP2B2
Max	HPA-9	GP3A	ITGB3	GP2B2/ GP2B3
PIA/Zw	HPA-1	GP3A	ITGB3	GP3A1/GP3A2
Pen/Yuk	HPA-4	GP3A	ITGB3	GP3A1/GP3A3
Ca/Tu	HPA-6	GP3A	ITGB3	GP3A1/GP3A4
Mo	HPA-7	GP3A	ITGB3	GP3A1/GP3A5
Sr	HPA-8	GP3A	ITGB3	GP3A1/GP3A6
La	HPA-10	GP3A	ITGB3	GP3A1/GP3A7
Gro	HPA-11	GP3A	ITGB3	GP3A1/GP3A8
Oc	HPA-14	GP3A	ITGB3	GP3A1/GP3A9

*ISBT: International Society Blood Transfusion HGM: Human Genom Mapping

Table 4: Neutrophil system genes(1)

Platelet system Classical	Platelet system ISBT*	Gen Name ISBT*	Gen Name HGM*	Alleles for molecular protocols given
NA	NA	NA	FCGR3B	NA1/NA2
NB	NB	NB	None	NB1/NB2
SH	None	None	FCGR3B	SH/ SH
Ond	None	None	ITGAL	Onda/Ondb
Marr	None	None	ITGAM	Marra/ Marrb
S	S	None	None	Sa/Sb
9a	None	None	None	
SL	None	None	None	

*ISBT: International Society Blood Transfusion HGM: Human Genom Mapping

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HOW TO RESOLVE ANTIBODY PROBLEMS? WHICH TESTS DO WE HAVE?

Davut ALBAYRAK

Antibodies to red blood cells (RBC) cause clinical problems and blood bank will find compatible blood for this patient. They are on surface of RBC, in plasma or both. Antibody binds to antigen of RBC leads to agglutination, hemolysis via complement activation and phagocytosis. Anti-body to recipient causes direct antiglobulin test (DAT) positivity, antibody to donor RBC causes indirect antiglobulin test (IDAT) positivity and major cross match incompatibility. DAT positivity present with hemolytic anemia. IDAT positivity causes hemolysis and ineffective transfusion after erythrocyte transfusion (1,2). Firstly, problem was determined by tests and clinical findings and history.to resolve antibody problems. History of Anti-E, anti-K, anti-D+anti-C, and anti-D+anti-E is important. Previous records of patient helps to rapid evaluation and to decide the solution. After understanding problem, The compatible blood may be obtained for transfusion and appropriate treatment modality may be chosen for patient.

Test and methods used to determine antibody problem and decide solution:

Direct antigolbulin test (Direct Coombs), indirect antiglobulin test (indirect Coombs), antibody identification test, Blood subgroup identification by antibody or molecular, Elution, absorption (2,3).

Direct antiglobulin test (direct Coombs):

This test is used to detect IgG and/or complement adherence to red cells. Positive test shows that anemia is an immune hemolytic anemia due to autoantibodies, drugs or delayed hemolytic transfusion reaction. The type of antibody can be identified with the use of monospecific antibodies to immunoglobulin G (IgG) and C3d. If gG or IgG plus C3d is positive, the antibody is usually a warm antibody . When the red cells are coated with C3d only, the antibody is often but not always a cold antibody.

A positive DAT indicates that an immune reaction has taken place on the patient's RBC (either patient's own RBC or transfused RBC). Antibody source may be Auto vs. Alloimmune. History of Previous transfusion or IVIG and RHIG use shows alloimmune source. But this did not exclude otouimmunity. Eluate will performed on patient cells after cell separation. This eluate is incubated auto or allo RBCsamples known subgroups. Differences help to evaluation.

If DAT is positive, additional tests will be performed including determination unexpected red cell antibodies in the serum and attached to the red cells. A patient with a positive DAT should be evaluated for hemolysis (blood smear, LDH, indirect bilirubin, reticulocytes, haptoglobin, etc) due to autoimmune antibody or a drug-induced auto-antibody. The most common cause of serious or fatal drug-induced hemolytic anemias is use of 2nd and 3rd generation cephalosporins. The previous and current drug therapy of patients with a positive DAT should be carefully evaluated . When possible, consideration should be given to substitute these antibiotics with others. Other drugs such as penicillin, quinidine, can cause immune red cell hemolysis, but severity is rarely same with 2nd and 3rd generation cephalosporins(4,5)

Autoimmune antibodies may be idiopathic or secondary to autoimmune diseases, infections, B-cell malignancies, or due to drugs, eg procainamide, alpha methyldopa. The DAT is frequently positive in patients with HIV infection. Autoimmune Ig G antibodies are usually benign, but occasionally cause mild to severe hemolytic anemia requiring urgent red cell transfusions despite plasma incompatibility with all red cells. In general, patients with warm reacting autoantibodies will not destroy transfused RBC faster than their own RBC and transfusion is safe (there are reports of thrombotic episodes in the rare cases of HIV patients with severe autoimmune hemolytic anemia who are transfused). In contrast, patients with high titer cold reactive autoantibodies such as titer > 1/500 may have severe acute hemolysis upon transfusion.

The presence of the autoantibody may make difficult to identify or rule out the coexistence of significant red cell alloantibodies in the plasma of patient. There is coexisting alloantibodies Up to 40% of patients with autoantibodies. In contrast with autoantibodies, alloantibodies to RBC may cause severe hemolysis of transfused red cells. when a patient has an autoantibody that may mask an alloantibody, transfusion should be undertaken only with careful monitoring and the full cooperation of the Blood Bank .

Autoimmune IgM antibodies are typically cold reactive (6). If they are present in sufficiently high titer, this are associated with severe hemolysis of the patient's own red cells and transfused red cells, despite steroid treatment. There are also rare cases of red cell agglutination in coronary arteries. Hemolysis during surgery may cause cardiac problem in patients with symptomatic cold agglutinin disease or high titer cold agglutinins. The management of these patients may include the use of RBC phenotype-matched blood, steroids, warmed blood and a warm room (for patients with cold reactive autoantibody), IVIG, plasmapheresis or Rituximab. Other diagnostic possibilities to think in a patient with a positive DAT include a delayed hemolytic transfusion reaction associated with recent blood transfusion or transfusion of ABO incompatible plasma or platelet transfusion.

Antibody screening

Antibody screening uses indirect coombs test with RBC panels known subgroup antigens. Usually, two or three cell panel is used. If it is positive, next step will be identification of target of antibody.

This test is recommended before transfusion, in pregnancy, multitransfused patients, ineffective transfusions, DAT positivity after transfusion, Rh-negative women with Rh-positive partner, Rh-positive women known to be at increased risk of antibody sensitization, such as previous history of antibody production, history of red cell transfusion, or placental incompetence, mothers with hemolytic disease of the newborn.

Patients whose plasma gives a positive red cell antibody screen (an indirect Coombs test) require extra time to obtain fully compatible blood. About 1/100 transfusions or pregnancies will result in the formation of an antibody to a foreign red cell antigen. Many of these antibodies can cause a severe hemolytic reaction, while others are clinically insignificant. They can be ignored. The Blood Bank should identify the antibody to group and decide its clinical relevance. Clinically significant antibodies usually require a search for red cell units that lack the sensitizing antigen. This takes extra time. If a patient with a positive antibody screen requires transfusion, appropriate blood can be obtained after the antibody can be identified. The Blood Bank will supply the safest blood, available and consistent with the patient's needs. This may consist of incompatible by crossmatch. Least incompatible units may be used for transfusion in autoimmune hemolytic anemia. In the above cases, the physician must signify his/her understanding of the added risk of transfusion reaction in such cases by signing a form (7).

If the current antibody screen is negative and the patient has had a history of an alloantibody(s), an anamnestic

antibody response may occur. Response usually appears 2-4 day after transfusion with increasing titer. If it is suspected from direct antiglobulin test (DAT)-negative immune hemolytic anemia, more sensitive methods were used (8)

Antibody identification studies:

Antibody identification studies will be performed if the antibody screen is positive. Antibody screen use a RBC panels with known subgroubs. Presence or absence antigens and positivity with individual cells helps decide which antibodies are present. Additional knowledge may obtained with use of enzyme treatment with neuromidase activityand cold incubation. Antibodies with specificity known to cause hemolytic disease are titrated to assist in determining the need to monitor the severity clinical disese such as the newborn hemolytic disease.

The determined antibodies are classified by clinical significance: ABO ,Duffy, Rh, Kidd, Kell and SsU antibodies are always important clinical potential. Lewis, Lutheran,MNS, Cartwright and P may sometimes cause imporatnt important reaction. Leb,Xga,Chido/Rodgers Bg andYork HTLA is rarely associated with important reaction.

Molecular testing may be used to obtain more information on relevant antigen such as variant D gene (9).

Additional investigations:

Patient history includes these headings: Diagnosis, Pregnancy history, Medications / IV therapy, signs of immune disease, previously identified antibodies (especially, history of the antibodies, Anti-E, anti-K, anti-D+anti-C, and anti-D+anti-E.), previous transfusion history, date of last transfusion, use of IVIG. If the patient was seen at another hospital, it is when and where? may records be accessible and obtainable? Have you had any problems during transfusion, where have you been transfused? Physician and Nurse may assist. If previous records is accessible, it include patient demographics (age, sex, race), the observed serologic problem, test descriptions (method, strength of reactivity, estimated prevalence of reactivity). a complete record of the transfusion histories of patients with antibody sould be maintained to prevent haemolytic transfusion reaction in future transfusion due to the amanaestic effect of these antibodies. Medication history should include use of all blood products. Commercial IVIG have measurable levels of anti-A and -B (IgG class), as well as a variety of non-ABO antibodies.

In conclusion, an antibody is present in patient, this is important for treatment and transfusion selections. Antibody is screened and then identified. Subgroup of patient is determined. Then compatible blood is searched. Sufficient stock should be available for patient needs. It is very important for the blood bank to maintain the list of the rare blood group donor pools in order to provide the suitable blood when necessary. If hospitals have not such laboratory facilities, they should determine a referee blood center.

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PROBLEMS RELATED WITH BLOOD GROUPING AND CROSSMATCHING

Güçhan ALANOĞLU

The ABO system is the most important of all blood groups in transfusion practice. It is the only blood group system in which individuals have antibodies in their serum to antigens that are absent from their red blood cells (RBC). This occurs without any exposure to RBCs through transfusion or pregnancy. For this reason they are called natural antibodies. Due to the presence of these antibodies, transfusion of an incompatible ABO type may result in immediate lysis of donor RBCs. This produces a very severe, if not fatal, transfusion reaction in the patient. Pretransfusion testing is based on the testing to detect ABO incompatibility between a donor and potential transfusion recipient1. Due to these antibodies, transfusion of ABO-incompatible blood may cause severe intravascular hemolysis as well as the other manifestations of an acute hemolytic transfusion reaction[2].

Forward grouping (front type) is defined as using known sources of commercial antisera (anti-A, anti-B) to detect antigens on the individual's RBCs. Reverse grouping (back type) is defined as detecting ABO antibodies in the patient's serum by using known reagent RBCs, namely A1 and B cells. ABO forward and reverse grouping tests must be performed on all donors and patients. ABO grouping is the most frequently performed test in the blood bank. There is always an inverse reciprocal relationship between the forward and reverse type; thus, one serves as a check on the other. For example, if the individual has A antigens only on their red cells, there will be an ''expected'' naturally occuring anti-B antibody in their serum since they lack the B antigen1(figure1).

ABO discrepancies

ABO discrepancies occur when unexpected reactions occur in the forward and reverse grouping. These can be due to problems with the patient's serum (reverse grouping), problems with the patient's red cells (forward grouping), or problems with both the serum and cells. The unexpected reaction can be due to an extra positive reaction or a weak or missing reaction in the forward and reverse grouping. All ABO discrepancies must be resolved prior to reporting a patient or donor ABO group1. When a discrepancy is encountered, the discrepant result must be recorded, but interpretation of the ABO group must be delayed until the discrepancy resolved. If the specimen is from a donor unit, the unit must not be released for transfusion until the discrepancy is resolved. When the blood is from a potential recipient, it may be necessary to administer group O red cells of the appropriate Rh type before the investigation is completed. It is important to obtain sufficient pretransfusion blood samples from the patient to complete additional studies that may be required2. Red cell and serum test results may be discrepant because of intrensek problems with red cells or serum, test related problems or technical errors. Discrepancies may be signaled either because of negative results are obtained when positive results are expected, or positive results are found when tests should have been negative[2].

Technical Errors

Technical errors can also cause ABO discrepancies. Table1

Table 1: Common causes of false-negative and false –positive results in ABO testing[2]

False –negative results	*False-positive results*
Reagent or test serum not added to a tube	Over centrifugation of tubes.
Hemolysis not identified as apositive reaction.	Use of contaminated reagents, red cells, or saline
Inappropriate ratio of serum (or reagent) to red cells.	Use of dirty glassware
Tests not centrifuged sufficiently	Incorrect interpretation or recording of test results
Tests incubated at temperatures above 20-24 C	
Incorrect interpretation or recording of test results	

Table 2: Common sources of Technical Errors resulting in ABO discrepancies[1]

- Incorrect or inadequate identification of blood specimens, test tubes or slides.
- Cell suspension either too heavy or too light
- Clerical errors or incorrect recording of results.
- A mix-up samples
- Missed observation of hemolysis
- Failure to add reagents
- Failure to add samples
- Failure to follow manufacturer's instructions
- Uncalibrated centrifuge
- Overcentrifugation or undercentrifugation
- Contaminated reagents
- Warming during centrifugation

Table 3: Overview of ABO discrepancies

Problems with red blood cell testing?	*Problems with Serum testing?*
Extra antigens	Extraantibodies
Acquired B phenotype	A subgroups with anti-A1
B(A) phenotype	Cold alloantibodies
polyagglutination	Cold autoantibodies
Rouleaux	Rouleaux
Missing or weak antigen	Missing or weak antibody
ABO subgroup	Newborn
Pathologic etiology	Elderly population
Mixed field reaction	Pathologic etiology
Transfusion of group O to A, B or AB	
Bone marrow or stem cell transplantation	
A3 phenotype	

ABO discrepancies may be arbitrarily divided into four major categories

Group I Discrepancies

These are associated with unexpected reactions in the reverse grouping due to weakly reacting or missing antibodies. Discrepancies in this group includes

I. *Anti-A and anti-B agglutinins (IgM) produced by the infant* can first be demonstrated at 3–6 months. Anti-A and anti-B if present in cord sera are usually IgG and are of maternal origin. Reverse ABO grouping in infants is not warranted before 6 months

II. *Elderly patients:* Earlier studies showed a progressive decrease in anti-A and -B agglutinin titers with age, with low levels (titer 4 or less) being common in subjects aged 80 years or more.

III. *Severe hypogammaglobulinemia:* Anti A and Anti B are often present in very low concentration in patients with inherited immunodeficiency and in rare X-linked Wiskott- Aldrich syndrome . Anti-A and anti-B may also be present in very low concentration in patient immunosuppressed by therapy or disease and in patients undergoing intensive plasma exchange.

IV. *ABO incompatible HPC transplantation:* ABO incompatible HPC transplantation with induction of tolerance e.g. group A patient receiving group O bone marrow will have circulating group O red cell but will only produce Anti B antibody.

V. *In chimerism:* That is, a person with dual population of cells from more than one zygote. Presence of two populations of red cells of different ABO group may lead to absence of antibodies. Twin chimerism occurs when hematopoietic stem cells migrate between vascular bridges which allow mixing of blood between two fetuses. Chimeric twins have immune tolerance; they do not make against A ro B antigens that are absent from their own red cells but present on cells of engrafted twins.

VI. *Pediatric patients receiving long term parentral and entral nutrition* which is sterile and free of bacteria. It is believed that the immunizing source for such naturally occurring antibodies is gut and environmental bacteria which have been shown to possess ABO like structures on their lipopolysaccharide coats.

Resolution of group I discrepancies

a. It can be resolved by enhancing weak or missing reaction by incubating the patient's serum with reagent A1 and B cells at room temperature for 15-30 minutes

b. If there is still no reaction after centrifugation, serum cell mixture is incubated at 40 C for 15-30 minutes

Note: an autocontrol and O cell control must always be tested concurrently to detect reactivity of other commonly occurring cold agglutinins e.g. anti I

Group II discrepancies

These are associated with unexpected reactions in forward grouping due to weakly reacting or missing antigen.

Discrepancies in this group includes

I. *Subgroups of A or B:* subgroups of A antigen (Ax, Am, Ay, Ael) which are not agglutinated or weakly agglutinated by most anti A. Subgroups of B antigen (Bx, Bm, Bel)) which are not agglutinated or weakly agglutinated by most anti B. Both can present as group II discrepancies.

II. *Leukaemia may yield weakened A or B antigen:* In acute leukaemia, the A antigen may be weakened. Sometimes the blood appears to contain a mixture of group A and group O cells or of A1 and weak A. In other cases the red cells react weakly with anti-A, even behaving like A3 or Am15. In a patient with erythroleukaemia, of group B, 60% of the cells were not agglutinated by anti-B and appeared to be group O, but were really very weak B, when separated from the normal B cells they would absorb anti-B.

III. *Acquired B, B(A) and A(B) phenotypes:* Acquired B results from the action of bacterial deacetylase, which converts N-acetylgalactosamine to -galactosamine, which is very similar to galactose, the chief determinant of B. The second type of acquired B that may be called the 'passenger antigen' type is caused by adsorption of B-like bacterial products on to O or A cells but occurs only in vitro.

IV. *Out of group transfusion or ABO mismatched hematopoietic progenitor stem cell transplantation:* ABOcompatible but not identical transfusion of red cell (e.g. group O red cells transfused to group A or B person) results in artificially induced chimerism. ABO mismatched hematopoietic stem cell transplant (e.g. group O person transplanted with group A or B marrow, group A or B person transplanted with group O marrow).

V. *Neutralization of anti A and anti B typing reagent by high concentration of A or B soluble* substances in serum with serum or plasma suspended red cell

VI. Chimerism in fraternal twins, mosaicism arising from dispermy: Tetra-gametic or dispermic chimeras present with chimerism in all tissues and are more frequently identified because of infertility and rarely because of mixed populations of red cells

Resolution of group II discrepancies

a. Weaker reactions with antisera can be resolved by enhancing reaction of antigen with respective antisera by incubating test mixture at room temperature for 15-30 minutes

b. Sub groups causing group discrepancies can be resolved by adsorption elution studies

c. Acquired B phenomenon can be resolved by lowering PH of monoclonal antisera. Anti B in the serum of acquired B person does not agglutinate autologous red cells (autocontrol negative). Secretor status of person can resolve acquired B, saliva of acquired B person contains A substance not B substance. Serum of acquired B person contains A substance.

d. High concentration of A or B substance causing group discrepancies can be resolved by saline washing of red cells

Group III discrepancies

These are associated with protein or plasma abnormalities, rouleaux formation and pseudoagglutination. Discrepancies in this group includes

I. *Elevated level of globulin* from e.g. multiple myeloma, Waldenstorm macroglobulinemia, Hodgkin lymphoma.

II. Elevated level of fibrinogen.

III. Small fibrin clot in plasma or incompletely clotted serum can be mistaken for red cell agglutinates of reverse grouping. Principal: patient's sample with abnormal concentration of serum proteins, altered serum protein ratio, or high molecular weight volume expanders can aggregate reagent red cells and can mimic agglutination. Rouleaux are red cell aggregates that adhere along their flat surfaces, giving a stacked coin appearance microscopically. Rouleaux will disperse when suspended in saline. True agglutination is stable in the presence of saline.

Group IV discrepancies

These discrepancies are because of miscellaneous problems. These can be due to-

I. *Recent transfusion of out of group plasma containing component.*

II. *Cold alloantibodies* (e.g. anti M) or autoantibodies (e.g. anti I), PH dependent autoantibodies, a reagent dependent antibody (e.g. EDTA, paraben) leading to unexpected positive eaction.

III. *Recent infusion of IvIg which can contain ABO isoagglut*inins.

IV. *Mix field agglutination with circulating red cell of more than one ABO type.*

V. *Polyagglutination* (e.g. T activation) resulting from inherited or acquired abnormalities of red cell membrane with exposure of auto cryptantigen. The T determinant is normally covered by N acetylneuraminic acid and can therefore be described as a cryptantigen. The antigen can be exposed by the action of bacterial or viral neuraminidases Anti-T and anti-Tn present in the serum of all subjects except infants, are presumably formed as a reaction to T and Tn present in many Gram negative bacteria and vaccines. Very many organisms, including pneumococci, streptococci, staphylococci,clostridia, E. coli, Vibrio cholerae and influenza viruses are capable of producing this effect in vitro. T activation may occur in vivo. Usually, this polyagglutinability occurs as a transient phenomenon, disappearing within a few weeks or months of the time when it is first observed In the past, T activation was almost always detected by finding discrepancies between the results of testing red cells and sera in the course of ABO grouping. Nowadays, monoclonal anti-A and -B are widely used and so T activation seldom causes trouble in blood grouping.

Resolution of group IV discrepancies

a. Cold autoantibodies causing false positive reaction in forward grouping can be eliminated by washing of red cell with warm saline. If warm saline fails to resolve, removal of autoantibody with acid glycine EDTA or chloroquine can be used.

b. Autoagglutination causing false positive reaction in reverse grouping can be resolve by incubating at 37 c for 30-60 minutes. It can also be resolved by incubating red cells in presence of either dithiothreitol or 2-mercaptoethanol.

c. Unexpected alloantibodies in the patient's serum other than ABO isoagglutinins causing group discrepancy is resolved by as soon as antibody is identified (e.g. anti M), reverse grouping should be repeated by A1 and B cell that are negative for that antigen.

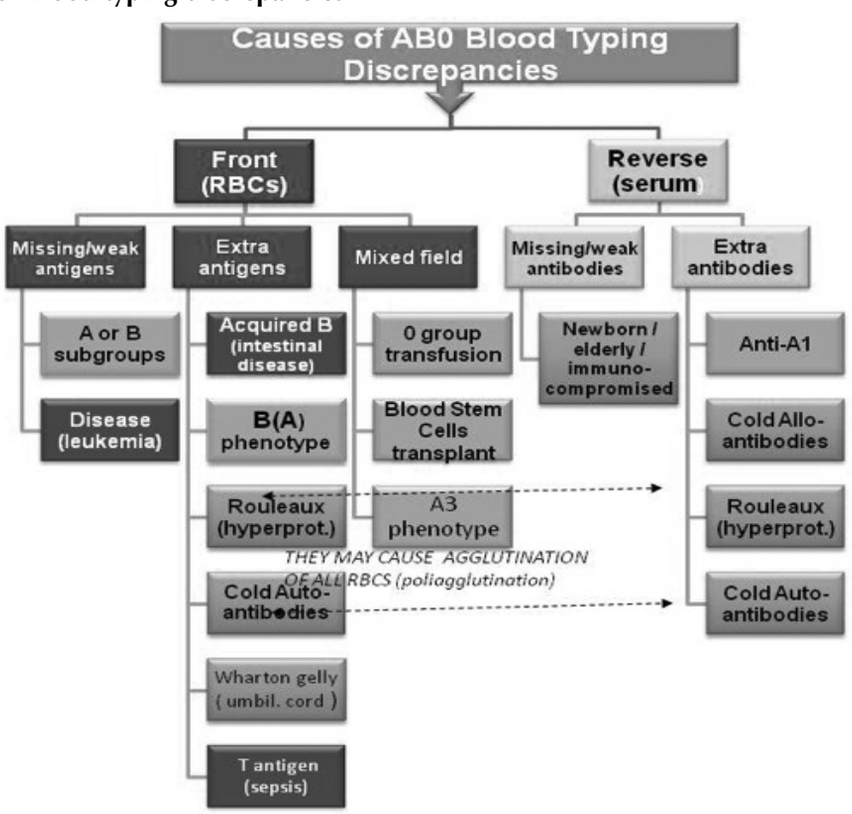
d. Unexpected ABO isoagglutinins (e.g. anti A1 in A2 or A2B) producing group discrepancies can be resolved by repeating reverse grouping using at least 3 A1, A2, B, O cell along with autocontrol. Patient's red cell can be typed with anti A1 lectin from dolichos biflorus to determine subgroups of A antigen.

e. A reagent dependent antibody (anti acriflavine antibody against acriflavi used in Anti B) causing group discrepancy should be resolved by washing person's red cell with normal saline for at least 3 times.

Conclusion

A major reason for the clinical importance of the ABO blood group system is the obligatory presence of isoagglutinins, potent natural antibodies directed against A and B antigens lacking on an individual's own red cell (RBC) membranes. Therefore, an individual's ABO phenotype must be determined both by directly testing the antigens on the RBCs and by testing the plasma for the presence of isoagglutinins. A discrepancy exists when the results of red cell antigen grouping do not agree with serum grouping. When a discrepancy is encountered, results must be recorded, but interpretation of the ABO type must be delayed until the discrepancy is resolved. If the discrepant sample is from a potential transfusion recipient and there is a clinical urgency, it is better to issues group O, Rh- compatible RBCs before the discrepancy is resolved.

Figure 1 Causes of Blood typing discrepancies



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PATHOGEN INACTIVATION: TODAY & FUTURE

Rebecca YEUNG

Current blood testing measures have greatly improved blood safety, particularly with regard to established transfusion-transmitted infections (TTIs) such as HIV, HBV, and HCV. Yet, residual risks exist such as those due to emerging pathogens and bacterial contamination. Examples of recent emerging pathogens are chikungunya and dengue, pathogens for which there are no commercially available tests.

Pathogen Inactivation – Today and the Future

Pathogen inactivation is recognized by various centers and institutions, including AABB and FDA, as the proactive strategy to reduce the risk of transfusion-transmitted infections. This talk will provide updates on pathogen inactivation in light of industry events, including the heightened concern with regard to arboviruses like Zika, dengue and chikungunya. Considerations that have driven the adoption of the INTERCEPT Blood system for pathogen inactivation, such as therapeutic efficacy and safety of treated platelets and plasma components, will be presented. The status of new developments such as red cell pathogen inactivation will also be discussed.

DIFFERENT ALGORITHMS FOR BLOOD DONOR SCREENING TEST

R.N. MAKROO

Provision of safe blood for transfusion is the prime responsibility of every transfusion facility. The donor screening algorithm include taking the elaborate history and testing for infectious markers for transfusion transmitted infections (TTI) prevalent in a geographical area, in line with the local guidelines.

What is a screening algorithm?

- The specific tests and testing processes to be followed in each facility to ensure the suitability of each unit of donated blood / blood component.
- It should be developed for each transfusion transmissible infection.

The design for such an algorithm would be decided upon by considering the specific infection marker to be screened for, the expertise of the users, the infrastructure provided, the testing conditions and the quality systems.

These algorithms help to ensure consistency in application of screening tests, decision making regarding the release of screened blood and donor notification for the transfusion transmitted diseases for which the consent of the donor is to be taken in advance.

As per WHO, the tests followed in an algorithm should be highly sensitive and specific. It recommends two approaches for blood screening based on the presence or absence of well-established quality systems in the laboratories.

In conditions of absence of well-established quality systems, blood and blood components should be immediately segregated and discarded once found to be reactive for a transfusion transmitted infection. The test on an initially reactive donation may be repeated in duplicate, either using the same sample or a sample from the tubing attached to the blood donation, and using the same assay in laboratories with well-established quality systems. If either of the duplicate testing result shows a positive result, the unit is segregated and discarded, followed by confirmatory testing for donor counselling.

Testing for HIV 1& 2/ Hepatitis C virus/ Hepatitis B virus

As per WHO, highly sensitive and specific antibody immunoassay or combined antigen-antibody immunoassays should be used to minimise the risk of transfusion transmitted infection. Such tests should be able to detect subtypes of an infectious agent, specific to the country or region. Rapid assays can be used in laboratories with small throughput, in remote areas and emergency situations.

As per National Aids Control Organization, for screening of donated blood, Algorithm I needs to be followed

wherein, blood is subjected once to a highly sensitive ELISA/Rapid testing for HIV. If negative, it is considered free of HIV and if positive, is taken as HIV infected for all practical purposes.

For Hepatitis B, screening for anti-HBc is not recommended as a routine. Countries should determine the need for anti-HBc screening based on the prevalence and incidence of HBV infection.

WHO algorithm for testing for Syphilis

Screening should be performed using a highly sensitive and specific test for treponemal antibodies, either with treponemal pallidum hemagglutinating assay (TPHA) or enzyme immunoassay. In populations with a high incidence of syphilis, screening should be performed using a non-treponemal assays like Venereal Disease Research Laboratory (VDRL) or Rapid Plasma Reagin testing (RPR).

WHO algorithm for testing for Malaria

Algorithm varies with the endemicity of the disease in a region. In endemic regions, all donations should be screened for parasitaemia using thick blood films or for evidence of malarial antigen using a highly sensitive enzyme immunoassay. Whereas for non-endemic regions, all donors with a history of malaria/ malaria exposure risk should be temporarily deferred until six months after symptoms or treatment have ceased and then may be re-instated as donors if there is no evidence of malarial antibody using a highly sensitive enzyme immunoassay.

The Nucleic Acid Testing (NAT) algorithms

The risk of TTIs has reduced considerably with improvements in safe donor recruitment and strict adherence to national strategies and algorithms for blood and blood component testing. Nucleic Acid testing (NAT) has been recognized as an effective tool to improve safety of transfused blood and blood components. It is a highly sensitive and specific test for detection of viral nucleic acids. It helps in interdicting window period donations and adds a layer of safety to when coupled with serological tests. The algorithms followed for testing donations by NAT vary greatly from country to country and also from within a country.

Few of the Asian countries, directly run the discriminatory assays based on initial reactive reports of NAT testing. The drawback to this lies in that, the low viral load in cases of Hepatitis B infection can be missed by this algorithm.

In most of the blood centres in India, Malaysia, Egypt and Greece all the sero-positive donations are screened by NAT and if this yields a negative result, is tested in duplicate to identify low viral loads and/or labelled as a 'serological yield'. If a sero-negative donation is found to be reactive in NAT testing, it is repeated in triplicate and labelled as a potential 'NAT yield' if either these repeat tests are positive. Testing in triplicate helps in high recognition of NAT yields and avoids discriminatory runs on false reactive samples.

All Donors, either with concordant serology and NAT yield or a potential serological yield or a potential NAT yield, are deferred permanently. Donors with non-repeat reactivity in NAT testing are eligible for further donation but the index donation needs to be discarded. The algorithm followed at our centre has been elucidated in figure 1.

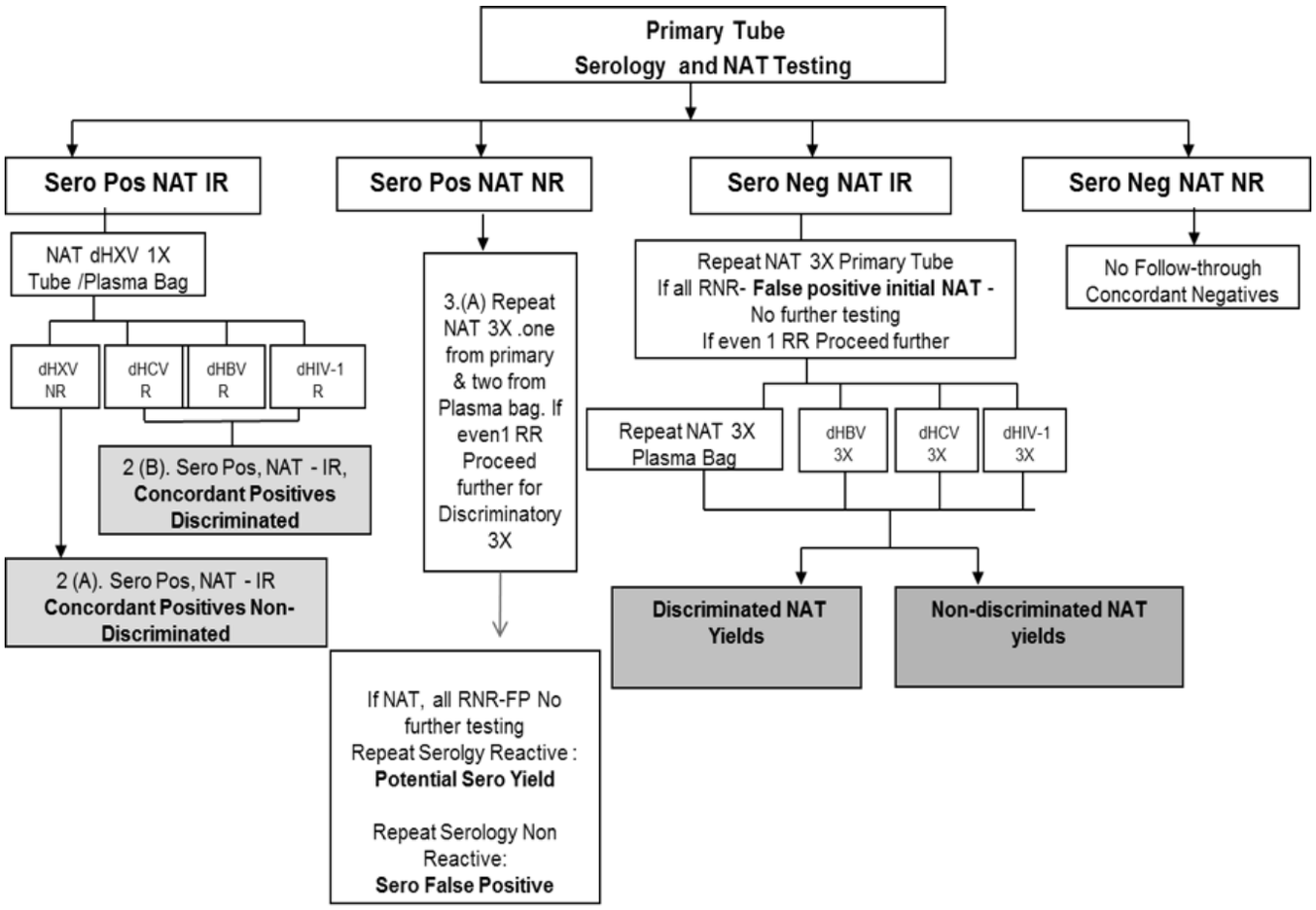

Figure 1: NAT algorithm followed at Department of Transfusion Medicine, Indraprastha Apollo Hospital,

RARE BLOOD PHENOTYPE: ETHNIC VARIATION AND CURRENT SITUATION OF RARE DONOR REGISTRY IN ASIA

Hülya BILGEN

A rare donor phenotype includes high-frequency-antigen-negative or multiple-common-antigen-negative or an IgA-deficient donor (concentration less than 0.05 mg / dL determined on two separate samples). Such donors need to be recognized, to overcome the most challenging situations of transfusion services, in providing antigen-negative compatible blood to patients with clinically significant antibodies against high prevalence antigens.

The requirement for rare blood donations to meet the transfusion needs of patients with unusual blood group antibodies or mixtures of antibodies was recognized in 1959 when the American Association of Blood Banks set up a Rare Donor file ,France soon followed in 1965 .In the same year the International Society of Blood Transfusion (ISBT) formed the World Health Organization International Donor Panel (WHO IDP) with the routine running of this being assigned to the International Blood Group Reference Laboratory (IBGRL) now situated in Bristol, England. The WHO IDP brings together data from various national sources, with the bulk of data coming from the UK, USA and Japan.

The ISBT Rare Blood Donor Working Party (ISBT W/P) was appointed in 1985 by the ISBT to provide oversight of any matters related to the supply of rare blood donations on an International basis.

In Asia Singapore ,Taiwan ,Iran ,Japan ,India ,China has rare blood group registrries. There are studies in Oman also. The Sankalp India Foundation is a non-profit organisation, which has been running a rare blood group network (www.bombaybloodgroup.org) with the voluntary participation of blood banks, individuals with Bombay blood group (BBG), specialists in transfusion medicine and volunteers. The national network aims at making rare blood available when needed, promoting use of alternatives to transfusion, as well as building a rare blood group donor registry and preventing wastage of blood.

In their terms of reference, they were to

a. develop guidelines for standardisation of listing, labelling, shipping, testing and reimbursement for rare donor blood;

b. provide ongoing information on matters related to rare blood, and

c. develop and expand the liaison with the IBGRL and thus assist blood services to be aware of, and contribute to, the WHO IDP in Bristol, United Kingdom.

Members of the ISBT W/P meet regularly at ISBT meetings for administrative matters, conducting surveys, making recommendations related to rare blood donation procedures and publishing relevant papers The Working Party has also been active in promoting seminars on rare blood donors at National and International meetings in an effort to educate and improve the flow of information on rare blood. Details on rare blood donors can also be obtained on

the ISBT web site.

The ISBT W/P has, at present, 15 well-qualified members representing all the major continents. It works in close cooperation with the IBGRL, acting as a focus for rare blood donor information as well as carrying out advanced investigations into blood group antigens and antibodies. A variety of topics related to rare blood donors are under investigation by the Working Party.

In the future, it is anticipated that a wider range of countries will contribute to the International Donor Panel. It is likely that with the many major population movements throughout the world and the potential consequent development of rare antibodies or mixtures of antibodies, the need for the availability of rare blood donations will remain for the foreseeable future.

Education is still a priority. The aim is to create a greater awareness of the availability of rare blood donors as well as the availability of considerable technical help. The ISBT W/P intends to continue contributing to both national and international meetings and to publish relevant information.

In conclusion, the requirement for rare blood is a clinical problem that may confront any of us at any time. International co-operation between countries to provide often urgently needed rare blood is a worthwhile programme and needs to be supported by all means available. The ISBT Working Party is committed to ensuring that all such clinical needs are met effectively and efficiently. Asia should be a part of it.

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PARTIAL D AND WEAK D: PICKING UP THE Rh(esus) PIECES

Susan T. JOHNSONS

Detecting the presence or absence of the *RhD* antigen has challenged transfusion medicine specialists for decades. It is not uncommon for laboratories to encounter discrepancies in RhD typing as compared to what is on record or to detect weak or questionable results. Today, we have a better understanding of what causes the discrepant typing results and genotyping to help confirm RhD status. Over 200 RHD alleles have been described and this number will continue to grow (see, www.uni-ulm.de/~fwagner/RH/RB2/; also: http://www.isbtweb.org/working-parties/red-cell-immunogenetics-and-blood-group-terminology/blood-group-terminology/blood-group-allele-terminology/).

RhD antigen resides on a multi-pass, integral membrane protein. External loops of the protein are subject to conformational/shape change. At least 30 different epitopes (antigenic determinants) to which an anti-D reagent may bind have been described.

To add to the complexity in routine testing are individuals identified with weak expression of RhD antigen. The first description of an unusual D variant was reported in 1946, as a new antigen termed D^u. Many years later, Du is no longer a valid description of this type. Instead, individuals with weak D antigen are those with a serologic weak D phenotype.

In a Commentary published as a result of an inter organizational work group sponsored by AABB and the College of American Pathologists (CAP), the serologic weak D phenotype was defined as "anti-D reagent giving no or weak (≤2+) reactivity in initial testing, but agglutinating moderately or strongly with antihuman globulin".[1] A serologic weak D phenotype is also detected when discordant typing results are obtained either at point of testing or upon review of patient records. The frequency of serologic weak D phenotypes is reported to be 0.2 – 1% of the Caucasian population.[2] A few studies exist that support a higher incidence in other populations but further research is needed.

The majority of serologic weak D phenotypes studied to date are Weak D Types with a single nucleotide polymorphism which results in a single amino acid change in *RHD* reducing expression of the RhD protein. The most common reported in a Caucasian population are Type 1, 2 and 3 who have reduced RhD antigen expression but all normal D epitopes present. These individuals are not at risk of making anti-D and can be interpreted as RhD positive.

Individuals with partial D are encountered less frequently. Partial D usually result from hybrid *RHD/RHCE* genes. Individuals with partial D are missing D epitopes and are at risk of making anti-D if exposed to RhD positive blood through pregnancy or transfusion.

D epitopes can also occur on the RhCE protein. These result from gene conversion events between *RHD* and

RHCE genes as well as single nucleotide polymorphisms. It is known that some reagent anti-D will be strongly positive with individuals of the ceHAR or ceCF phenotypes while they lack the RhD protein.

Not only do RhD typing discrepancies occur due to variant *RHD* genes, discrepancies occur when testing with different licensed anti-D reagents. All reagent anti-D are tested for specificity and sensitivity, however, because of variation in RhD antigen expression each may detect a slightly different epitope(s) on the RhD protein.

The testing platform used to perform pretransfusion testing also influences detection of the RhD antigen. Test tube, column agglutination methods (gel and glass beads) and solid phase automation all utilize standard hemagglutination. The difference is in visualizing the positive versus negative result. Test tube methods require manual, gentle resuspension of the RBCs while column agglutination requires observation and interpretation after centrifugation. When using an automated solid phase method, Rh typing is performed using a microtiter plate where the anti-D reagent is mixed with the individuals red cells. In both the automated gel and automated microplate methods reactions are observed after centrifugation with an optical image reader. Differences in the way hemagglutination is visualized may influence strength of a positive result.

Finally discrepant Rh typing results occur based on why an individual is being typed. Many laboratories whether testing transfusion recipients or pregnant women do not require a weak D test (indirect antiglobulin test with anti-D), for those typing negative or weakly positive (<2+). They interpret these individuals as Rh negative. Other laboratories will perform a weak D test. For blood donors and newborns, it is required to have procedures to ensure a serologic weak D phenotype will be detected and called Rh positive.

It is impossible to tell the difference between weak D and partial D types based on serologic typing. *RHD* genotyping can be performed to differentiate the common weak D types 1, 2 and 3 from partial D. In June of 2015 the AABB and CAP issued a Joint Statement on Phasing-In *RHD* Genotyping for Pregnant Women and Other Females of Childbearing Potential with a Serologic Weak D Phenotype based on the work in the previously mentioned Commentary.[1] http://www.aabb.org/advocacy/statements/Pages/statement150722.aspx. The statement: "*RHD* genotyping is recommended whenever a weak D phenotype is detected by routine Rh blood typing of pregnant women and other females of childbearing potential." This was rated as strong recommendation, based on high-quality evidence from observational studies (1A).[3]

Discrepant results in Rh typing are inevitable. It is up to transfusion medicine specialists to determine their best course of action to interpret the results. Numerous reasons for variability seen in typing have been outlined. Finally, guidance in interpretation of this important testing has been provided, however, one must keep in mind that RhD typing challenges will remain despite our best efforts to improve methods and to improve our understanding of the RhD protein and the molecular basis of the *RHD and RHCE* genes.

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NON-INVASIVE PRENATAL METHODS FOR FETAL RhD GENOTYPING

Özgür ÇOĞULU

Prenatal diagnosis/screening is evaluating foetus or embryo for health and well-being by using a number of procedures which can be gathered under the titles of invasive and noninvasive methods. Noninvasive methods involve ultrasound scanning and maternal serum biochemical analysis, and invasive methods involve invasive sampling of fetal tissues by using techniques such as chorionic villus sampling or amniocentesis. For years those methods have been the only available procedures to have information about the health of foetus. The major concern in those tests has been the risk of harming foetus or mother, therefore studies have been focused on the safety of those procedures.

Noninvasive prenatal testing (NIPT) in its current understanding is the genetic testing of fetal biological material by using maternal blood sample. This technique provides information about foetus by using fetal cells or fetal DNA. cffDNA immediately disappears from maternal circulation 1 day after delivery. Interestingly fetal cells may persist in maternal blood for years. Cell-based technique is not used for this purpose because of a number of limitations, however analysis of cell-free fetal DNA (cffDNA) in maternal blood allows assessment of fetal health status in respect of different conditions including fetal rhesus D (RhD) status in RhD negative mothers (RhD genotyping), fetal sex determination, fetal aneuploidy detection or the diagnosis of single gene disorders. Because alloimmunisation is a crucial problem which leads to haemolytic disease in the newborn, with the detection of paternal allele in the prenatal period, antenatal prophylaxis would be available to those D-negative women carrying a D-positive foetus. Consequently, this prevents unnecessary anti-D treatments.

Maternal blood includes both maternal and fetal nucleic acids. cffDNA in maternal blood is derived from apoptotic trophoblastic placental cells, fetal hematopoietic system and lysis of other fetal cells. It can be detected in maternal blood from the 18th day of gestation. Fetal DNA is present with low concentrations in early pregnancy and the concentration gradually increases as pregnancy progresses. There also exists variation in cffDNA concentrations between individuals. The complete fetal genome is available in maternal blood therefore the technique is based on the detection of fetal RhD specific DNA sequences (paternally inherited allele) which should not present in RhD negative maternal blood. RhD genotyping of the foetus by using cffDNA in maternal plasma has become available since 2001.

NIPT is based on numerous techniques, namely, PCR-based methods, microarrays or next generation sequencing. RhD genotyping in maternal blood which is the first application of DNA-based NIPT can be performed by PCR-based methods. This is a qualitative analysis which identifies the presence or absence of the RhD gene. Its sensitivity is 99.5–99.8% and specificity=94.0–99.5%. The RhD gene is located on chromosome 1 and consists of 10 exons which is contiguous to the RhCE gene. They form the Rh locus. On the other hand several RhD variants have been described in RhD negative individuals such as pseudogene of RhD gene (RhDψ) and hybrid gene containing both RhD and RhCE (RhD-CE-D). Due to the high complexity of the Rh system and the possibility of false results, at least two exons are recommended for a safe analysis of RhD genotyping. The most commonly used exons are exons 4, 5,

7 and 10. Inclusion of exon 5 is mostly suggested to prevent false negative results.

In conclusion NIPT has become a routine application of genetic counselling in certain circumstances in clinical practice worldwide and RhD genotyping has been one of the most common indication of NIPT.

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MOLECULAR TECHNICS IN BLOOD GROUPING, SEROLOGIC AND MOLECULAR TEST DISCREPANCIES

L. Tufan KUMAŞ

Antibodies developed against Red Blood Cell (RBC) antigens is a major handicap in transfusion practices. Donor or recipient RBC antigen typing (sometimes platelet or leucocyte antigen) and screening/identifying antibodies against these antigens is vital for safe transfusion. Routinely used serologic method for blood grouping and compatibility tests is hemagglutination. But in some cases molecular tests are used to solve the immunohematological problems when serologic methods are insufficient. Molecular tests depend on the analysis of deoxyribonucleic acid (DNA) or ribonucleic acid (RNA) molecules in the interested region of blood group genes.

The red cell membrane contains many surface proteins. Some of these surface proteins are polymorphic and carry the different blood groups. Most blood group antigens are glycoproteins and their specificity is mostly determined either by the oligosaccharide (e.g. ABO) or amino acid sequence (e.g. Rh). Each blood group system represents either a single gene or a cluster of closely linked homologous genes. The 35 human blood group system genes have been identified and sequenced and most of the polymorphisms are now known. Although many mechanisms give rise to a blood group antigen or phenotype (Table 1), the majority of blood group antigens are a consequence of single nucleotide polymorphism (SNP). SNPs encode amino acid substitutions in either a glycosyltransferase (e.g. ABO) or extracellular domain of a red cell membrane protein (e.g. Kell, Duffy, Kidd).

Table 1: Molecular events that give rise to blood group antigens.

Molecular Mechanism	**Example for Blood Group**
Single nucleotide change in a transcription site	T > C in GATA of *FY*
Single nucleotide change in a splice site	ag > aa in Jk(a-b-)
Deletion of an exon(s)	Exon 2 of *GYPC* in Yus phenotype
Deletion of a gene(s)	*RHD* in some D-negative people
Insertion of a nucleotide(s)	37-bp insert in *RHDΨ* in some D-negative people
Insertion (duplication) of an exon(s)	Exon 3 of *GYPC* in Ls(a+)
Alternative exon	Exon 1 in I-negative people
Gene crossover, conversion, other recombination events	Many hybrid genes in MNS and Rh systems
Alternative initiation (leaky translation)	Glycophorin D
Absence/alteration of a required interacting protein	RhAG in regulator Rh_{null}, and Rh_{mod}
Presence of a modifying gene	*InLu* in dominant Lu(a-b-)

Once the molecular basis of a blood group antigen has been known, the precise area of DNA can be analyzed to predict the presence or absence of a blood group antigen. As the majority of genetically defined blood group

antigens are the consequence of SNPs, simple Polymerase Chain Reaction (PCR) based assays can be used to detect a change in a gene encoding a blood group antigen. A wide range of DNA-based assays have been used for this purpose: PCR-RFLP, PCR-SSP or PCR-ASP, real time PCR, DNA sequencing and pirosequencing and methods with microarrays-based systems. The molecular methods for red cell genotyping can be divided into the following categories: low to medium-throughput: PCR-RFLP, PCR-SSP or PCR-ASP, real time PCR, DNA sequencing and pirosequencing and high-throughput with microarrays-based systems.

The main question about the intended use of molecular methods is when or where to use the RBC genotyping.

When? To solve the problems that could not be solved because of the limitations of serologic immunohematology. These are:

- **Technical limitations**
  - Subjective interpretation
  - Labor intensive procedure requiring manual data entry
  - Requires use of reliable antisera
  - Cost of FDA-approved reagents is escalating
  - Many antisera used are not FDA approved
  - Antisera are often limited in volume, weakly reactive, or unavailable
  - Source material is a biohazard serving as a potential reservoir of infectious disease
- **Clinical limitations**
  - Typing of RBCs from patients who have been recently transfused
  - Typing of RBCs from patients with autoantibodies
  - Does not precisely determine RHD zygosity in D-positive individuals
  - Small number of donors are typed for a small number of antigens, limiting antigen-negative or rare donor registries

Where? Application and Implementation of Molecular Technologies:

- **Donor center**
  - Genotype RBC products
    - Product for special patient populations, such as sickle cell disease patients
    - Products for patients with multiple alloantibodies
    - RHD genotyping donors who are D-negative
  - **Reference laboratory**
    - Reagent RBCs for antibody detection
    - Genotype to determine dosage of RBC antigens
    - Resolution of typing discrepancies
    - Genotype to predict presence or absence of an antigen when no antisera exists
    - Determination if new antibody is an autoantibody or alloantibody
    - Resolution of unusual serological findings
- **Transfusion service**
  - Genotype patients
    - Recently transfused patients
    - Patients with autoantibodies
    - D type of the patient to predict need for RhIg or D-negative products
  - **Providing genotyped matched products**
    - Patients with SCD

- Patients with thalassemia
- Patients with AIHA
- Chronically transfused patients

o **Prenatal testing**

- RHD type to predict need for RhIg
- Genotype fetal DNA to predict risk for HDFN

Abbreviations: SCD, sickle cell disease; AIHA, autoimmune hemolytic anemia; HDFN, hemolytic disease of the fetus and newborn.

Although molecular methods in blood grouping provide so many advantages in Transfusion Medicine and they are being more commonly used with the developing technology, there is still some questions about ABO testing. Genotyping is not yet recommended for routine ABO blood group testing. According to "Guidelines for the Blood Transfusion Services in the UK"; "Whereas ABO typing by serological means is straightforward and extremely accurate, the genetics of ABO is complex, rendering ABO molecular typing by available methods unreliable. This is particularly so in people of African origin, where hybrid ABO alleles are present. As it is never acceptable to obtain a false ABO typing, prediction of ABO phenotype by molecular methods is not currently recommended.".

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TÜRKÖK PROJECT: FROM THE VIEW OF MINISTRY OF HEALTH

Medine HASÇUHADAR

TURKOK, is the name of the Stem Cell Coordination Center of Turkey, which was established for patients in need of a hematopoetic stem cell transplant.

Bone Marrow Banking in Turkey has been carried out by two registries: TRIS was established in 1999 under the auspices of Istanbul University Medical Faculty and TRAN was established in 2006 under the auspices of Ankara University Medical Faculty. Despite their great efforts, they both could reach the number of 60 000 volunteer donors until these days. If more volunteer donors sign up, the chances of finding an unrelated donor match will increase. For this reason, TURKOK was launched on the 1sth April 2015 under the authority of The Ministry of Health of The Republic of Turkey. In other words, TURKOK is responsible for facilitating the coordination between the transplant centers, conducting the National Bone Marrow Bank which stores patients HLA data, and a great number of volunteer donor's HLA data, increasing the number of volunteer donors and making this system more effective and efficient.

TURKOK has structured at three (multi-unit) different functions: volunteer stem cell donor recruitment, tissue typing and national bone marrow banking.

Volunteer Stem Cell Donor Recruitment:

When TURKOK was a project, A Collaboration Agreement was signed on the 7th November 2013 between The Ministry of Heath of Turkey and Turkish Red Crescent. This agreement states that Turkish Red Crescent is responsible for providing volunteer donor recruitment, sample collection and submission and this agreement also says that an accomplished task-based payment is used for these services. In order to reach larger donor rate at short notice, it is aimed to draw advantage from past experience of Turkish Red Crescent about blood donation. 12 volunteer stem cell donor centers was constructed throughout Turkey and they are located within regional blood donor centers of Turkish Red Crescent. (they are located in these provinces: İstanbul, Eskişehir, Antalya, Ankara, Bursa, Düzce, Adana, Kayseri, İzmir, Samsun, Gaziantep and Erzurum)

HLA Typing:

While TURKOK was a project, in order to procure HLA typing service, TURKOK selected external contractor through call for tender, TURKOK signed contract with The Tissue Typing Laboratory on 1sth February 2014 and this laboratory began HLA testing on the 25th October 2014. This contract states that the laboratory is responsible for performing HLA testing and loading these results into the database of Turkok and this contract also says that an accomplished task-based payment is used for these services. Turkish Red Crescent collects blood samples from the donors and then submits these samples to the laboratory, furthermore Turkish Red Crescent uses ISBT 128 for labelling of these samples. HLA typing is performed via Next Generation Sequencing (NGS) Technologies. The

laboratory reports, on average, about 1000-1200 results in one week time. The samples are typed at five HLA loci (HLA-A, -B, -C and –DQ) and resolved to the 4 digit level.

National Bone Marrow Banking:

The database of TURKOK is formed by loading the HLA results which performed by TURKOK Tissue Typing Laboratory. Also the patients' list is formed by taking the details of patients, who are in need of an unrelated hematopoetic stem cell transplant, from all transplant centers in Turkey. TURKOK's formal framework by which job tasks are divided five groups (Searching, Matching, Coordination, Administrative & Financial Affairs, Performance and Quality): they are carried out these tasks in order; making search on the database, finding out best match/matches, informing to relevant transplant center about search result, reaching to the volunteer donor, collecting & processing the hematopoetic stem cell unit and shipment of this stem cell unit to the transplant center. In other words, TURKOK is concerned about the coordination process between all relevant parties. In addition, National Bone Marrow Bank manages both short term and long term post-transplant follow-up for donor and patient.

Furthermore, we applied to BMDW (Bone Marrow Donors Worldwide) as a registry. After our participation, we can provide access to stem cell donors in the world, in other words we provide to maximize the chance of finding stem cell donor for our patients, at the same time any patients in the world can have chance to find a stem cell matches in the database of TURKOK.

TÜRKÖK PROJECT, DONOR REGISTRY

Şenay CANPOLAT

TURKOK Project aims to establish Bone Marrow Bank for patients needing Hematopoietic stem cell transplantation treatment in Turkey, to find candidate donors wishing to donate bone marrow or peripheral stem cell voluntarily and to establish coordination between Apheresis Centers and Transplant Centers.

Turkish Ministry of Health and Turkish Red Crescent signed a cooperation protocol on 07.11.2013 and Turkish Red Crescent has assumed the duty of "Stem Cell Donor Recruitment".

The protocol aims at establishment of Red Crescent Stem Cell Coordination Center and Volunteer Donor Centers, setting out personnel recruitment and training, donor automation system, campaign, public relations and communication strategies, donor management, serology tests, transfer of tubes to TTL(Tissue Typing Laboratory) and in case of matching, contacting the donor, receiving his/her acknowledgement, renewing serological tests and transferring the donor to TURKOK.

Stem Cell Coordination Center (SCCC) established within organization of General Directorate of Turkish Red Crescent Blood Services and Volunteer Donor Centers (VDC) established within organization of Regional Blood Centers carry out donor recruitment activities.

1. Kuzey Marmara **(İstanbul)** BKM
   • Avrupa BKM
2. Orta Anadolu **(Ankara)** BKM
3. Ege Bölge **(İzmir)** BKM
4. Batı Akdeniz **(Antalya)** BKM
5. Güney Marmara **(Bursa)** BKM
6. Batı Karadeniz **(Düzce)** BKM
7. Orta Akdeniz **(Adana)** BKM
8. Batı Anadolu **(Eskişehir)** BKM
9. Doğu Akdeniz **(Gaziantep)** BKM
• Güney Anadolu**(Diyarbakır)** BKM
• **Malatya** BKM
10. İç Anadolu **(Kayseri)** BKM
11. Orta Karadeniz **(Samsun)** BKM
   • Doğu Karadeniz**(Trabzon)** BKM
12. Doğu Anadolu **(Erzurum)** BKM
   • Güney Doğu **(Van)** BKM

Training and informing are paid maximum care in donor recruitment. That is why instructors specialized in their fields have given "Stem Cell Medical-Technical Training to Volunteer Donor Recruitment Personnel to be employed in stem cell donor recruitment activities, Blood Donor Planning Personnel and Regional Blood Center Directors. In addition, the same personnel have taken "Communication-Persuasion Training" to show professional approach during their talks with the potential donors.

Target mass in volunteer stem cell donor recruitment is firstly blood donors, apheresis donors and the youth. The

samples from stem cell donors are accepted at 12 Volunteer Donor Centers at based blood taking units and stem cell teams. Mobile blood donation teams do not accept stem cell donation. According to the protocol, donor recruitment activities are not conducted for specific patients but covers all patients waiting for transplantation.

Stem Cell Module for stem cell donor registration and management has been incorporated into Hemonline Automation system of Turkish Red Crescent Blood Banking Information Management System. ISBT 128 barcode system is used in all forms and tubes used for Bone Marrow Bank data inputs.

"Standard Operation Procedures" (SOP) have been set out in Turkish Red Crescent Quality and Performance Management System for stem cell donor recruitments and incorporated into Quality Management procedures.

Public spot with slogan of "Step forward –Save Life" and various visual materials have been provided for Stem Cell Donor promotion activities. Information on Stem Cell Donation is available in details at www.kanver.org web site of Turkish Red Crescent. Promotional activities are carried out from various social media accounts.

Upon reaching 100.000 stem cell donors specified under the protocol, targets were revised on 16.06.2015 and new protocol was put into effect. The new target for 2016 is 80.000 donors.

DONOR RECRUITMENT

Healthy individuals of 18-50 years old, informed and giving consent can donate stem cell.

Stem cell donation process is initiated by taking sample of 10-20 ml of total 3 tubes. Following completion of serological and blood grouping tests by Turkish Red Crescent, HLA samples of compatible ones are delivered to Tissue Typing Laboratory of Turkish Ministry of Health. The results of tissue typing tests conducted by the laboratory are transmitted to TÜRKOK Bone Marrow Bank (BMB).

In case of discovery of compatible donor in BMB system by Turkish Ministry of Health, Red Crescent Stem Cell Coordination Center (SCCC) is informed for contacting the donor. Red Crescent reaches potential stem cell donor and takes his/her consent for donation. After taking consent, the sample is taken again for serological tests (HbsAg, Anti HCV, Anti HIV and syphilis). HLA sample is taken from those compatible for donation according to test results and delivered to TTL, and samples from patient and donor are analyzed in comparison so as to minimize error rate.

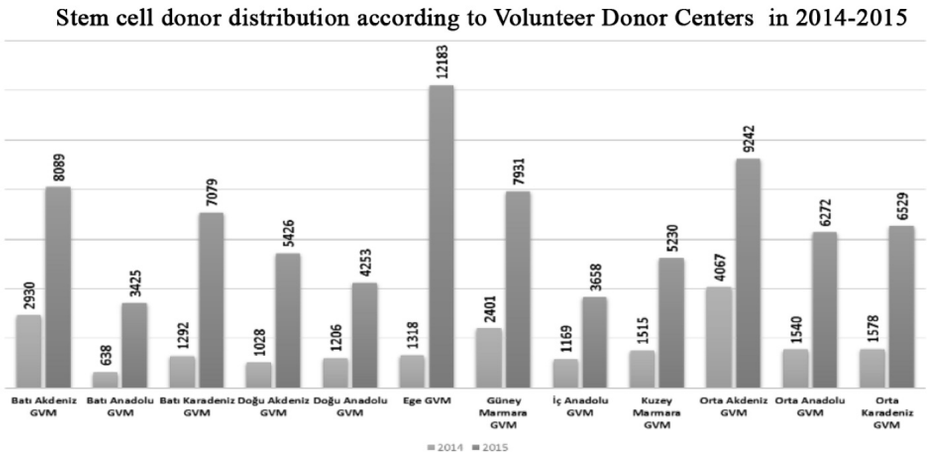
Following approval from the physician of the patient upon such study, the donor is contacted to talk on date and method of transplantation in coordination with Turkish Ministry of Health.

PATIENTS TO HAVE STEM CELL TREATMENT

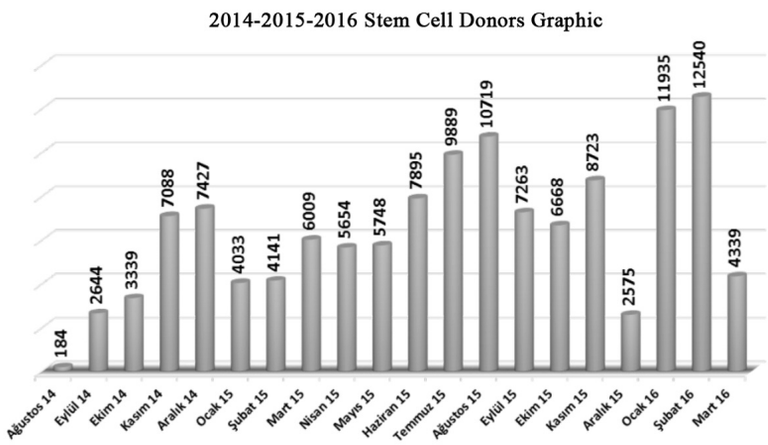
Stem cell transplantation is applied for multiple myelom, lymphoma, various organ cancers, cases in which bone marrow functions inadequately or fails to function, hereditary anemia, immune deficiencies, hereditary metabolic diseases.

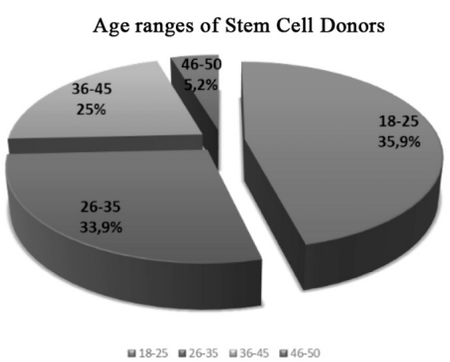
NUMBER OF STEM CELL DONORS

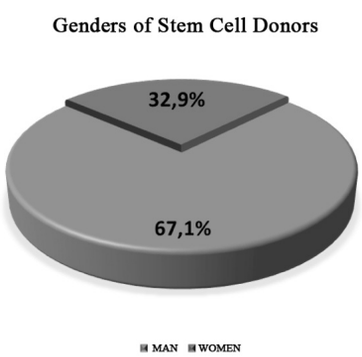
Upon donor recruitment activities initiated actively as of 13.08.2014, the number of donors by end of 2015 reached 99.999.

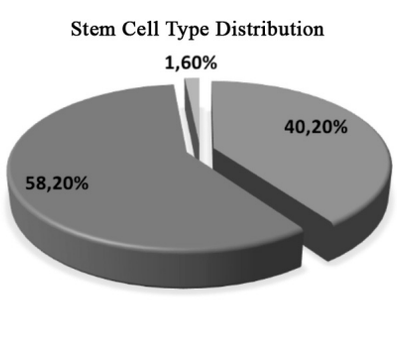


Total number of donors as of March 2016 reached 128.813. 67% of the donors is male and 33% is female. 70% of potential donors are in 18-35 age range and 60% of them are blood and/or aphaeresis donors at the same time.

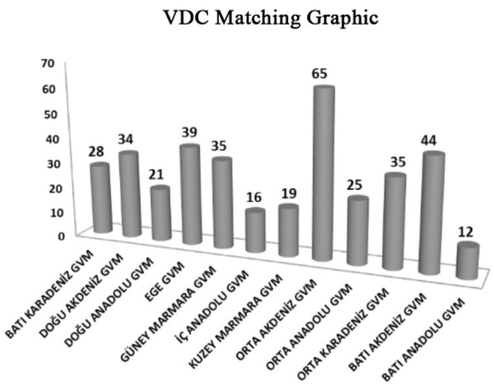


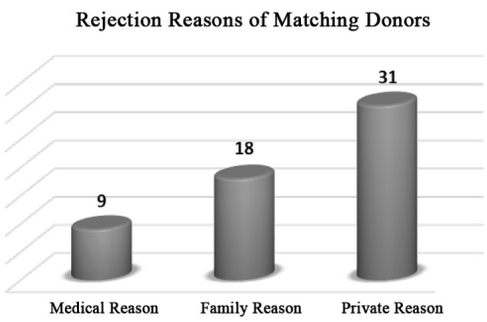






According to scanning studies conducted by Turkish Ministry of Health, 375 matching requests were informed and 84% have given affirmative feedback. 58 individuals have decided not to be donors for various reasons before or after matching.





Stem cell collection was made in 49 donors and transplantation to patients was completed. On the other hand, 13 donors are in the stage for planning transplantation.

SOCIAL MEDIA IN DONOR ACQUISITION

Metin KALENDER

When it is considered basically; the most important point of donor acquisition is that “it is located at the junction of social awareness and personal sensitivity.” It requires a large communication network in its infrastructure. If we look at the resulting strategy in general, when all points of communication come together; we monitor two different effects together.

1. Top-down effect. Here advertising, promotion and public relations activities, carried out on a national basis are highlighted.
2. Bottom-up effect. All points requiring face-to-face contact with people are included in this effect. All platforms in which closest contact with blood donors is realized, such as a Blood Donation training provided in an institution or the right information to be given by a phlebotomist when he meets a blood donor, will create this effect.

When we approach social media in this context, social media takes its place in the steps of both the top-down effect and the bottom-up effect. Therefore, it plays an important role in the rapid communication strategies. Social media is the media system which allows the access to double-sided and simultaneous information sharing along with bringing the Web 2.0 into use, rather than one-way information sharing. Besides, social media is the whole of dialogues and information sharing realised on the internet by the people. In social networks, thanks to websites and applications which enable people to share content and information with each other, everyone may have access to the content that is inquired and interested. Also it allows for the production of contents without the need for different sources of information. On the other hand, It provides an informal environment for people's education.

What should be the purpose of using social media? Generally speaking, it is evident that two main objectives are required to achieve the desired point.

1. To give, propagate and sustain correct information. Blood donation activities should be announced. On the other hand, informing should be carried out in areas on which an awareness raising is desired. Social media is a non-formal educational tool. Relevant information studies realized especially following an information request should be delivered to the target audience properly and in a short time by being spread rapidly.
2. To change a negative or incorrect information.

Since the impact from social media is instant by its nature, the main point is to what extent crisis management is implemented properly. Then, how many types of reaction can be given to an impact coming from any channel?

An idea is developed against the incoming impact. In this case, a risk of increasing the power of knowledge advocated by the counterparty exists. For example, “I'm not sure about the safety of blood, therefore I do not want to give blood.” The effect may be grown more if the total opposite idea is told. “No, this is wrong because our system

is strong enough not to accept such errors."

Parallel ideas may be developed against the incoming impact. In this case, it can be declared that such a risk exists although the blood safety is tested in laboratories of international standards. However, in such a case, again the power of incoming impact will increase. Because social media is a platform whose language is short, but its effect may be long.

Sub-ideas may be developed against the incoming impact. The subject is moved to a different platform from the point of incoming impact. "The most important point on blood safety is the window period of infection." With this information, scientific data on the safety of blood comes to the fore. Then the subject is treated in this context and the process is continued. In this case, what we want takes place as expected, the power of incoming impact will decrease and a different area will be opened for giving right information.

"Social media does not sleep."

Reaction rate must be strong against the instant and inevitable rate of social media. An information, news or any positive or negative demand should find instant answers with pre-planned processes. Answers should be quick, short, simple and meaningful.

When we look at the pros and cons of social media, it can be seen that both of them begin at the same point. First of all the real intention of the incoming impact should be read correctly. Because the nature of the information content will determine whether its effects will be positive or negative. The positive side of social media is that sharing is instant. However, the downside is still the same; instant sharing. For these reasons, the source of the subject consists of the nature of intention sharing. The important point is the provision of necessary manipulations which will ensure that the sharing will come to the desired point at the next step.

MESENCHYMAL STROMAL CELLS: ARE THEY READY FOR CLINICAL USE? AN UPDATE

Naynesh KAMANI

Mesenchymal stromal cells (also known as Mesenchymal stem cells or MSCs) were initially identified in cultures of bone marrow a half century ago. Over the past two decades, methodologies for isolating and growing them in vitro have been developed. We now know that MSCs are present in many body tissues and organs, have the common characteristic of being adherent cells with the potential of differentiating into osteocytes, chondrocytes and adipocytes and relatively unique cell surface characteristics. The bone marrow, adipose tissue and cord blood are the most commonly used sources of MSCs. MSCs exert their function via multiple mechanisms of action including the secretion of many bioactive molecules that have anti-inflammatory, tissue regenerative and immunosuppressive properties. Both academic and industry laboratories have now used clinical grade MSCs for a variety of clinical conditions including autoimmune diseases, graft-vs-host disease and tissue repair indications for many different organ systems. There are several hundred phase I and II clinical trials being conducted with MSCs. Results of MSC use in clinical trials for GVHD and stroke wil be discussed and challenges in bringing these cellular therapies to the clinic will be discussed.

CT INITIATIVES AT AABB: STANDARDS, ACCREDITATION AND EDUCATION

Naynesh KAMANI

AABB is an international not-for-profit professional association of over 7,000 individuals and organizations working in the field of transfusion medicine and cellular therapy. Its mission is focused on patient and donor safety and health. AABB was the first organization to develop standards for blood transfusion over six decades ago and started to accredit facilities that collected and transfused these products against these standards. Standards have now been developed for other therapies such as hematopoietic cell collection, processing, banking, release and administration and facilities such as public and family cord blood banks and hematopoietic progenitor cell processing laboratories voluntarily seek accreditation to demonstrate compliance with AABB cellular therapy standards. The standards are revised on a two year cycle to remain current and compliant with federal and national regulatory requirements. More recently, novel cell therapy standards have also been developed. In addition to standard setting and accreditation activities, AABB has many educational offerings including the society journal, TRANSFUSION, many textbooks in the field of transfusion medicine and cell therapy, audiocasts and webinars. An on-line, self-paced CT certificate program is under development and will be launched later this year.

WHAT TYPE OF STANDARDS? NATIONAL OR REGIONAL OR INTERNATIONAL?

Ayla YAVUZ

What is a standard?

A standard is a document that provides requirements, specifications, guidelines or characteristics that can be used consistently to ensure that materials, products, processes and services are fit for their purpose.

ISO/IEC Guide 2 defines a Standard as a: "document, established by consensus and approved by a recognized body, that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context. Standards should be based on the consolidated results of science, technology and experience, and aimed at the promotion of optimum community benefits."

Standards are published documents setting out specifications and procedures designed to ensure that products, services and systems are safe, reliable and consistently perform the way they were intended to. They establish a common language that defines quality and safety criteria. Standards are practical and set achievable goals. They are based on sound industrial, scientific and consumer experience and are regularly reviewed to ensure that they keep pace with advances in technology.

Purpose of Standards

Standards are developed for a number of purposes, including:

1. Voluntary or mandatory applications: Standards that specify requirements to achieve at least the minimum objectives of safety, quality or performance of a product or service.

2. Regulatory compliance: Standards that are used to specify minimum least-cost solutions to technical requirements expressing characteristics, performance and design criteria compatible with the function of legislation.

3. Contractual purpose: Standards that serve as purchasing specifications or technical conditions of contract between two parties.

4. Guidance: Standards that may be intended for educational purposes and which include recommendations, or administrative or project management procedures. In general, these Standards will not be adopted in either legislation or contract specifications.

Types of Standards

There are three categories of Standards that are generally recognised by the Standards community: International, Regional and National.

According to the structure characters	According to the application form	According to the application area
1.Basic standards	Voluntary	Interoperability standards
2.Design standards	Mandatory	Industrial
Matter standards		National
Product standards		Regional
Test Method standards		International
Service standards		

Figure.1. Types of Standards

International Standards

International Standards are publicly available Standards that have been developed and approved by an international SDO. ISO (International Organization for Standardization) and IEC (International Electrotechnical Commission) are the two main international standardising bodies. Other international bodies include the ITU (International Telecommunications Union) and the Codex Alimentarius Commission (set up by the Food and Agriculture Organization of the United Nations and the World Health Organization (WHO) to develop food Standards, guidelines and related texts such as codes of practice).

International Standards are used directly or are adopted by regional or national Standards bodies. ISO and IEC encourage national adoption if International Standards. There are also 'de facto' international Standards that, although they have not been developed by an international Standards organisation, have widespread acceptance. These may also be adopted by international, regional or national Standards bodies.

Regional Standards

Regional Standards are publicly available Standards that have been developed and/or adopted by a regional SDO; the most well-known of these are those that apply in the European Union (EU). These Standards are developed by the European Committee for Standardization (CEN) and the European Committee for Electrotechnical Standardization (CENELEC) and then adopted as national Standards by the member countries of the EU. EU Standards are sometimes adopted by national Standards

National Standards

National Standards are publicly available Standards that have been developed, approved and/or adopted by a national Standards body or other accredited organisation.

(AFNOR: Association Française de Normalisation, BSI: British Standards Institution, DIN: Deutsches Institut für Normung, DS: Dansk Standardiseringsraad, NNI: Nederlands Normalisatie-Instituut, TSE: Turkish Standards Institution, UNI: Ente Nazionale Italiano di Unificazione, etc.)

Functions of Standards

Product Standards: These specify characteristics (including dimensions), design, construction or composition of

a product to ensure acceptable performance, reliability, durability, finish, or other characteristics necessary to ensure the product's suitability for the purpose envisaged by purchasers or users

Examples *Consumer products such as toys, motorcycle helmets, electrical appliances and bottled water

Design Standards: Design Standards are a basic element of nearly all engineering and building projects.

Examples *Steel structures, timber framed buildings, concrete structures, or boilers and other pressure vessels.

Code of Practice: Also called '**Service Standards**'. These Standards specify the practices or procedures for the design, manufacture, installation, maintenance or utilisation of equipment, structures or products.

Examples *Llaying floor coverings, use of chainsaws, laundry practice, and information security.

Safety Standards: Provide guidance on safety in health, life and property matters.

Examples *Safety in the design, construction and/or operation of plant and equipment (e.g. milling machinery, wood processing machinery), workplace health and safety (WH&S), and personal safety and health (e.g. swimming pool fencing and hand operated electric tools).

Test Methods: Set out the steps to be followed to determine the properties of a product or component.

Examples .*Testing of physical properties (e.g. resistance to forces or linear dimensions when considering safety) where acceptable test results are used in meeting requirements in other Standards,

Management System Standards: Also called 'Process Standards'.These specify requirements to be fulfilled by management systems or other processes.

Examples *ISO 9001 (Quality Management Systems) and ISO 14001 (Environmental Management Systems) as well as other systems in the WH&S, food safety and climate change areas.

There are **additional types of Standards** including Interoperability Standards (IT), Terminology Standards, and Standards on data to be provided.

Performance based and prescriptive Standards

Standards are often broadly classified as 'Performance Based' or 'Prescriptive'.

Performance Based Standards have their requirements expressed in terms of performance, i.e. outcomes to be achieved. This approach leaves freedom for the development of innovative technical methods to meet the requirements of the Standard.

Prescriptive Standards express requirements in precise, often quantitative, terms. This leaves little opportunity to depart from the specifications in the Standard.

Each Standard (International, Regional, or National) is uniquely identified by a letter/number combination termed

the ‘designation’.

• Prefix • Main number • Part numbers. • Interim• Year. • Suffix

Mandatory, Normative İnformative

Three terms that are consistently used with Standards are ‘mandatory’, ‘normative’ and ‘informative’.

Mandatory is a term used to describe a provision of a Standard to which it is necessary to conform in order to be able to claim compliance with the Standard

Normative is a term used to describe an element of a Standard to which it is necessary to conform in order to be able to claim compliance with the Standard.

Informative is a term used to describe an element (clause, note or appendix) of a Standard that gives additional information, recommendations and/or guidelines, i.e. is of a non-mandatory nature.

The use of Shall, Must and Should

The word ‘**shall**’ is used to state that a requirement is strictly to be followed in order to conform to a Standard. there can be no deviation from that requirement, other than where there is a specified tolerance.

In legislation and specifications it is common to use the word ‘must’ to express a requirement; however, the use of ‘must’ is avoided in Standards.

Where Standards are adopted in legislation, the word ‘shall’ in the Standard is to be considered as equivalent to ‘must’ in the legislation.

The word ‘**should**’ (or ‘may’) introduces a suggestion or recommendation that is not a requirement. It is not necessary that such recommendations or suggestions be followed in order to comply with the Standard. Similarly, the antonyms ‘should not’ or ‘may not’ are only suggestions and are not required to be complied with.

Product status

Current, Available Superseded, Obsolescent, Redesignated, Superseded, Withdrawn

Patents

A Standard does not confer a monopoly on one section of industry to the detriment of another that can provide an equally satisfactory article. Nonetheless, on exceptional occasions, technical reasons may justify inclusion in the Standard of items or services covered by patent rights. There is no objection in principle to this, provided that certain rules are adhered to.

International adoption Where an International Standard deals with the subject covered by a new project, such a Standard is considered and evaluated for adoption as a national Standard by the committee concerned.

Standards in legislation

Standards are often cited ('called up') in State and Commonwealth legislation. When this happens, these Standards become mandatory and can be subject to the scrutiny of the courts. Therefore, every attempt is made to ensure Standards are written in a clear and concise manner, avoiding ambiguity and making it totally clear what has to be done to comply with the Standard (and hence the regulation or contract that calls up the Standard).

STANDARDS FOR BLOOD BANK AND TRANSFUSION SERVICE

Blood transfusion is a multi-step process with risk of error in each process from selecting donors, collecting and processing donations, testing of donor and patient samples, issue of compatible blood, to transfusing the patient. An effective quality system provides a framework within which activities are established, performed in a quality-focused way and continuously monitored to improve outcomes.

Key elements of quality systems include:

- ➢ Organizational management
- ➢ Standards
- ➢ Documentation
- ➢ Training
- ➢ Assessment

WHO

Regulatory Standards for Vaccines and Biologicals

The WHO Expert Committee on Biological Standardization is commissioned by WHO to establish detailed recommendations and guidelines for the manufacturing, licensing, and control of blood products, cell regulators, vaccines and related in vitro diagnostic tests.

EU

The European regulation on blood and blood components is declined in four directives: the Directive 2002/98/EC known as "mother Directive" and three directives called "daughter Directives" 2004/33/EC, 2005/61/EC and 2005/62/EC. The primary piece of EU legislation related to blood is Directive 2002/98/EC. It lays down the general framework for ensuring quality and safety for the collection, testing, processing storage and distribution of blood and blood components.

AABB

Since 1957, AABB has been developing standards for blood banks and transfusion services. From the 1980s to the present standards for Cellular Therapies, Perioperative Services, Relationship Testing, Immunohematology Reference Laboratories, Molecular Testing and Patient Blood Management

Standards for Blood Banks and Transfusion Services, 30th edition
Standards for Cellular Therapy Services, 7th edition
Standards for Immunohematology Reference Laboratories, 9th edition

Standards for Molecular Testing for Red Cell Platelet and Neutrophil Antigens, 2nd edition
Standards for Perioperative Autologous Blood Collection and Administration, 6th edition
Standards for Relationship Testing Laboratories, 12th edition

ISBT

The International Society Of Blood Transfusion (ISBT) is a scientific society that was founded in 1935. Since that time the ısbt has grown in to an international society where transfusion medicine professionals from across the globe come together and do the one thing they do best: share knowledge to improve the safety of blood transfusion worldwide.

ISBT Workıng Partıes: That focus on the study of specific topics.
(e.g.Workıng party on haemovıgılance)

ISBT 128 is a global standard for the identification, labeling, and information transfer of medical products of human origin (including blood, cells, tissues, milk, and organ products) across international borders and disparate health care systems.

ISO

The International Standard Organisation (ISO) 9000 standards are commonly accepted by blood establishments. ISO 9001:2000 specifies requirements for a quality management system.

The standards given by ISO 9001 specify requirements for quality management systems that can be used for internal application by organisations, or for certification, or for contractual purposes.

ISO 15189 Medical laboratories: Particular requirements for quality and competence specifies the quality management system requirements particular to medical laboratories.

PHARMACEUTICAL INSPECTION CO-OPERATION SCHEME
PIC/S **GMP** Guıde For Blood Establishments

STANDARDS FOR BLOOD BANK AND TRANSFUSION SERVICE

FACILITIES
Directive 2002/98/EC Art.3(e,f) Directive 2005/61/EC Art. 1(f) Directive 2005/62/EC Annex 3 AABB Standards for Blood Banks and Transfusion Services, 29 th, 30th edition PIC/S GMP Art.7
PERSONNEL
Directive 2002/98/EC Art.9,10 Directive 2005/62/EC Annex 2 AABB Standards for Blood Banks and Transfusion Services, 29 th, 30th edition PIC/S GMP Art.6
DONOR SESSIONS
Directive 2002/98/EC Art.16,17,18,19,20,21 Directive 2004/33/EC Art.2,3,4 Annex III, II A,B Directive 2005/62/EC Art 6.1, 6.2 AABB Standards for Blood Banks and Transfusion Services, 29 th, 30th edition PIC/S GMP Art.10
LABORATORY TESTING
Directive 2002/98/EC Annex IV Directive 2005/62/EC Art 6.3 AABB Standards for Blood Banks and Transfusion Services, 29 th, 30th edition PIC/S GMP Art.14
COMPONENT PREPARATION
Directive 2002/98/EC Annex III Directive 2005/62/EC Art 6.4, 6.5 AABB Standards for Blood Banks and Transfusion Services, 29 th, 30th edition PIC/S GMP Art.11
STORAGE, RELEASE AND DISPATCH
Directive 2002/98/EC Art.3, 22 Directive 2003/94/EC Art.10,11,12 Directive 2004/33/EC Art.5, Annex IV Directive 2005/62/EC Art 7 AABB Standards for Blood Banks and Transfusion Services, 29 th, 30th edition PIC/S GMP Art.6.6, 12 ISBT 128
COMPLAINTS AND RECALLS
Directive 2005/62/EC Art 9.2, 9.3 AABB Standards for Blood Banks and Transfusion Services. 29 th, 30th edition PIC/S GMP Art.15
TRACEABILITY
Directive 2002798/EC Art.3.1,14,15 Directive 2005/61/EC ISBT WORKING PARTY ON HAEMOVIGILANCE 2008, 2011, 2013
QUALITY SYSTEM
Directive 2002798/EC Art.28,29 Directive 2005/62/EC Art. 1(c), Annex AABB Standards for Blood Banks and Transfusion Services. 29 th, 30th edition Guide To The Preparation, Use And Quality Assurance Of Blood Components EDQM 18th Edition 2015 PIC/S GMP Art. 5 ISO 9000,9001,9004

Figure.2.Samples of Standards For Blood Bank And Transfusion Service

WHAT TYPE OF STANDARDS? NATIONAL OR REGIONAL OR INTERNATIONAL?

A national regulatory system may legally require all similar organizations to meet certain standards

Keeping in mind the guiding principle of consistency, the manual on 'National Standards for Blood Transfusion Service' has been prepared on the basis of Good Laboratory Practice and Good Manufacturing Practice, with the objective of ensuring quality and safety of blood and blood products in the face of known and emerging threats to public health in the country.

The existence of any relevant national legislation or regulations must be acknowledged and incorporated into the framework for quality.

WHO Global Database on Blood Safety Summary Report 2011

WHO recommends that every country should put in place policies, systems and structures to ensure the safety, quality, accessibility and timely availability of blood and blood products to meet the needs of all patients who require transfusion. Support countries in developing and/or strengthening efficient and sustainable national blood systems with national blood policies/plans, strategies, infrastructure, organization and management structure and regulatory mechanisms, integrated within the national health care system.

Develop norms, standards, best practice guidelines, tools and materials on various steps of the blood transfusion process from donor to patient to ensure blood safety.

In parallel, increased travel and improved communications will lead to a converging of global regulation and standards.

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3. http://www.isbtweb.org
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6. Standards And Other Publıcatıons Standardısatıon Guıde 003 Standards Australia
7. http://www.picscheme.org
8. PIC/S GMP Guıde For Blood Establıshments Pharmaceutıcal Inspectıon Conventıon Pharmaceutıcal Inspectıon Co-Operatıon Scheme Pe 005-3 25 September 2007 Pe 005-3 25 September 2007
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QUALITY RISK MANAGEMENT IN BLOOD BANKING AND TRANSFUSION MEDICINE

Ayse Esra KARAKOÇ

As it is stated in World Health Organization (WHO) documents, quality systems are the "key for ensuring the availability of safe blood for all patients needing transfusion"(1). WHO defines quality as safety and availability of blood. In blood banking and transfusion medicine quality and safety should be considered together.

The direct relationship between quality and safety in transfusion services has been shown in a number of studies. In a study blood availability for elective surgery over 3 audited intervals was investigated and the incidence of patients undergoing elective surgery without available crossmatched blood that had been requested was 1:333, 1:328, and 1:225 for pre-quality improvement, post-quality improvement, and subsequent postintervention audit assessments, respectively. The relationship between operations, quality management, and risk management is demonstrable in the transfusion services(2).

Blood is a medicinal product obtained from a biological starting material and blood banking today is composed of a chain of processes. Quality of blood and blood components has risks in terms of collection, manufacturing and throughout the life cycle of the component, as well as the transfusion. It is critical to maintain the quality of blood and blood components starting from the initial steps of manufacturing as early as the selection of donors until the final use of the component for the patient who is expected to benefit from it as it is stated in clinical studies.

Risk management has long been an integral part of quality systems. Quality risk management is defined as "a systematic process for the assessment, control, communication and review of risks to the quality of a product across its lifecycle. It can be applied both proactively and retrospectively(3).

Quality risk management requires a systematic approach. It is an obligation to comply with the requirements of good manufacturing practice (GMP) and other quality systems like ISO(4). A quality system framework should have a formal quality risk management approach with processes, methods, responsibilities and tools defined and in place. An effective quality risk management is a proactive process that defines potential risks starting from the very first process until the very last in development, manufacturing and use of the blood products. It enables the establishment to improve decision making abilities when quality problems arise.

Risk is defined as the combination of the probability of occurance of harm and the severity of that harm. The evaluation of the probability and the severity of harm show great variance. Perception of risk differs from one to another and it is affected by public and political opinions (5). The impact of the loss of public confidence on safety of blood would be dramatic. Thus the global safety of the blood supply system should be carefully monitored and the public should be informed on the level of safety very carefully. In relation to blood banking and transfusion medicine; patients, medical practitioners, government and manufacturers are the primary steakholders and it is the safety of patient that is most important (3). The principles and the tools of quality risk management enables the regulators and the manufacturers to make risk based decisions that are more effective and consistent.

Harm is damage to the health of the recipient and it includes the damage arising from the loss of quality or the availability of the component. Hazard is the potential source of harm. In order to manage risk, it is necessary to define it first. Risk assessments reflect the assessment of hazards which represent a significant risk to the staff, to the blood donor and to the patients receiving a blood or blood component transfusion. All of the people who could be harmed by the hazard need to be considered; in transfusion medicine it will usually be the receiver of the transfusion, the patient. Risk assessment includes risk identification, risk analysis and risk evaluation.

Two main principles of risk management are: 1. The methods used to evaluate the risk to quality should be based on scientific knowledge and should be linked to patient safety and 2. The efforts, the procedures, the action plan to protect from the defined risk should be relevant with the degree of the risk.

Each hazard should be assessed against a risk matrix for the severity and probability rating. Severity is rated from 1:negligable, 2:minor, 3:moderate, 4:serious, to 5:catastrophic and probability is rated from 1:rare, 2:unlikely, 3:possible, 4:likely, to 5:almost certain. Risk is rated with the risk matrix by multiplying the rates of severity and probability and the rates of risks are graded as high, medium and low. According to this, control measures for each hazard have to be identified and recorded. Further assessment is required if existing measures are not adequate to control the risk with action plan of how to reduce or eliminate the risk. The risks have to be placed on a risk register and should be recorded. The risks have to be reviewed on a regular basis(6). In Figure 1 and 2 below the sequence and the interrelations and the overview of the processes in quality risk management are shown respectively.

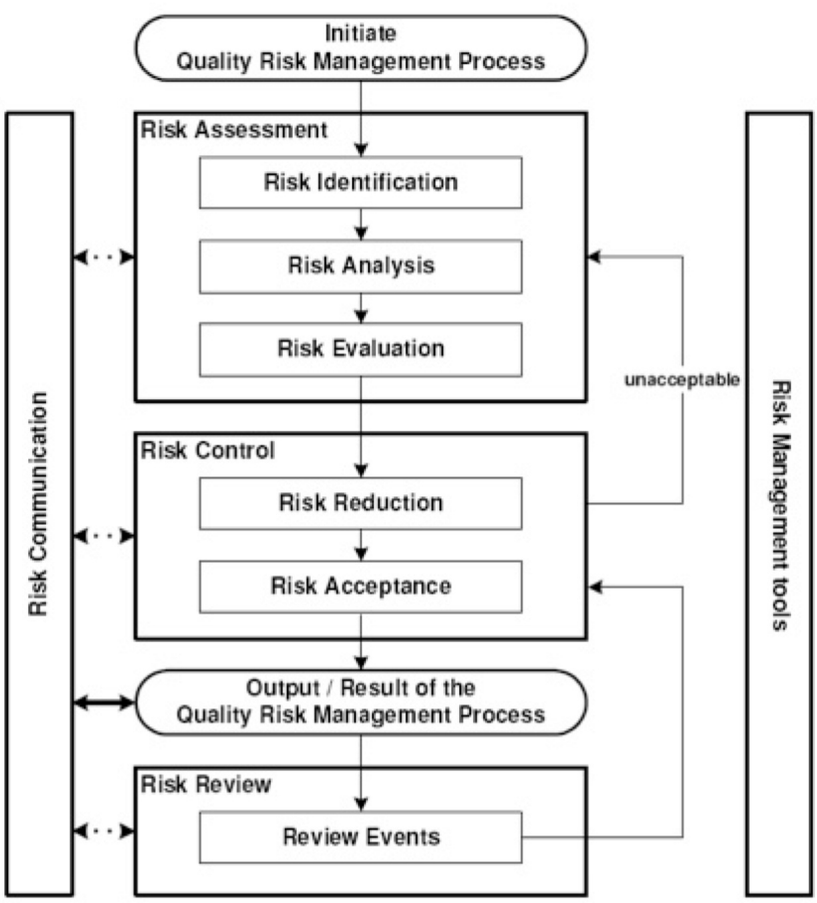

Figure 1. The sequence and interrelations of quality risk management process (3)

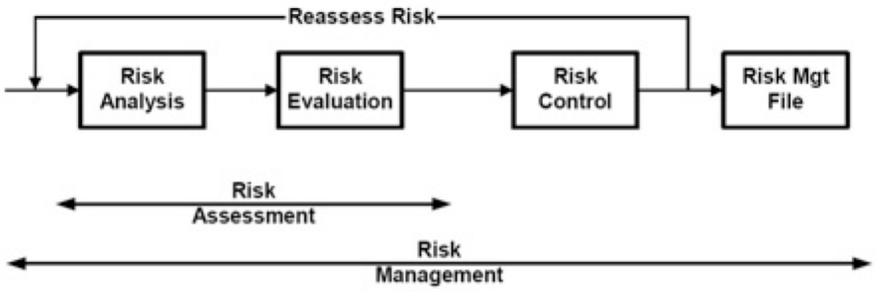

Figure 2. An overview of risk management process (7)

The responsibilities are stated to be interdisciplinary in quality risk management. Quality unit, engineering, business developers, regulators, operational, clinical and legal people are stated to be involved(3).

Concerning the blood banking and transfusion medicine, the establishments should learn from adverse events. Errors, noncompliance to certain procedures, near accidents (identification errors, sample transpositions etc), accidents give information to the blood bank on the insufficiency of the ongoing operations. Adverse events tell what had happened. To analyse why it had happened helps to make the root cause analysis. The risk management efforts can be directed to one or two most frequently occuring root causes.

To understand and to apply quality risk management is accepted as an essential requirement of 21st century pharmaceutical industry that involves blood and blood products as well. It allows the processes and the equipment to be designed more efficient and safer for the users, donors and patients(8).

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EDUCATION FOR NURSES & TECHNICIANS

N. Nuri SOLAZ

Nurses and technicians have an essential role in Blood Banking & Transfusion Medicine (BBTM). Discussions on education of this group has been going on decades and it will never be ended because of the progresses and changes in the field of BBTM.

This group may have a role at 2 different parts of BBTM;
1) Blood banks or centers where blood is collected and prepared for transfusion
2) Hospitals or treatment centers where blood is transfused

Education of this group can be classified as;
1) Pre-graduate education
2) Post graduate education
    2.a. Post graduate academic education
    2.b. Post graduate continuous education

1) Pre-graduate education:

Pre-graduate education curriculum is the basic teaching of this group and there is still no common consensus on it. There are numerous education model offers on this subject issued by different national and international bodies. The most concrete and widely accepted one is "**Recommendation Rec (2004)18 of the Committee of Ministers to member states on teaching transfusion medicine to nurses**" issued by Committee of Ministers on 15 December 2004 at the 909th meeting of the Ministers' Deputies).

One of the most recent activity on this topic was Anatolian Blood Days – II (ABD); an international workshop organized by Turkish Blood Foundation (TBF) at November 25 – 27 2013 at Antalya / Turkey. During the meeting 30 transfusion professionals representing 17 countries gave presentations on their own services. They presented evidence of inadequate training of nursing personnel in clinical transfusion that confirmed the need for work on this subject. The participants in the meeting took into consideration the Rec (2004)18 of the Council of Europe on teaching transfusion medicine to nurses.

This text has based on those above mentioned sources which are more in details and recently performed depending on survey results and clear evidences.

After a plenary discussion at Anatolian Blood Days – II; the participants formed three working groups. Based on the reports presented by each working group a draft consensus statement was prepared and discussed. The final statement agreed by the participants is shown below.

1 The curriculum for education and training of nurses in the topic of clinical transfusion.

- Should be clearly defined and the method of delivery should be practically achievable.
- The latter requirement is especially important for in service training
- The core curriculum for nurses in training and for in-service nurses should be similar
- In service training should give special emphasis to practical procedures that affect patient safety.
- The pregraduate core curriculum should preferably be covered as a single block rather than distributed among different parts of the course.

2 The core curriculum should cover the following topics

- Responsibilities of the nurse in clinical transfusion.
- Knowledge of regulations and guidelines on blood transfusion
- Compatibility of the blood component with the patient: ABO types, hemolytic transfusion reactions and prevention. Prevention of Rh immunization
- Description of the main blood components, main indications, storage handling and administration
- Complications of blood transfusion
- Description of the clinical transfusion process
  - o Informed consent
  - o Request form, sampling and patient identification
  - o Receipt and visual inspection of the component unit
  - o Pre-transfusion identity checks to ensure that the blood component is the one intended for the patient
  - o Baseline observation of vital signs
  - o Administration of the blood component
  - o Monitoring vital signs
  - o Recognition of signs of acute transfusion reactions and initial management
  - o Finalization of transfusion (completion of transfusion record, discard of blood pack and giving set).
  - o Ensuring traceability of each unit transfused by completing the required documentation

3 With respect to the dedicated nurses in clinical transfusion, it was agreed that role requires a person with good clinical experience and skills, preferably including experience in a clinical specialty in which transfusion is used. This position might be named as “Transfusion Control Nurse” like “Infection Control Nurse”. The role of Transfusion Nurse involves coordination, communication and the promotion of change and quality improvement, so a successful appointee will have a good aptitude for management. Specific tasks of Transfusion Nurse are listed below;

- Leading the implementation of training in clinical transfusion
- Co coordinating Haemovigiliance reporting
- Promoting best clinical transfusion practice
- Co coordinating a program of transfusion audits
- Providing progress reports to the Hospital Transfusion Committee (HTC)
- Participating as a full member of the HTC

Structure of the training program such as total hours, grades, etc. may vary but dedicating necessary minimum hours and combining education hours not more than 2 different grades are highly recommended.

2) Post graduate education

2.a. Post graduate academic education; can be done by academic institutions such as master or PhD programs.

2.b. Post graduate continuous education; might be organized by scientific societies and locally by academic or national health system institutions. Selection criteria, location of training, selection procedure, and conditions of

service of nurses undergoing training, and the structure of the training program (hours, topics, diploma etc) all vary. This education is widely used for the nurses who are going to work blood supplying institutions and transfusion centers of the hospitals or clinics.

Regarding demands of modern medical treatments and technologies it will be wise to give a special postgraduate basic / continuous education to the nurses who are dealing in clinical transfusion. This training might be a one-day training with the below listed topics;

a) Actual legal and administrative conditions on BBTM
b) Blood components; preparation, storage, transportation, volume, etc.
c) Bedside transfusion safety
d) Transfusion complications
e) Haemovigiliance

Conclusion

To increase efficiency in blood transfusion medicine, physicians and nurses and other health workers who handle blood or blood components should collaborate on development, evaluation and implementation. Documentation regarding transfusions needs to be simplified and coordinated. Knowledgeable staff is an essential element of safe systems.

Basic knowledge should never be assumed: mechanisms to monitor knowledge of key processes along with ongoing feedback and remedial action are necessary to maximize performance. Nurse training curricula and formats at all levels must reflect the requirements of modern transfusion medicine from novice to expert. Monitoring and evaluation of the training activities are essential which should not be ignored

The Council of Europe's Recommendation could contribute to the adoption and implementation of training programs at a national level.

References

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COMPONENT PRODUCTION: HOW MANY, WHEN AND WHY

Sadhana MANGWANA

Introduction

Blood transfusion saves lives and improves health, but many patients requiring transfusion do not have timely access to safe blood. Blood transfusion is associated with both beneficial effects and adverse events in recipients. The use of blood for transfusion has evolved in most parts of the world from the transfusion of whole blood to the use of individual components: packed RBCs, platelet concentrates, and plasma. This approach allows the transfusion of only those parts of the whole blood that the patient requires and facilitates the removal of unwanted elements such as leukocytes. There have been six major paradigmatic shifts associated with transfusion medicine science and technology-

Early 1900 - Karl Landsteiner discovers the ABO blood groups and humoral immunity; the main paradigm explaining the effects of allogenic transfusion.

1940 - Edwin Cohn develops cold ethanol fractionation, the process of breaking down plasma into protein components and products

1950 - Carl Walter and W.P. Murphy introduce the plastic bag for blood collection and component preparation.

1960 to 1980 - Development and implementation of effective screening methods to reduce pathogen transmission.

1990 - Leukocyte reduction of blood components shown to be associated with improved clinical outcome, which led to the implementation of universal leucoreduction (ULR) in many countries.

1995 to 2010 - Development of pathogen inactivation (reduction) technology to reduce the risk of pathogen transmission by blood components.

Blood transfusion services play a central role in health systems by providing safe and adequate supplies of blood and blood products for patients requiring transfusion. Blood products are defined as any therapeutic substances derived from human blood, including whole blood, labile blood components (i.e. red blood cells, platelets and plasma) and blood- or plasma-derived medicinal products (PDMPs) e.g. albumin, polyvalent and specific immunoglobulin and blood clotting factors that are prepared in fractionation facilities from pools of thousands of plasma units.

Availability and safety of blood and blood products remains a major concern in many countries around the world. According to the World Health Organization (WHO), 1-3% of the world's population needs to be blood

donors to maintain adequate blood supply. WHO data reveals that worldwide about 108 million blood donations are collected every year. More than half of these are collected in high-income countries, home to 18% of the world's population. There is a marked difference in the level of access to blood between low- and high-income countries. The median blood donation rate in high-income countries is 36.8 donations per 1000 population. This compares with 11.7 donations in middle-income countries and 3.9 donations in low-income countries.

Component Production

Blood components can either be produced from a manually collected unit of whole blood, or they can be collected as specific products using automated collection devices. In the manually collected units, there are options for the strategies to choose for the post-donation processing of the whole blood.

i. Apheresis

Apheresis is the withdrawal of blood from a donor, removal of one or more blood components, and transfusion of the remaining blood back into the donor. There are some distinct advantages of apheresis. It allows the collection of specific products, and thus may help to better match inventory supply and demand with a concomitant reduction in wastage due to outdating. Collection of plasma for transfusion or fractionation is greatly facilitated by apheresis as the lack of red cell loss means the donation interval can be much shorter than whole blood donation. It is also an important technology to produce specialty blood products that would be very difficult to obtain otherwise e.g. Platelet- specific antigen matched and HLA-matched platelet products, as apheresis permits the collection of a transfusion dose from a single donor. Blood components harvested, through Apheresis technology, are generally 3-4 log leukoreduced, and provide better therapeutic benefits than the random donor products. More recently, apheresis equipment is increasingly adopted for the collection of two units of red cells in a single procedure but there are challenges for iron management in donors.

ii Whole blood donation

Blood collected in an anticoagulant can be stored and transfused to a patient in an unmodified state i.e. 'whole blood' transfusion. In developing countries, or for military use, whole blood remains an important resource. However, blood can be used more effectively if it is processed into components, such as red cell concentrates, platelet concentrates, plasma and cryoprecipitate to meet the needs of more than one patient.

There are two main methods for the production of red cell concentrates, platelet concentrates, and transfusion plasma. The first method, called the platelet rich plasma (PRP) method, in which two fractions are separated first, a red cell concentrate and a mix of the platelets and plasma, then following a second centrifugation, separates the plasma from the concentrated platelets. In second method, the buffy coat method, all the three elements are separated in the first step: red cell concentrate, plasma, and the buffy coat. For platelet production, the buffy coats of 4- 8 units are pooled, centrifuged and a platelet rich plasma is removed.

The main components are –

- Packed Red Blood Cells (PRBC)
- Platelet concentrates or Random Donor Platelets (RDP)
- FFP
- Cryoprecipitate
- Cryo- poor Plasma (CPP)

- Plasma-derived medicinal products (PDMPs) i.e. Albumin, Polyvalent and specific Immunoglobulin and Blood clotting factors.

After blood collection, PRBC from whole blood units by buffy coat method are prepared and refrigerated within 8 hours of collection. Buffy coat method outweighs the benefits compared to the PRP method with lower overall leukoreduction, increased platelet yield and reduced bacterial contamination rates. Buffy coat production of platelets also positions the blood centre to use platelet additive solutions to reduce recipient reactions or pathogen reduction technology, neither of which can readily be applied to PRP platelets.

In high-income countries (HIC), each unit of whole blood collected is separated into several therapeutic blood components to both deliver the most effective treatment (component therapy) and to make most efficient use of human resource. Access to safe and effective blood products is a major challenge in low and middle income countries (LMIC) where local blood establishments may have very basic facilities and systems, where quality and safety standards need to be established or strengthened, and where blood supplies may be insufficient to meet medical needs. 95% of the blood collected in high-income countries is separated into components, 80% in middle-income countries and 45% in low-income countries due to limited capacity to provide patients with the different blood component.

Leucoreduction of blood Components

Amongst various strides in sample collection, processing and storage technologies, a comparatively recent innovation is introduction of leucoreduction strategies. Freshly collected, whole blood unit contains roughly 109 leukocytes. Leukocyte reduction is defined as a blood processing step for reducing the leukocyte content of whole blood, RBCs, or platelet units less than 5×106 (3 log reduction 99.9%) with a minimum of 85 % red cell recovery in 95 % of the units tested, as per the standards of the American Association of Blood Banks while European Council guidelines require it to be less than 1×106 residual WBCs per unit of component. Leucocytes reduction can be done by cellulose acetate filters, red cell washing, centrifugation and buffy coat removal, freezing and deglycerolization of red cells, and blood component collection through apheresis technology. Leucoreduction by leucofilters (third generation) and components collected through apheresis devices meet the standards of leukocyte depletion, i.e. < 5 × 106 WBC/unit of blood component while other methods achieve variable leukocyte depletion which is as follows-

- Centrifugation and buffy coat removal — 108 WBCs (1 log leucodepletion)
- Washed red cell concentrate — 107 WBCs (1-2 log leucodepletion)
- Frozen deglycerolized red cells — 106-107 (2-3 log leucodepletion

Current generation of leukocyte filters (third and fourth) have leukocyte removal efficiency up to 99.99% as compared to the first and second generation filters (90-96%).

Leukocyte reduction procedures can be done either pre-storage, at the time of collection or processing, post processing (within the blood bank), or by the side of the patient (post storage) just prior to transfusion. Pre-storage leukocyte reduction of cellular blood components removes donor WBCs before they undergo apoptosis or necrosis and before they release breakdown products or cytokines. Clinical benefits of leucoreduction has been subdivided on the basis whether benefit has been proven by evidenced based guidelines to be relevant clinically, likely relevant clinically or clinical relevance is unproven.

Proven relevant clinically:

- Reduced frequency and severity of NHFTRs;
- Reduced risk of CMV transmission;
- Reduced risk of HLA-alloimmunization and platelet refractoriness.
- Reduced mortality and organ dysfunction in cardiovascular surgery patients.

Likely clinically relevant:

- Reduced infectious risk associated with immunomodulation (TRIM);
- Reduced direct risk of transfusion-transmission bacteria.

Unproven clinically:

- Avoidance of vCJD transmission.
- Avoidance of HTLV I/II, EBV etc.
- Reduced risk of GVHD.
- Reduced risk of TRALI.

Universal Leukocyte Reduction Strategies

There has been considerable debate on whether all cellular blood components should undergo leucoreduction or selective leucoreduction protocol should be followed.

Selective pre-storage leucofiltration - The packed red cells are selectively leukofiltered prior to storage for patients on regular transfusion therapy such as, thalassemia major patients, immunocompromised or chronically transfused with skillful inventory management and active coordination between the transfusion physicians and the blood bank.

Universal leukocyte reduction (ULR) is the routine application of the blood-processing step for reducing leukocyte content to < 5 x 106 WBC per unit to all units of whole blood, RBCs, and platelets prior to storage in a country or in a blood transfusion service. Internationally, 19 countries namely France, Canada, Luxembourg, Austria, Eire (Southern Ireland), Wales, Scotland, Switzerland, England, Northern Ireland, Malta, Spain (Portugal), New Zealand, United Arab Emirates, Germany, Qatar, Holland, Norway and Finland have implemented ULR as part of their blood safety policy. Several other countries are also currently moving toward implementing ULR, including Sweden, Denmark, Italy, Belgium, Cyprus and Japan.

The adoption of ULR in the United States has been delayed primarily because of economic issues, leading to the approach of selective leukocyte reduction protocols for patients thought to be at greatest risk for adverse effects associated with the presence of leukocytes in blood components.

Plasma-derived medicinal products (PDMP)

It is the responsibility of individual governments to ensure sufficient and equitable supply of plasma-derived medicinal products namely immunoglobulins and coagulation factors, which are needed to prevent and treat a variety of serious conditions that occur worldwide. According to WHO, 43 countries (23 high-income, 18 middle-

income, 2 low-income) of the 156 reporting countries, reported producing all or part of the PDMP through the fractionation (e.g. domestic or/and contract fractionation) of plasma collected in the country. 35 of the 43 countries report plasma fractionation carried out within the country. 8 of the 43 countries report plasma sent for contract fractionation in another country. Around 10 million litres plasma from 35 reporting countries (22 high-income countries, 12 middle-income countries and 1 low-income country, covering a population of 2.76 billion) was fractionated for the production of PDMP during the year. This includes around 50% plasma recovered from the whole blood donations. World Health Assembly resolution (WHA63.12) has urged Member States to establish, implement and support nationally-coordinated, efficiently-managed and sustainable blood and plasma programmes according to the availability of resources, with the aim of achieving self-sufficiency.

International challenges of self-sufficiency in blood and blood products

- Lack of clear national policy and government commitment
- Increasing needs and demand
- Inadequate supply of blood and blood products
- Decreasing donor base
- Failure to identify blood as national resource
- Dependence on family/replacement donations
- Risks to donors' health and safety
- Risk of transfusion-transmissible infections
- Limited capacity in production and processing
- Poor quality systems in developing countries
- Wastage of blood
- Wastage of plasma
- Inappropriate use of blood and blood products
- Influence of market force

Conclusion

Universal leucoreduction seems to be justified but in view of evidence and cost involved in universal leucoreduction, it is not practically feasible to implement this policy especially in developing countries and under-resourced countries. It is the commitment by national governments to be self-sufficient in safe blood and blood products and a coordinated and integrated approach to policy development. Implementation of a policy for self-sufficiency in blood and blood products generally follows a stepwise progression in scope, from whole blood transfusions towards blood components for transfusion and further towards plasma fractionation, aligned to the state of development of the national health system.

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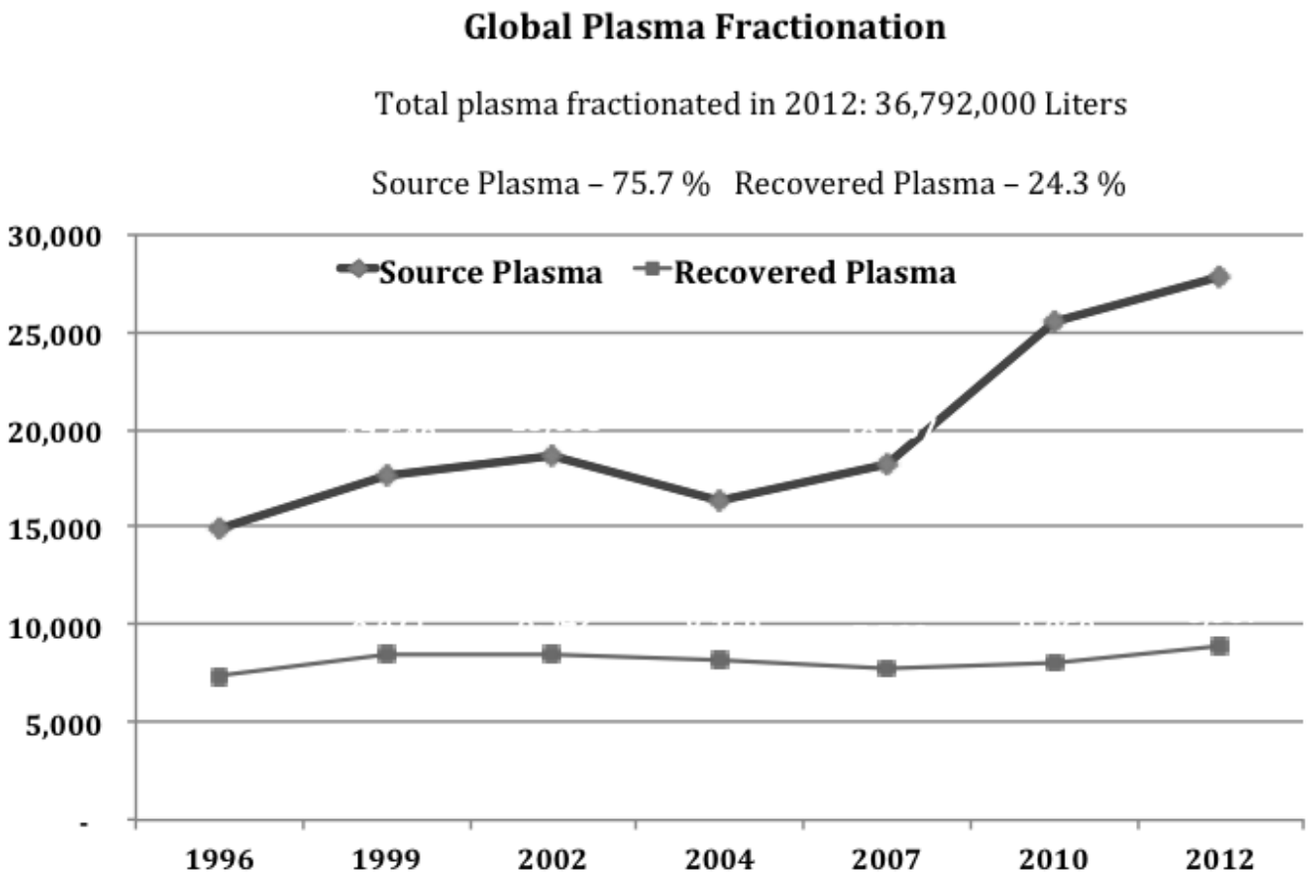
LAST TEN YEARS IN PLASMA FRACTIONATION

Ranjeet Singh AJMANI

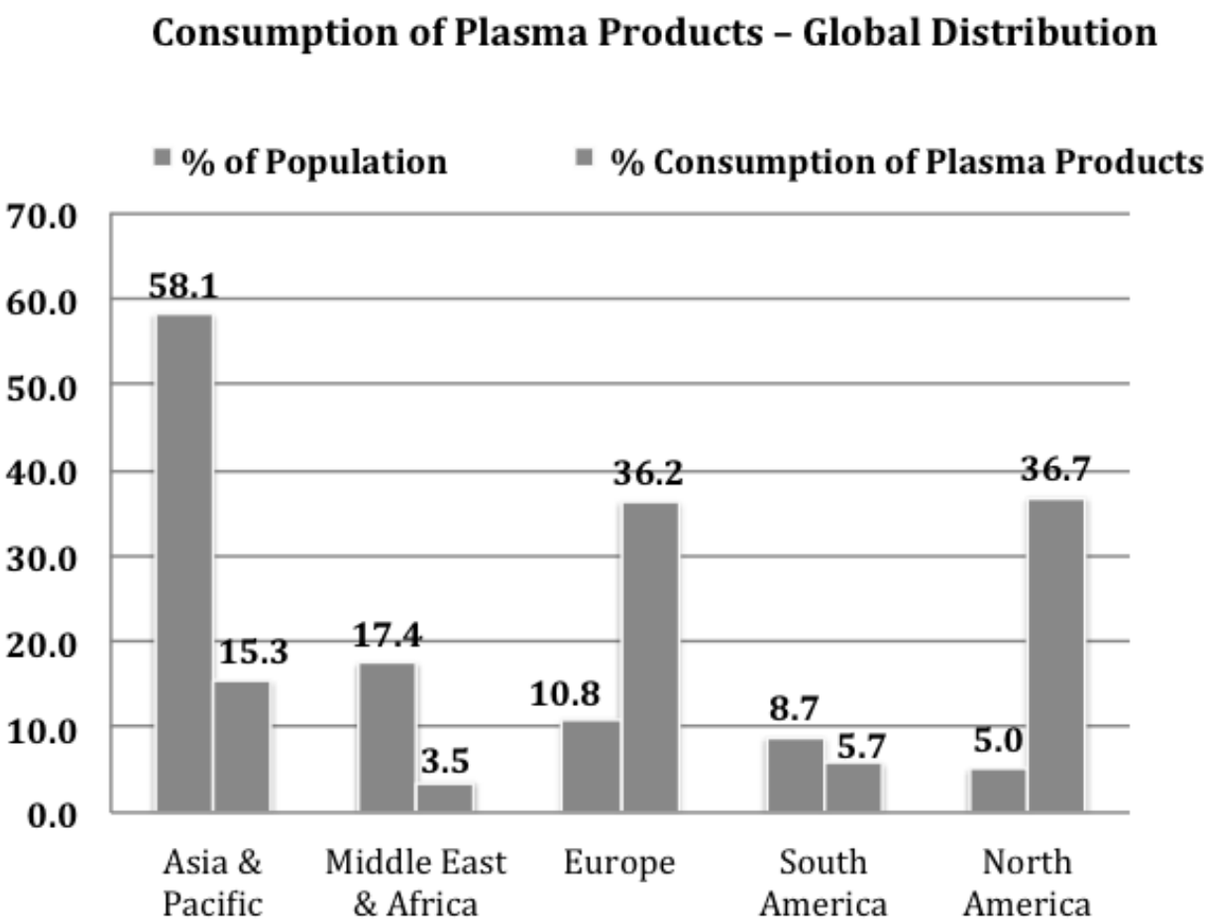
In the last 10 years plasma fractionation industry has undergone many changes from the point of view of - plasma supply, safety profile, public health policies, new products, use of products for newer indications, industry collaboration, regulatory reforms, technological development, improved rate of diagnosis, development of recombinant plasma proteins and patients advocacy. The changes happened in the last one decade have brought a significant improvement in the life of the patients, who are dependent on plasma protein therapy.

In 2005, worldwide about 22 million liters (7.69 recovered and 14.22 apheresis) of plasma was fractionated while in 2012 it has increased to about 37 million liters (8.93 recovered and 27.85 apheresis) [1].



It clearly indicates an upward trend of apheresis plasma while recovered plasma collection has remained fairy unchanged. Because of advancement and improvisation in clinical and surgical practices, usages of blood and its component have gone down in many of the developing countries, which is reflected in the trend of availability of recovered plasma. This also implies that a large number of patients, who use plasma protein therapy, are dependent

on products coming from source plasma. About 60 % of apheresis plasma is collected in US while majority of recovered plasma is collected in European region. Most of the Asian and Latin American countries do not have a robust source plasma program and therefore are dependent on recovered plasma for production of plasma proteins either indigenously or by toll fractionation. In 2005 the overall plasma product market was about $ 7 billion which grew up to about $ 27 billion by 2014. Although many plasma fractionation plants have closed their operations or shut down because of various reasons during this time, however there is an overall significant rise in global plasma fractionation capacity. Mainly because of optimization of operational cost and other economic/business reasons there has been a trend of setting up relatively large plasma fractionation units, in the last one decade. However this increase in capacity has not changed the skewed pattern of availability of plasma products to the patients living in developed and developing economies, it is because of the fact that most of fractionation capacity has either increased in developed countries or China, which has very strong regulatory restriction on movement of plasma products as well as it does not allow contract plasma fractionation. It has been reported that about 60 % of global population living in developing countries have access to only 15 % plasma products [(1)].



Asia collects very limited quantity of plasma in proportion to its population and demand and therefore it remains largely import dependent. This situation puts a large number of patients, with rare genetic disorders, living in developing world at a very vulnerable position as the availability of products is dependent on external forces like availability, regulatory restrictions and fluctuation of currency etc. Because of this, a large percentage of patients living in developing countries remain un/under-diagnosed and face the challenges of consistent availability and affordability of safe plasma products. It has been reported that about millions of liter of plasma is wasted globally for variety of reasons like viral safety, quality of plasma, regulatory restrictions across the countries for contract fractionation (2). Many lives can be saved if this plasma can be made available for fractionation and by improving

the quality of plasma and harmonization of regulatory system across the countries for contract fractionation.

In the last one decade various patient groups have played a very significant and active role in initiating a dialogue with government /policy makers in advocating the rights of patients, which has helped early and improved diagnosis, formation of national registries/chapters of various patient groups and allocation of more funds for plasma products. Various plasma fractionating companies came forward and extended support to hemophiliac patients by converting unutilized excess cryoprecipitate to manufacture factor concentrate and supply it to the patients of developing world. This humanitarian effort was possible because of closed coordinated efforts between patient organizations and the industry. The rate of diagnosis of Primary Immune Deficiency (PID) has improved in the last one decade and this has lead to significant increase in the usages of Immunoglobulin (IVIG) across the world. Use of IVIG for newer indications has also contributed in increased demand of IVIG. In the last one decade demand of Albumin has increased very significantly and in many countries are facing acute shortage of its supply. Demand of hyper immune proteins likes Anti-D, Tetanus, Rabies, CMV and Hepatitis B is still there however some of the hyper immune proteins like mumps, pertussis, tick-borne encephalitis have become obsolete.

In the last one decade there were many viral outbreaks e.g. H1N1, Dengue, SARS, Bird Flue, Zika etc. in the different parts of the world and this situation did pose a potential threat of viral transmission by plasma products however there has not been any reported case of infection through plasma products. However outbreaks like these kept industry on high alert and work towards better/newer viral inactivation protocols. These outbreaks have encouraged industry to explore the possibility of manufacturing specific Immunoglobulin to treat these infections. Considering criticality of the situation, World Health Organization also came with guidelines for empirical usages of convalescent whole blood or plasma for treating the patients.

On the technology front, though Cohn Chromatography remains most widely used technology platform across the globe but few newer options/concepts have also been introduced in this field claiming a significant increase in yield, better product quality, operational ease, relatively less investment with an option of tailor made plants. Some of these options are cascade technology, charged based separation etc. The products from these technology options are yet to undergo clinical evaluation and regulatory approval. Introduction of newer technology platforms may change the face of industry in coming years. Industry is also witnessing a trend of merger, acquisition and consolidation.

In the last one decade organizations like Plasma Protein Therapeutic Association (PPTA), International Plasma Fractionation Association (IPFA), World Federation of Hemophilia (WFH), World Health Organization (WHO), International Patient Organization for Primary Immunodeficiencies (IPOPI) etc. have contributed very significantly in development and growth of this industry and patient care by setting up stage for open dialogue and discussion. Social media has changed the dynamics of our lives in the last one decade. It has played a very pivotal role in connecting various patient/patient groups who were isolated and fighting their battle more at individual/local level, to share their concern/vision/challenges and have a collective & common voice, which has more impact on society at large. Now these groups are able to share their resources and thoughts very freely and conveniently, which is helping them to unite and fight for a common cause. Many books and publications, got more visibility in the last decade and have increased level of awareness amongst patients, regulators, clinicians, corporate sector about various aspects of plasma industry.

A lot needs to be done on the issue of self-sufficiency of plasma products country wise/region wise, as the disease pattern, usages of plasma products, rate of diagnosis, public health policies are different in different parts of the world (3). Although the last 10 years have been very significant for plasma fractionation industry but coming 10

years will still be more important with hope that patients across the globe would have better quality of life.

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THE IMPLEMENTATION AND PROGRESS OF PLASMA FRACTIONATION IN TURKEY

Ünal ERTUĞRUL

TURKEY; Geography, Land, Population, Income

Turkey is a country in between Balkan Peninsula, Caucasians, North Africa and Middle East. Land area is 780.000 km^2. 2016 population is 79 million, annual income was approximately 10.400 USD/pc in 2014.[1]

BLOOD SERVICES; Organisational Chart, Current Dual Structure, Progress

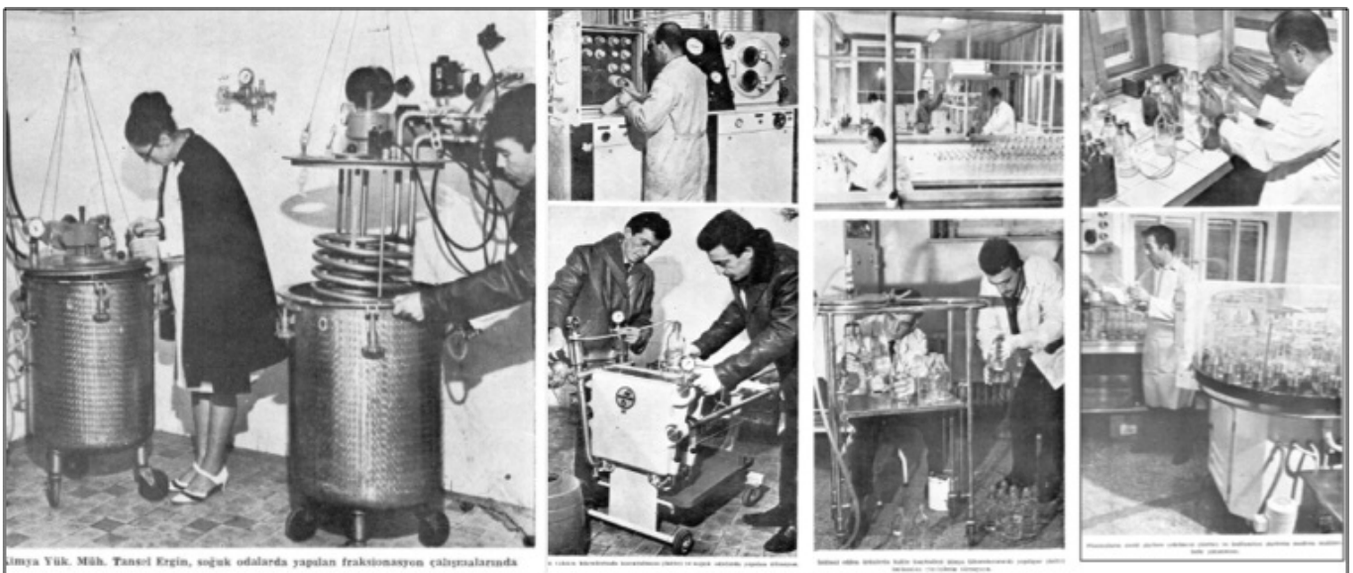
National Health Authority (Ministry of Health - MoH) legislate, licence and control all bodies and activities. Leaded by MoH, Supreme Board of Blood prepares "The National Guide for Blood and Blood Products" which is the main directive/guide in blood banking and transfusion medicine activities country-wide.2 "Blood Safety Project" of MoH and Turkish Red Crescent (TRC) indicates that TRC is the appointed organisation to cover county wide blood component demand by 2016. Till full coverage is achieved, some hospitals in relevent provinces are licenced to receive donations.[3] In 2015, TRC delivered 1.876.000 units of erytrocyte suspension to more than 1.100 hospitals, covering 75% of country demand, mostly by voluntary donations, while 35 hospital blood centers covered the rest mostly by replacement donations.[3] TRC's coverage ratio increases 5% in average, each year. In 2015 TRC delivered 927.000 units of fresh frozen plasma (FFP) for clinic use.[3]

Progress in blood services is summarized below. Some key steps of preparation for plasma fractionation are given in bold characters.

1957 : First Modern Blood Banks by TRC
1983 : Law on Blood and Blood Products
1997 : Mandatory questioning form
2001 : Certification Program BB and TM employees by MoH
2005 : **"Blood Safety Project"** of MoH / TRC, TRC authorized as the main blood supplier
2006 : TRC started **ISBT-128 barkoding system**
ISO 9001:2000 acreditation for all TRC Blood Banks
2007 : TRC wide **Information Management System**
New Blood and Blood Products law
First **international accreditation**, (JCI, ISO 15189:2007), TRC Ankara RBC
2009 : First **National Guide** for Blood and Blood Products (revised in 2011)
Data bank for fractionation, cooperation with fractionators
2011 : **Universal deferral database**
2012 : **Component identification and traceability system**
2013 : **Plasma supply plan for fractionation**
2014 : Universal **NAT Testing** for HIV1/2-HBV-HCV, at TRC
Donations for National Stem-Cell Bank to TRC
2015 : **Plasma Products Protocol - MoH, Social Security Inst. of MoLabor&SS , TRC**

PLASMA FRACTIONATION PROJECT; History, Perspective, Actors, Responsibilities, Expectations

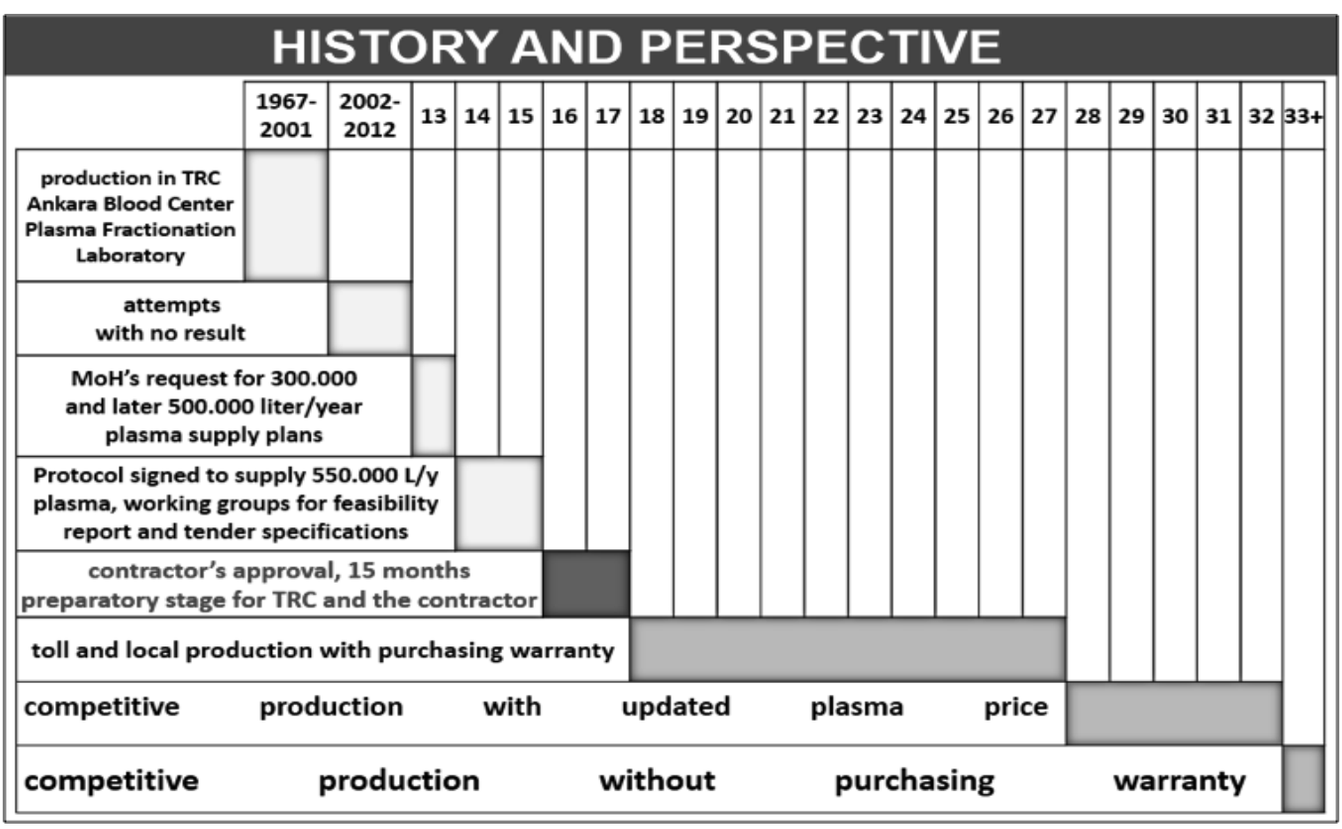
A narrow range of plasma products were produced in limited amounts in TRC Ankara Blood Center Plasma Fractionation Laboratory in years 1967-2001.



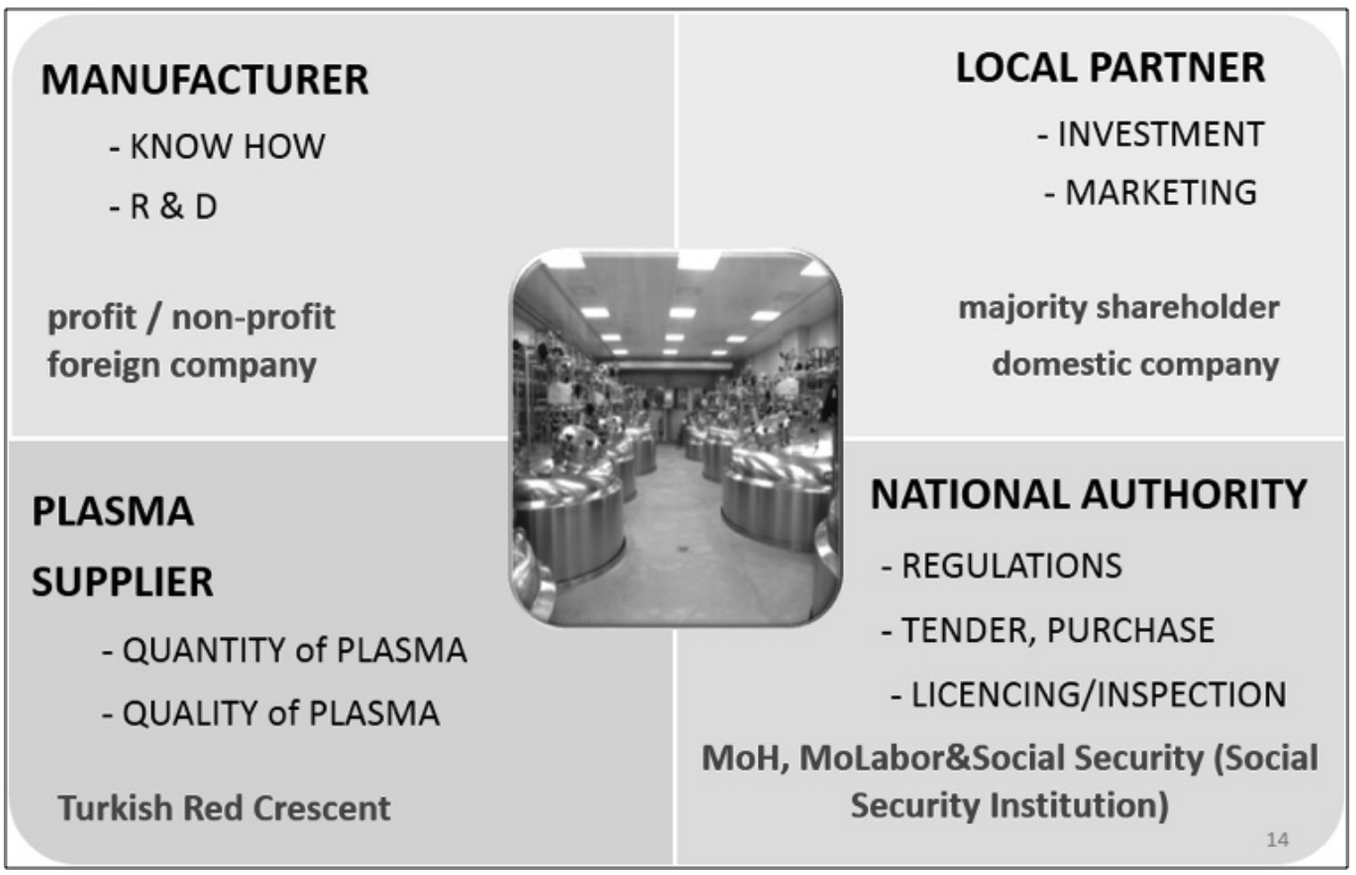
Kimya Yük. Müh. Tansel Ergin, soğuk odalarda yapılan fraksionasyon çalışmalarında

Production of Plasma Derivatives
Plasma Fractionation Laboratory
Turkish Red Crescent Ankara Blood Center, 1967-2001

In 2002-2012 MoH and TRC witnessed several attempts without any result for a domestic fractionation facility. In 2013, MoH declared that production of leading plasma derived medicines (PDMs), using domestic plasma, in a facility in Turkey is a priority and turned to TRC for a 300.000 and later 500.000 liter/year plasma supply plan for industrial use. After a negotiation period longer than a year (including workshops for feasibility report and tender specifications), in 2015 a protocol was signed by MoH, Ministry of Labor & Social Security (MoL&SS) and TRC.[3]



According to the Protocol actors of the project will be the MoH as the national authority, the Ministry of Labor and Social Securiy's (MoLabor&SS) Social Security Institution (SSI) putting in a tender, a local company as the investor, a foreign manufacturer company to transfer technology and fractionate plasma, Turkish Red Crescent as the plasma supplier.[4]



Responsibilities of the actors are summarized as follows;

- Social Security Institution
  - ✔ Make tender, sign with contractor, mediate writing of additional protocols
  - ✔ Pay for products
  - ✔ Fund TRC in blood component production
- Ministry of Health
  - ✔ Make legal changes, authorization/licensing/periodic inspection, quality control
  - ✔ Order products to meet state hospitals need
  - ✔ Fix clinic use of plasma to 750.000 / year level
  - ✔ Support TRC's PR campaigns to recruit plasmapheresis donors
- Turkish Red Crescent
  - ✔ Share necessary data and cooperate with contractor
  - ✔ Plan and finance physical and operational preparations
  - ✔ Realize all steps of preparation in 15 months
  - ✔ Provide relevant data for Plasma Master File (PMF)
  - ✔ Recruite plasma donors, operate plasmapheresis centers
  - ✔ Provide 550.000 liters of industrial plasma each year
- Contractor Consortium
  - ✔ Conduct audits in RTC premises, lead corrective steps

- ✔ Plan and realize investments
- ✔ Set up the facility, cold-storage warehouse, plasmapheresis centers
- ✔ Run pilot production, prepare PMF, get approvals/licences
- ✔ Pay for plasma,
- ✔ Fractionate plasma abroad and in Turkey, transfer technology

Expectations of the actors are summarized as follows;

- Social Security Institution
  - ✔ Pay less for at least 25 % of national consumption (in IU or gram)
  - ✔ Fix the prices for at least 10 years
  - ✔ Put this price as a leverage on the rest of the market
- Ministry of Health
  - ✔ Secure product flow to some extend
  - ✔ Bring in new technology, products, opportunities
  - ✔ Import substitution, foreign exchange savings
  - ✔ Positive political impact
- Turkish Red Crescent
  - ✔ Develop new organizational and operational capacities
  - ✔ Widen product and service range (PFF, plasma donor)
  - ✔ Compliance with new international quality standards / partners
  - ✔ Positive general impact on blood products / services quality
  - ✔ Higher countrywide/worldwide organizational reputation and prestige
  - ✔ Provide additional income out of excess plasma
- Contractor Consortium
  - ✔ Privileged long term access to Turkey's plasma for low price
  - ✔ Purchase warranted market share in a big and growing market
  - ✔ Good returns for investment due to financial, tax incentives
  - ✔ Experience in overseas country operations

REQUIREMENTS; National, International

In addition to Protocol, National regulations, directives, guidelines, standards, recommendations of EU (and EMA) will be the main references for plasma and medicines.[4]

National and international requirements that the actors have to comply with are given below.

REQUIREMENTS

TO COMPLY WITH;

1. National legislative regulations, guidelines

- Blood and Blood Components Law
- Blood and Blood Components Code
- Other related codes
- National Guide for Blood and Blood Components 2011, 2014(?)
- Protocol signed, Protocols to be signed

2. International regulations, recommendations, standards, expectations

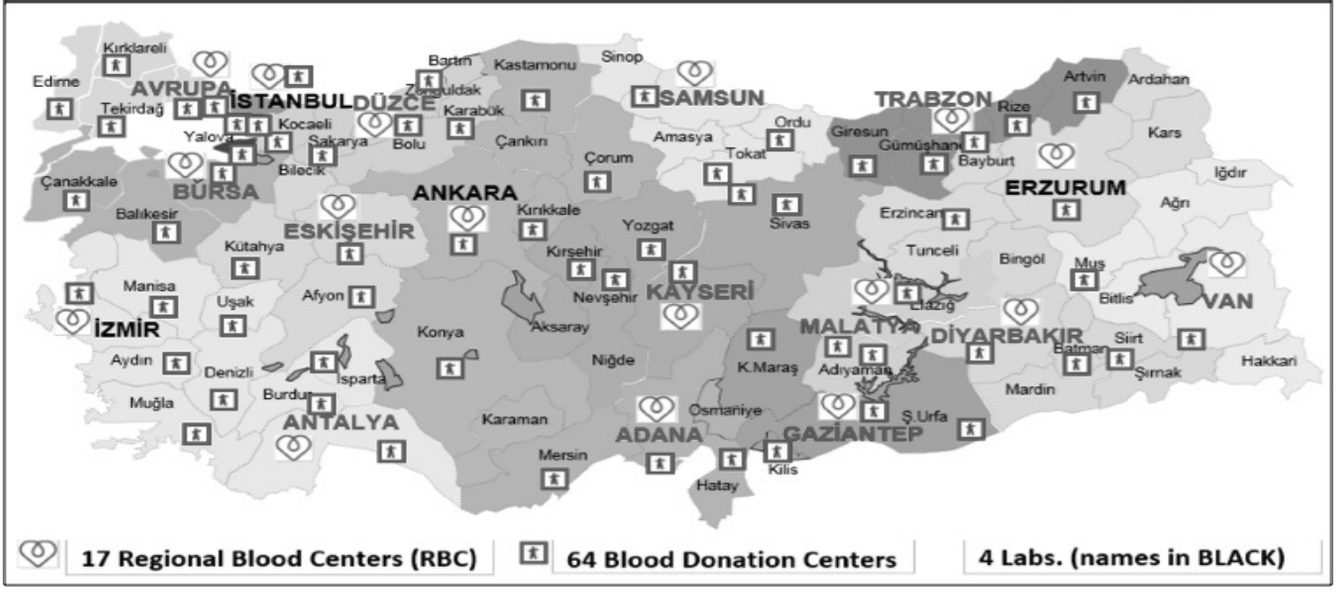
- **EU**
  1) EC Directives (main, secondary, related directives)
  2) EudraLex Vol-4, Annex-14)
  2) EMA documents (Guideline on PDMP, PMF Requirements...)
  3) European Pharmacopoeia
  4) others (EDQM Guide, DOMAINE, EQUAL, EuBIS...)
- **WHO**
  1) WHO Recommendations for Human Plasma for Fractionation
  2) others (Tech.Report 924 Annex-4, PF Info Sheet, ...)
- **Industry standards (IPFA, PPTA)**
- **AABB, FDA, ... (?)**

3. Contractor's, other partners', consumers' expectations

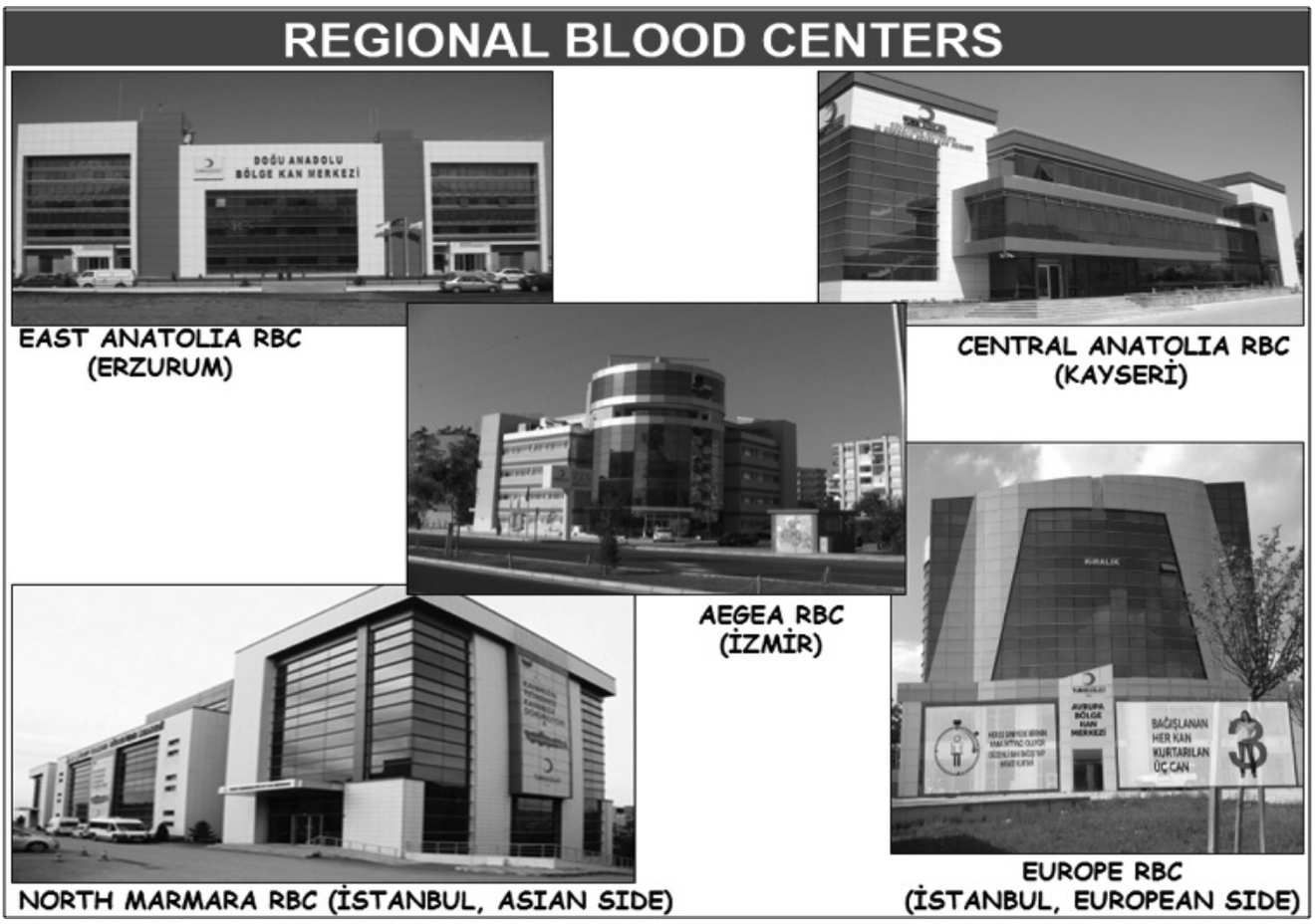
WHAT IS DONE; Quality, Quantity

Blood Safety Project which induced improvements in blood donation management, rehabilitation of facilities and product management, distribution and stock management (2005), use of ISBT-128 barkoding system (2006), ISO 9001:2000 acreditation (2006), information management system, first international accreditation (2007), universal deferral database (2011), component identification and traceability system (2012), universal NAT Testing for HIV1/2-HBV-HCV (2014) were some key steps for progress in blood banking as well as getting prepared for plasma fractionation.

TRC BLOOD SERVICES – PREMISES (2016)

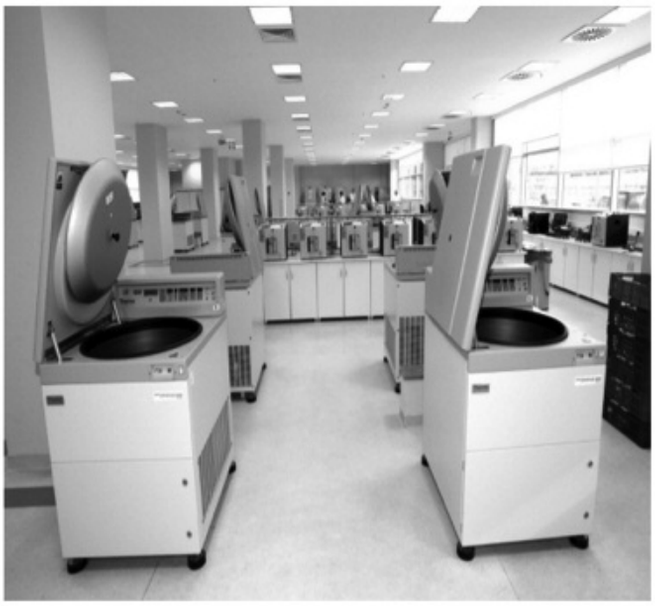


As part of Blood Safety Project TRC have already renewed some premises, equipments, devices and quality documents, procedures and instructions as well. Considerable improvements have been achieved in donor recruitment activities, public and donor group education, PR activities, donation, controlled transportation, processing, labeling, pathogen safety measures, quality control, storage, logistic management, information technologies and quality system.



Number of permenant and total personel has reached to 3.116, motor vehicles to 735 in 2016. Mobile donation teams are supported with modified blood donation trucks.[3]

PROCESSING and DISTRIBUTION OF BLOOD COMPONENTS



Processing Capacity 1000 unit /day

NORTH MARMARA RBC
(İSTANBUL, ASIAN SIDE)

CENTRALIZED LABORATORY SYSTEM (1)

TÜRKKIZILAYI

serologic screening		
test	*method*	*kit / manufacturer*
Anti-HCV	EIA	DIASORIN Murex anti-HCV (version 4.0), United Kingdom
HBsAg	EIA	DIASORIN Murex HBsAg Version 3, United Kingdom
HIV1/2 Ag+Ab	EIA	DIASORIN Murex HIV Ag/Ab Combination, United Kingdom
T.pallidum Total Ab	EIA	DIASORIN ICE* Syphilis, United Kingdom
serologic confirmation		
test	*method*	*kit / manufacturer*
Anti-HBc	EIA	DIASORIN Murex anti-HBc (total), United Kingdom
HBsAg Neutralization	EIA	DIASORIN Murex HBsAg Confirmatory Version 3, United Kingdom
HBsAg (alternative)	CLIA	DIASORIN Liaison XL Murex HBsAg Quant, Italy
Anti-HBs	CLIA	DIASORIN Liaison Anti-HBs II, Italy
Anti HCV LIA	RIBA	FUJIREBIO Inno-LIA HCV Score, Belgium
Anti-HIV 1-2 LIA	RIBA	FUJIREBIO Inno-LIA HIV I/II Score, Belgium

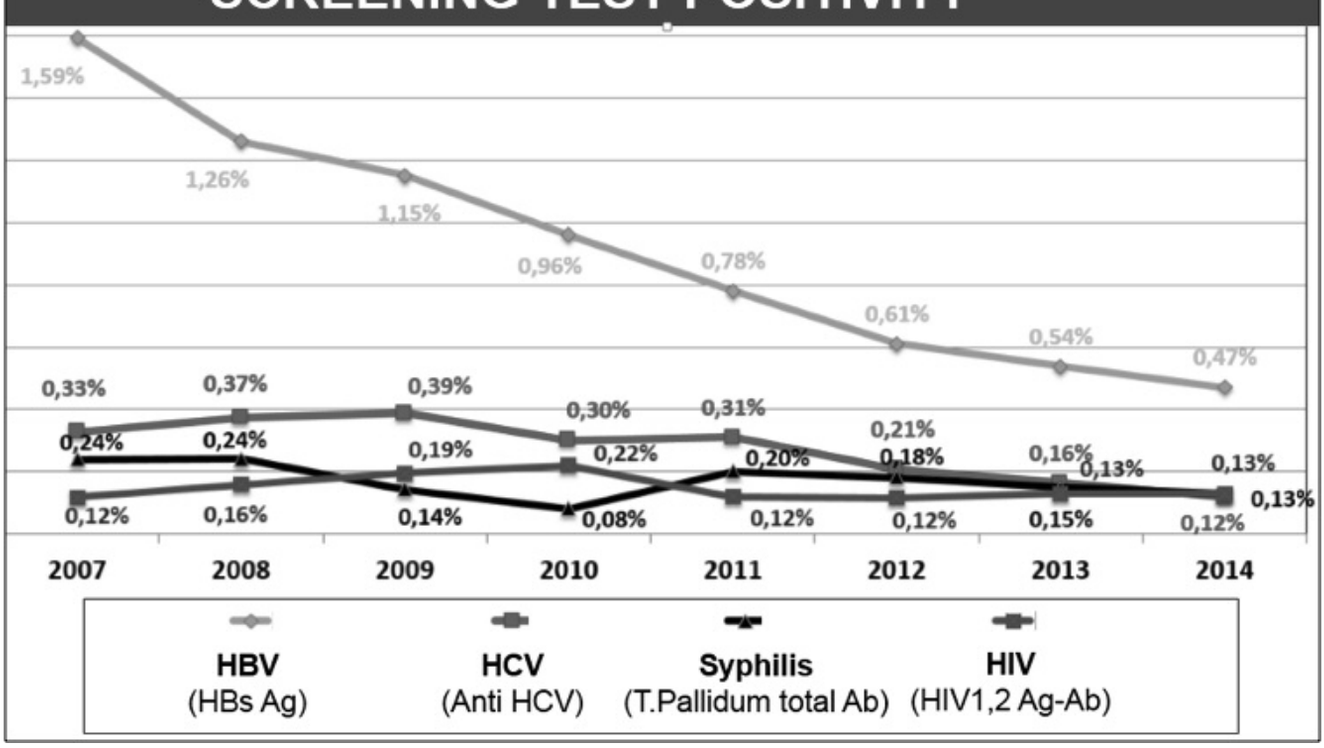
Table-1: Test methods and kits for screening and confirmatory testing
(EIA; Enzyme immunoassay, CLIA; Chemiluminescence immunoassay, RIBA; Recombinant immunoblot assay)

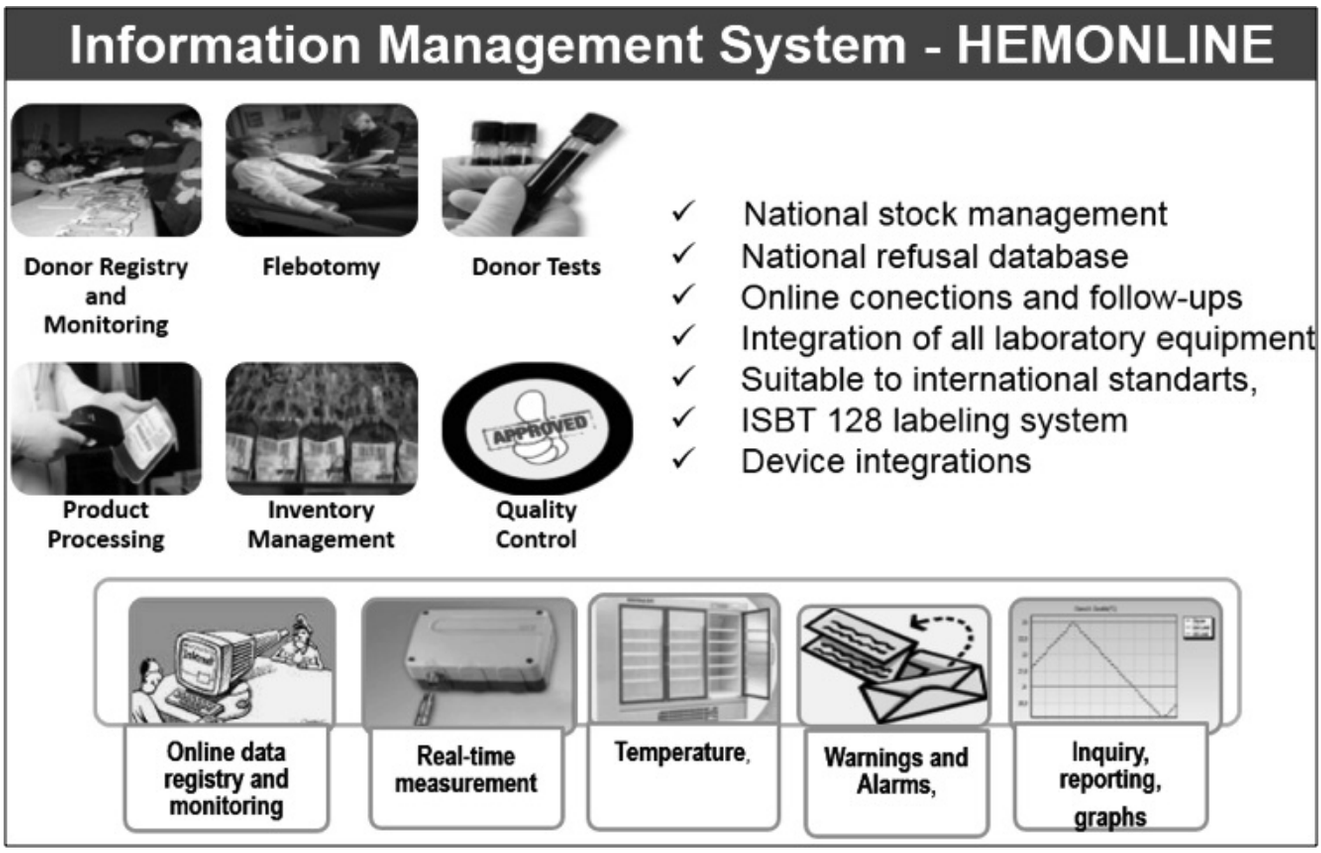
CENTRALIZED LABORATORY SYSTEM (2)

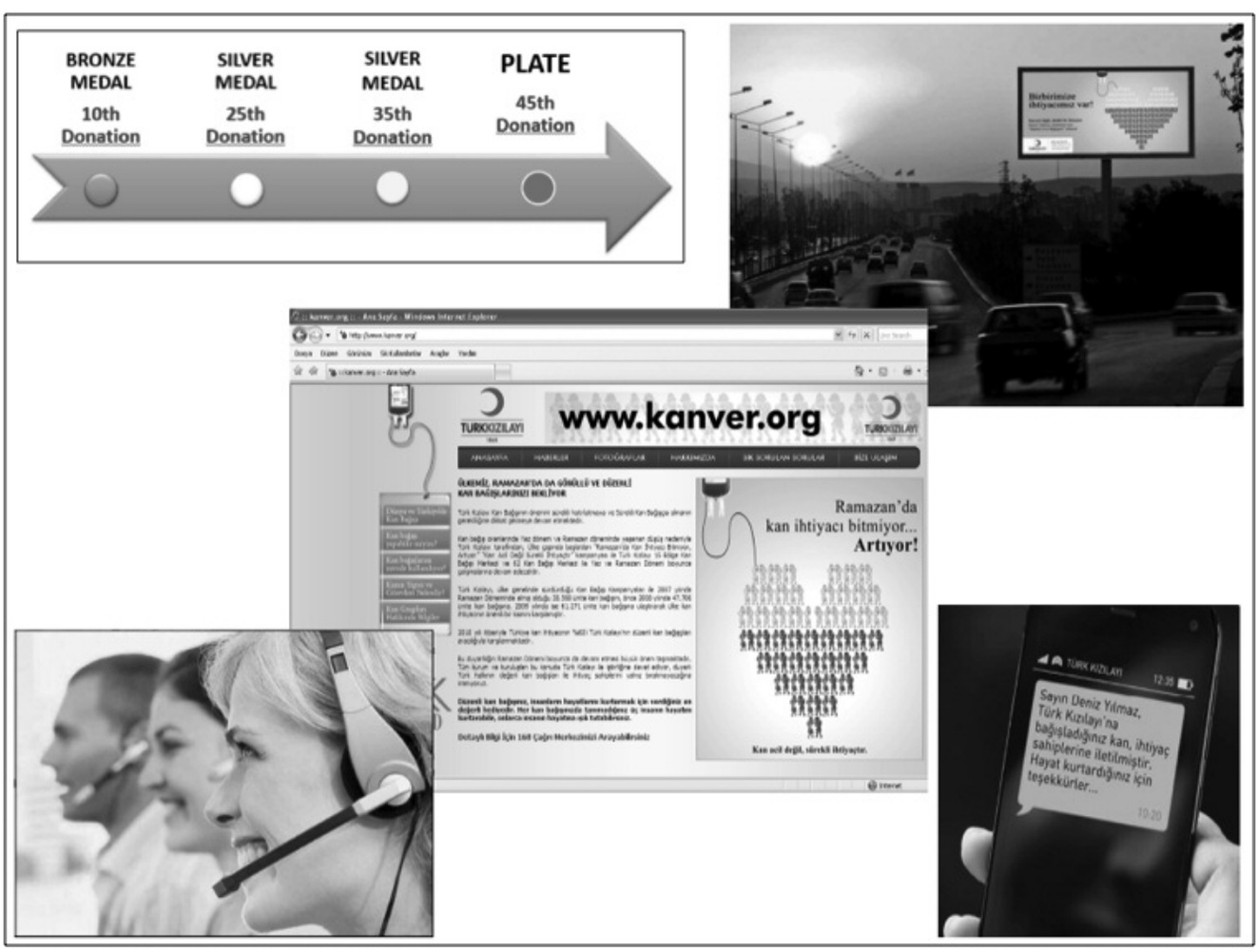


NAT screening		
Test	*Method*	*Instrument/kit/manufacturer*
HBV DNA HCV RNA HIV-1 RNA HIV-2 RNA	• Real Time PCR (Multiplex, Multi Dye Technology) • Minipool-6; MP6	• Cobas s-201 platform, Roche Diagnostics, Switzerland • Cobas Taq Screen MPX Test v.2.0, Roche Diagnostics, Switzerland
NAT confirmation		
Test	*Method*	*Instrument/kit/ manufacturer*
HCV RNA (quantitative)	Real Time PCR	• m2000, Abbott Molecular Inc, USA • Real Time HCV, Abbott Molecular Inc, USA
HIV-1 RNA (quantitative)	Real Time PCR	• m2000, Abbott Molecular Inc, USA • Real Time HIV-1, Abbott Molecular Inc, USA
HBV DNA (quantitative)	Real Time PCR	• m2000, Abbott Molecular Inc, USA • Real Time HBV, Abbott Molecular Inc, USA

SCREENING TEST POSITIVITY




Information Management System - HEMONLINE
Donor Registry and Monitoring
Flebotomy
Donor Tests
Product Processing
Inventory Management
Quality Control
APPROVED
✓ National stock management
✓ National refusal database
✓ Online conections and follow-ups
✓ Integration of all laboratory equipment
✓ Suitable to international standarts,
✓ ISBT 128 labeling system
✓ Device integrations
Online data registry and monitoring
Real-time measurement
Temperature,
Warnings and Alarms,
Inquiry, reporting, graphs


BRONZE MEDAL
10th Donation
SILVER MEDAL
25th Donation
SILVER MEDAL
35th Donation
PLATE
45th Donation
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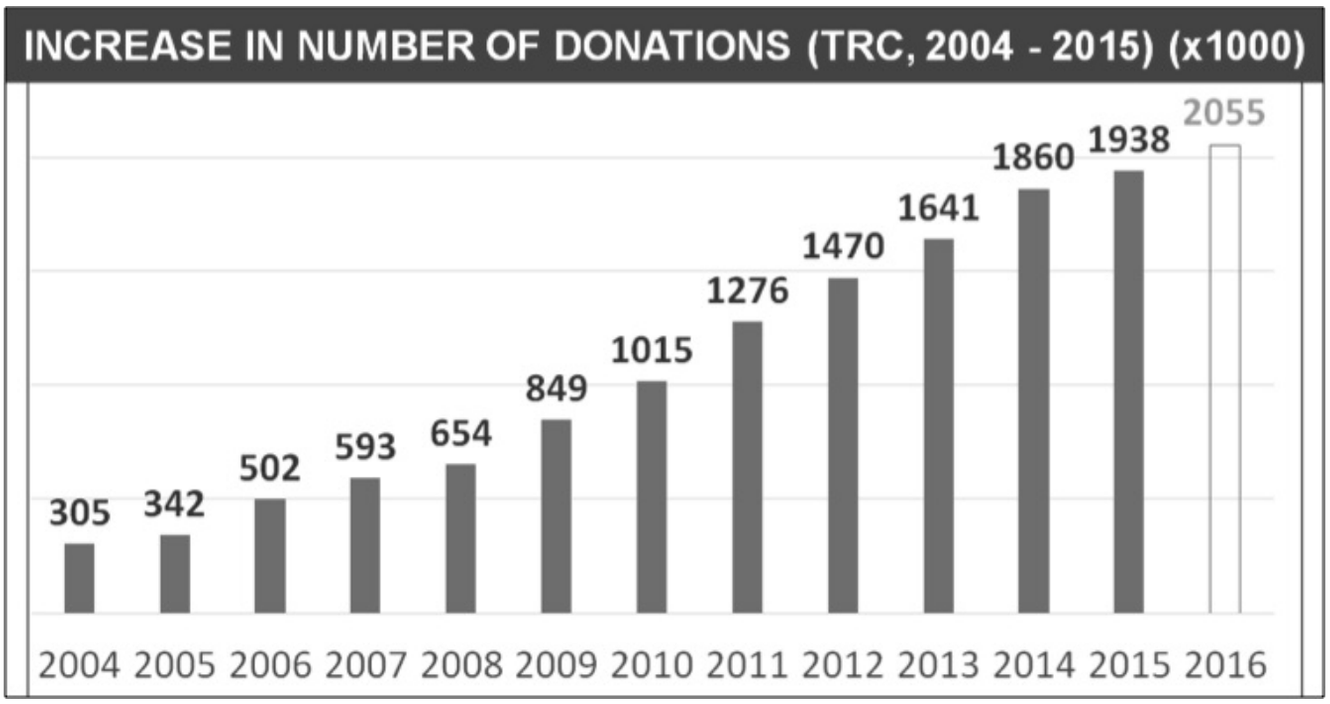
Ramazan'da kan ihtiyacı bitmiyor... Artıyor!
Sayın Deniz Yılmaz, Türk Kızılayı'na bağışladığınız kan, ihtiyaç sahiplerine iletilmiştir. Hayat kurtardığınız için teşekkürler...



TRC's POSITION IN IFRC MEMBER ORGANISATIONS (2013)

	donations received by IFRC member organisations	leading organisations
Asia-Pacific	10.036.243	1) Japan 2) South Korea
Europe	6.343.594	1) Germany 2) Turkey
Americas	3.753.442	1) USA
Middle East & North Africa	477.380	
Africa	139.490	
WORLD WIDE	20.750.149	1) Japan 2) USA 3) South Korea 4) Germany 5) Turkey

IFRC 2015 Report http://www.ifrc.org/en/who-we-are/data-explorer/

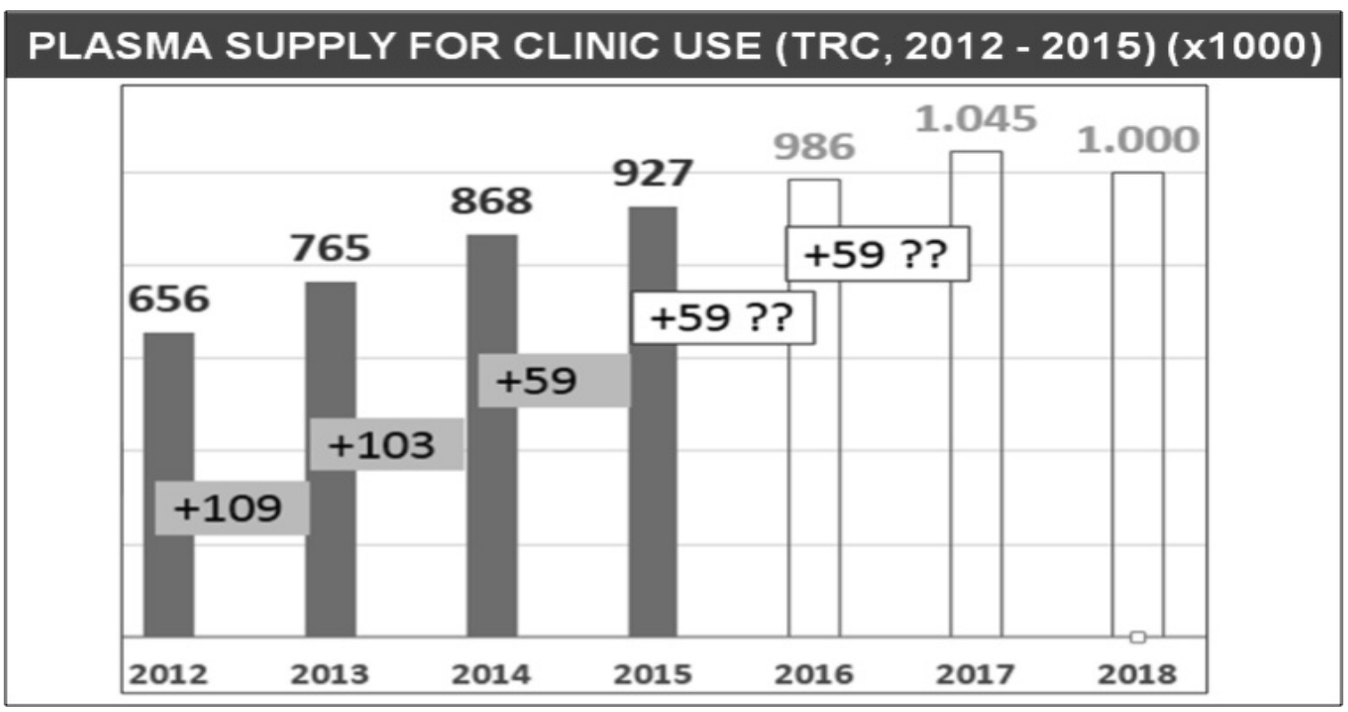
WHAT IS NEXT; Quality, Quantity

Due to the Protocol, TRC's commitment is to supply 550.000 liters of plasma. Recovered and source plasma will make the sum. Since TRC will be responsible from operating a dozen of plasmapheresis centers, recruiting the new kind of donor (plasma donors) will be TRC's new and tough challenge. A reasonable but steady increase in whole blood donation figures (reaching 2,5 million in not more than a few years) is necessary to fulfill the "recovered" side of the mission. This means; renewing some premises to run larger production, lab and storage capacities, also constracting some regional cold storage houses, rent a number of refrigerated trucks, planning and conducting more visits to the existing and potential blood donors, more mobile and fixed teams, more modified trucks, personnel, equipment, validation, training, visits for supervision and inspection, adaptive changes for software etc. Plasma protein level screening tests have to be put into practice. New quality documents, procedures, instructions as well.

HOMEWORK FOR RTC; DESIGN, IMPROVE, INVEST

- Better schedules for donation teams
- Improved donor selection
- Better donation conditions
- Real time deferral records
- Faster blood transfer to RBC
- Better temperature control
- Additional screening tests
- More of samples and records to keep for long years
- Timeliness in production lab.
- New archives for signed up registry forms
- Adaption of Information Management System
- Introducing new promotions for plasmapheresis donors
- Introducing new PR strategies, policies, messages
- Improved processing, stock and transport capacity
- Operating plasmapheresis centers
- Recruiting plasmapheresis donors
- Additional personnel
- New definitions, procedures, forms, trainings
- Additional quality documens, control forms, visits

Appropriate use of plasma in clinics enable countries to divert more of plasma to the industry. The well-known ratio is 1/4 or for some instances 1/5 of the total plasma. Turkey's erythrocyte suspension need is predicted to be 2,5-3,0 million/year. For the worst-case scenario, consuming 750.000 in clinics can be realistic. However, both last few years' figures and the trend curve (given in the graphic below) sign consistent increase.3 Due to the Protocol, at first to stabilize, then to reduce the consumption, MoH is expected to interfere the situation via conducting training seminars for clinicians or encouraging specialists to follow the related annex of Turkey's brand-new "National Guide".



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PATIENT BLOOD MANAGEMENT: WHAT&HOW?

Fevzi TORAMAN

Allogenic transfusion is one of the oldest and most common applications in clinical practice and faced with many problems like questionable safety and efficacy, increased cost and limited stocs. Knowing the early and late adverse effects (bad outcomes) of using blood bank products clearly, requires to be more careful about blood transfusion practice. Actually blood transfusion should be thought as an organ transplantation.

When we look at the economic burden of the countries for using blood bank products, it seems about 4,5 percent of health care budget is spent on blood products. More importantly, the use of blood products without indication induces the wrong consumption of limited sources. If it is not found a liquid that can be used instead of blood in the coming years, there will be a big trouble for patients who really needs blood transfusion. Furthermore the increasing and aging of the world population, increasing rate of diabetes mellitus, hypertension, hepatitis, AIDS and other viral infections seen among people who can be donors, will negatively effect the donor pool.

If we continue to use blood products as we do today, it is obvious that we will be faced with a big trouble for having bank blood products for our increasing world population in the coming years. So our knowledge about blood transfusion should be updated and, patient-centered approach should replace the product-centered approach.

Patient blood management (PBM) is a system using patient-centered approach in clinical practice. İn PBM approach, patients are evaluated prior to surgery and the patients with anemia (except urgent surgery) are treated to correct anemia before surgery **(optimization of haematological status of the patient)**. Furthermore using of pharmacological agents to reduce blood loss, close monitoring of bleeding and coagulation system and, minimally invasive surgery applications are recomended to reduce blood requirement during surgery **(to ensure minimal bleeding)**. PBM recommends a multidisciplinary approach to evaluate of each patient's own situation and doesn't determine a standardised hemoglobin threshold for transfusion requirement during perioperative period **(optimization of the physiological response to anemia)**. Thus PBM prevents making the transfusion decision by single physician.

Unlike existing transfusion guidelines PBM; not only updates theoretical knowledge, but also takes an active role in the clinical practice. In this way PBM allows to get some results like avoiding unnecessary transfusions, prevention of adverse effects due to blood use (mortality-morbidity), ensuring the protection of stocks and, providing significant economic benefits (Australian health ministry has reported that $ 50 million profit in 4 years after PBM application and Austrian health ministry has put the project into practice as well).

How should we apply PBM:

PBM awareness should be created and, for this purpose the following procedures should be performed respect vely.

1. The initial PBM group should be established.
2. Education of the initial group about patient blood management should be provided.
3. For creating PBM awareness throughout the country, scientific programs should be created.
4. The support of the ministry of health and public insurance foundation should be received to reach larger populations.
5. The cooperation with the relevant associations should be established and the bigger PBM groups should be organised.
6. Mandatory training sessions (education meetings) should be held for 5 participants from each hospital.
7. Volunteer representatives should be chosen from the participants.
8. Each volunteer representative should prepare the transfusion schema of their hospital.
9. The doctors and clinics using blood products most common should be identified.
10. Hospital representatives should meet and educate these physicians and clinics about PBM.
11. These clinics and clinicians should be followed and the data obtained before and after PBM training should be compared.
12. Hospital representatives should prepare a report every 3 months.
13. Based on these reports, the main PBM groups should have meeting every 6 months, and find financial, logistic, technical and educational solutions.
14. The solutions should be unique to each hospital.
15. After 3 months of observation, if the problems persist the meetings attended by hospital administrators, PBM representatives, ministry of health and public insurance foundation should be organised for each hospital.
16. Pilot hospitals should be determined.
17. Transfusion data especially the positive ones obtained PBM meetings should be shared with the others.
18. The awarding of the hospital using appropriate transfusion strategies should be provided by public insurance foundation (like increasing the package price).

HAEMOVIGILANCE: JUST THE BASICS

Mustafa Nuri GÜNÇIKAN

The word "hemovigilance" comes from the French and it means being "watchful" about "blood". From 1980s through early 1990s, a number of blood transfusions ended up in HIV/AIDS cases in some transfusion recipients in France. In reaction to this unfortunate experience, a surveillance system for blood transfusion was implemented in 1994 and the term "hemovigilance" coined.

Hemovigilance can simply be defined as; **"A set of surveillance procedures of the whole transfusion chain intended to minimize adverse events or reactions in donors and recipients and to promote safe and effective use of blood components".**

Basic Terminology:

-***An adverse event*** is an undesirable and unintended occurrence in the blood transfusion chain (which consists of the collection, testing, preparation, storage, distribution, ordering, issuing, and administration of blood and blood components). It may or may not be the result of an error or an incident and it may or may not result in an adverse reaction in a donor or recipient.

-***An incident*** is a case in which the patient is transfused with a blood component that did not meet all the requirements for a suitable transfusion for that patient, or that was intended for another patient. Incidents thus comprise transfusion errors and deviations from standard operating procedures (SOPs) or hospital policies that have lead to mistransfusions. It may or may not lead to an adverse reaction.

-***A near-miss*** is an error or deviation from standard procedures or policies that is discovered before the start of the transfusion and that could have led to a wrongful transfusion or to a reaction in a recipient.

-***An adverse reaction*** is an undesirable response or effect in a patient or donor temporally associated with the collection or administration of blood or blood component. It may, but need not, be the result of an incident.

"Adverse reactions in recipients" is synonymous with "Transfusion Reactions".

NON INFECTIOUS TRANSFUSION REACTIONS

HEMOLYTIC TRANSFUSION REACTIONS

A hemolytic transfusion reaction is one in which symptoms and clinical or laboratory signs of increased red cell destruction are produced by transfusion. Hemolysis can occur intravascularly or extravascularly and can be immediate (acute) or delayed.

Acute hemolytic transfusion reaction (AHTR)

An AHTR has its onset within 24 hours of a transfusion. Clinical or laboratory features of hemolysis are present.
Common signs of AHTR are: Fever; Chills/rigors; Facial flushing; Chest pain; Abdominal pain; Back/flank pain; Nausea/vomiting; Diarrhea; Hypotension; Pallor; Jaundice; Oligoanuria; Diffuse bleeding; Dark urine.

Common laboratory features are: Hemoglobinemia; Hemoglobinuria; Decreased serum haptoglobin; Unconjugated hyperbilirubinemia; Increased LDH and AST levels; Decreased hemoglobin levels.

Not all clinical or laboratory features are present in cases of AHTR. Blood group serology usually shows abnormal results but absence of immunological findings does not exclude AHTR. AHTR may also be due to erythrocyte auto-antibodies in the recipient or to non immunological factors like mechanical factors inducing hemolysis (malfunction of a pump, of a blood warmer, use of hypotonic solutions, etc.).

Delayed hemolytic transfusion reaction (DHTR)

A DHTR usually manifests between 24 hours and 28 days after a transfusion and clinical or laboratory features of hemolysis are present. Signs and symptoms are similar to AHTR but are usually less severe. DHTR may sometimes manifest as an inadequate rise of post-transfusion hemoglobin level or unexplained fall in hemoglobin after a transfusion. Blood group serology usually shows abnormal results.

Delayed serologic reaction (DSTR)

There is a DSTR when, after a transfusion, there is demonstration of clinically significant antibodies against red blood cells which were previously absent (as far as is known) and when there are no clinical or laboratory features of hemolysis. This term is synonymous with alloimmunization.

NON HEMOLYTIC TRANSFUSION REACTIONS
Febrile non hemolytic transfusion reaction (FNHTR)

There is a FNHTR in the presence of one or more of: fever (≥38 ° C oral or equivalent and a change of ≥1 ° C from pretransfusion value); chills/rigors.

This may be accompanied by headache and nausea occurring during or within four hours following transfusion without any other cause such as hemolytic transfusion reaction, bacterial contamination or underlying condition. FNHTR could be present in absence of fever (if chills or rigors without fever). For international comparisons, only the most serious cases od FNHTR should be accounte for: fever (≥39° C oral or equivalent and a change of ≥2 ° C from pretransfusion value) and chills/rigors.

Allergic reaction

An allergic reaction may present only with mucocutaneous signs and symptoms: Morbilliform rash with pruritus; Urticaria (hives); Localized angioedema; Edema of lips, tongue and uvula; Periorbital pruritus, erythema and edema; Conjunctival edema occurring during or within 4 hours of transfusion.

In this form, it usually presents no immediate risk to life of patient and responds quickly to symptomatic

treatment like antihistamine or steroid medications. This type of allergic reaction is called 'minor allergic reaction' and would be graded as 1, i.e. non-severe.

An allergic reaction can also involve respiratory and/or cardiovascular systems and present like an anaphylactic reaction. There is anaphylaxis when, in addition to mucocutaneous systems there is airway compromise or severe hypotension requiring vasopressor treatment (or associated symptoms like hypotonia, syncope). The respiratory signs and symptoms may be laryngeal (tightness in the throat, dysphagia, dysphonia, hoarseness, stridor) or pulmonary (dyspnea, cough, wheezing/bronchospasm, hypoxemia). Such a reaction usually occurs during or very shortly after transfusion. For the purpose of classification, this type of allergic reaction would be graded as 2 (severe), 3 (life-threatening) or 4 (death) depending on the course and outcome of the reaction.

Transfusion associated graft-versus-host disease (TA-GVHD)

TA-GVHD is a clinical syndrome characterised by symptoms of fever, rash, liver dysfunction, diarrhea, pancytopenia and findings of characteristic histological appearances on biopsy occurring 1-6 weeks following transfusion with no other apparent cause. The diagnosis of TA-GVHD is further supported by the presence of chimerism.

Post transfusion purpura (PTP)

PTP is characterized by thrombocytopenia arising 5-12 days following transfusion of cellular blood components with findings of antibodies in the patient directed against the Human Platelet Antigen (HPA) system.

Transfusion-related acute lung injury (TRALI)

In patients with no evidence of acute lung injury (ALI) prior to transfusion, TRALI is diagnosed if a new ALI is present:

- Acute onset;
- Hypoxemia, (Pa02 / Fi02 < 300 mm Hg), or

Oxygen saturation is < 90% on room air, or

Other clinical evidence;

- Bilateral infiltrates on frontal chest radiograph;
- No evidence of left atrial hypertension (i.e. circulatory overload);
- No temporal relationship to an alternative risk factor for ALI during or within 6 hours of completion of transfusion.

Alternate risk factors for ALI are:

Direct Lung Injury;

- Aspiration
- Pneumonia
- Toxic inhalation
- Lung contusion
- Near drowning

Indirect Lung Injury;

- Severe sepsis
- Shock
- Multiple trauma

- Burn injury
- Acute pancreatitis
- Cardiopulmonary bypass
- Drug overdose.

It has been suggested by the Toronto TRALI Consensus Panel to add a category of Possible TRALI that would have the same definition as TRALI except for the presence of a temporal relationship to an alternative risk factor for ALI (as described above). In such a circumstance, TRALI should be indicated with a possible imputability to transfusion.

TRALI is therefore a clinical syndrome and presence of anti-HLA or anti-HNA antibodies in recipient nor confirmation of cognate antigens in donors are required for diagnosis.

Transfusion associated dyspnea (TAD)

TAD is characterized by respiratory distress within 24 hours of transfusion that does not meet the criteria of TRALI, TACO, or allergic reaction. Respiratory distress should be the most prominent clinical feature and should not be explained by the patient's underlying condition or any other known cause.

Transfusion associated circulatory overload (TACO)

TACO is characterized by any 4 of the following:
- Acute respiratory distress
- Tachycardia
- Increased blood pressure
- Acute or worsening pulmonary edema on frontal chest radiograph
- Evidence of positive fluid balance occurring within 6 hours of completion of transfusion.

An elevated BNP is supportive of TACO.

Hypotensive transfusion reaction

This reaction is characterized by hypotension defined as a drop in systolic blood pressure of ≥ 30 mm Hg occurring during or within one hour of completing transfusion and a systolic blood pressure ≤ 80 mm Hg. Most reactions do occur very rapidly after the start of the transfusion (within minutes).

This reaction responds rapidly to cessation of transfusion and supportive treatment. This type of reaction appears to occur more frequently in patients on ACE inhibitors. Hypotension is usually the sole manifestation but facial flushing and gastrointestinal symptoms may occur. ***All other categories of adverse reactions presenting with hypotension, especially allergic reactions, must have been excluded. The underlying condition of the patient must also have been excluded as a possible explanation for the hypotension.***

Other transfusion reactions

Haemosiderosis

Transfusion-associated haemosiderosis is being defined as a blood ferritin level of ≥ 1000 micrograms/l, with or

without organ dysfunction in the setting of repeated RBC transfusions.

Hyperkalemia

Any abnormally high potassium level (> 5 mml/l, or ≥1.5 mml/l net increase) within an hour of transfusion can be classified as a transfusion- associated hyperkalemia.

Unclassifiable Complication of Transfusion (UCT)

Occurrence of an adverse effect or reaction temporally related to transfusion, which cannot be classified according to an already defined Adverse Transfusion Effect and with no risk factor other than transfusion and no other explaining cause.

The severity of an adverse reaction in a recipient is graded according to an international scale:

Grade 1 (Non-Severe):
- the recipient may have required medical intervention (e.g. symptomatic treatment) but lack of such would not result in permanent damage or impairment of a body function.

Grade 2 (Severe):
- the recipient required in-patient hospitalization or prolongation of hospitalization directly attributable to the event; and/or
- the adverse event resulted in persistent or significant disability or incapacity; or
- the adverse event necessitated medical or surgical intervention to preclude permanent damage or impairment of a body function.

Grade 3 (Life-threatening):
- the recipient required major intervention following the transfusion (vasopressors, intubation, transfer to intensive care) to prevent death.

Grade 4 (Death)*
- the recipient died following an adverse transfusion reaction.

**** Grade 4 should be used only if death is possibly, probably or definitely related to transfusion. If the patient died of another cause, the severity of the reaction should be graded as 1, 2 or 3.***

The term "Imputability" denotes the likelihood that an adverse reaction in a recipient can be attributed to the blood component transfused:*

Definite (certain): when there is conclusive evidence beyond reasonable doubt that the adverse event can be attributed to the transfusion.

Probable (likely): when the evidence is clearly in favor of attributing the adverse event to the transfusion.

Possible: when the evidence is indeterminate for attributing the adverse event to the transfusion or an alternate cause.

Unlikely (doubtful): when the evidence is clearly in favor of attributing the adverse event to causes other than

the transfusion.

Excluded: when there is conclusive evidence beyond reasonable doubt that the adverse event can be attributed to causes other than the transfusion.

Only possible, probable and definite cases should be used for international comparisons.

Transfusion-transmitted infections (TTIs)

Viral infection (TTVI)

Following investigation, the recipient has evidence of infection post-transfusion and no clinical or laboratory evidence of infection prior to transfusion and either, at least one component received by the infected recipient was donated by a donor who had evidence of the same infection, or at least one component received by the infected recipient was shown to have been contaminated with the virus.

Bacterial infection (TTBI)

A TTBI should be clinically suspected if fever >39 °C or there is a change of >2 °C from pretransfusion value; and rigors; and tachycardia >120 beats/min or a change of >40 beats/min from pretransfusion value or a rise or drop of 30 mm Hg in systolic blood pressure within 4 hours of transfusion are present.

Possible TTBI:

- detection of bacteria by approved techniques in the transfused blood component but not in the recipient's blood; or
- detection of bacteria in the recipient's blood following transfusion but not in the transfused blood component and no other reasons are ascertainable for the positive blood culture.

Confirmed TTBI:

- detection of the same bacterial strain in the recipient's blood and in the transfused blood product by approved techniques.

Parasite infection (TTPI)

Detection of the same parasite in the recipient's blood and parasite or specific antibodies in the donor's blood.

INVESTIGATION OF TRANSFUSION TRANSMITTED INFECTIONS

In order to investigate a possible Transfusion Transmitted Infection, primarily, a complete list of the blood components received by the patient and their dates of transfusion is required.

Additionally, the following information is sought from the hospital:

(1) Patient details
(a) full name
(b) address
(c) date of birth
(d) sex
(e) ethnic origin.
(2) Clinical details
(a) Physician, with specialty
(b) reason for transfusion

(c) underlying diagnosis
(d) current condition
(e) clinical evidence of post-transfusion infection.
(3) Laboratory results
(a) copies of laboratory reports for infectious markers
(b) any test results on samples prior to transfusion
(c) liver function test results (hepatitis cases).

With the primary information at hand, the donors of the blood components are identified and their records are reviewed regarding the results of routine testing for index donations (the one the infected recipient received) and any donations given subsequent to them. The situation is then assessed, considering the whole data, regarding whether any further investigation is required and what will be investigated specifically. Then the need for additional testing (and additional samples from the donors) is decided and you proceed as needed. Then the results are reviewed. Finally, the conclusion is reported to clinician/hospital, etc.

OVERLAPPING SIGNS AND SYMPTOMS OF TRANSFUSION REACTIONS

SIGN OR SYMPTOM	POSSIBLE REACTION	MOST LIKELY > LESS LIKELY BLOOD COMPONENT*
Fever, chills	**Febrile nonhemolytic** **Septic** **Acute hemolytic** **TRALI**	**Platelets (especially septic) > RBCs > Plasma**
Urticaria, pruritus	**Allergic** **Anaphylactic**	**Plasma > Platelets > RBCs**
Dyspnea	**TACO** **TRALI** **Anaphylactic**	**Any**
Hypotension	**Septic** **Hypotensive** **Acute hemolytic** **Anaphylactic**	**Platelets > plasma > RBCs**

PREVENTIVE MEASURES FOR TRANSFUSION REACTIONS

TRANSFUSION REACTION	*PREVENTIVE MEASURES*
Transfusion-transmitted bacterial infection	**Donor skin cleansing Diversion pouch on donation line Pathogen reduction Correct storage conditions.**
Transfusion-transmitted viral infection (HBV, HCV, HIV-1/2, other)	**Donor selection Donation testing Pathogen reduction.**
Transfusion-transmitted parasitic infection (malaria, other)	**Donor selection Donation testing Pathogen reduction.**
Hemolysis due to incorrect storage	**Quality assured clinical transfusion process.**
Transfusion Related Acute Lung Injury (TRALI)	**TRALI risk may be reduced with Fresh Frozen Plasma (FFP) from male donors.**
Graft-Versus-Host Disease	**Use of irradiated components for at-risk patients; use of amotosalen treated platelets.**
Transfusion Associated Circulatory Overload (TACO)	**Avoid over-infusion; infusion should be at a rate not to exceed 2 to 4 mL/kg/hour, and the rate should be lower (1 mL/kg/hour) for patients at high risk of circulatory overload.**
Febrile non-hemolytic TR	**Incidence may be reduced by Leucodepletion.**

ADVERSE REACTIONS OR COMPLICATIONS IN DONORS

Complications mainly with local symptoms

These complications are directly caused by the insertion of the needle. Some of these are mainly characterized by occurrence of blood outside vessels, whereas others are mainly characterized by pain.

Complications mainly characterized by the occurrence of blood outside the vessels. Haematoma (bruise)

A haematoma is an accumulation of blood in the tissues outside the vessels. The symptoms are caused by blood flowing out of damaged vessels and accumulating in the soft tissues. For apheresis procedures, haematomas may also be caused by infiltration of the soft tissues by red cells during the return phase of the procedure. Large haematomas, particularly those in deeper layers of the forearm, put pressure on surrounding tissues and may contribute to other complications such as nerve irritation and injury and more rarely compartment syndrome. ***Signs and symptoms: Bruising, discolouration, swelling and local pain.*** Accumulation of blood in deeper tissues may result in more serious pain and pressure syndromes listed below.

Arterial puncture

Arterial puncture is a puncture of the brachial artery or of one of its branches by the needle used for bleeding the donor. Because of the rapid blood flow, the risk of a large haematoma is increased and thereby risks of more serious pain and pressure syndromes listed below. S**igns and symptoms: A lighter red colour than usual of the collected**

blood can be seen. The needle and tubing may appear to pulsate; the blood bag fills very quickly. There may be weak pain localized to the elbow region.

Delayed bleeding (re-bleeding)

Leakage of blood from the venipuncture site after the initial bleeding has stopped. Re-bleeding may be related to pressure not being applied to the correct location or for an adequate duration, or premature removal of the bandage. After the donor has left the clinic, re-bleeding may be related to heavy lifting or strain to the donor's arm. Donors on certain medications, such as autologous donors on anticoagulants, may be at higher risk to rebleed. **Signs and symptoms: Spontaneous recommencement of bleeding from the venipuncture site, after pressure has been applied and the initial dressing has been removed, or leaking through the dressing.**

Complications mainly characterized by pain

Nerve injury / irritation

Injury or irritation of a nerve A nerve may be hit directly by the needle at insertion or withdrawal, or there may be pressure on a nerve due to a haematoma or inflammation of the soft tissues. Include medically diagnosed cases, as well as **cases reported on the basis of documented 'nerve' type symptoms. Signs and symptoms: Radiating, often 'electrical' sharp pain moving away from the venepuncture site, and/or paraesthesias such as tingling, burning sensations in the hand, wrist or shoulder area but away from the venepuncture site.** Symptoms may arise immediately when the needle is inserted or withdrawn. In cases associated with a haematoma, pain may not be apparent at the time and may start when the haematoma has reached a sufficient size, some time after insertion of the needle. Symptoms may be worse in certain positions or with certain arm motions. **Rarely, weakness of the arm may develop.**

Symptoms resolving within 12 months: Symptoms usually resolve within days, but rarely may persist for months or become permanent.

Symptoms lasting more than 12 months.

Other Painful arm

Pain in the arm is the primary symptom, without the characteristics of nerve irritation outlined above, or the presence of a large hematoma or other defined complications that may be painful. Pain may be related to tissue injury, possibly due to hematoma in the deeper tissues. **Signs and symptoms: Pain in the arm, without characteristics of nerve irritation. May be described as an ache or heaviness in the arm, similar to that experienced after vaccination. Include all cases where arm pain is the main symptom, unless a diagnosis of nerve injury/irritation is suspected in the presence of nerve type symptoms recognised by trained staff.**

Localised infection/inflammation

Inflammation along the course of a vein, which may progress to localised infection several days after phlebotomy. There may be clotting in the vein. Tissue damage and introduction of surface bacteria into the deeper tissues with venepuncture. The superficial vein itself (thrombophlebitis) or the surrounding subcutaneous tissue (cellulitis) may be predominantly affected. **Signs and symptoms: Warmth, tenderness, local pain, redness and swelling at the site of phlebotomy. The site and the vein may feel tender, firm, and warm to the touch. Fever may be present.**

Thrombophlebitis: The redness, swelling, and tenderness extend along the course of the vein.

Cellulitis: The redness, swelling and tenderness affect the soft tissues, and are not localised to the course of the vein.

Other major blood vessel injury

These rare, serious conditions **must always be medically diagnosed.**

Deep venous thrombosis (DVT)

Thrombosis of a deep vein in the donor's phlebotomy arm. Superficial venous thrombosis may progress into the deeper veins of the donor's arm. **DVT may also rarely occur without previous signs and symptoms of superficial thrombosis. An additional risk factor for thrombosis, in particular, the use of oral contraceptives, may be present in these donors. Symptoms and signs: Swelling and pain in the upper arm. May be accompanied by symptoms of superficial inflammation and thrombosis.**

Arteriovenous fistula

Acuired connection between the vein and artery due to venepuncture lacerations. A channel forms between the lacerated vein and artery immediately postvenepuncture, or in the healing process. **May be related to arterial puncture. Signs and symptoms: Pulsating mass with a palpable thrill and associated bruit. The affected area may be warm, and the distal part of the arm may be cool if significant shunting of blood is present. The distal veins may be dilated and may pulsate.**

Compartment syndrome Increased intracompartment pressure leading to muscle and soft tissue necrosis. Blood may accumulate in the frontal deep areas of the forearm, closing small blood vessels and resulting in muscle and nerve tissue necrosis. **May be related to arterial puncture. Signs and symptoms: Painful arm, particularly on movement; swelling, paresthesias and partial paralysis.**

Brachial artery pseudoaneurysm

Collection of blood outside an artery, contained by adventitia or the surrounding tissues alone. After a traumatic arterial puncture, blood may leak out of the artery and accumulate in the surrounding space. **Signs and symptoms: Pulsating mass in the arm. May be accompanied by pain and paraesthesias. May be preceded by a large hematoma following arterial puncture.**

Complications mainly with generalized symptoms

Vasovagal reactions

A vasovagal reaction (VVR) is a general feeling of discomfort and weakness with anxiety, dizziness and nausea, which may progress to loss of consciousness (LOC: faint). **It is the most common acute complication related to blood donation.** Both physiologic and psychological factors may be important. The reaction is generated by the autonomic nervous system and further stimulated by psychological factors and the volume of blood removed, relative to the donor's total blood volume. **Signs and symptoms: Usually several of the following: discomfort, weakness, anxiety, light-headedness/dizziness, nausea, chills, sweating, vomiting, pallor, hyperventilation, rapid or a slow pulse. Hypotension and loss of consciousness (LOC) may occur and can be accompanied by loss of bladder or bowel control or convulsive movements.**

Reactions may occur before phlebotomy (rare), during phlebotomy or immediately after phlebotomy, when the donor stands up, in the refreshment area, or after the donor has left the collection site. Most reactions occur within 12 hours of phlebotomy. Reactions accompanied by LOC carry a risk of injury, particularly if they occur once the donor has left the collection site (delayed vasovagal reactions).

Without loss of consciousness (LOC) - the donor does not faint

With loss of consciousness (LOC) - the donor faints for a period of time

- LOC < 60 seconds - without other signs and symptoms
- LOC ≥ 60 seconds - or with complications of convulsive movements, urinary or faecal incontinence
- With injury - Injury caused by falls or accidents in donors with a vasovagal reaction
- Without injury
Location of reaction:
- On collection facility*- Symptoms occurred before donor has left the donation site
- Outside collection facility - Symptoms occurred after donor has left the donation site
***in area within which staff can observe the donor and be responsible for the care of donors with complications**

Complications related to apheresis

Citrate reaction

Neuromuscular hyperactivity related to reduced ionized calcium levels. Infusion of citrate anticoagulant during apheresis causes a fall in ionised calcium levels, leading to neuromuscular hyperactivity. If untreated, symptoms may progress to tetany and severe cardiac arrhythmias, including cardiac arrest. Operator error with mix up of saline and citrate bags may occur with some apheresis equipment, and lead to rapid citrate infusion. **Symptoms and signs: Numbness or tingling of lips, feelings of vibrations, numbness or tingling in the fingers, metallic taste, chills, shivering, light-headedness, feeling of tightness, muscle twitching, rapid or slow pulse, shortness of breath. Symptoms may progress to carpopedal spasms and vomiting, and in severe reactions, to generalised muscle contractions (tetany), shock, irregular pulse and cardiac arrest.**

Haemolysis

Donor red cells may be damaged, releasing haemoglobin. There may be malfunctioning valves, kinks or obstruction of the tubing, incorrect installation of equipment, or other equipment failures affecting the extracorporeal circuit. Incompatible replacement fluids, such as dextrose D5W, may be used in error. **Signs and symptoms: Pink or red plasma, blood in lines or filter may appear dark. The donor may notice pink or red urine after collection.**

Air embolism Air bubble introduced into the donor's circulation. Mechanism: Air may enter into the lines due to incomplete priming of lines, as a result of a machine malfunction or defective collection kits or through incorrect manipulation by staff. Air in the donor's pulmonary circulation may occlude the pulmonary arteries in the lung and cause cardiopulmonary symptoms. Air may pass to the arterial circulation through an atrial septal defect, and reduce blood flow to the brain. **Signs and symptoms: Bubbling sound or feeling at the venipuncture site. Cough, dyspnea, apprehension, sweating, chest pain, confusion, tachycardia, hypotension, nausea and vomiting.**

Infiltration Intravenous solute (saline solution) enters the extravascular tissues during volume replacement (generally only applicable to double red cell procedures). The needle is no longer positioned in the intravascular space, so fluids enter the surrounding tissues. **Signs and symptoms: Swelling of the tissues at the venipuncture site.**

Allergic reactions

Allergy (local) Red or irritated skin at the venipuncture site. Reaction caused by allergens or irritants in solutions used for disinfection of the arm (such as iodine or chlorhexidine) or in manufacture of the collection set. Irritation may also occur due to application of the adhesive bandage (bandage adhesive dermatitis). An allergic reaction to latex that may be in supplies such as gloves may also occur. **Signs and symptoms: Itching and redness at the venepuncture site, the bandage site, or the entire skin disinfection area.** In a true allergic reaction, there may be a raised rash or hives in these areas that may expand to cover a larger area of the arm. The reaction may occur soon

after donation or in the hours to days post-donation.

Generalised allergic reaction (anaphylactic reaction) Anaphylactic type reactions usually starting soon after the procedure is begun and may progress rapidly to cardiac arrest. Extremely rare reactions, attributed to donor sensitivity to ethylene oxide gas used to sterilize some collection kits. **Signs and symptoms: Apprehension, anxiousness, flushing, swelling of eyes, lips or tongue, cyanosis, cough, wheezing, dyspnea, chest tightness, cramps, nausea, vomiting, diarrhoea, tachycardia, hypotension, and altered mentation.**

Other serious complications related to blood donation

Major cardiovascular event (MCE)

Acute cardiac symptoms (other than myocardial infarction or cardiac arrest).
Myocardial infarction
Cardiac arrest
Transient Ischemic Attack
Cerebrovascular accident
Death.

Reporting is encouraged of MCE or death from any cause up to 24 hours after donation, with an assessment of imputability. Only cases with definite, probable or possible imputability should be included in international reporting. Major cardiovascular events, including death, may occur in the hours after attending the collection centre for blood donation. This can occur **without any relation to the donation** (for deaths, this is described by the term actuarial deaths).

Other complications

Other systemic reactions or complications that do not fit into the above, such as chest pain that may have been investigated as angina, but was actually musculoskeletal, or transmission of infection to a donor through erroneous reuse of equipment.

Grading of complication severity and imputability

Grading of severity

Life-threatening complications and long-term disability are thankfully extremely rare after blood donation. Grading of severity for donor reactions does not easily fit into grading systems used for adverse reactions in patients. Use of this grading system is therefore optional. The criteria for classification of a reaction as serious (severe) as derived from these systems are:

Hospitalization: If it was attributable to the complication. The criterion of hospital admission is applicable if a donor is kept in hospital overnight. Cases where a donor is seen, examined, and in some cases given treatment (e.g. suturing, IV fluids, treatment of a fracture) but discharged home are not automatically classified as serious.

Intervention: To preclude permanent damage or impairment of a body function or to prevent death (life-threatening)

Symptoms: Causing significant disability or incapacity following a complication of blood donation and persisted for more than a year after the donation (Long term morbidity)

Death: If it follows a complication of blood donation and the death was possibly, probably or definitely related to the donation.

Certain complications of donation are by their nature mild or severe.

Local reactions

Most local reactions (hematoma, arm pain syndromes) would not be considered severe. Severe consequences are separate reaction types: **deep venous thrombosis, arteriovenous fistula, and compartment syndrome. Nerve injury may rarely result in long term donor signs and symptoms. This may be captured by the duration of symptoms (optional split in nerve pain category).**

Systemic reactions

Complications that are by their nature severe include generalised allergic (anaphylactic) reactions, and all major cardiovascular events.

Grading of imputability

The strength of relation between donation and complication is:

Definite or certain: When there is conclusive evidence beyond reasonable doubt for the relation. Probable or likely: When the evidence is clearly in favor of a relation.

Possible: When the evidence is indeterminate for attributing the complication to the donation or an alternative cause.

Unlikely or doubtful: When the evidence is clearly in favor of attributing the complication to other causes.

Excluded: When there is conclusive evidence beyond reasonable doubt that the complication can be attributed to causes other than the donation.

Imputability should only be reported for cardiovascular events leading to hospitalization or death post-donation, and only cases with imputability of possible, probable or definite should be captured.

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IMPLEMENTATION OF NATIONAL HAEMOVIGILANCE SYSTEM

Meral SÖNMEZOĞLU

The transfusion of blood and blood products is a life-saving intervention. Major surgeries are not taking place without blood, and acute bleeding, treatments of traumas and several chronic diseases all rely on the availability of blood. However, there are risks of adverse events associated with the donation of blood and its components, and with the transfusion of blood and blood products to patients.(1) Adverse events include all reactions, incidents, near misses, errors, deviations from standard operating procedures and accidents associated with blood donation and transfusion. Despite the useful information gained over transfusion reactions, the main risk remains human factors. Learning from adverse events and identifying systems problems can drive the introduction of measures to enhance the quality, safety, efficacy, and cost-effectiveness of blood and blood products as well as the donation and transfusion processes.(2)

Blood components are living human tissue and their administration is not without risk. The safety of the blood component that is delivered to the patient is thus of critical concern. To ensure the safety of the blood supply, there must be systems in place that will evaluate, monitor and manage risk along the entire blood supply value chain. Haemovigilance is a set of surveillance procedures covering the entire transfusion chain, from the donation and processing of blood and its components, to their provision and transfusion to patients and their followup. Haemovigilance includes the monitoring, reporting, investigation and analysis of adverse events related to the donation, processing and transfusion of blood, as well as the development and implementation of recommendations to prevent their occurrence or recurrence. The ultimate goal of haemovigilance is continuous quality improvement of the transfusion chain through corrective and preventive actions to improve patient safety and outcomes, enhance donor safety and reduce wastage. Haemovigilance should be fully integrated into the quality systems of all institutions involved in the donation and provision of blood and blood products, including processing, inventory management, storage and distribution, and in clinical transfusion. The organization of a haemovigilance system is largely determined by the structure of the national blood system and the health system.(3) A system of haemovigilance is dependent on the traceability of blood and blood products from donors to recipients and vice versa, and on the monitoring, reporting, investigation and analysis of adverse events. The rigorous management of information generated through this system is key to introducing amendments in blood policies and guidelines that lead to changes in processes and practices in donation and transfusion. The establishment of a haemovigilance system involves coordination and collaboration among all stakeholders, including the ministry of health, blood transfusion services, hospitals, professional bodies, public health institutions and regulatory agencies, as well as patient and donor group.

The evolution of Haemovigilance systems:

The 1980s were plagued by a new epidemic, AIDS (as it was then known) which shook the world. This was at a time of medical conquest of Infectious Diseases with various immunization programmes and when some diseases like Small Pox had been eradicated. Man had been to the moon, the pharmaceutical companies were producing a

multitude of newer, more effective drugs, researchers were decoding the human genome, and longevity, the ultimate medical dream was within reach. After regular blood and blood product users such as people with Haemophilia became infected with the AIDS (HIV) virus, countries around the world took swift action in order to keep their blood supply safe. The lessons learned from this epidemic and the related safety measures set the stage for the development of nationwide monitoring systems that track adverse events and incidents associated with collections from blood donors and transfusion to recipients.

On January 4 1993, a French law was enacted, establishing the world's first Haemovigilance system, which they defined as; “a set of surveillance procedures from the collection of blood and its components to the follow up of recipients aimed at collecting and assessing information on unexpected or undesirable effects resulting from the therapeutic use of blood products on a National level”. The French programme places a 'rapporteur' in each hospital, and that person is charged with implementing a system to track outcomes on all patients, which are then coordinated and analysed nationally. It also includes the French territories, such as Guadeloupe, Martinique, Guyana and Reunion and has 1400 Haemovigilance officers. Their extensive system led to the discovery and reporting of a Chikungunya outbreak in Reunion, in 2005.

The British followed in 1996 by developing the Serious Hazards of Transfusion (SHOT) network, based on the French system. Other countries in Europe and other parts of the world saw the value of having this type of system and followed suit. Being voluntary, the SHOT programme has been very successful, providing reliable data and is hence used as a benchmark for policy decisions on transfusion in other countries. For instance, the discovery that, using male only plasma reduced the risk of TRALI has changed transfusion policy in some countries.

As several European nations implemented their own Haemovigilance systems in the 1990's, with a myriad of varying definitions regarding the nature of adverse transfusion- related events, representatives of blood transfusion and other health related organizations in Belgium, France, Luxembourg the Netherlands and Portugal joined forces in 1998 to create the European Haemovigilance Network, with the goal of developing universal standards for Haemovigilance and maintaining a common framework for ensuring the safety of blood and its components. They also established a rapid alert system for reporting “clustered “ clinical signs that may point to a specific disease or other problems in transfused blood or components. The European Haemovigilance network has expanded, numbering 20 members by 2006, and extending beyond Europe to include Canada, Malta, New Zealand and Singapore. The International Society for Blood Transfusion (ISBT) working party on Haemovigilance has 28 member countries and contributes toward an effective international Haemovigilance programme.(4)

The word ‘haemovigilance’ (he ´movigilance in French) was coined in France in 1991 in analogy to the already existing term ‘pharmacovigilance’. It is derived from the Greek word ‘haema’ = blood and the Latin word ‘vigilans’ = watchful (Fig. 1). The aim of haemovigilance is to detect and analyse all untoward effects of blood transfusion in order to correct their cause and to prevent recurrence, thus improving the safety of blood transfusion.

Between 2003 and 2005, the European Commission published European Blood Directives that give mandatory rules for ‘collection, testing, processing, storage and distribution of human blood and blood components’ [3,4,6,13]. The Directives dealing with haemovigilance require: 1. Full traceability of blood products from donor to recipient; 2. NotiŞcation of a. serious adverse events (SAE) that may have an inşuence on and b. serious adverse reactions (SAR) that may be attributed to the quality and safety of blood and blood components.

WHO Global Strategic Plan, 2008–2015 released in 2007 indicated challenges for blood transfusion safety in developing. The objective of the WHO programme on blood safety and availability is a reduction in avoidable

morbidity and mortality through improved access to safe blood and blood products and the safe and rational use of blood transfusion, with a particular focus on life-saving emergency transfusions for reducing maternal and child mortality, and on the prevention of HIV/AIDS, hepatitis B and C.

With the goal of ensuring universal access to safe blood, WHO has been at the forefront of the movement to improve blood safety as mandated by successive World Health Assembly resolutions. Therefore, strengthened national capacity for the implementation of strategic approaches and the development of effective systems to achieve universal access to safe blood transfusion is necessary.(5)

Priority needs for blood transfusion safety in developing countries

– the building of national assessment and monitoring systems as part of the national blood transfusion service

– Support the development of effective national systems for the collection and management of data throughout the transfusion chain

– Build and strengthen global, regional and national surveillance, vigilance and alert systems for blood safety and availability, and adverse transfusion events.

–Strengthen the global, regional and national monitoring of process and outcome indicators on blood safety and availability and measure progress.

Activities related are;

– Update and maintain global and regional indicators on blood safety and strengthen systems for national monitoring and evaluation

– Improve the coverage and reliability of data from the WHO Global Database on Blood Safety and regional databases

– Identify priority areas and countries requiring technical support in strengthening national systems for monitoring and evaluation

– Advise on evidence-based, cost-effective strategies for blood safety and availability, based on information obtained from indicators.

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HAEMOVIGILANCE; EFFECTIVE BUT ONLY PART OF THE STORY

James T. PERKINS

Hemovigilance is defined by the United States National Institutes of Health as "a set of surveillance procedures covering the whole transfusion chain from the collection of blood and its components to the follow up of its recipients, intended to collect and access information on unexpected or undesirable effects resulting from the therapeutic use of labile blood products." That is certainly a good definition of formal hemovigilance systems which began to be developed in some countries in the 1970's. However, informal collection of such "...information on unexpected or undesirable effects..." was producing valuable insights even earlier. Important data on transfusion safety is also gained by studies focused on individual types of adverse events rather than "...covering the whole transfusion chain...." Whether formal or informal, comprehensive or focused, vigilance regarding adverse transfusion events has led to profound improvements in transfusion safety.

For example, post-transfusion hepatitis (PTH) cases were first reported in the 1940s. Studies of "serum" and "infectious" hepatitis over the following 3 decades culminated in discovery of the "Australia Antigen" or hepatitis B surface antigen (HBsAg) test as well as the hepatitis A virus antibody test. Application of the HBsAg test to blood donors allowed deferral of some who were infectious, but had two other major consequences. It aided in the identification of paid blood donors as the most important source of PTH, and led to recognition that most PTH was due to neither HAV nor HBV. Another 20 years of study was required to identify the virus causing such "non-A, non-B hepatitis" and to develop a specific test for HCV, but the improvement in safety has been profound.

The much shorter time period between case reports of transfusion-associated AIDS (TA-AIDS) in 1982, isolation of HIV, and development of the first effective HIV-antibody test in 1985 reflected the tremendous growth in knowledge of biochemistry and microbiology between the 1940's and the 1980s. Similar sequences of recognition of a transfusion-transmitted infection through more-or-less systematic 'hemovigilance', quantification of the risk through more focused studies, and development of an effective donor test have followed, in affected countries, for West Nile virus (WNV) and Chagas disease.

Bacterial contamination of blood components has also been addressed through event reporting (hemovigilance) followed by focused study and implementation of closed system collection kits and more recently, by component testing. Again, the risk has decreased tremendously. Other infectious risks of lower magnitude remain, and we will continue to make progress in reducing these risks as targeted by hemovigilance systems.

Hemovigilance has been an essential part of risk identification and reduction with respect to non-infectious risks of transfusion as well. In the United States the first hemovigilance program began in 1976 when the FDA required hospitals to report all transfusion-associated fatalities. A 1980 publication summarizing the first 3 years of reports revealed that half of all such deaths were due to clerical errors leading to ABO antibody-mediated immediate hemolytic reactions (IHTRs). Subsequent reports refined these observations, helping to identify their "root causes". The U.K hemovigilance or Serious Hazards of Transfusion (SHOT) system, which began in 1996, has been

particularly useful in identifying how such errors occur. Application of these insights has reduced the risk as shown in subsequent FDA and SHOT hemovigilance reports.

A final example of the power of hemovigilance is the story of transfusion-related acute lung injury (TRALI). TRALI came to the attention of the transfusion medicine community in 1985 when Popovsky and Moore (Transfusion, 25;573-7) reported 36 cases of respiratory failure during or soon after transfusion and showed that many of the responsible components had HLA antibodies directed against the recipient leukocytes. Hemovigilance such as that conducted by the SHOT group highlighted the fact that plasma-containing components, FFP and platelets, were disproportionately implicated and most often came from female donors. This led to the recommendation that female donor plasma not be used for transfusion (SHOT Annual Report, 2000/2001), and since implementation of such preventative measures TRALI fatalities have declined significantly.

So hemovigilance efforts have contributed to implementation of testing and other interventions that have greatly reduced transfusion risks. And they have given us some idea of the residual magnitude of those risks. Can this help us in making the difficult decision of whether or not to transfuse a specific patient? It is tempting to think that we could enter those magnitudes into some simple risk versus benefit equation and out would pop our answer. But there are at least two limitations that preclude this simple approach.

First, we have little information regarding the benefit side of the equation. In some situations the obvious need for transfusion overrides consideration of the risks. Examples include patients in hemorrhagic shock or anemic patients with severe symptoms such as angina or disabling shortness of breath. Others include bleeding patients with severe thrombocytopenia due to chemotherapy or coagulopathy due to warfarin. If transfusion is successful we observe resolution of the anemia symptoms or cessation of bleeding. But a majority of our transfusions are not performed for such clear cut indications. Instead, we typically find ourselves transfusing to correct a number, most often a hemoglobin level, a platelet count, or a clotting time. In these cases we believe the number predicts a negative outcome such as those listed above, and we transfuse with the idea that we are preventing an adverse outcome such as a myocardial infarction (MI) or bleeding. The benefit of such prophylactic transfusions is not visible; if effective, nothing happens! In these cases we are balancing the risk of transfusing against the risk of NOT transfusing, but unfortunately the risk of not transfusing is generally not known and typically overestimated.

A second problem is that hemovigilance focuses on specific events that are recognizably due to the transfusion. But patients receiving transfusion are already ill. When confronted with fever or respiratory distress during or soon after a transfusion we must consider whether it is due to the patient's interaction with the blood component itself, or whether it's due to the patient's underlying condition. This difficulty is acknowledged in hemovigilance systems incorporating "imputability" criteria in an attempt to estimate the likelihood that the manifestations are due to the transfusion. And consider events such as in-hospital infections. These inevitably occur, but if their incidence is increased by transfusion, they cannot be tied to any one blood component as hemovigilance-defined events must be.

The only solution to these two problems is an experimental trial comparing the outcomes of patient groups transfused differently and controlled either by multivariate statistical analysis or by prospective randomization. Thankfully more and more such data is available to help us make transfusion decisions.

A particularly powerful such trial by Hebert and coauthors appearing in 1999 (N Engl J Med, 340:409-17), compared 838 ICU patients randomized either to receive RBCs according to a restrictive ([hgb] < 7 g/dL) or liberal ([hgb] < 10 g/dL) strategy. The primary outcome was 30-day mortality. Surprisingly the 'restrictive group' had slightly

better survival than the group that received blood more liberally, although this difference was not quite statistically significant. But when the comparison was limited to patients less than 55 years old or those with lower disease severity scores, the mortality difference was significant. Less blood yielded better survival! Adverse events were tallied and compared between groups. The rate of pulmonary edema in the 'liberal group' was double that of the restrictive group (10.7% vs. 5.3%, $p<0.01$), a comparison that did not depend on assigning these events to hemovigilance categories such as TRALI or TACO (transfusion-associated circulatory overload). Interestingly the MI rate was four times higher in the liberal group! This is not an outcome that could have been associated with transfusion in a hemovigilance system.

We must ask ourselves whether these striking results are plausible. Namely, do other studies show such a substantial deleterious effect of transfusion? In 2010 Carson reported a meta analysis of 17 such randomized trials (AABB meeting, platform presentation). Five of the trials failed to achieve comparison groups with different levels of transfusion. In every other study the restrictive transfusion group yielded equivalent or superior outcomes to the liberal group, regardless of how the groups were defined. Another important paper that documents the deleterious effects of transfusion as it is currently used is the review by Marik and Corwin (Crit Care Med, 2008:36;2667-74) of 45 observational studies that used multivariate analysis to investigate the relationship between transfusion and mortality, infection, acute respiratory distress syndrome (ARDS), and multiple organ dysfunction syndrome (MODS) in various patient populations. Such studies attempt to compare outcomes of transfused versus un-transfused patients in a defined patient population, eliminating the effect of other prognostic variables using multivariate statistical analysis. In 42 of the 45 reports the risks of transfusion appeared to have been greater than the benefits. Only one study suggested that transfusion improved survival, in this case in elderly patients with a hematocrit below 30 admitted to the ICU for acute MI. Of note however, this study is deeply flawed since the hematocrit used was taken on admission to ICU; the immediate pre-transfusion hematocrit was not available. Of 18 studies in which the effect of RBC transfusion on mortality could be evaluated, 17 suggested that transfusion was independently associated with mortality; in 22 of 22 evaluable studies transfusion predicted infections; and in 6 of 6 it was associated with ARDS.

In making the decision to transfuse we are often influenced by the patient's age and frailty. In orthopedic surgical practice it may be argued that a higher hemoglobin level will help the patient participate in post-operative physical therapy, thereby improving functional outcome. Carson and colleagues performed a trial in 2000 patients over age 50 (average age 81 years) who had risk factors for heart disease (40% had established coronary artery disease) and were undergoing surgical repair of a hip fracture (N Engl J Med. 2011:365;2453-62). Patients were randomized to restrictive (hgb < 8g/dL) or liberal (hgb < 10g/dL) transfusion of RBCs. In addition to the usual mortality outcome measure, functional outcome (ability to walk 20 meters) was measured. In brief, liberal transfusion did not improve functional outcome or survival.

The authors of the Hebert study cited above were similarly concerned whether their analysis might have missed a positive effect of transfusion in patients with cardiovascular disease (CVD). Reanalysis of their data showed that patients with CVD did not experience increased mortality with restrictive transfusion, and they had half the rate of pulmonary edema as those transfused liberally. Only when the authors looked at the patients with acute ischemic syndromes (acute MI or accelerating angina) did there appear to be a 5% survival disadvantage from restrictive transfusion, but this was not statistically significant (Hebert. Crit Care Med, 2001:29; 224-39). Subsequently Rao and colleagues (JAMA, 2004:292;1555-62) attempted to define the appropriate “transfusion trigger” for patients with acute MI. In their analysis of a large database of studies of cardiac interventions transfusion was associated with increased mortality or MI unless the patient's hematocrit was 25 or below.

Patients with upper gastrointestinal (UGI) bleeding are frequent candidates for transfusion. In a recent

randomized trial of such patients the restrictive transfusion group (hgb trigger <7g/dL) again experienced better survival in spite of receiving half as much blood than the liberal group (Villanueva, N Engl J Med, 2013:368;11-21). Liberally transfused patients started bleeding again 60% more often than those with restrictive transfusion, particularly if liver disease was their underlying problem. The rate of adverse transfusion events was also higher in the liberal group in whom TACO events were over four times as common.

Electronic medical records allow us to improve transfusion reaction surveillance by having the computer actively search for transfusion-related events. This approach to hemovigilance is active, not passive and is not dependent on practitioner knowledge. Collaborating investigators at two institutions in the USA use this approach to identify transfusion-related pulmonary events (Murphy, Am J Med, 2013:126). Although the cases found are difficult to classify as TRALI or TACO, selection of a set of relatively clear cut TACO cases allowed identification of its underlying risk factors. These included transfusion for hemorrhagic shock, chronic renal and heart failure, and high levels of concomitant fluid administration.

As discussed above, hemovigilance studies cannot assess the relationship between transfusion and hospital acquired infection (HAI) while outcome studies show that promotion of infection is a major adverse consequence of transfusion. Taylor and colleagues (Crit Care med, 2006:34;2302-8) performed a single institution, observational cohort study of infection rates in 2,085 ICU patients, 21.5% of whom were transfused an average of 3.7 units of RBCs. The rate of HAI was more than twice as high in the transfused than not-transfused patients (14.3% vs. 5.8%). The association was dose-dependent, each additional unit of RBCs increasing the infection rate by 9.7%, which makes a causal link more plausible. A more recent meta analysis of 18 randomized trials of restrictive versus liberal transfusion that included infection as an outcome (Rohde et al. JAMA, 2014:211;1317-26) corroborated the association of transfusion with HAI. The pooled infection rate in the restrictive group was 11.8% compared with 16.9% in the liberal group. This study showed that one HAI could be prevented for every 20 patients who were only transfused for a hemoglobin <7g/dL. Patients in the ICU for sepsis particularly benefitted from restrictive transfusion.

Conclusions: Hemovigilance studies tell us that transfusion may cause specific adverse events and give us an idea how commonly those events occur. Investigation into the causes of these events has frequently led to appropriate corrective actions, the implementation of which has saved many lives. Nonetheless, outcome studies, both randomized and observational, continue to demonstrate that patient survival could be improved in many clinical scenarios if transfusion were used more sparingly. Both approaches are needed if transfusion practice is to be optimized.

POOLED VERSUS APHERESIS PLATELET CONCENTRATES

Mehmet YAY

Platelet Products Available;

- **RDP=** Random donor platelet
- **BCPP=** Buffy coat pooled platelet
- **SDP =** Single donor platelet

Preparation and Administration

Platelets can be prepared as random-donor platelet concentrates from whole blood derived platelets or as apheresis platelets from a single donor. In the whole blood harvest method, 500 mL of blood is collected and stored in a citrate preservative at room temperature within eight hours, the blood is centrifuged with a slow spin and the platelet-rich plasma (PRP) is separated into an attached empty satellite bag. This PRP is centrifuged again with a fast spin and separated into one unit of platelet concentrate and one unit of plasma. Each unit of platelets contains 5.5 x 1010 platelets in 50 to 70 mL of plasma (to maintain the pH at >6.2) and 4 to 10 units of platelets are usually pooled together in a single component bag.

Alternatively, platelets can be isolated from whole blood from the buffy coat layer, following centrifugation of whole blood in specific bags that removes RBC and plasma through tubings in the bottom and top of the bag. The platelet-enriched buffy coat is further processed (through centrifugation and/or leuko-reduction filters) to eliminate WBCs and remaining RBCs. This method is currently employed in Europe and Canada and it permits storage of whole blood at room temperature for up to 24 hours prior to platelet harvesting and provides some other potential advantages.

Apheresis platelets or single donor platelets are obtained by performing apheresis on volunteer donors. During this procedure, large volumes of whole blood are processed into an extracorporeal circuit and centrifuged to separate the components. The red blood cells and a certain percentage of the plasma are returned to the donor. A single donor on apheresis donates the equivalent of > 3.0 x 10^{11} or six units of whole blood derived platelets suspended in a volume of 200 to 400 mL of plasma. Single donor apheresis-derived platelets minimize the number of donor exposures for the transfusion recipient and have become the primary source of platelets in the USA.

Platelet transfusions play an important role in prevention or treatment of bleeding in patients with thrombocytopenia or severely impaired platelet function. Platelet concentrates available for transfusion are prepared either from whole-blood donations or by platelet apheresis procedures. Both products are in widespread clinical use. For example in Germany, about 40% of PC produced in the year 2007 were whole blood derived and 60% were produced by apheresis. When comparing European Countries supposed to provide a similar transfusion service, the respective use of apheresis PCs and pooled PC is very heterogeneous. In 2004, the use of pooled PCs ranged from

10% to 98%. Two methods of preparing PCs from whole blood are in use. The predominant method in Europe is the buffy-coat (BCPP) method and in the United States the platelet rich plasma (PRP) method. For production of pooled PCs from BC either the pooling kit method or the chain method can be used, also there are manual and automated methods of pooling. Pooled platelets prepared by the BC method are usually stored in additive solution rather than in plasma making more plasma available for clinical use and reducing the plasma-associated transfusion reactions. The type of additive solution influences integrity, metabolism, recovery and function of platelets. The timing of preparation of BC-derived platelets from either fresh or overnight-stored whole blood influences metabolic activity, storage lesion and platelet count. Several studies demonstrated that PCs produced from whole blood by the BC method after an overnight hold have laboratory characteristics suggestive of a higher quality than those concentrates produced by the PRP method. As a result of the different preparation methods there is substantial variability of the products with regard to number of pooled donations, platelet content, residual leukocyte count, plasma content, type of additive solution and timing of the processing steps. There has been an ongoing debate whether one of these types of platelet products has clear advantages over the others. In this review, we will summarize the existing evidence, in particular comparing PCs from apheresis donation with PCs from whole-blood donation. Given the differences between PCs produced by the PRP method and the BC method in terms of preparation, in vitro function and adverse events, we try to discriminate between the different types of whole blood-derived PCs.

Quality control;

With platelet apheresis it is possible to collect enough from a single donor to constitute at least one transfusion dose. It is possible to collect up to more than $8 \cdot 10^{11}$ platelets per apheresis session. Usually these are divided into two therapeutic units of about $3 \cdot 10^{11}$ platelets. In new, still experimental approaches triple apheresis with production of three therapeutic units is attempted. A recent study demonstrated that high-yield plateletpheresis donation can correlate with reduced transfusion efficacy and that in-vivo studies are necessary to assess the quality of the products. To obtain a therapeutic dose of platelets from whole blood donations requires pooling of the BC from four to six donations. In our hands, the platelet content as well as the number of residual white blood cells and erythrocytes is not different between a therapeutic unit of pooled PCs which are prepared with the chain method from BCs or apheresis PCs which are mainly split products of double apheresis. Also others found similar platelet content and mean platelet volume comparing BC-derived and apheresis PCs or similar platelet content in BC-derived PCs and similar number of leukocytes.

Efficacy;

Post transfusion platelet increment is an important surrogate marker to assess the efficacy of platelet transfusions. Several studies directly compared corrected count increments (CCI) after transfusion of apheresis or whole blood-derived platelets]. In a systematic comparison on the basis of raw data from some of these studies, Heddle et al. found a higher 1-h CCI with apheresis PC compared with all whole blood-derived PCs when PRP and BC-derived PCs were combined. However, when whole blood-derived PCs were stratified into pooled PCs prepared by either BC or PRP method, a significant difference remained between apheresis PCs and PRP pooled PCs, but there was no significant difference between apheresis PCs and BC-derived pooled PCs. As with the 1-h CCI, there was a significant difference between apheresis PCs and PRP pooled PC for the 18- to 24-h CCI, but apheresis PCs and BC-derived pooled PCs were again not different. The 'Trial to Reduce Alloimmunization to Platelets (TRAP) Study Group' evaluated patient- and product related characteristics that influence post transfusion platelet response and interval between platelet transfusions. Platelet factors that were associated with improved platelet response were giving AB0-compatible platelets and platelets stored less than 48 h. Similarly, platelet factors that were associated with significantly longer time to next transfusion were storage of 48 h or less and increasing platelet dose. In contrast,

type of platelet product (apheresis PCs, leuko-depleted pooled PCs), AB0 incompatibility or c-irradiation had no influence on the transfusion intervals. Patient factors that improved platelet responses were splenectomy and increasing patient age. In contrast, at least two prior pregnancies, male gender, splenomegaly, bleeding, fever, increasing height and weight, lymphocytotoxic antibody positivity, an increasing number of platelet transfusions, or receiving heparin or amphotericin were associated with decreased post-transfusion platelet responses.

Safety;

Febrile non-hemolytic transfusion reaction Febrile non-hemolytic transfusion (FNHTR) reactions are the most common adverse reaction to platelet transfusions. Reactions to platelets are caused by leukocyte-derived cytokines that accumulate in the component during storage. Therefore, only products with similar leukocyte content should be compared. In a randomized comparison, no difference in the acute reactions were reported comparing pre-storage leuko-reduced apheresis PCs and pre-storage leuko-reduced whole blood-derived PCs prepared by the PRP method (13.3 vs. 11.4%). In a prospective randomized study from the UK, the probability of the occurrence of a FNHTR following transfusion of PCs showed a significant decrease for apheresis PCs and pooled PCs produced by the BC method (3.1% and 3.8% respectively) when compared with pooled PCs produced by the PRP method (17.1%). Also the TRAP Study Group reported that apheresis PCs did not independently influence reaction rates. Reaction rates were low with both apheresis PCs and filtered, pooled random-donor PCs which were prepared with the PRP method (1.6% vs. 1.8%, resp) and significantly higher with pooled random-donor PCs which were not leuko-depleted (2.5%). Use of platelet additive solution which results in reduction of remaining plasma from individual donors leads to significant reduction of allergic transfusion adverse events. Most Blood Services have implemented additive solution for BC-derived PCs. Also preparation of apheresis PCs can be adapted to use additive solution. However, additive solution so far is not used to the same extent for apheresis PCs as it is already the case for BC-derived PCs. But even if additive solution is used for apheresis PCs the remaining plasma volume is about 60–120 ml from one donor. In contrast, the plasma in BC-derived PCs originates from four to five donors. The volume of plasma from the individual donor is only about 15–25 ml. In a systematic review, Heddle et al. found no difference in acute reactions when leuko-reduced whole blood-derived pooled PCs (PRP and BC method) and apheresis PCs were compared. Thus, quality of the product in terms of residual leukocytes, plasma content or storage period and also patient factors seem to be more important for acute transfusion reactions than platelet product type – at least as long as apheresis PCs and pooled BC-derived PCs are compared.

Bacterial and viral contamination;

A reservation against pooled PCs came from the theoretical argument of increased risk for transfusion-transmitted infections (TTI) due to a 'pooling' of infectious agents. It has been argued that use of apheresis PCs leads to lower donor exposure of the recipient. However, the current tests for detection of human immunodeficiency virus (HIV), hepatitis B and C virus (HBV, HCV) have reduced the infectious risk for these viruses to a very low level in the range below 1:4 · 106 for HIV and below 1:107 for HCV. Of course, if platelets of four or five donations are pooled, the risk of infection is increased compared to a single unit. However, does this translate into increased risk for the recipient when comparing apheresis PC and pooled, whole blood-derived PCs? As counterbalance to a 'pooling' of infectious agents, one must take into account a 'distribution' effect by apheresis PCs. If one of the whole-blood donors contributing to a therapeutic PC unit would be infected with a TTI, this would result in exactly one infectious therapeutic PC unit. If an apheresis donor who is a regular donor or who donates by double- Ğ triple-plateletpheresis procedure is infected, this can result in several infectious therapeutic PC units. The majority of apheresis PC units nowadays are prepared by a double- or triple-apheresis procedure. As a consequence up to three therapeutic units per apheresis procedure can be produced. According to the guidelines which are in place in many countries the

maximum frequency of donation is higher for plateletpheresis compared with whole-blood donation. This translates into higher average number of donations and shorter interval between donations. The probability of several donations in the therapeutic window is higher in plateletpheresis donors and might lead to donation of more than one infectious units in the window period. Given the higher risk for transfusion-transmitted infections in first-time donors, only repeat donations should be used for preparation of pooled PCs. In case of pooling there might be a change that if one of the donors is infectious for Hepatits B, another donor contributing to the pooled PC product carries a sufficient amount of neutralizing antibodies. Asymptomatic donors with persistant hepatitis B infection who are HBsAg-negative and pool PCR-negative might excape detection if no test for anti-HBc is performed.

Bacterial contamination of PCs is a longstanding problem in transfusion medicine. Prevalence data vary considerably from one study to the next The incidence of reported clinically relevant reactions to contaminated platelet products is much lower. Nevertheless, bacterial contamination is now considered as the most frequent clinical relevant infectious risk of platelet transfusion. It was suggested to use generally apheresis PCs instead of whole blood-derived pooled concentrates since higher bacterial contamination rates or higher incidence of septic platelet transfusion reactions in pooled products has been reported when comparing sequential time periods. Theoretically, one would assume that pooling of four or five BCs would increase the risk of bacterial contamination by the same factor. However, using whole-blood donations which were spiked with bacteria it has been shown that the preparation procedure for random BC-derived pooled PC can reduce titres by several log. In a prospective study comparing contamination rates in more than 15 000 apheresis PCs and more than 37 000 pooled PCs by aerobic and anaerobic cultures we found a significantly lower rate of potentially positive pooled PCs compared to apheresis PCs and equal rate of confirmed positive apheresis and pooled PCs. Other studies arrived at similar results. When comparing published data on bacterial contamination of platelet products one must take into account the strategies which have been implemented in the recent years to reduce the risk of bacterial contamination: guidelines excluding donors with risk of bacteraemia are in place; skin disinfection has been improved by implementation of skin disinfectant standard operation protocols with repeated application and defined minimum resident time of disinfectant prior to venipuncture; the diversion of the first 30–40 ml has been introduced in many centres. It has been demonstrated that all these measures can be effective for reduction of bacterial contamination of blood products.

Alloimmunization and platelet refractoriness

Several studies addressed whether transfusing only apheresis PCs can prevent alloimmunization as measured by lymphocytotoxic antibodies and refractoriness as defined by poor post transfusion increments. In a metaanalysis combining studies that used non-leukoreduced products, the overall relative risk for allosensitization was not significantly different between apheresis PCs and pooled whole blood-derived PCs. In the TRAP trial patients who were receiving induction chemotherapy for acute myeloid leukaemia were randomly assigned to receive one of four types of platelets transfusions: unmodified, pooled PCs from random donors; filtered, pooled PCs from random donors; ultraviolet B-irradiated, pooled PCs from random donors; or filtered platelets obtained by apheresis from single random donors. All patients received transfusions of filtered, leukocyte reduced red cells. Of 530 patients with no alloantibodies at base line, 13% of those in the non-leukodepleted, pooled PC group produced lymphocytotoxic antibodies and their thrombocytopenia became refractory to platelet transfusions, as compared with 3% in the leukodepleted pooled PC group, 5% in the UVB PC group, and 4% in the leukodepleted apheresis AP group. The rate of alloimmunization was significantly lower in all groups as compared with non-leukodepleted pooled PCs. However, there were no significant differences amongst the other groups. Of the product-related factors, c-irradiation was associated with a significant increase in platelet refractory rates, whereas refractory rates were the same regardless of the type of platelets transfused. Overall there is no evidence that apheresis PCs and pooled random-donor PCs differ in the rate of alloimmunization as long as the products are leuko-depleted.

Logistic aspects and cost effective;

Preparation of apheresis PCs requires more additional resources in terms of staff, equipment and room which can be attributed to plateletpheresis. This is reflected in higher cost of apheresis PCs. However, it is difficult to provide exact figures on the difference because the accounting system, the attribution of costs and the pricing policy differs substantially between institutions. In one study on cost-effectiveness it was concluded that the use of apheresis PCs as opposed to pooled random donor platelets may not be a cost-effective method of reducing donor exposure in an adult patient population.

Conclusion

There is a bunch of data, some are conflicting, on quality, safety and efficacy of PCs prepared by different methods In summary, there is some advantage of pooled platelets prepared by the BC method over the PRP PCs. However, in comparison between apheresis PCs and pooled BC-derived PCs the data suggest equivalence of the products in non-allosensitized recipients. A clear advantage of apheresis PCs can only be demonstrated in allosensitized patients with HLA- and or HPA-antibodies who receive antigen-compatible apheresis PCs. On this basis it was recommended to base the product choice mainly on availability and medical indication. The comparative studies were mainly based on surrogate parameters. We are missing sufficient comparative data on prevention or treatment of bleeding or the interval between transfusions. Thus, from the point of clinical relevance current evidence none of the products proofed superior. From the donor's point of view, the additional risk of producing pooled PCs from the whole-blood donation is zero. On the other hand, there are specific adverse events of plateletpheresis which is undertaken solely to generate apheresis PCs and put the donor at risk. The frequency of adverse events is very low, but not zero. The research on donor complications so far focussed on acute reactions. Long-term effects, in particular taking into account late consequences of metabolic effects, are less investigated. Therefore, to be on the safe side from the donor's perspective we are in favour of using the abundance of platelets available from whole-blood donation. On the basis of currently available data, we prefer pooled PCs derived from whole-blood donation and prepared by the BC method unless a specific clinical condition such as neonatal immune thrombocytyopenia or platelet refractoriness due to alloantibodies requires transfusion of matched PCs. However, further studies are needed, in particular prospective trials comparing the product types for clinically relevant endpoints. When deciding about the PC supply strategy, every Blood Service has to take into consideration its own specific requirements and conditions, e.g. number of available whole-blood donations; number of refractory patients, number of immuncompromised patients requiring CMV-negative products. The decision must balance donor safety and optimal use of the blood donors gift with an optimal management of the patients. Furthermore the comparison between the product types needs regular re-assessment since new developments, e.g. pathogen inactivation, also have impact on the assessment of the various product types. From a risk management point of view it is advisable that a Blood Service has both methods of preparation on hand.

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INFORMATION TECHNOLOGIES FOR APHERESIS MACHINES

F. Yüce AYHAN

Operational necessity of the work in 24 hours a day, 7 days a week and the serious consequences of even minor clerical errors on patient's life are challenging for blood banking and transfusion medicine services. Evolving from simple databases to fully integrated workflow applications in time made the information technology (IT) most challenging aspect of the field (1,2).

In general, health information technology (HIT) is defined as hardware or software that is used to electronically create, maintain, analyze, store, receive of information or otherwise aid in the diagnosis, cure, mitigation, treatment or prevention of disease (3). It is also stated that it must not be an integral part of the device. Therefore, though the relationship to HIT, information technologies for medical devices-including apheresis machines need to provide the optimal conditions for medical device data systems.

Medical device data system (MDDS) is integration of the electronically display, storage and transfer of medical device data. The system may include software, electronic or electrical hardware such as a physical communications medium (including wireless hardware), modems, interfaces, and a communications protocol. It is expected that the MDDS should neither control nor alter the functions of the connected device (4).

U.S. Food and Drug Administration (FDA) stipulates that the components of general IT infrastructure could not be considered MDDS even though expressing the capabilities of display, storage, transfer or convertion of data. It is necessary that the components of the system are specifically connected to the medical device for intended use (4).

In the field of blood banking and transfusion medicine, ITs were initially used for improving of transfusion safety. The introduction of ITs into the field with barcodes, automated testing and automated processing equipments were followed by fully integrated IT systems which increase the safety of the processes and the products and eventually transformed the workflows (5, 6).

As concerning the both aspects of the transfusion medicine –patients and donors, ITs for apheresis machines need to be distinctive and more comprehensive including donation based operations and therapeutic apheresis procedures.

The competition between the companies that of the producers of apheresis machines forced them to develop advanced systems endowed with information technologies and various data softwares were developed peculiar to devices.

Haemonetics offers specialized software solutions for blood banks and hospitals. Cellular therapy units using the devices of the company are improved transfusion services with the software, the *EdgeCell*™ which enables the management of data in a centralized system from collection to utilization. To streamline the operations of collector

devices with flexibility, the *NextGen* system is provided by Haemonetics, also. The system is associated a web based user interface and customizable workflow. Additionally, tracking of donors and management of donation process is implemented with the development of the software for donor management, *DMS*™.

Apheresismaster, a data software developed by Fresenius Kabi consists a server connected to multiple cell separators via a wireless link (Figure1).

Cadence Data Collection System, provided by Terumo BCT is a service that collects and transfers information from the devices, enabling a team of support professionals to analyze the data and provide detailed reports to customers for maximizing the utilization of the devices (Figure 2). The other services provided by Terumo BCT, T-POD (Trima-Prediction of Donation), TAR (Trima Accel Reporter) and OR (Outcome Review) consist a substantial structure for the data collection system for apheresis procedures.

The evolvement of the data management systems implemented by ITs for apheresis devices not only improves the time management by reducing non donor/non patient time of the staff which is stated as an important key performance indicator by European Blood Alliance (EBA), but also provided detailed clinical data and operational information that promote the constitution of apheresis registries in national scale or world wide (7,8).

In association with thriving ITs, raising requirements of cellular therapies and developing approaches of blood banking and transfusion medicine would reformat the scope of the apheresis, which is emulated as a sleeping beauty for decades to awaken and enjoy new developments in the future (9)

Figure 1: Apheresismaster by Fresenius Kabi

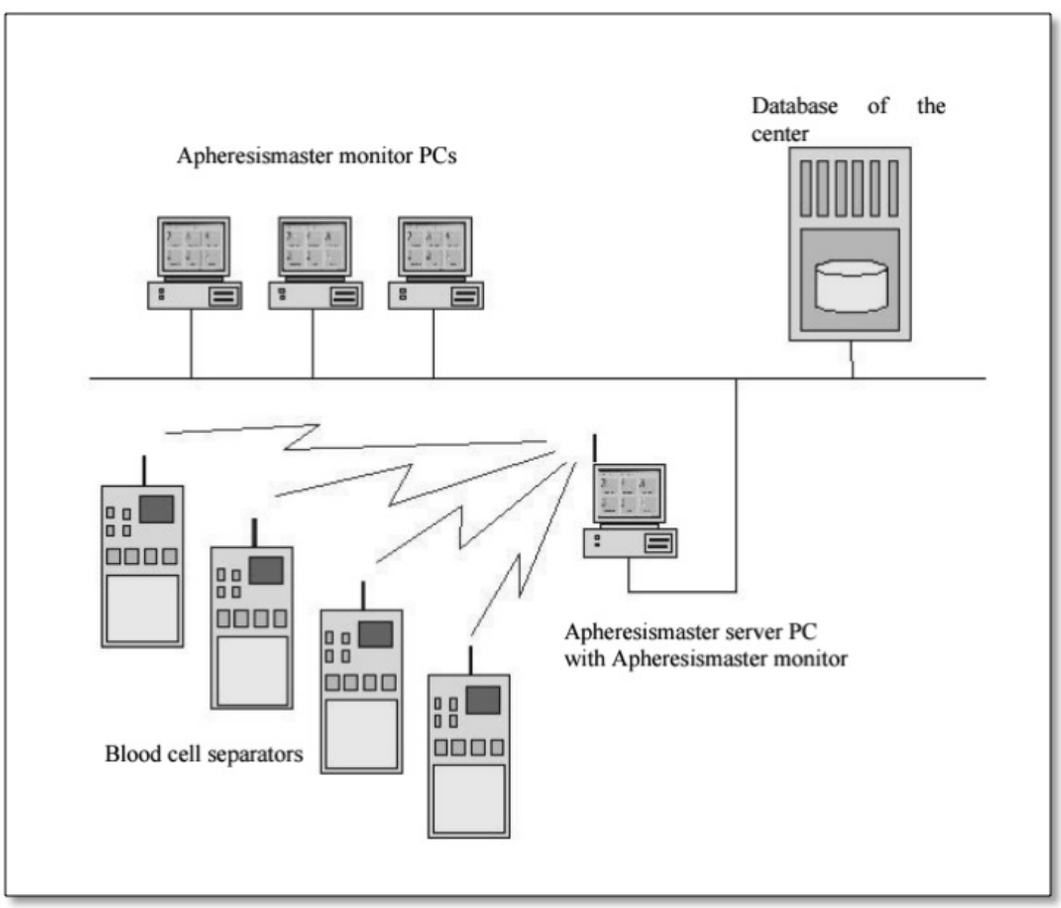
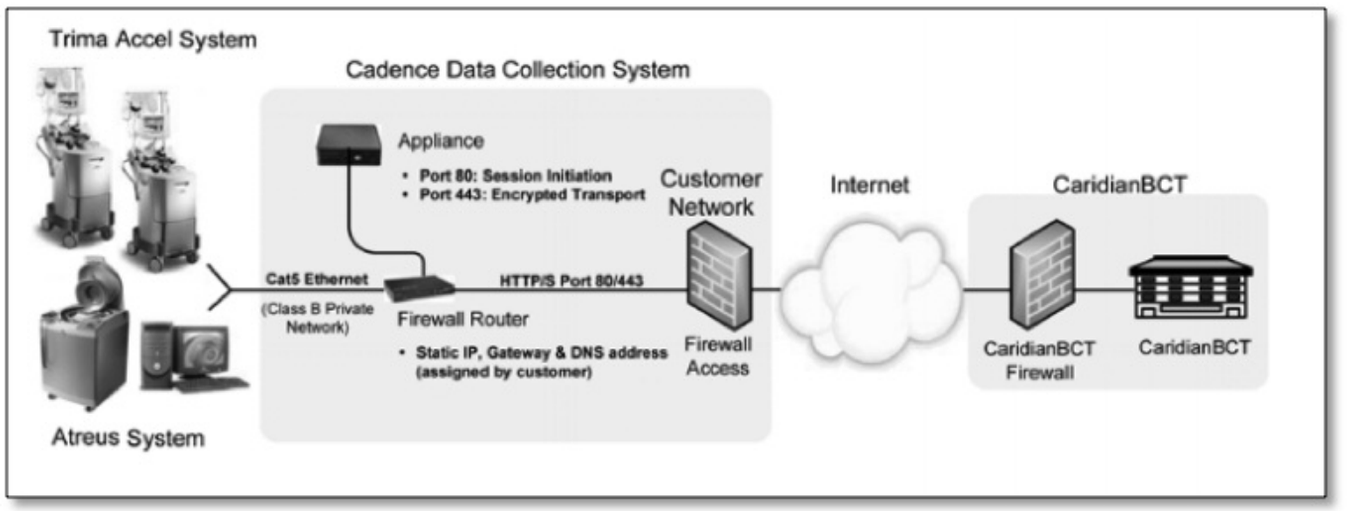


Figure 2: The Cadence Data Collection Sytem by Terumo BCT



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THERAPEUTIC EFFICACY OF GRANULOCYTE APHERESIS

Ekrem ÜNAL

Background

Neutrophil granulocytes are the most abundant type of leukocytes and crucial in protection against bacterial and fungal infection. A persisting reduction in neutrophil numbers is called neutropenia. The absolute neutrophil count (ANC) in the peripheral blood is used for classification of neutropenia into mild (1.0– 1.5 x 10^9/l), moderate (0.5–1.0 x 10^9/l), and severe (<0.5 x 10^9/l). In clinical practice neutropenia is generally observed as febrile neutropenia, a complication after intensive chemotherapy or hematopoietic stem cell transplantation (HSCT). On the other hand, congenital neutropenia related to different monogenetic entities, such as ELANE, GFI1, HAX1, G6PC3, and GCSF3R deficiency [1-3], and neutrophil functional disorders such as chronic granulomatous disease [4-6], leukocyte adhesion defect [7], and myeloperoxidase deficiency [8] may be rarely seen.

Febrile neutropenia is a common emergency encountered in children receiving chemotherapy for malignancies or HSCT. Left untreated, it can lead to acute and life-threatening invasive bacterial and fungal infections such as brain abscess, cellulitis, pneumonia, sepsis, chronic stomatologic infections such as recurrent aphthosis, paradontopathy with serious morbidity and mortality [9,10]. Febrile neutropenia is suspected in any patient on chemotherapy who presents with fever. Prompt evaluation and management is essential for a better outcome. Initial stabilization, prompt initiation of appropriate antibiotics and adequate supportive care are the cornerstone of treatment. Although broad-spectrum antibiotics and antifungal therapies had become the mainstay treatment of febrile neutropenia, they could not control infections in all cases and these patients require additional treatment strategies.

Granulocyte transfusions can be used as supportive therapy in patients with life-threatening neutropenia caused by bone marrow failure or in patients with neutrophil dysfunction. With the advent of potentially curative intensive chemotherapy regimens used alone or in combination with stem cell transplantation, there has been an increase in patients with fungal infections during periods of prolonged neutropenia and subsequently, a renewed interest in the use of granulocyte transfusions to support these patients [6,9,11-15]. Despite the potential availability of this component, there is limited published literature on the in vivo efficacy of whole blood derived granulocyte concentrates [16-20].

Clinical indications for Granulocyte transfusion:

Therapeutic granulocyte transfusions may be indicated for patients with severe neutropenia who fulfill all of the following criteria:

I. Severe neutropenia, defined as ANC <0.5 x 10^9/L due to congenital or acquired bone marrow failure syndromes.
II. Receiving active chemotheraphy in an attempt to achieve disease remission.

III. Proven or highly probable fungal or bacterial infection that is unresponsive to appropriate antimicrobial therapy as demonstrated by visible spreading lesions on skin, mucosa or radiological examination.
IV. In whom neutrophil recovery is expected (ANC>0.5x10^9/l) in the near future and / or in whom definitive therapy of curative potential is planned.
V. Therapeutic granulocyte transfusions may also be indicated for patients with a known congenital disorder of neutrophil function regardless of neutrophil count with proven or highly probable fungal or bacterial infection unresponsive to appropriate antimicrobial therapy, demonstrated by visible spreading lesions on skin, mucosa or radiological examination.

The current guidelines indicated that the granulocyte transfusion should not be issued for therapeutic use in patients with bone marrow failure where neutrophil recovery is not anticipated to recur spontaneously and no further active treatment is planned, sepsis in the absence of either neutropenia or known neutrophil dysfunction, fever of unknown origin [21].

Unstimulated vs stimulated granulocyte transfusion:

The use of a single injection of G-CSF alone or combined with a single oral dose of steroids has enabled the collection of significantly greater yields of granulocytes by apheresis. Using this method, doses of granulocytes in excess of 5 x 10^{10} cells can be produced for larger children and adults. The ability to collect greater numbers of granulocytes has been a major factor influencing the rekindling of interest in the potential role of granulocyte transfusions as additional therapy for patients with neutropenia and established infections. Studies with promising but overall inconclusive results have been reported both in adults, and children.

There are a number of technical problems that make it difficult to collect adequate granulocyte doses for transfusion. Normal donors do not have very high levels of circulating granulocytes in the peripheral blood and as a result can donate doses of granulocytes that are only likely to be sufficient for very small children. Moreover granulocytes are difficult to separate from other blood cells even if this has been facilitated by commercially available long-chain starch solutions (sedimenting agents) such as hetastarch and pentastarch. The concerns grew after multicentre randomised trials found that administration of hydroxyethyl starch in patients who had sepsis or were critically ill was associated with a higher risk of kidney injury and bleeding, and more deaths in patients who had sepsis, when compared with crystalloids. The trials prompted the German Federal Institute for Drugs and Medical Devices to ask the European Medicines Agency (EMA) to review the use of HES in 2012 [22]. In stimulated granulocyte regimen donations are collected from donors following the administration of G-CSF and the steroid (dexamethasone) for transfusion to children or adults. The exposure of a healthy volunteer donor to any form of medication with potential side effects does however present ethical and safety issues (this will be discussed in the following phrases). The guidelines of European Committee (Partial Agreement) On Blood Transfusion (Cd-P-Ts)

Granulocyte preparations (Dosage, Storage, Release Transport, Compatibility testing, Irradiation)

Donors should be tested for the blood-transmissible diseases HIV, hepatitis B and C, HTLV-I/II and syphilis. The hospital blood bank should be advised to carry out appropriate compatibility testing according to local practice. In view of the high red cell content, granulocyte preparations should be compatibility tested in the same manner as red cells. ABO and RhD matching is essential, as is the determination of irregular erythrocyte and HLA antibodies, and the performance of erythrocyte cross matches and (in the case of HLA antibodies) granulocyte cross matches. Major or minor ABO incompatibility does not form an absolute contra-indication, but does create a risk of acute or delayed hemolytic transfusion reactions. In the case of major or minor incompatibility between the donor and the

patient, measures (tailored to antibody titres) should be implemented to reduce the number of red blood cells and plasma if relevant. Reactive HLA and/or HNA antibodies between donor and patient should be considered as a contra-indication for the donor involved.

Typically, granulocyte suspensions are prepared for a specific patient and administered immediately. Generally storage is not recommended since the half life time of granulocyte suspensions are very short. The granulocyte component has a short shelf-life, with infusion within 6 hours of collection being preferable. The maximum shelf-life for granulocyte components is 24 hours. However the volume of the product may cause problem especially for low weighted recipients causing volume overload. Oymak et al. [12] reported that splitted products can be used but the ANC increment of primer product was higher than that of splitted product.

There is not any fixed component specifications have been agreed upon due to the large individual donor and patient variation. However, regarding the number of granulocytes per component and in accordance with the European Guidelines, a minimum of 1 x 10^{10} granulocytes per component is advised [23]. The initial dose of granulocytes per kilogram of body weight for the patient is preferably > 8 x 10^{8}/kg. Doses of at least 1 x 10^{10} granulocytes per transfusion appear to be required to treat or prevent infection [23].

Granulocytes are stored at 22+2ºC ideally without agitation. If granulocytes are agitated in error this does not preclude their transfusion as there is limited evidence that agitation affects them functionally [24,25]. Granulocytes must be irradiated to prevent transfusion associated graft versus host disease.

Safety

The guidelines of European Committee (Partial Agreement) On Blood Transfusion (Cd-P-Ts) reported that the potential donor of granulocytes needs to receive medication, and sedimenting agents may be needed during the apheresis procedure. Both of these have potentially severe side-effects that need to be communicated to the donor as part of the informed consent process. In addition to the recognised complications of routine donor apheresis, the following side-effects may occur.

• Hydroxyethyl starch (HES): acts as a volume expander. Donors who have received HES may experience headaches or peripheral oedema because of expanded circulatory volume. HES may accumulate, which can result in pruritus, and allergic reactions are possible.

• Corticosteroids: may cause, for example, hypertension, diabetes mellitus, cataracts, peptic ulcer, and psychiatric problems.

• Granulocyte colony-stimulating factor (G-CSF): the most common short-term complication following G-CSF administration in peripheral blood stem cell (PBSC) donors is bone pain; although, on very rare occasions, splenic rupture or lung injury may occur. Concerns relating to the development of acute myeloid leukaemia (AML)/myelodysplasia (MDS) after G-CSF administration are based primarily on reports of increased rates of these disorders among women with breast cancer who received chemotherapy or patients with severe chronic neutropenia who received G-CSF support. To date, however, registry data from Europe and the United States have not identified any increased risk of AML/ MDS in over 100 000 healthy individuals who donated PBSCs and received G-CSF as pre-treatment. The median follow-up of these studies is, however, less than 5 years. Therefore, if G-CSF is given to a donor, a protocol for long-term follow-up should be in place (as advised by JACIE/FACT) [20, 26].

Adverse events such as febrile reactions, occasional severe pulmonary reactions and HLA (human leucocyte antigen) alloimmunisation are well recognized complications in the recipients of granulocyte transfusions.

Efficiency of Granulocyte transfusions

There are controversital findings about the efficiency of granulocyte transfusions. Non randomized studies showed benefits of granulocyte transfusions especially for patients with severe invasive fungal infections [6,9,11-15]. Currently, Estcourt et al. [18] reported an update of a Cochrane review which was first published in 2009. The authors concluded that in people who are neutropenic due to myelosuppressive chemotherapy or a hematopoietic stem cell transplant, there is low-grade evidence that prophylactic granulocyte transfusions decrease the risk of bacteraemia or fungemia. There is low-grade evidence that the effect of prophylactic granulocyte transfusions may be dose-dependent, a dose of at least 1.0 x 10^{10} per day being more effective at decreasing the risk of infection. There is insufficient evidence to determine any difference in mortality rates due to infection, all-cause mortality, or serious adverse events. However, Metzendorf et al. [19] recently underlined the tricks and pitfalls of taking well-informed decisions or carry out sound research via different literature database.

Conclusion

The issue of efficacy of granulocytes (either therapeutically for refractory infection or as secondary prophylaxis for high risk groups of patients with prior severe infection) is still very much an open question. Possible future clinical studies of this component to address efficacy in patients with neutropenia will need to evaluate how best to use the component alongside granulocytes for transfusion collected by apheresis from GCSF/steroid stimulated donors. New studies to definitively address the issue of effectiveness are required

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VALIDATION PROCEDURE OF APHERESIS INSTRUMENTATION

Servet Uluer BİÇEROĞLU

Quality management in blood banks relates to all the actions in order to ensure the quality and safety of blood products. Quality programs in blood banks warrants the entire process starting from the safety of donors during blood collection until the delivery of the final product. According to National Turkish Blood and Blood Products Guide every blood service unit should have a validation policy with the following features.

1. Supports the quality system
2. Clearly explains the thing or things that needs to be validated according to the standards, guides and regulations
3. Clearly identifies the validation process and the targets in the system
4. Should undertake that the critical processes and the systems are valid

Validation is the entire work done to ensure that the intended quality conditions are met and to prove that the performance of the system is continious, accurate and precise. The use of a validated method warrants that the procedure is accurate, specific, consistent, valid and reliable. Validation should be done when a new system (informatic system or equipment) is implemented or when a process is carried out fort he first time. In the case of a change in the current process validation is performed as a part of the change control. Validation also has targets such as control demonstration, ensurance of compliance, data collection, providing information and determination of future needs.

Validation protocol or validation master plan (VMP) is a document that specifies how the validation will be conducted, the testing parameters to be used, product (result) characteristics and decision points to determine acceptable test results. According to the European GMP directive: "All validation activities should be planned. The key elements of a validation program should be clearly defined and documented in a VMP or equivalent documents". For validation of commercial instruments and systems the 4Q model can be used which has phases such as design qualification (DQ), installation qualification (IQ), operational qualification (OQ), performance qualification (PQ). The process is illustrated in Figure 1.

DQ is the documented collection of activities that define the functional and operational specifications of the instrument and criteria for selection of the vendor, based on the intended purpose of the instrument. IQ demonstrates that the instrument is properly installed in environmental conditions that meet the manufacturer's specifications. OQ demonstrates that the installed equipment operates as intended. It is the documented collection of activities necessary to demonstrate that an instrument will function according to its operational specification in the selected.) PQ demonstrates that the equipment performs as expected for its intended use in the facility and that the output meets specifications. The criteria which indicates acceptable performance must be defined. PQ is the documented collection of activities necessary to demonstrate that an instrument consistently performs according to the specifications defined by the user, and is appropriate for the intended use. All activities related to validation process

should be documented in a validation report and the conclusions should also be defined. If unexpected results are obtained during validation testing, it should also explain what changes will need to be made or what workarounds will be implemented to mitigate the risks.

According to the Guide to the preparation, use and quality assurance of blood components released in 2015 by the European Directorate for the Quality of Medicines & Health Care; 'All equipment and technical devices must be used in accordance with validated procedures (Directive 2005/62/EC Annex 6.4.1). The processing of blood components must be carried out using appropriate and validated procedures, including measures to avoid the risk of contamination and microbial growth in the prepared blood components (Directive 2005/62/EC Annex 6.4.2).' According to the same guide all automated systems and processes should be validated. All platelet units collected by apheresis should be screened for volume, platelet content, residual leucocyte content and the pH should be measured at the end of shelf-life. The volume of all apheresis platelet units should be > 40 mL per 60×10^9 of platelets. The platelet content standard unit should be minimum 2×10^{11} per unit and one per cent of all units with a minimum of 10 units per month should be screened. Residual leucocyte content should be $< 0.3 \times 10^9$ per unit and one per cent of all units with a minimum of 10 units per month should be screened. The pH measured (+ 22 °C) at the end of the recommended shelf-life should be > 6.4 and one per cent of all units with a minimum of 4 units per month should be screened.

Plateletapheresis instrumentation validation is required to document that a new or modified instrument or technique is capable of consistently producing acceptable products at the blood service. Although the instruments have CE mark or FDA approved they need to be validation at each center. Validation is required when a new instrument or technique (process) is used that could affect the quality of the product. According to the FDA, each apheresis system and each type of product (single, double, triple) need to be validated separately. The parameters to be validated are at the may vary among the blood services center. At least product volume, platelet yield and WBC content (incase the product is leukoreduced) need to be validated, and 5-day pH needs to be monitored if products are to be stored up to five days. FDA's product performance qualification criteria for platelet component collection is shown in Table-1.

Figure-1 Phases of validation

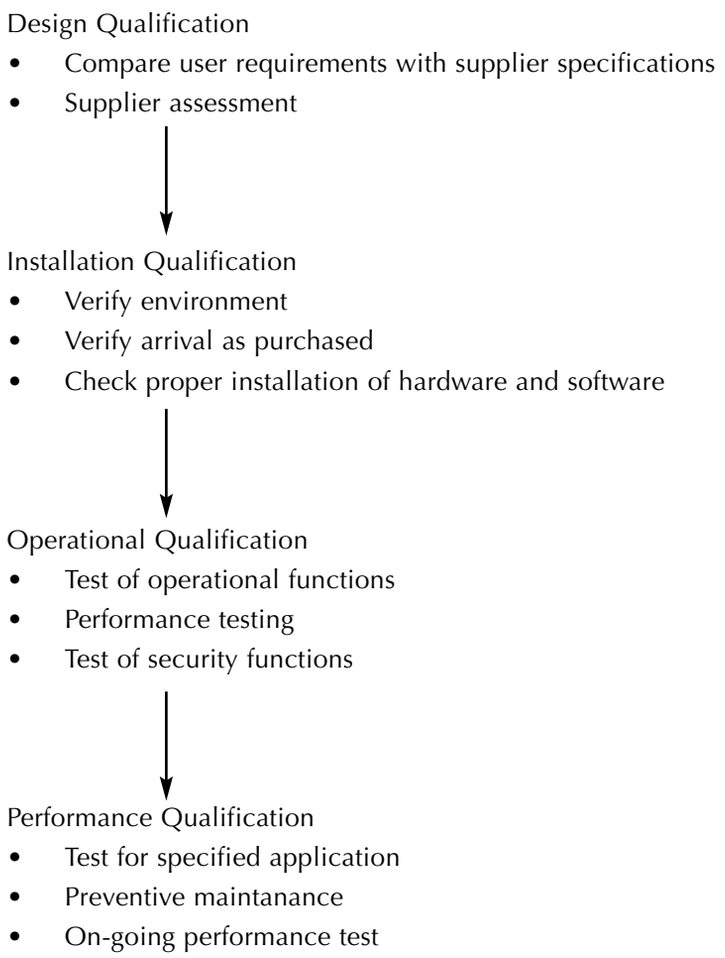

Table 1. Product Performance Qualification Criteria for the Platelet Component Collection

Test	Recommended Results	Target[1]	Allowable Process Failures[2] to achieve recommended results for a set of N tests[3]		
Actual platelet yield of transfusable component	≥ 3.0×10^{11}	95%/75%*	N=11**	N=18**	N=23**
			0	1	2
pH	≥ 6.2	95% / 95%***	N=60	N=93	N=124
			0	1	2
Percent component retention	≥ 85% component retention if performed****	95%/95%	N=60	N=93	N=124
			0	1	2
Residual WBC count***	Single collection: < 5.0×10^6	95% / 95%	N= 60 collections	N=93 collections	N=124 collections
			0	1	2
	Double collection: Collection: < 8.0×10^6 or Components: < 5.0×10^6	95%/95%	N=60 collections	N=93 collections	N=124 collections
			0	1	2
	Triple collection: Collection: < 1.2×10^7 or Components: < 5.0×10^6	95%/95%	N=60 collections	N=93 collections	N=124 collections
			0	1	2

[1, 2] Process failures only; non-process failures should be excluded.

[3] Corrective actions for exceeding allowable process failures

- if you select a sample size of 11 and find one failure, 17 additional samples would need to be tested with no additional failures.
- if you select a sample size of 60 and find one failure, 91 additional samples would need to be tested with no additional failures. If you select a sample size of 93 and find two failures, 157 additional samples should be tested with no failures. If you select a sample size of 124 and find three failures, 127 additional samples should be tested with no failures.

* 95% confidence that greater than 75% of the components meet the standard.

** The sample size numbers can be used in a sampling plan that should be representative of products collected on each machine type in each facility.

*** 95% confidence that greater than 95% of the components meet the standard.

**** Or per the container/automated blood cell separator device manufacturer's specifications

***** The stratified recommended results should ensure that the individual transfusabl&e units will be < 5.0×10^6 even with a 25% error in equilibration of the volume for double and triple collections.

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CELLULAR MANIPULATIONS IN STEM CELL TRANSPLANTATION

Ercüment OVALI

Hematopoietic stem cell transplantation (HSCT) has revolutionized the treatment of hematologic malignancies, bringing substantial improvements to survival outcomes for many patients. However, infection, graft-versus-host disease (GVHD), and relapse are still the most challenging sequelae to address to improve the outcomes of all patients after allogeneic transplantation.

History of HSCT began with bone transplant in the 1950s. Today, it has become a model of adoptive immunotherapy using cellular manipulations. We see that the first cellular manipulation started with purification and cryopreservation of collected bone marrow in 1970s. 1990s was the period that first peripheric stem cell collection was made for HSCT. The second half of 1990s, we began to see T and B cell reduction from peripheric or bone marrow stem cell suspensions. In 2000s, donor lymphocyte infusion (DLI), virus specific T (VST) cells and mesenchymal stem cells (MSC) began to be implemented in stem cell transplants. Today, we see that cellular manipulations applied in stem cell transplants increased and become more sophisticated. The cause of all this manipulations are to reduce the basic transplant complications and to increase transplant success. Today, applied cellular manipulations and some of their details are summarized below.

1. Cellular manipulations for GVHD prevention
    a. CD34 selection,
    b. CD3 or CD3 and CD19 depletion,
    c. αβ-T cell depletion,
    d. CD45RA depletion,

2. Cellular manipulations in GVHD treatment
    a. MSC (autologous, allogeneic-donor origin/third party)
    b. Donor regulatory T lymphocyte (T-reg) infusions

3. Cellular manipulations for augmentation of graft versus tumour effect(GVT),
    a. DLI,
    b. T/ ⊠-T cell depleted DLI,
    c. Tumour specific T cell infusions,
    d. High affinity T-cell receptors or chimeric antigen receptors (CAR) positive T cell infusions,
    e. KIR mismatch NK cell infusions,
    f. CAR positive NK92 cell line infusions,

4. Cellular manipulations for virus specific treatment
    a. Virus specific T cells
    b. CD45RA depleted DLI

Cellular manipulations for GVHD prevention

Alloreactivity in stem cell transplantation is a major player of rejection, engraftments, GVHD and GVT in HSCT. In early period of cellular manipulations, pure CD34 positive cell transplantation was studied. Engraftment failure, rejection and/or relapse were major problems in using CD34 positive only cell infusions in HSCT. Therefore, this method was abandoned, especially in allogeneic transplants. Studies on T cell depletion protocols in second period of cellular manipulations of HSCT showed that T cell depletion could control the GVHD. But, this protocol had the same problems as engraftment, rejection and relapse also. Studies in the coming years showed that αβ-T-cell receptor (1) and CD45RA positive T cells (2) have a major roles in GVHD while γδ T cell receptor, CD45RO positive T cells and NK cells have important roles in GVT (3). Therefore, αβ-T cell reduction from stem cell product arose as an option, particularly in haplo-identical HSCT. However, this model has some problems as extended immune suppression, high rate of engraftment failure and especially increased viral infections.

A new method studied in recent years gives new opportunities in HSCT. According to method, CD45RA positive cells (naïve T cells) are depleted from remaining stem cell product after CD34 positive selection (Because of some CD34 positive cell are CD45RA positive). Remaining CD45RO positive T and CD34 positive cells are infused together. Early results showed that it has optimal engraftment rates with low GVHD, low viral infection rate and no increased relapse risk (2).

Cellular manipulations for GVHD treatment

MSC has strong regulator and immune suppressive effect on immune system. These features of MSC makes it an important option for keeping aGVHD under control. Studies exhibit that response rate is about %50-70 in aGVHD with MSC therapy (4).

Cellular manipulations for graft versus tumour effect (GVT) augmentation

In case of relapse, post-transplant DLI infusion is the first cellular therapy protocol currently used, but this protocol has low effectivity and high aGVHD risk. Therefore, αβ-T-cell receptor or CD45RA positive T cells depleted DLIs are tried to control relapse without aGVHD risk. In recent years, a new cellular manipulation have been developed to control relapse as chimeric antigen specific receptor positive or high affinity T cell receptor positive T cell infusions (5). These cells are formed with constructed gene transfer. Other promising cellular therapy products are KIR mismatch NK or genetically modified NK cell lines (such as CAR positive NK92 cell line)(5).

Cellular manipulations in viral specific treatment

After HSCT, prolonged immunesuppression and viral infections, especially in cases where the reduction of T cells is an important issue in the transplantation clinic. The Virus-specific T cells (VST) is a good option to treat viral infections. VST are isolated from donor or 3rd party donors and they are expanded to be prepared of VST suspensions. A recent study showed that VSTs can control viral disease in %70 overall response rate (6).

All these challenges indicate that we leave the classic HSCT transplant soon. Future HSCT protocols will be the safer and more effective with activation of cellular manipulations.

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HB TRIGGERS & SINGLE-UNIT TRANSFUSION: IMPLEMENTING EVIDENCE-BASED TRANSFUSION PRACTICE

Astrid NORGAARD

Evidence from randomized clinical trials has shown that liberal red blood cell transfusion in the non-bleeding may increase infection, circulatory overload and short term mortality in some patients. Liberal transfusion practice has been the rule in Denmark, caused by too high pre-transfusion haemoglobin concentration (Hb trigger) combined with a traditional dose of 2 red cell units. Single-unit dosing has been proven safe when applied together with a restrictive Hb trigger in a number of randomized controlled trials. Transfusion of two or more RBC units in succession is associated with an increased risk of pulmonary oedema or transfusion-associated circulatory overload (TACO), especially in the elderly, females and patients with heart or kidney failure, or a positive fluid balance.

We established a Patient Blood Management programme to improve the quality of transfusion treatment. The goal was to increase compliance with transfusion guidelines by decreasing Hb triggers and increasing single unit transfusions, and thereby reducing unnecessary transfusion exposure in the 10 hospitals serving the 1.7 Million citizens of Copenhagen. From 2009-11 the biggest hospital implemented restrictive transfusion practice and in 2011-13, 8 of the 9 remaining hospitals joined, 1 hospital declined to participate in the PBM intervention.

In all participating hospitals, transfusion above the guideline was reduced by 23-43 percent in participating vs. 13 percent in the non-PBM hospital. Transfusion compliance with the restrictive trigger increased with 26-100 percent in PBM hospitals vs. 16 percent in the non-PBM hospital. The percentage of single-unit transfusions increased with 19-39 percent in PBM hospitals vs. 2 percent in the non-PBM hospital. Blood usage decreased with 15-24 percent per admission and 14-23 percent per operation in PBM hospitals vs. an increase of 6 percent and a decrease of 2 percent respectively in the non-PBM hospital. At the regional level the percentage of patient transfused with red cells was halved in elective hip surgery and reduced with 30 percent in CABG.

The implementation of restrictive transfusion practice increased the compliance with transfusion guidelines, reduced the patients' unnecessary exposure to blood transfusion and constituted the first phase of PBM in Copenhagen.

USE OF TRANSFUSION ALTERNATIVES IN ELECTIVE ORTHOPAEDIC SURGERY

Cynthia SO-OSMAN

A randomised multicentre study was recently performed in the Netherlands on the integrated use of Patient Blood Management interventions as erythropoietin (Epo), cell saver and/or postoperative drain re-infusion to evaluate the effect on red blood cell (RBC) transfusion reduction and costs in 2442 adult elective hip-and knee surgery patients while applying a restrictive transfusion threshold. (1,2) Firstly, patients were stratified by the preoperative hemoglobin (Hb) level: low Hb (10- 13 g/dL) patients were randomized for Epo or no Epo; normal Hb patients (above 13 g/dL) were ineligible for Epo. Secondly, patients from both strata were randomized for autologous re-infusion by cell saver device or postoperative drain re-infusion device or for no blood salvage device. Outcome measures: RBC use and cost-effectiveness. Epo resulted in a significant 50% reduction of transfused patients (OR 0.5, 95% CI: 0.35- 0.75) and a non-significant 29% mean reduction in RBC use (ratio 0.71, 0.42-1.13). Epo, however, increased costs by €785 per patient (262-1309), i.e. €7300 per avoided transfusion (1900-24000). In both strata, autologous blood re-infusion did not result in a RBC reduction and increased costs by €378 per patient (161-595).

It can be concluded, that in elective knee-and hip surgery, while using a restrictive transfusion trigger, autologous re-infusion by cell saver or postoperative drain re-infusion were no longer found effective in reducing RBC use and are consequently not cost-effective, while Epo, although it is effective in reducing RBC use, is not cost-effective due to its high costs. Therefore, these interventions are no longer considered as appropriate transfusion alternatives in this clinical setting. The finding that autologous blood re-infusions were no longer reducing RBCs was further explored and explained in a subsequently performed meta-analysis, of which the results will be discussed as well. (3)

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BLOOD BANK REGULATORY FRAME WORK IN ASIAN COUNTRIES

Sangeeta PATHAK

The blood transfusion service (BTS) of a country is like its lifeline is an indispensable, potentially life-saving medical intervention, and blood products such as clotting factors and some immunoglobulins are designated by WHO as essential medicines. Regulatory issues and guidelines play a vital role in shaping the structure of this vital service in any country because the inherent risks of blood and the complexity of providing adequate, timely and equitable access to safe blood products require an organized national or regional blood regulatory system. To achieve the goal of safe and adequate blood for all, WHO has advocated for the establishment and sustenance of strong national regulatory authorities (NRAs) both in developed and developing countries. In in 2010, the World Health Assembly urged Member States "to take all the necessary steps to update their national regulations on donor assessment and deferral, the collection, testing, processing, storage, transportation and use of blood products, and operation of regulatory authorities in order to ensure that regulatory control in the area of quality and safety of blood products across the entire transfusion chain meets internationally recognized standards."

In a hospital, all other medical services such as cardiac/renal care and even laboratory testing remain free of any legal guidelines, the blood bank is always under the scanner of the local regulatory health authority.

The blood transfusion service (BTS) of countries in South Asia (barring a few) are plagued with certain common problems such as

- Paucity of funds
- Shortage of voluntary donors
- Higher infection rates in donors
- Difficulty in implementation of uniform regulatory policies
- Fragmented services with private and government blood banks

Below is a brief

Singapore

More than 100,000 units of blood are required by patients in Singapore every year. Through a strategic partnership with the Singapore Red Cross, the National Blood Programme works towards collecting sufficient blood to fulfil this need. The Blood Services Group (BSG) of the Health Sciences Authority is responsible for collecting, processing and distributing blood and blood components to all public and private hospitals in Singapore. The Blood Services Group ensures that all Singaporeans have access to adequate and safe blood. The Group comprises the following branches: Blood Resources, Blood Supply, Patient Services and Clinical Services.

Bhutan

The national blood transfusion service also termed as 'blood bank service' is one of the listed programs under the Health Care and Diagnostic Division of Department of Medical Services, Ministry of Health. The national blood

policy has been endorsed by MoH in 2007 and the ten-year national blood plan was drafted in 2010 for finalization and adoption. The national standards for BTS have been developed and endorsement by MoH recently in 2012-2013. There are 27 blood banks in the country which collect about 8028 units out of which voluntary donation is 3686 (46%) and family relative donors are 4342 (54%). All blood banks are hospital based and managed by the Royal Bhutan Government.

India

Blood has been treated as a 'drug' under the Drugs and Cosmetic Act (D and C Act), 1940 and Drugs and Cosmetics Rules, 1945. In 1993, Supreme made it mandatory for all blood banks to be licensed licensing of blood banks in the country mandatory and also directed that the National Blood Transfusion Council (NBTC) along with State Blood Transfusion Councils (SBTC) be set up for monitoring the activity of blood banks in India. The Indian BTS is highly fragmented with over 2500 blood banks, 9 Million blood donations and poses unique challenges. The National Blood Policy (NBP) was published by the Government of India in 2002. The NBP reiterates government commitment to safe blood and blood components and has well documented strategies, for making available adequate resources, technology and training for improving transfusion services. It also outlines methods for donor motivation and appropriate clinical use of blood by clinicians. Some improvements have been seen in India over the last two decade with better qualified staff, rules laid down for minimum requirements in terms of space, staff and equipment, public awareness of blood donation and also National Aids Control Organization (NACO) support for blood safety.

Bangladesh

There are more than 131 blood banks under government sector and 45 blood banks in the private sector. Red Crescent blood banks are another prominent force in the BTS in Bangladesh. To oversee regulation and development of BTS, a high power committee named 'National Safe Blood Transfusion Council' was formed in 2002. National blood policy is at the stage of finalization by the government. As reported from the Safe Blood Transfusion Programme 2012, currently more than 600,000 units of blood are required annually in Bangladesh and the requirement is gradually increasing. Only 31% of the annual demand is fulfilled from voluntary blood donations, while the rest comes from relatives or replacement donors. The use of blood component is only 17% which is inadequate in implementation of specific use of blood products. Therefore, the improvement of the national blood transfusion service is essential for addressing the challenges arising out of HIV, Hepatitis B & C, and other infectious diseases.

South Korea

The Korean Red Cross (KRC) Blood services started in 1957. In 1981 the government entrusted the Blood services to the KRC which is now actively involved in blood donation and donor recruitment. It is a centrally coordinated and monitored blood transfusion service under the Ministry of Public Health. Korean Red Cross blood service is the single largest domestic program, covering over 95% of South Korea's total blood supply. The KRC Blood services have a working relationship with government bodies, medical blood banks, and private blood center as a components of blood service in Korea. The 16 blood centers, nearly 2.5 million blood donations, a blood transfusion research institute, 3 NAT laboratories, a fractionation center are under the management of KRC Blood Service Headquarters.

Indonesia

Indonesia has about 211 blood banks under Indonesian Red Cross (IRC) and another 150 hospital-based blood banks under government control. Government-controlled blood banks are gradually becoming operational and IRC blood banks take care of major part of the blood supply. IRC blood banks collect more than 2 million units per year

and 87% donation comes from voluntary source. About 70% of total collection is separated into components. IRC blood banks distribute blood and components directly to the hospitals after doing cross matching test or the hospital store and cross match as per their requirement. Indonesian BTS runs on cost recovery system; however, there is government subsidy on different sectors.

Sri Lanka

National Blood Transfusion Service (NBTS) is established in Sri Lanka in 1950s and is an integral part of the National Health Service. The main function of NBTS is to collect, process and deliver safe blood, blood components and blood products through 19 cluster centres and 77 peripheral blood banks situated island wide. As of 2014, the NBTS collected over 350,000 voluntary blood donations.

NBTS is a decentralized unit which comes under Ministry of Health, Sri Lanka. NBTS is the sole supplier of blood and blood products to all state hospitals and some of the private hospitals which are registered under Ministry of Health for supply of blood and blood products.Having its head quarters at National Blood Centre (NBC), NBTS has 96 blood banks island wide. The categorization of blood banks is as follows...

1. National Blood Centre - the head quarters.
2. Cluster Centres.
3. Peripheral Blood Banks.

Maldives

Maldivian Blood Services (MBS) is formed on 1st November 2012. "National Thalassaemia Centre (NTC)" and "National Blood Transfusion Services (NBTS)" were merged to form Maldivian Blood Services with the hope and aim to provide better service to patients suffering from hematological disorders like Thalassaemia and other hemoglobinopathies and also to provide safe blood to those who are in need.. There are two multi-specialty hospitals, one in government sector i.e. Indira Gandhi Memorial Hospital (IGMH) and another one in private sector. IGMH has a basic level of modern blood bank with component preparation facility. Blood collection by IGMH is about 300 units per month. There is another blood bank attached to National Thalassaemia Center (NTC) which caters to only thalassaemia patients in the city as well as from other parts of the country. NTC collects about 500 units per months. Both the blood banks collect blood mainly from family replacement donors and directed donors for their own patients. About 80% blood units are collected by this mechanism. There are few blood banks in other islands of Maldives.

Myanmar

The Myanmar Red Cross Society (MRCS) initiated blood donation activities in 1961, and since then, has been organizing regular blood donation activities. The MRCS supports the 'national blood and blood product law' (enacted in January 2003) to save patients lives through blood transfusion of quality assured blood and blood products There is a nationally coordinated BTS managed by government. National Blood Center(NBC) at Yangon is the technical hub for development of the BTS in the countryThe Blood Policy is in the stage of finalization and subsequent implementation. Voluntary blood donation in the country is about 85%. National Blood Center coordinates with Red Cross and other organizations for voluntary blood donation. It distributes components only in the capital Yangon and more than 20,000 blood units are distributed per year.

Nepal

Blood Transfusion Service of Nepal Red Cross Society was established in the year 1966 i.e. 3 years after the inception of the Society itself. The Central Blood Transfusion Service Center (CBTSC) in Kathmandu is responsible for management of services in the Kathmandu valley, and for supervising and monitoring the technical standards of the district centers, providing guidance to ensure the collection and supply of safe blood. Thus, the CBTSC not only

serves the blood transfusion needs of the people in Kathmandu valley, but also provides technical and other supports to the blood service centres across the country. In the year 2008 nationwide 1,78652 units of blood and blood products were provided to the patients from different blood centers. There are about 70 blood centers in 50 districts. There is one Central Blood Transfusion service in the capital Kathmandu and four regional BTS (Pokhra, Nepalganj, Biratnagar, Citwan). There are 21 district blood transfusion services; 19 emergency BTS and 25 hospital-based blood transfusion services.

Malaysia

Blood services in Malaysia started in the 1950s, based on voluntary non-remunerated blood donation. Since then, the provision of safe and quality blood and blood products through the national blood service has grown under the Ministry of Health of Malaysia. In 2011, there were 627,518 whole blood donations to the MOH Blood Services and 17,068 apheresis donations of plasma and platelets. Whole blood, red blood cells and other blood components are provided free of charge for all patients in the public hospitals in Malaysia. Private hospitals pay service charge which is heavily subsidized by the government.

Thailand

Thailand has one of the best BTS in this region. It is nationally coordinated and BTS is managed by the Thai Red Cross Society. National Blood center is in the capital Bangkok and there are 12 other regional centers in provinces. National blood policy was enacted about 15 years back and it was revised in 2010 to incorporate necessary amendments. The National Center collected about 539,094 units in 2009. More than 93% of total collected blood in the country is separated into components.

Pakistan

The total blood collection is more than 1.6 million. The BTS is not nationally coordinated and proper regulatory mechanism is not available. As per unofficial sources, there are 450 hospital-based blood banks and 2357 private blood banks. Many private blood banks maintain questionable quality standard and ethics. About 90% blood is collected from family replacement donors and out of which 10% comes thorough 'unsafe' paid donors. Disease burden among blood donor is high and needs screening of all units with sensitive tests. 20-40% blood collected is not even screened for disease markers especially in non-regulated private sectors. There are 13 regional blood centers and under which 78 hospital-based blood banks are operating mainly in public sector. Two policies are designed, one at national and another in ground level.

Vietnam

Through the International Development Association (IDA) funding and World Bank Group expertise, Vietnam is now providing more and better quality blood in over 32 provinces through a modernized transfusion system. A new network of transfusion centers is nationally coordinated to provide blood products free of the HIV/AIDS virus and targeted for the right clinical uses. The World Bank is supporting Vietnam's National Blood Transfusion Program, which is aimed at increasing blood supplies through a higher number of voluntary non-remunerated blood donors. Beyond building the country's first blood centers with IDA support, the government has developed a national blood policy and is working with other donors to build blood centers in other parts of the country. It has also recently inaugurated the National Institute of Hematology and Blood Transfusion in Hanoi—a new facility under the Ministry of Health—outfitted with modern medical technologies to diagnose and treat all blood-related diseases. It also has the capacity to stock 150,000 units of blood per year.

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COST, PRICE & BUDGETS IN BLOOD BANKS

Amit AGRAWAL

Blood Banking in present era is lifeline of health care. Every technology requires cost input so is blood products. Era has changed from glass bottles to plastic bags, reusable material to disposables, slide to robust testing technology and much more.

Developing of blood transfusion services is complex,costly and time consuming strategy.Blood Banking is under "NOT FOR PROFIT" model and under control of Drug Authorities and respective government organizations,Eg-NACO in India..At one side,technology and blood safety requires expenses,other side we have to work on Not For Profit model and committed to provide safe blood at reasonable cost.

Working on costing involves all expenses direct or indirect,including any sort of freebies or support from Government or grant from Non-Government Organizations.This sort of working is easier in stand alone blood banks but difficult in Government set up where financial grant in various forms received and in hospital set up where services among various departments are intermingled and difficult to work out actual cost involvement.In addition,depends upon whether set up is dealing with whole blood/component,total no. of donations,type of component made,usage of components and discard etc.

Chart 1

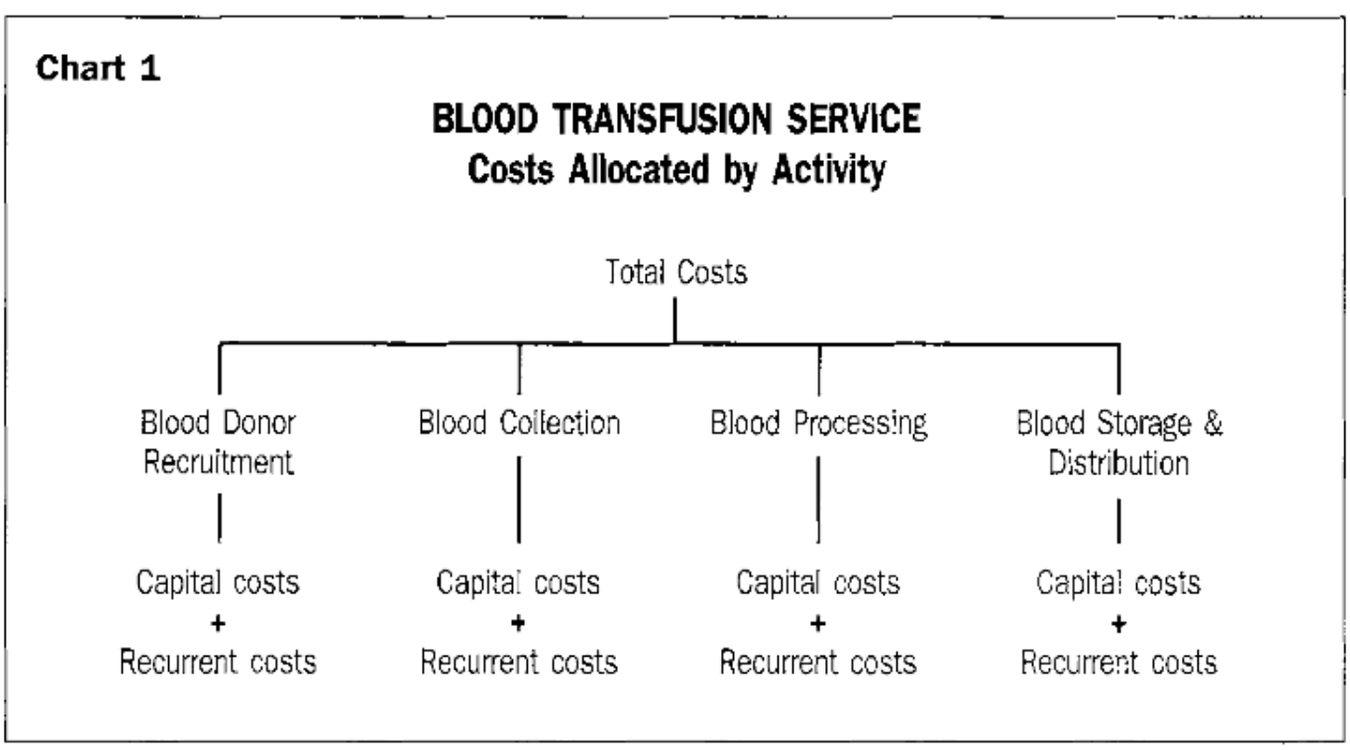
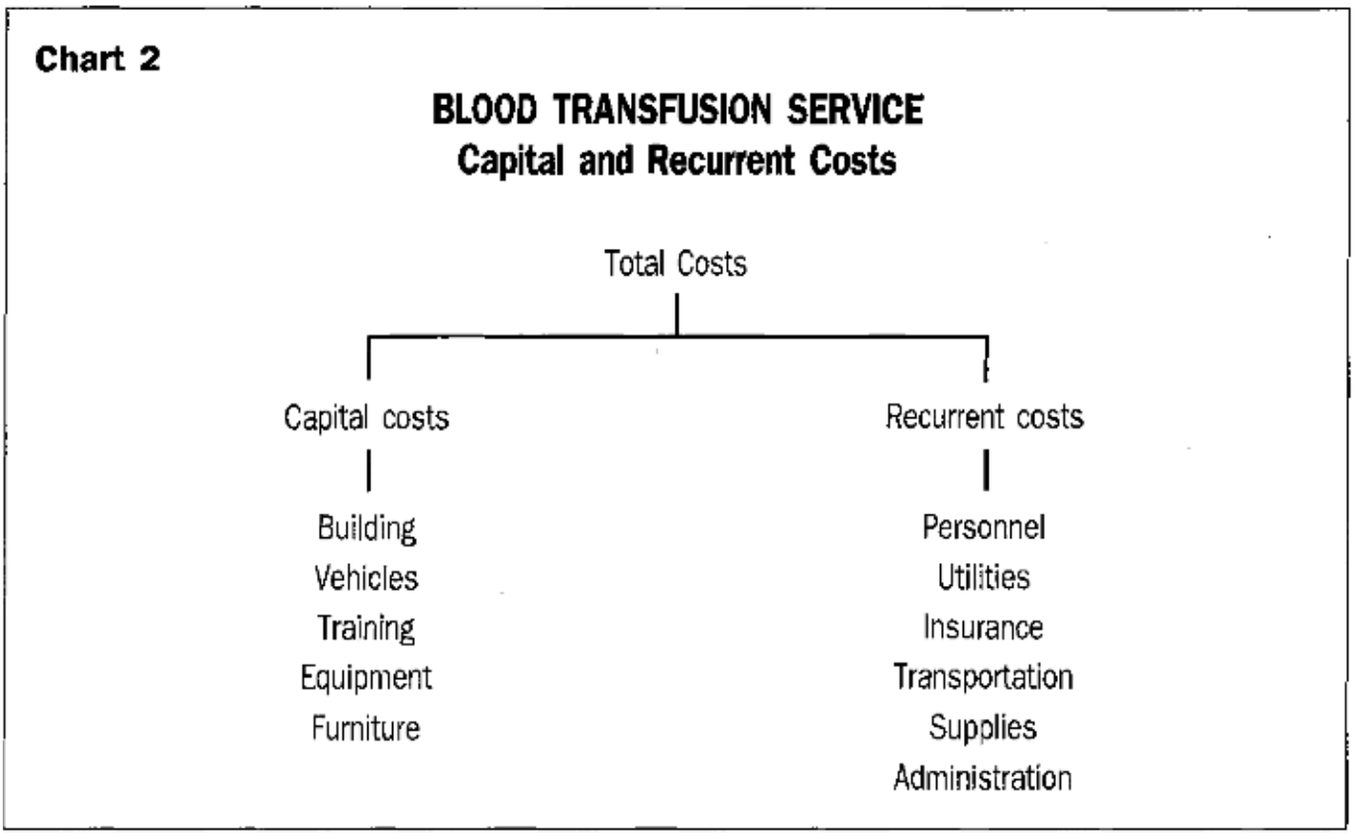


Chart 2



While deciding for price of particular blood component,in addition to cost consideration should be given to rates as fixed by Government agencies and/or through survey as done by centres in nearby area/same country or nearby or far off countries.

Budgeting is the most important aspect in any industry. Any organization can survive only if budgeting is done in proper fashion taking into consideration priorites, hidden expenses and futuristic vision.Budget in various heads need to be decided based on capex purchase,maintenance,recruitment,market inflation,unexpected expenses etc. versus income/grant/freebies or any other support expected.

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YIELD OF NAT: DATA AND NAT ALGORITHM IN TURKEY

Levent HAYAT

Although serological tests are main screening methods in blood banking, importance of nucleic acid amplification tests (NAT) are increasing day to day. It has been shown that the major residual transfusion risk arises from donations taken from recently infected donors in the pre-seroconversion phase of infection. Routine screening of blood and blood products by serological tests and NAT shortens seronegative "window period" of HBV, HCV and HIV infections and detect variant viruses result in risk of transfusion transmitted infections (TTI) decreases .

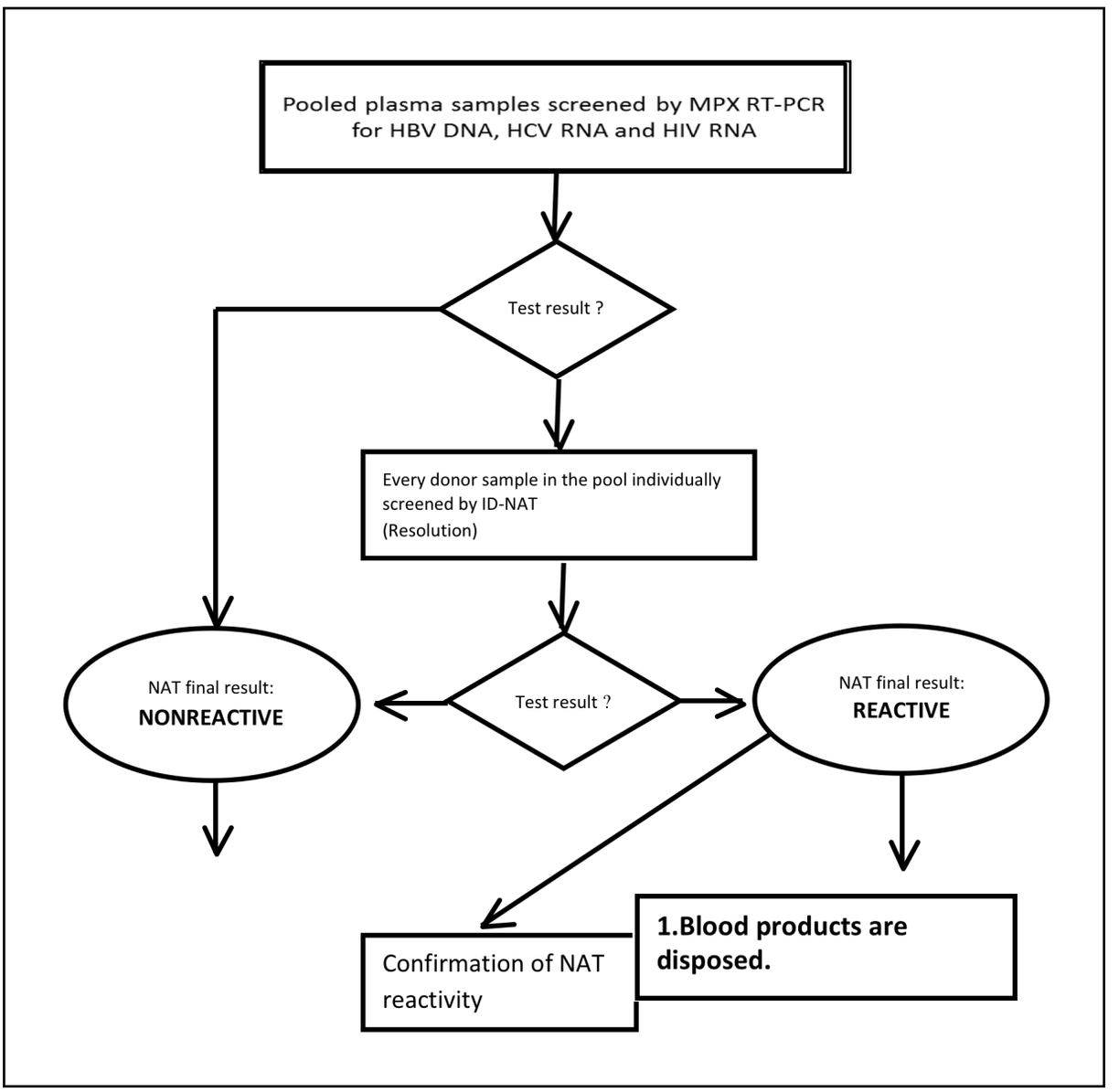
Turkish Red Crescent is main blood and blood products supplier in Turkey. Totally 1937932 units whole blood were donated to Turkish Red Crescent in 2015. All donated whole bloods and blood products has been screened by NAT in Turkish Red Crescent's laboratories since November 2014.

Cobas s201 system MP6 (Mini Pool 6) (Roche Diagnostic Inc. Switzerland) has been used by four Turkish Red Crescent's laboratories in Turkey. The Cobas s201 system is used for testing donor pools and resolution testing of reactive pools to identify the reactive individual donor specimens. Cobas s201 system consist of three main components: Hamilton Microlab Star Pipettor, Cobas AmpliPrep Instrument and TaqMan Analyzer. This system use Cobas TaqScreen MPX test v2.0 test kit. The test kit is approved by FDA and CE-IVD. This kit is qualitative multiplex (MPX) test that enables the simultaneous detection and discrimination of HIV RNA (HIV-1 group M, group O and HIV-2), HCV RNA and HBV DNA. Reactive test results are confirmed by quantitative RT-PCR method with Abbott m2000rt system (Abbott Molecular Inc. USA). This system use Abbott Real Time HBV, HCV and HIV kits (Abbott Molecular Inc. USA).

The first step of the NAT algorithm of Turkish Red Crescent's laboratories is pooling the donor plasma samples. Pool of the six plasma samples is screened by multiplex RT-PCR method. Test results are transferred by Cobas s201 system to laboratory information system (LIS) and evaluated conjunction with serologic test results. If test results detected as "non-reactive" blood products released from quarantine units. If NAT result of pooled plasma sample detected as "reactive" resolution procedure started and every donor plasma sample in the pool individually screened by NAT (ID-NAT). If ID-NAT and/or serologic test results detected as "reactive" related blood products are disposed and infected blood donor is deferred permanently. Reactive donor samples are sent confirmation laboratory either serologic and NAT reactivity.

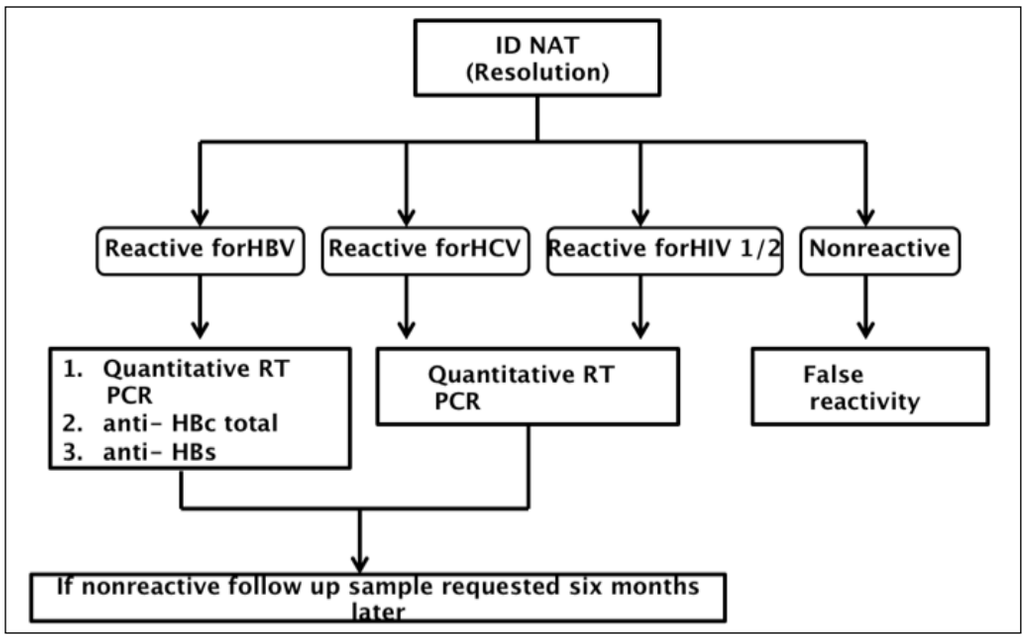
NAT algorithm of Turkish Red Crescent's laboratories is summarized in Figure-1.

Figure-1:


Pooled plasma samples screened by MPX RT-PCR for HBV DNA, HCV RNA and HIV RNA
Test result ?
Every donor sample in the pool individually screened by ID-NAT (Resolution)
Test result ?
NAT final result: NONREACTIVE
NAT final result: REACTIVE
Confirmation of NAT reactivity
1.Blood products are disposed.

Confirmation of NAT reactivity algorithm is summarized in Figure-2.

Figure-2:



The samples of 1436555 donations between November 2014 - August 2015 were screened by Turkish Red Crescent's laboratories. In this period, 7068 samples for HBV, 1774 samples for HCV and 2273 samples for HIV were detected as reactive by serologically and/or NAT screening.

Serologic tests and NAT results of HBV, HCV and HIV are summarized in Table 1.

Table-1

	Test name	***Number of reactive results***	***%***	***Total number***
HBV	Only HBsAg	1702	24,1	
	HBsAg + HBV DNA	4526	64	7068
	Only HBV DNA	840	11,9	
HCV	Only anti-HCV	1613	91	
	anti-HCV + HCV RNA	144	8,1	1774
	Only HCV RNA17	0,9		
HIV1/2	Only anti-HIV ½	2165	95,3	
	anti-HIV ½ + HIV RNA	92	4,1	2773
	Only HIV RNA	16	0,6	

Serologically nonreactive / NAT reactive donor screening results of Turkish Red Crescent laboratories are summarized in Table-2.

Table-2

	HBV	**HCV**	**HIV 1/2**	**Total**
N	840	17	16	873
%	0,058	0,012	0,011	0,061 (873/1436555)

In November 2014 – August 2015 period Turkish Red Crescent laboratories' NAT yields were detected as 1/3288, 1/358700, 1/717149 for HBV, HCV and HIV respectively.

Main advantage of the NAT is able to detect serologically nonreactive donor. Totally 873 (%0,061) screening results were detected as serologically nonreactive / NAT reactive in aforementioned time period. NAT is not decrease importance of serologic screening tests and these tests are not used for each other. However, NAT screening has significantly reduce seronegative "window period" of TTI agents and residual risk especially for HBV.

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WHAT ARE THE ADVANTAGES AND DISADVANTAGES OF UNIVERSAL LEUKOREDUCTION

Berrin UZUN

Leukoreduction is a process in which the white cells, ordinarily present in collected blood components, are intentionally reduced in number. Through the use of centrifugation or filtration, 99.995% leukocyte reduction can be accomplished. Leukoreduction may occur in two forms: prestorage filtration or poststorage filtration. The most common form used in Europe and the USA is prestorage leukoreduction, which removes leukocytes before they can contribute to the storage lesion (RBCs) or transfusion reactions (platelets/RBCs). The process allows the opportunity for better quality control, has not been associated with acute hypotensive episodes, and eliminates the need for transfusion services to manage fitler inventories and for nursing staff to maintain multiple blood administration protocols.

However, Prestorage leukoreduction, at the present time, is more costly than poststorage leukoreduction. Poststorage filtration may be beneficial because the filter may remove undesired substances that accumulate during storage.

There are some accepted and some controversial advantages associated with universal leukoreduction (**Table 1**). First, it is widely accepted that leukoreduction is an effective technology for reducing recurring transfusion reactions. It is likely that the use of selective leukoreduced blood for these recipients eliminated many of the recurring nonhemolytic transfusion reactions. It has been argued that the application of universal leukoreduction would result in a substantial fall in reported transfusion reactions for RBCs. However, populations of patients who historically have received nonleukoreduced blood (eg, surgical patients, patients with acute gastrointestinal bleeding) account for a very small percentage of the total number of reported transfusion reactions. Because of this selection bias, when an institution changes from selective leukoreduction to universal leukoreduction, only a small decrease (perhaps not statistically significant) will be observed in the reported transfusion reaction rates, although formal studies designed to detect milder reactions may show a significant decrease.

The assertion, therefore, that universal leukoreduction will have a dramatic impact on reported transfusion reaction rates is likely exaggerated, and institutions converting from selective leukoreduction (which, for practical purposes, reduces many of the transfusion reactions) to universal leukoreduction should have a low expectation that there will be a material difference in reported transfusion reaction rates. In contrast, leukoreduced products certainly will result in the reduction in primary HLA alloimmunization. A policy of selective leukoreduction for patients at risk for transfusion complications resulting from anti–class 1 HLA antibodies probably mitigates most of this adverse effect. Thus, the application of universal leukoreduction to prevent primary HLA alloimmunization in recipients for whom no immediate or short-term benefit is anticipated is difficult to justify. However, younger recipients of blood transfusion who become HLA alloimmunized by blood transfusion and require multiple platelet transfusions in the future may constitute a delayed complication of non–leukoreduced blood transfusion, which is not realized until many years after the initial transfusion event.

Leukoreduction is a known effective strategy for reducing the transmission of cell-associated viruses. The most prominent among these viruses are the herpesviruses, particularly cytomegalovirus (CMV or human herpesvirus [HHV]-5). There also should be reduction in the transmission of other herpesviruses, such as Epstein-Barr virus (HHV-4) and HHV-6 and HHV-8, although the clinical implications of this are largely unknown. Again, a policy of selective leukoreduction probably achieves most of the same benefit of preventing primary CMV disease in recipients at risk for this complication. However, the clinical implications of transmitting CMV infection by blood transfusion to people who are not at risk for CMV disease are unclear. Conventional thinking is that this is innocuous. At least on theoretical grounds, avoiding CMV infection by blood transfusion would be desirable, as a current blood transfusion recipient may develop a medical condition at some time in the future for which CMV reactivation could cause substantial morbidity, eg, a renal allograft recipient in which the occurrence of CMV disease could be a serious, life-threatening postoperative complication. Of considerable importance (which has received little attention) is that leukoreduction likely would be an effective strategy for preventing the transfusion-associated transmission of some retroviruses, such as HTLV-I and HTLV-II, which are known to be transmitted only by the transfusion of cellular blood products. This is an important principle in that a processing step (leukoreduction) could obviate the need for a testing step (enzyme-linked immunosorbent assay for anti–HTLV-I and anti–HTLV-II).

There also is the question of improved RBC potency with prestorage leukoreduction. This effect on improving quality (approximately 2%) tends to offset to some extent (although not totally) the reduction in quantitative potency owing to the filtration process itself (approximately 5%-10% RBC loss). With the recent introduction, however, of 500 mL collections, the residual potency of many blood products collected is higher than in the era before universal prestorage leukoreduction, even after filtration. It is unlikely, therefore, that filtration-associated potency loss will result in a noticeable increase in total RBC units transfused.

There are additional possible benefits associated with universal leukoreduction. Leukoreduction filters bind *Trypanosoma cruzi* promastigotes and may reduce the risk of transfusion-associated Chagas disease. In the case of RBCs, bacterial sepsis from *Yersinia enterocolitica* may be reduced by prestorage leukoreduction of the RBC product. Some cases of transfusion-related acute lung injury have been attributed to the presence of allogeneic leukocytes in the stored RBC product, although most cases are due to the passive transfusion of anti-HLA antibodies, which react with recipient neutrophils.

There are other possible areas that are controversial but have considerable implications for the benefits of universal leukoreduction. First, there is literature on the value of leukoreduction (mostly poststorage) for preventing postoperative complications in patients undergoing surgery. This is one of the more contentious and difficult areas.

There also is reported evidence of improvement in morbidity and mortality in cardiac surgery. Two reports have been published, one involving a large series of patients in whom the mortality rate was 50% less in patients receiving leukoreduced blood (regardless of whether it was prestorage or poststorage leukoreduced). The findings of this large study suggest that leukoreduction should be applied for patients undergoing cardiac surgery in order to improve patient outcome.

There are some useful practical aspects to be considered once a policy of universal prestorage leukoreduction is adopted vs a policy of selective (poststorage) leukoreduction. From the transfusion service perspective, the timeconsuming need to search for CMV-seronegative blood products can be eliminated. Inventory of multiple filters for RBCs and platelets can be eliminated. Inadequate inventory control may cause these filters to be unavailable at particular times, creating urgent situations and logistic difficulties. Furthermore, some patients (eg, in the operating room) require transfusion of RBCs at a more rapid rate than is customary with elective RBC transfusions. Under these

circumstances, different filters capable of achieving leukoreduction at rapid RBC infusion rates need to be in stock. Although it is difficult to estimate the amount of time and resources consumed in all of these processes, in the aggregate, they are likely to be quite substantial. The application of a policy of universal leukoreduction has some practical advantages for blood administration, whereby this process essentially can be standardized, and further modifications of this process incorporating the use of bedside leukoreduction filters for subpopulations of patients are no longer necessary. This eliminates the need for nurses to be trained specifically in the tech technology of using bedside filters for defined (selected) transfusion recipients. Also, procedure manuals do not need to reference specific filters, avoiding documentation difficulties filters is a perennial problem (particularly with platelets), causing considerable frustration for patients and nurse transfusionists alike. Application of universal prestorage leukoreduction is sometimes seen as improving the efficiency of transfusion, particularly for outpatients, not only in terms of a reduction in transfusion reactions but also in improved patient throughput. Little attention has been given these practical benefits of a policy of universal leukocyte reduction. associated with vendor changes. Furthermore, clogging of filters is a perennial problem (particularly with platelets),30 causing considerable frustration for patients and nurse transfusionists alike. Application of universal prestorage leukoreduction is sometimes seen as improving the efficiency of transfusion, particularly for outpatients, not only in terms of a reduction in transfusion reactions but also in improved patient throughput. Little attention has been given these practical benefits of a policy of universal leukocyte reduction.

Disadvantages of Leukoreduction

The major disadvantages associated with leukocyte reduction are those of cost and logistics (**Table 2**). Logistics and cost are clearly interrelated, since incurring extra expenditures and resource consumption is, when properly applied, an effective means of overcoming logistic difficulties. As stated previously, there is some loss in product potency associated with leukoreduction technology, although, at the present time, for RBCs this is unlikely to cause an increased demand for blood transfusion because of the concurrent increase in the volume of whole blood collections that offsets this loss in product potency. With regard to the loss in platelet potency, a substantial number of platelets already are being leukoreduced in the institutions that use a policy of selective leukoreduction. In the remaining platelet transfusion situations, eg, cardiac surgery and trauma, there is already considerable uncertainty about the therapeutic dose of platelets, such that a 10% to 15% quantitative reduction is unlikely to be noticeable clinically. As in the case of RBCs, the increase in whole blood collection will increase the platelet potency of whole blood–derived platelets by 11%, negating the filtration effect.

Table 1: Advantages of Universal Leukocyte Reduction

- Reduction in total number of transfusion reactions
- Reduction in primary HLA alloimmunization
- Reduction or elimination in the transfusion transmission of CMV, HTLV-I, and other cell-associated viruses such as EBV, HHV-6 and HHV-8
- Improvement in RBC quality
- Possible reduction in
  - Parasite transmission (Toxoplasma gondii)
  - Bacterial sepsis from RBCs
  - Prion disease transmission by blood transfusion
  - Transfusion-related acute lung injury
- Possible reduction in transfusion-associated morbidity and mortality
  - Postoperative infections in abdominal surgery

Morbidity or mortality in cardiac surgery
Organ dysfunction in patients in the ICU

- Simplifies inventory management; avoids errors; reduces transfusion service workload
- Simplifies blood administration; no requirement to maintain nursing procedures for special filter use, training, filter failure: improves efficiency of nursing time

CMV, cytomegalovirus; EBV, Epstein-Barr virus; HHV, human herpesvirus; HTLV, human T-lymphotropic virus; ICU, intensive care unit.

Table 2: Disadvantages of Universal Leukocyte Reduction

- Cost
- Logistics

2% loss of red blood cells
Platelet loss of 11% due to trapping

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CURRENT STATUS OF BACTERIAL CONTAMINATION OF BLOOD COMPONENTS

İsmail Yaşar AVCI

Improvements in blood banking (e.g. in donor selection, leukocyte depletion, introduction of new-generation ELISAs, mini-pool nucleic acid testings and pre-donation sampling), have reduced the resudual risk for the transmission of clinically relevant viral agents to far below that of bacterial ones(1–3).

The residual virali nfectionrisk is less than 1:1000000. In contrast, the risk for bacterial infections in general has remained stable and ranged between 1:2000 and1:3000, and the incidence for fatal septic reactions ranges between 1:100000and 1:500000 (4).

Contaminated blood units may contain a numbers of virulent bacteria as well as endotoxins that are considered to be fatal to the recipient (5,6).

All blood components can be contaminated, but platelet concentrates due to their storage at room temperature have the main focus. However, transfusion-related septic reactions have also been reported for red cell concentrates.

The bacterial contamination of blood products represents an on-going challenge in transfusion medicine, although increased scientific research has been performed and many developments have been achieved with in the last decade.

There are three major distiguishing aspects for bacteria from viral agents: The potential sources of bacterial contamination of blood collected for transfusion are skin flora introduced at the time of phlebotomy and from bacteria in the donor's bloodstream (7-9).

Improved donor arm disinfection is important to reduce the bacterial concentration prior to puncture. Independent of the disinfection fluid, diversion of the first 10–40 ml after blood puncture reduces the residual bacterial infection risk by approximately 50%. Diversion has been a general procedure to improve blood safety due to bacterial infections (10,11).

The second major point is that bacteria are growing pathogens. Very few viable microorganism (estimated at only 10–100 bacteria per bag or 0-3 CFU/ml), can grow over time and achieve transfusion-relevant concentrations prior to transfusion (4,10,11).

The last one is that each bacterium hase different behaviours in response to environmental conditions. Some of them need strongly aerobic or anaerobic growth conditions (4).

Most patients transfused with contaminated blood products do not show immediate clinical signs. Active surveillance suggests patient risk 10- to 40-fold higher than passive hemovigilance especially in neutropenic

patients, passive hemovigilance fails to reliably detect such reactions, and that commonly used clinical diagnostic criteria are not useful for the recognition of transfusion reactions associated with exposure to bacterially contaminated platelets. (12,13).

Among the bacteria confronting in of contaminated blood transmission are gram negative bacteria including *Klebsiella pneumoniae, Escherichia coli, Yersinia enterocolitica, Pseudomonas fluorescence, Pseudomonas aeruginosa* and gram positive bacteria including *Bacillus* and *Staphylococcus*. Greatest contamination in red blood cell units is mostly created by Yersinia enterocolitica. Among other organism associated to red blood cells contamination are *Serratia marcescens, Serratia liquefaciens, Pseudomonas aeruginosa* and various species of *Enterobacter* (14).

TRANSMISSION FROM ASYMPTOMATİC BACTEREMİC DONOR

The major source of bacterial contamination in blood prod¬ucts is the donor arm (15,16), and to a much lesser extent donor bacteremia (17) contaminated collection equipment, (18) contamina¬tion of the blood (product) during processing (19,20) and finally procedures around transfusion in the hospital.

In the majority of cases, bacteremic donors will be sick enough to avoid donation. However, bacteremia can be asymptomatic during the incubation period and low-grade in chronic infections or can be transient, eg, after dental procedures (21,22).

Yersinia enterocolitica is one of the most important bacteria in asymptomatic healthy blood donors as a result of a low-grade infection. Indeed, half of the Yersinia cases reported were asymptomatic. Transfusion of red cells con¬taminated with Y. enterocolitica after long storage is most risky. It is one of the few human patho¬gens able to grow at 4°C (psychrophilic) (23).

For platelet concentrates, contamination with Y. enterocolitica does not seem to be a problem, related to the siderophilic character of Yersinia. After a peak in the mid-1990s, probably related to the increased use of leukocyte-depleted blood products, the incidence of transfusion-related Yersinia infections seems diminished (24-26).

Many bacteria may be involved in asymptomatic bacteremia. Transfusion transmission of Salmonella enterica and Staphylococcus aureus from asymptomatic bacteremic donor was also reported (27). Gram-negative bacteria usually cause the most severe septic reactions in the recipient due to the presence of lipopolysaccharides or endotoxin, even in killed bacteria (28).

DISINFECTION of VENIPUNCTURED SKIN

The skin-derived organisms (resident and transient) account for over 90% of reported platelet concen¬trate- and 70% of reported erythrocyte concentrate-associated bacterial transmissions (29-31). Effective disinfection of the skin will result in reduction of bioburden during skin penetration upon venipuncture.

A single-step 2% chlorhexidine swab disinfection technique is superior to other technique (32) but the result depends also on the quality of the skin. Dimpled skin or skin with scars or eczema will prevent proper disinfection of the surface. It has also to be kept in mind that surface disinfection will not reach microorganisms in the deeper layers of the skin or those present as biofilms(27).

DIVERSION OF FIRST BLOOD VOLUME

Most of the microorganisms found in blood bag were most probably derived from the skin of the donor, either resident or transient. Therefore, it was suggested to avoid use of the first volume of collected blood. During venipuncture, a so-called skin plug containing bacteria was punched by the needle. If the first volume of blood, containing this skin plug with bacteria, would be removed, this would reduce the bacterial load considerably(27).

Studies showed that removal of the first collected volume resulted in a lower degree of bacterial contamination and by incorpo¬rating a small pouch with a Y-piece into the collection line of standard blood-collection systems, the diverted volume could be collected in a closed system and used for testing (10,11).

SCREENING for BACTERIAL CONTAMINATION

Platelet concentrates are most likely to be contaminated, as these products are stored at room temperature, under aerated conditions with high concentrations of glucose and other nutrients for bacteria. For single-donor platelet concentrates, screening of platelet concen¬trates for the presence of bacteria means indirectly screening of red blood cells, but apheresis platelets also must be screened.

Early Testing

Blood culture can be considered the method of choice, despite the disadvantage of being time-consuming. For most of the bacteria related to bacterial transmissions with high clinical impact, in automated culture systems, the cultures flag positive within the first 24–48 hours of culture.

Early culture testing resulted in a 50%–75% decrease in septic transfusion reactions (STRs), especially those due to Gram-negative bacterial contamina¬tion (10,33). Despite the use of early testing, some platelet concen¬trates remain contaminated with bacteria and sometimes result in STRs in recipients. This may due to false-negative testing results. For several bacterial spe¬cies (*Staphylococcus epidermidis, Streptococcus pyogenes, Klebsiella pneumonia, and Escherichia coli*), with a spiking of ~10 CFU per unit of platelets (actually 0.01–0.23 CFU/mL), the bacteria were able to grow to very high levels in platelet concentrates during storage (34).

Late, Rapid Testing

Platelet units with bacteria concentrations of$<10^5$ CFU/mL are much less likely to cause severe STRs than units with higher bacteria concentrations (35). So late testing can also be allowed to be less sensitive, as the level of bacteria shown to be harmful to patients is around 10^3 CFU/mL or higher. However, units with a low bacteria concentration might still be responsible for STRs at a later moment, especially for patients with vascular implants.

There are few number of assay currently licensed in the US for secondary screening of platelets. Some are Pan Genera Detection (PGD) test from Verax Biomedical (Marlborough, MA, USA) and the BacTx® from Immunetics Inc. (Boston, MA, USA) (27).

Alternative methods for rapid testing are flow cytometry-based methods, nucleic acid testing (polymerase chain reac¬tion=PCR),and delayed sampling before culturing in BacT/Alert. Standard flow cytometry did not meet the criteria for sensitivity, and although BacT/Alert was able to meet these criteria. The flow-cytometry method called BactiFlow® (BioMérieux), was found to be sensitive enough and took about 2–3 hours. Also, 16S deoxyribonucleic

acid testing with PCR was found to be sensitive enough for late testing. that BactiFlow and 21S RNA reverse-transcription PCR were shown sensitive enough to be used for late testing (36-39).

RESUDUEL RISK AFTER OF SCREENING

One in 1,500 units was contaminated with bacteria that were not detected by early automated culturing. Based on clinical data, the STR rate following transfusion of whole blood-derived platelets screened for bacteria from 2007 to 2011 was estimated to be one in 100,000 (40).

PATHOGEN INACTIVATION TECHNIQUES

Pathogen inactivation techniques were mainly focused on viruses, either well-known viruses like HIV and hepatitis C or new viruses thought to threaten the blood supply. The available methods for pathogen reduction, currently restricted to platelet concentrates and plasma, have been shown to be very effective in killing most bacteria spe¬cies(41). But the current methods for pathogen inactivation have a negative effect on the quality of platelets, although this is not always reflected in clinical effectiveness (42).

STORAGE-TIME REDUCTION

Fresher units have a lower risk for STRs than units stored for up to 5 days, with a clear increase in risk from day 3 of storage and most fatalities related to units stored for 5 days (30).

An option to decrease STRs could be to screen platelets with an early culture method and to transfuse platelets as early as possible in their shelf life. Units stored longer than 4 days, a late and rapid testing should be implemented to reduce the risk that highly contaminated units would be transfused.

APHERESIS VERSUS POOLED PLATELETS

No significant difference in risk between pooled or apheresis platelets (27).

WHAT DO GUIDES SAY?

Turkish National Guide For Preperation, Use And Quality Assurance Of Blood And Blood Components:

Bacterial quality control tests may be employed on all blood components. For this purpose bacterial cultures of platelets are most often used. If bacterial cultures of platelet concentrates will be employed as a general contamination indicator, bacterial culture shall be performed at the suitable time and under appropriate conditions.

Sampling can be done after 48 hours for single unit platelet concentrates derived from whole blood. If a sample will be taken from a pooled or aphaeresis platelet concentrate, it might be taken at any time within the first five days following the donation.

With agitation, the maximum storage time is 5 days. Can be extended up to 7 days when a method is used in order to determine or reduce bacterial contamination.

In order to provide the quality control that aseptic conditions are observed during blood collection practice,

blood service unit must determine the ratio of bacterial contamination in platelet concentrates. To this end, 5 % of the issued platelet units (including the expired units) shall be sampled to make bacterial cultures.

In the event that donated units in the blood service center are not processed to obtain platelet concentrates, then blood components (whole blood or erythrocyte concentrates) corresponding to 1 % of the number of all blood donations shall be cultured.

In case rate of contamination exceeds 0.4% in random platelet concentrates and 0.2% in other blood components, potential sources shall be searched; corrective and preventive measures shall be carried out; all blood collection and product processing procedures shall be re-validated (43).

European Guide to the Preparation, Use And Quality Assurance Of Blood Components

As a quality control for aseptic collection of blood components, blood collection centres should determine the rate of bacterial contamination in platelets at least yearly by culturing 1500 or more units (about 30 units per week or 5% of units released after 48 hours of collection, whichever is larger).

Routine pre-release bacteriological testing of all platelets to establish a criterion for issue of platelets as "culture-negative to date" obviatesrecommendations in "Quality control of aseptic collection and processingof blood components". Sampling of platelets for the purpose ofestablishing a release criterion based on a negative result of bacterial cultures requires that the integrity of the closed system should be maintained.

The quality of platelets is preserved if the pH stays continuously above 6.4 under storage period used.

The impact of transport conditions on the quality of platelet components should be validated by quality control tests, e.g. swirling tests and pH measurements of components at the end of storage period.

The maximum storage time for Platelets, Rec, Pool is five days. Storage may be extended to 7 days in conjunction with appropriate detection or reduction of bacterial contamination (44).

CDC, AABB and FDA Recommandations:

CDC and FDA recommends the implementation of measures to improve the safety of platelet transfusions from bacterial contamination and has approved multiple novel technologies to that end, including 2 rapid diagnostic tests that are performed on the day of transfusion to detect high concentrations of bacteria (105 CFUs per mL) and a pathogen reduction process that is performed soon after collection and is capable of inactivating most but not all bacteria, viruses, protozoa, and leukocytes.

FDA mandate the use of approved technologies to reduce the risk of bacterial contamination, as a means to ensure universal implementation.

The AABB emphasizes the need to recognize and provide a timely response to suspected STRs and to protect other patients from receiving contaminated co-components (45).

Red Book -Guidelines for the Blood Transfusion Services:

Bacterial sampling after skin cleansing with 70% isopropyl alcohol/2% chlorhexidine gluconate will reveal bacteria at a rate of no greater than 2 cfu per standard contact plate.

A minimum of 20 mL of the first part of every blood donation should be diverted into a side-arm pouch.

There should be a means of detecting bacterial contamination of platelet components, using validated methods. The key requirements of a detection system are (i) effective sample size, (ii) a rapid test result or automated 24-hour readout with alarm notification and (iii) reliable detection of bacteria at a level indicating emerging risk to recipient (46).

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TRIM
IMPORTANCE AND PREVENTIVE STRATEGIES

Salih Haldun BAL

Transfusion is life saving. But it has serious and life threatening complications. These can be classified as infectious, immunological and non-immunological complications. One of the immunological complications is transfusion related immunomodulation (TRIM). TRIM describes various benefical or deleterious clinical effects that occured by some alterations in the immun status of the transfusion recipient after allogeneic blood transfusion (ABT). These clinical effects have been summarized as the followings (1-2):

Benefical effects:

- Enhanced survival of renal allograft
- Reduced recurrence rate of Crohn's disease
- Decreased rate of recurrenced spontaneous abortion

Deleterious effects:

- Increased recurrence rate of resected malignancies
- Increased incidence of postoperative bacterial infections
- Icreased short term mortality (up to 3 month)
- Activation of endogenous CMV or HIV infection

TRIM was firstly reported at 1973 in patients who underwent renal transplantation. It was observed that pretransplant ABT could improve allograft survival (3). But this benefical effect has not been corroborated by randomized controlled trials. However, ABT has been accepted as a standart procedure before renal transplantation until the AIDS pandemia. In course of time many studies have shown other effects of TRIM (4-14).

It is not clear, how TRIM phenomenon occur? Until today, studies about TRIM haven't provided any significant proof of the presence and any explanation for main mechanisms of TRIM (15). A lot of parameters were investigated in these studies like allogeneic leukocytes and dendritic cells (16-17), soluble Fas ligand (sFasL) (18-19), soluble class I HLA molecules (sHLA-1) (19-20), microchimerism (21-22), biologic response modifiers like histamine, eosinophilic cationic protein, myeloperoxidase (23), cytokines (19, 24-26), bioactive lipids (27-28), supernatant of red blood cell concenrate (RBCC) (29-30), storage time of blood component (31-32) and many other potential agents. A set of alterations in recipient's immun system after ABT have been postulated through these studies. Decreased helper T (Th) lymphocyte account, natural killer (NK) cell function, ratio of CD4/CD8, antigen (Ag) presentation, lymphocyte blastogenesis, late type hipersensitivity reaction, cytokine production, monocyte/macrophage phagocytic function and increased anti-idiotypic and anti-clonotypic antibody (Ab) production are some of these postulated mechanisms (33-34).

All these postulated mechanisms and paratmeters are summarized in a review. TRIM orginates from three main sources (1):

1. *İmmunologically active and intact allogeneic white blood cells (WBC):* Allogeneic WBCs or mononuclear cells (MNC) exist in blood components. If the donor cells are not cleared by a special process, they can pass to recipient circulation through ABT and trigger TRIM. Many studies have shown that the donor MNCs could contribute to the TRIM development (16, 35). Allogeneic MNCs may mediate TRIM by various mechanisms. For example, they can manipulate the recipient's lymphocyte clones that are spesific to itself to deletion (36-37) or to anergy (38), also they can lead to microchimerism (39-40) and immunosuppression through apoptotic MNC transfer (41-43).

2. *Soluble, leukocyte derived mediators accumulating in the supernatant fluid of stored RBCCs:* The soluble and leukocyte derived mediators that accumulates in the supernatant at storage time of RBCCs are very various. Although these mediators are usually secreted from donor's MNCs, they may be secreted from other blood cells. For example, free Hb is derived from red blood cells and lipid mediators from many others. Various studies has shown that RBCC's supernatants and soluble mediators may contribute to TRIM (23, 29, 44-46). It was shown that they could lead to immunosuppression in the ABT recipient (29, 47-48).

3. *Soluble HLA peptides circulating in allogeneic plasma:* sHLA-I has been found significantly elevated in supernatant of 30 days old stored RBCCs (44). Elevated sHLA-I levels are corelated with long storage time and residual leukocyte in RBCC. sHLA-I may induce TRIM by various mechanisms as clonal deletion (49) and immunosuppression (44, 47).

As seen above, it is possible to suggest that allogeneic MNCs and derivatives are the most important sources of the TRIM phenomenon. In spite of many studies that support this view (14, 50-53), some studies support the opposite (54-62). Therefore MNCs and derivatives are not considered as the only source of TRIM. If only these three sources that are derived from MNCs lead to TRIM, prevention of it's development would be possible with predeposit or universal leukoreduction. Some different mediators which are not derived from leukocytes like lipopolysaccharides, non-polar lipids, lysophosphatidylcholines (63), eicosanoid (64), free iron (65-68) may also induce TRIM. In addition a lot of different variables may trigger TRIM too. For instance, some properties of red blood cells such as microparticles (69), RBCCs storage time (70-75) and transfused product number (14, 53) were shown as other sources of immunomodulatuary effects.

The incidence of TRIM is not well known. But it can be harmful for the patient like other transfusion complications. This unwanted effect may be hazardous with not only it's direct effect to the patient, but also extended hospitalization time and increased expenses of treathment. TRIM should be prevented if it's possible. But there aren't any well known efficient preventive strategies. The potential reasons of TRIM can be classified like the followings:

- Leukocytes
- Mediators and molecules, derived from leukocytes
- Mediators and molecules, derived from red blood cells
- Mediators and molecules, derived from neither leukocytes nor red blood cells
- Prolonged storaged time
- Transfused product number

When these reasons are evaluated, leukocytes and mediators/molecules derived from them seems to be the most important source of TRIM. Therefore leukoreduction might be the most efficient preventive strategy. But its prevenive effect occasionally can fail due to other potential reasons mentioned above.

Efficiency of leukoreduction on preventing the TRIM is variable. To date, a lot of studies, reviews and meta

analyses have been published. While some of them have shown the preventive effect of leukoreduction on the hazardous impacts of ABT (14, 45, 50, 53, 76-78), some of them have shown contrast results (1, 79-81). Mediators and molecules that derived from other cells than leukocytes which exist in the supernatant fluid of RBCC can limit the leukoreduction's effectiveness. All these mediators and molecules may be actual reasons of TRIM. But the most important thing is that there isn't any sufficient method to take away the all these mediators and molecules from RBCC's supernatant. Therefore other preventive policies have to be improved. Prolonged storage time of RBCCs may another cause of TRIM due to critical accumulation of mediators in the supernatant. For example, as a new preventive strategy, old blood components might not be used for transfusion. But this strategy doesn't seem to be practicable, because this could lead to a great disposal of blood components because of a shortened shelf life. Moreover, to prevent unnecessary ABTs would be another strategy, not only for preventing TRIM, but also for other transfusion reactions.

Finally, we know that TRIM is an impotant transfusion reaction. Although it's mechanisms and reasons are still unkown, it is hypothesed that allogeneic leukocytes and various mediators/molecules in the RBCC might induce TRIM. Efficient preventive strategies still do not exist. In spite of universal leukoreduction seems to be the most preventive implementation, it has some limitations. Hence, avoiding unnecessary ABTs is one of the most important issue in transfusion medicine.

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MASSIVE TRANSFUSION

Nil GÜLER

Traditionally, massive Transfusion (MT) is described as the transfusion of more than 10 U per 24 hours. But this definition is insufficient because excludes patients died before 24 hours (1).

Approximately 10% of all injured trauma patients are transfused one or more units of blood and 30% of them need a MT (1). Models which describe the protocol for MT are mostly retrospective and based on the data collected from chart review. The Prospective Observational Multicenter Major Trauma Transfusion (PROMMTT) study gives us to a model to predict MT (1). According to this study current definition of MT may not catch the patients with significant mortality. A dynamic rate-based MT definition as the greater than 4U/h transfusion allows us early identification of patients with a significant mortality risk (1).

Up to one third of severely injured patients coming in the emergency room have a problem with hemostasis. It begins very soon after severe injury (1). Severe traumatic blood loss leads to the acute coagulopathy of trauma shock or trauma-induced coagulopathy (2). Because of that there is an opinion to start transfusion before admitting to hospital. Blood products for emergency status are type O negative uncrossed packed red blood cell, AB-negative plasma, and single donor platelets. It needs to keep several thawed universal donor (AB) plasma units (4–6 units) at all times (2).

The Pragmatic, Randomized Optimal Platelets and Plasma Ratios (PROPPR) and the study of Holcomb in 2008 demonstrated the benefit of transfusing higher plasma and platelet ratios in massively transfused trauma patients (7). Significantly less severe bleeding and overall higher survival at 3h has been demonstrated in ratios of fresh frozen plasma (FFP) : platelet concentrate :RBC (1:1:1) group compared with the 1 : 1 : 2 arm. Findings supported to no increase in complications and 4% reduction in mortality (2,3).

Trauma-induced coagulopathy is caused by multiple factors, such as anemia, hemodilution, hypothermia, acidosis, shock, and serious trauma itself (4). Early 'haemostatic resuscitation' is lifesaving (5). Damage control resuscitation (DCR) and damage control surgery (DCS), hemostatic resuscitation are essential in patients with severe hemorrhagic shock in the trauma patient (2). Hemostatic resuscitation aims to minimize dilutional coagulopathy (2). Low platelet and FFP, high amount of Erythrocyte Suspension cause dilutional coagulopathy.

Hemostatic resuscitation needs to be guided by laboratory study. However current laboratory tests such as PT, PTT are not enough to define the invivo real coagulation strength, fibrinolysis and platelet function (6). There isn't any test to determine the endothelial function (2).

Hemostatic analysis with viscoelastical hemostatic assays which include both TEG and thromboelastometry can identify deficits in clotting factors, initiation of clot, clot strength, and excessive clot breakdown. The rapid TEG uses tissue factor in addition to kaolin to speed the initiation of the clotting process (7). It may guide to give tranexamic

acid therapy if the patient is within 3h of injury (2).

AB plasma can be transfused because it doesn't carry anti-A and anti-B when the blood group is unknown and transfusion has to be switched to ABO-identical plasma once the blood group has been determined. In the absence of AB plasma, transfusion of A plasma seems safe. O plasma isn't appropriate because carries both anti-A and anti-B (8).

Conclusion: Firstly we have to aware that, massive transfusion can be harmful if hemostasis principles ignored. These patients can be hypothermic, hypotensive and with trauma induced hyper fibrinolytic status. Prehospital blood product transfusion and appropriate hemostasis testing may improve outcomes.

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BLOOD TRANSFUSION PRACTICE IN PREGNANCY AND THE NEONATAL PERIOD

Ece Gül İBRİŞİM

BLOOD TRANSFUSION IN PREGNANCY

Various hematological changes occur in the mother in pregnancy. There is a 40-50% increase in blood volume due to the salt and water retaining effect of increased estrogen while the increase rate in erythrocyte and plasma remains at 30%. This increase in blood volume causes vascular hypertrophy. The hematocrit level in pregnant women can decrease to 30-32%.

Generally, the number of leukocytes is normal during pregnancy but the number of neutrophils may increase. Myocytes can rarely be seen in the peripheral blood. Significant leukocytosis is present during childbirth and the puerperium.

The platelet count may reduce moderately in pregnancy. As the platelet size decreases, the mean platelet volume and platelet distribution with increases. Platelet half-life may be shortened. Changes in coagulation factors are also observed in pregnancy. Increased fibrinogen, factor II, VII, VIII, IX and X levels are observed while there is a moderate decrease of factor XI and factor XIII levels.

Anemia in pregnancy can be acquired or hereditary. It may appear as iron deficiency anemia (IDA), thalassemia, anemia due acute blood loss, sickle cell anemia, inflammation- or malignancy-associated anemia, other hemoglobinopathies, megaloblastic anemia, hemolytic anemias, and aplastic or hypoplastic anemia.

Pregnancy and bleeding diathesis

Thrombocytopenia

Thrombocytopenia (platelet count <150.000/mm^3) is seen in 6-10% of pregnant women.A platelet count<50.000/mm^3 is found in 0.1% of pregnant women. The platelet count is decreased significantly (10%) in the 3rd trimester in pregnancy. Thrombocytopenia in pregnancy can be due to;

1- Gestational (incidental) thrombocytopenia: 74%
2- Hypertensive diseases of pregnancy: 21%
3- Immune thrombocytopenic purpura (ITP): 4%
4- Other conditions: 1% (acquired hemolytic anemia, transfusions, coagulopathy during abruptio placenta, megaloblastic anemia, septicemia, SLE, antiphospholipid syndrome (APS), medications, viral infections, aplastic anemia, excessive radiation, and about 6% of pregnant women using cocaine).

Pregnancy and thrombosis

There is a predisposition to clotting during pregnancy. The thromboembolus incidence during pregnancy is

7/100.000. A blood component transfusion indication can arise in conditions related to the hematologic changes occurring in pregnancy. The decision for such a transfusion will be made in accordance with the general transfusion criteriaby considering the benefit and harms that may occur.

Rh Immunization; This is another condition that closely affects the prognosis of the fetus and neonate during pregnancy and that requires follow-up and treatment. While hemolytic disease due to Rh incompatibility was an important cause of perinatal mortality and morbidity in the past, its incidence has decreased rapidly with the developments in follow-up and treatment within the last 50 years and is now1-6 per 1000 births. Rh alloimmunization related fetal anemia is still seen despite increased anti-D immunoglobulin use. If an Rh(-)mother is not provided prophylaxis, her risk of becoming immunized with an Rh(+) ABO group fetus is around 16%. Of these cases, 1-2% emerge antepartum, 7% as an anamnestic response within 6 months after birth, and 7% as an anamnestic response in the early periods of the second pregnancy. The risk of isoimmunization decreases to 0.2% in mothers who have received prophylaxis with Rh Ig.

In case of a negative **indirect Coombs test** (ICT) at the initial check of a pregnant woman with blood incompatibility (Rh/Rh incompatibility), ICT should be repeated at four-week intervals from the 20th week due to the low possibility of Rh isoimmunization development in the antenatal period. ICT negative pregnant women should first receive prophylaxis with 300 micrograms of **anti-D gamma globulin** in the 28th week. The aim of prophylaxis during this period is to compensate for the fetomaternal bleeding that may occur during the 12-week period until birth. The most important period for a pregnant woman who has not been immunized is the birth itself. **Direct Coombs test (DCT)** from the cord blood of the infant and the infant blood type should be studied following the birth. If the DCT is negative and the infant blood type is Rh(+), anti-D immunoglobulin administration should be repeated. If the blood type of the infant is positive, anti-D immunoglobulin injection should be repeated within the first 72 hours after birth. This prevents antibody formationin the mother and prevents the next pregnancy from being affected by these antibodies. No problem occurs in the first pregnancy with Rh incompatibility. In case of ICT test positivity in pregnant women, titration should be performed. No risk is present in the intrauterine period for the fetus with titers of 1/16 or less. In this case, it is enough to repeat ICT at 2- to 4-week intervals. There is no need to intervene during pregnancy unless the ICT titer is over 1/16. No prophylaxis will be required since only isoimmunization will develop. In case of a titer of 1/16 or above, advanced investigations such as amniocentesis, cordocentesis and USG should be started in order to investigate the severity of the impact. If the condition is serious, changing the infant's blood in the mother (intrauterine transfusion) can be required.

The other common causes of fetal anemia are maternal parvovirus infection, chronic fetomaternal hemorrhage, erythrocyte function disorders, and twin to twin transfusion syndrome.

Intrauterine transfusion is required in cases where the fetal hematocrit level decreases to below 30%. Intrauterine transfusion can be performed between the 18th and 35th pregnancy week and can be intravascular, intraperitoneal or combined. Since the hematocrit of transfused blood decreases about 1% a day, repeat transfusions are required every 10-14 days. Although the general complication rate is 3.1% and the general survival rate 89% after intrauterine transfusion, these figures can change according to the gestational week, the center where the procedure is implemented, the experience of the implementing person, and the presence of hydrops in the fetus at the first presentation. About 70% of fetuses with hydrops and 92% of those without hydrops at the time of initial IUT survive. Therefore, determining fetal hematocrit by performing percutaneous umbilical blood sampling before hydrops develops in fetuses suspected of having anemia and initiating simultaneous intrauterine transfusion if required are vital.

Erythrocyte suspensions for intrauterine transfusion: These should have a blood type of 0 Rh(-), collected with CPD, have a Htc of 70-80%,and be compatible with maternal plasma during cross-match, filtered, irradiated, and obtained a maximum of 5 days ago. Post-delivery blood transfusion is often required for fetuses receiving intrauterine transfusion.

NEONATAL PERIOD TRANSFUSION PRACTICE

Neonates constitute one of the patient groups with the highest transfusion requirement. The transfusion requirements and blood components required are different than in adults due to their specific situation. These differences can be listed as follows;

- The growth and maturation of the organs are continuing and they are adapting from the womb to the outside world.
- The expected life duration is longer than in adults in terms of the late effects of the transfusion.
- The blood volume-bag volume relationship is different. They require less blood components than the volume of a standard blood bag.
- Their blood type antibodies are not fully developed.
- The frequency and the volume of blood drawn for tests often causes a transfusion requirement for the blood loss.
- The risk of infections caused by viruses such as CMV is high in premature infants.
- Transfusion indications may differ.
- Transfusion threshold values differ.

The blood components we use in neonatal transfusion are;

WHOLE BLOOD: HDN exchange blood for exchange transfusion should be as fresh as possible (not older than 5 days)

ERYTHROCYTE Susp.: Transfusion is performed in small amounts for chronic anemias of neonates related to the frequent drawing of blood samples and low Hb.

THROMBOCYTE Susp.

FFP

Granulocyte suspensions

NEONATAL BLOOD EXCHANGE REASONS are:

- Hemolytic Disease of the Newborn (HDN)
- Sepsis
- Metabolic Disease
- DIC disorders.

The main indication of blood transfusion in a neonate is the prevention of neurologic complications caused by rapidly increasing indirect bilirubin levels. This situation can emerge due to the inability of the immature liver to metabolize hemoglobin breakdown products. The underlying cause is usually hemolysis due to antibodies that have developed against the erythrocytes of the neonate. Various blood type antigens can cause hemolytic disease of the newborn (Kell, Duffy, Kidd, MNSs and Diego) but Rh is the predominant one. Hemolytic Disease of the Newborn (HDN) related to fetomaternal ABO incompatibilityis one of the commonest indications of blood transfusion in neonates. It develops due to an Anti-A and Anti-B IgG fraction when the blood type is A in the infant and O in the mother. The direct antiglobulin test (DAT) of the neonate can be positive. It usually has a mild course since there is less antigen A and B expression. A diagnosis of ABO incompatibility-related HDN is usually made in infants who

are not significantly anemic at birth but develop jaundice within the first 24hours. ABO incompatibility does not lead to in utero findings and never causes hydrops.

The most effective method in removing bilirubin is double volume transfusion (about 170 ml/kg).If bilirubin levels rise to dangerous levels again, a double volume transfusion should be repeated.

The Characteristics of the Blood Used in Blood Transfusion: This blood is usually mixed by the blood bank with erythrocytes to decrease the plasma hematocrit level to 50-60%. Group O erythrocytes and group AB plasma are mixed and used for blood group incompatibilities (these should be of the O blood type, or the ABO blood type that is compatible with the mother and neonate's plasma). Physiological saline or albumin can be added instead of plasma unless there is ABO incompatibility. If there is no incompatibility, the blood transfusion should be with the same blood type as the child's. Blood that is negative for the antigen that caused the subgroup incompatibility is used. It should not contain the erythrocyte antigen that has the maternal antibodies and should not be older than 5 days. If whole blood will be used in blood exchange, it should be fresh whole blood (not exceeding 24 hours). It should be taken with CPD, be CMV negative or leukocyte filtered, heated, irradiated, and used within 24 hours of the irradiation.

Volume. The volume should be 80- 160 ml/kg for full-term and 100- 200 ml/ kg for premature babies. While 75% of antibody-coated erythrocytes are removed with a single volume transfusion, 90% of antibody coated erythrocytes and 50% of bilirubin are removed with a double volume transfusion. Transfusion is conducted in 15 ml increments in full-term infants and at smaller volumes in smaller infants.

PRETERM infants: 80% of this group and especially those with a birth weight under 1500 grams will need a transfusion. They require erythrocyte suspensions as a large number of repeated volumes (10- 20 ml/kg) within the first few weeks of life. They will often encounter more than one blood donor. An inadequate erythropoietin response, short survival of fetal erythrocytes, and the large amount of losses from phlebotomy cause anemia in this group. The transfusion possibility is inversely related to gestational age and birth weight and directly related to phlebotomy losses.

The aims of neonatal blood transfusion should include minimizing the risk of encountering different donors and decreasing the number of transfusions. The basic logic of the transfusion decision is that the absolute benefit for the patient should overweight the unavoidable harm. Therefore, it should be possible to prepare the erythrocyte concentrate used for transfusion in neonates in small volumes or use it by dividing it into several parts. This procedure decreases waste of blood. The number of donors the infant encounters is also reduced and transfusion complications are therefore reduced. The cost is reduced and administration of more blood to the baby than was calculated is prevented.

Characteristics of an erythrocyte suspensionto be used in a small volume transfusion:

The transfusion should be of an ABO blood type compatible with the mother and neonate's plasma, should be the Rh D blood type compatible with the newborn or Rh D (-), should not be older than 35 days with SAG-M, should not be older than 21 days with CPD, and should be irradiated and used within 24 hours of irradiation. Htc should be 50- 60% and the transfusion rate should be monitored. A transfusion rate of 5 ml/kg/hour is considered safe. A transfusion volume of 20 ml/kg instead of 10 ml/kg is recommended.

What are the thresholds often recommended for erythrocyte transfusion?

Within the initial 24 hours	Hb: 12 g/dl
Neonatal ICU, initial week cumulative blood loss	About 10% of blood volume
Infant requiring intensive care	Hb: 12 g/dl
Acute blood loss	About 10% of blood volume
Late anemia, stable patient,chronic oxygen dependency	Hb: 11 g/dl

The Principles of Fresh Frozen Plasma Transfusion in the Neonatal Period

The use of plasma transfusions in neonatal intensive care units is controversial. There is no mortality decreasing effect, neurologic development supporting effect, intraventricular hemorrhage preventing effect, or cardiovascular supporting effect. they also cannot be used as a volume expander, to comb at infections, or for immunological support.

Clotting duration in term infants is longer than in adults due to inadequate synthesis in premature infants, even without any pathology. Coagulation parameter values should therefore be interpreted by comparison with the normal values of the age group. A 15 ml/kg/dose of ABO compatible fresh frozen plasma (FFP) transfusion is recommended in neonates with significant coagulopathy (PT and aPTT values 1.5 times higher than normal) when a risk of hemorrhage is present (preterm, intubated or history of periventricular hemorrhage)or in neonates with significant coagulopathyand those about to undergo a serious invasive intervention. FFP is not used to treat polycythemiaunless there is comorbid coagulopathy.

The Principles of Thrombocyte Transfusion in the Neonatal Period:

75% of sick neonates have temporary thrombocytopenia within the first two days of their life. Thrombocytes start to increase around the 4th day. They usually reach normal levels around the 10th day (86%).

If the number of thrombocytes is $<100x10^9$ L and bleeding is present
If the number of thrombocytes is$<50x10^9$/L and an invasive intervention will be performed
If the number of thrombocytes is$<20x10^9$ /L and the patient is clinically stable
If the number of thrombocytes is$<100x10^9$ /L and the patient is not clinically stable

In the presence of hemorrhage in any qualitative thrombocyte disorder or during an invasive intervention regardless of platelet count.

What is the recommended treatment strategy in neonatal alloimmune thrombocytopenia?

Antigen-negative thrombocytes usually obtained from the mother or rarely from another allogeneic donor are used together with a high dose of IVIG for neonatal alloimmune thrombocytopenia.

A platelet count above $30x10^9$ /L is recommended in this patient group.

The Principles of Granulocyte Transfusion in the Neonatal Period

This transfusion is used in presence of a neutrophil count $<3x10^9$/L in the first week of life or$<1x10^9$/L in the later period and when a severe bacterial or fungal infection does not respond to antibiotic or antifungal treatment.

Granulocyte concentrate transfusions are administered on a daily basis. They are continued until the infection improves or the neutrophil count becomes>1x10^{9} /L. The product must be ABO compatible, cross-match certified, and irradiated.

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BLOOD BANKS WORKING WITH TRANSPLANTATION CINICS

Nurhilal BÜYÜKKURT

- **Role of Transfusion Medicine in Transplantation:**

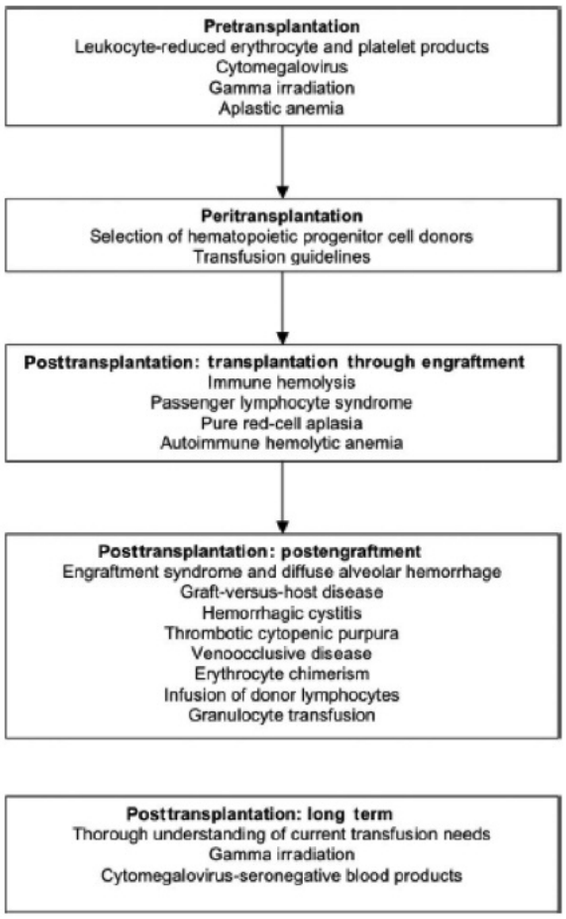
Hematopoietic progenitor cell (HPC) transplantations are used to treat hematologic malignancies, solid tumors, aplastic anemia/marrow failure states, and a continuously expanding list of autoimmune and inherited metabolic and immunodeficiency diseases. The increase in the number of HPC transplantations performed has impacted transfusion services, not only in hospitals where transplantations are performed, but also in hospitals that do not perform transplantations but may become involved in managing patients before or after the procedure. Outcomes of the HPC transplantation may be compromised with transfusion because of;

The alloimmunization from human leukocyte antigens (HLAs) with transfused products,
The immunohematologic consequences of ABO-mismatched transplantations. [1, 2]
The impact of immunosuppression associated with the HPC procedure.[3]

Transfusion support may differ in the three phases of transplantation pre, peri and post transplantation. Transplantation clinics must consider some issues with their blood bank as ABO issues, irradiation requirement, alloimmunization risks, and other product modifications at the time of pretansplantation period (Figure 1).[4]

On the other hand transfusion medicine holds a place of primer importance in solid organ transplant surgeries. The dependency on ABO and HLA matching has decreased considerably with the use of modern immunosuppressant drugs and transplant techniques. The greatest advance in clinical implementation of ABO-incompatible transplants came about through desensitization and isoagglutinin elimination techniques with immunoadsorption and anti-CD20 antibodies becoming the norm.

Figure 1. Transfusion-related considerations for each transplantation period



Before Transplantation; As soon as a patient is identified as a candidate for an HPC transplantation, the patient's physician should communicate this information to the blood transfusion service. HPC transplantation candidates may require special blood components, such as leukocyte-reduced cellular, cytomegalovirus (CMV)-seronegative, and/or -irradiated components.[3,5-7] Optimal use of resources may be compromised before transplantation because of the acuity of the patient's condition or the scarcity of resources.

The number and choice of blood products transfused during an organ transplant surgery is highly variable and it depends on the center and the organ to be transplanted. The perioperative team of doctors; surgeons and anesthesiologists, plays the determining role in the utilization of blood products.[3] The usage of various blood components in solid organ transplants is shown in table 1.[8]

Table 1. Blood products are used in solid organ transplantation

	Red cells	FFP	Platelets
Renal	0–1	–	–
Liver (85%)	3	6–12	2
Liver (15%)	20	30	6
Heart	2–4	1–6	1
Heart after LVAD/ heart–lung	8	12	2
Pancreas	1–2	–	–

Leukocyte-reduced erythrocyte and platelet components:

Reducing the exposure to leukocytes may also benefit potential HPC transplantation candidates (and other selected immunocompromised patients) by decreasing both the incidence of alloimmunization to HLA antigens and the risk of transfusion-transmitted CMV infections. In the multi-institutional Trial to Reduce Alloimmunization to Platelets study(5) a significant number of patients (17%-20%) developed HLA antibodies, although all of their erythrocyte and platelet components had been leukocyte reduced by stringently controlled leukocyte filtration. Results from studies in transfused solid organ transplantation patients showed a comparable incidence of HLA antibodies before and after implementation of leukocyte reduction, showing the incomplete effect of current methods of leukocyte reduction for preventing HLA alloimmunization. While the lack of 100% effectiveness in preventing HLA alloimmunization, authors still recommend transfusing only leukocyte-reduced erythrocyte and platelet components to pre-HPC transplantation patients because it is one of the few tools available to potentially reduce the risk of platelet transfusion refractoriness.

Cytomegalovirus infection:

Prevention of CMV transmission both with transfusions and transplantation components is important for successful transplantation.[9,10] CMV-seropositive rates among blood donors in different cities across the United States range from 40% to 80%,[11,12] in our country this rates is higher than United States. The current American Association of Blood Banks' Technical Manual13 states that a blood component with less than 5x10^6 residual leukocytes may significantly reduce, if not prevent, transfusion-transmitted CMV in transplantation recipients; much of these data were obtained from neonatal and hematologic malignancy patients and anecdotally applied to HPC transplantation recipients. As a result, most transfusion services in the United States now prevent transfusion-transmitted CMV infections by supplying leukocyte-reduced erythrocyte and platelet components. As a result, most transfusion services now prevent transfusion-transmitted CMV infections by supplying leukocyte-reduced erythrocyte and platelet components.

The incidence of CMV infections is significantly reduced in potential HPC transplantation recipients who are CMV-seronegative and who are exposed only to CMV-seronegative blood products (including a CMV-seronegative HPC graft). Avoiding antiviral CMV treatment for select HPC recipients prevents exposure to therapy, which can suppress hematopoiesis or be nephrotoxic, and may improve HPC transplantation survival time.[9,14] Leukocyte reduction filters, although helpful, have not convincingly demonstrated efficacy as a substitute for CMV-seronegative blood products. Access to CMV-seronegative blood products is problematic in many countries, and urgent transfusions should not be delayed until CMV-seronegative blood products are available. Although no formal recommendations exist for how long CMV-seronegative patients should use CMV-seronegative blood product, a prudent course may be to continue use until immunosuppressant is withdrawn.

Gamma irradiation:

Donor lymphocytes may be detected in recipients' circulation for months to years after the transfusion of freshly collected erythrocyte or platelet components (microchimerism).[15] The lymphocytes may engraft in a susceptible immunocompromised host and cause transfusion-associated graft-versus-host disease (TA-GVHD).[16] As a consequence of immunosuppressive treatment, both autologous and allogeneic HPC transplantation recipients are at increased risk for the development of TA-GVHD.[17] Limited data suggest that patients with cancer, bone marrow–failure states, and other diagnoses, such as inborn errors of metabolism and hemoglobinopathies, who may be treated by HPC transplantation, are also at increased risk. [16, 17, 18] Although TA-GVHD is uncommon, the

mortality rate is 88%. Clinical symptoms of TA-GVHD occur between 4 and 30 days after transfusion and may include fever, maculopapular rash, bloody diarrhea, and/or pancytopenia.[21] Gamma irradiation induces chemical crosslink in the DNA of irradiated donor lymphocytes, preventing their proliferation. The recommended dose is 2500 cGy. Gamma irradiation of all cellular blood components is also critical and standard practice in the peritransplantation and post transplantation periods.[19]

Peritransplantation;

The peritransplantation period begins with administration of the immunosuppressive preparative regimen, includes the HPC graft infusion, and extends until engraftment occurs. During this period, all pretransplantation considerations pertaining to blood transfusions remain in effect. Optimally, donor and recipient ABO/Rh (D) types will be serologically compatible, if not identical. However, ABO/Rh (D) mismatches do not exclude a candidate HPC donor. The outcomes of ABO/Rh (D)-mismatched transplantations have been mixed, with some studies associating mismatching with delayed engraftment of erythrocyte or platelet precursors and an increased incidence of acute GVHD and veno-occlusive disease (VOD); however, ABO/RH (D)-mismatched transplantations have usually not been associated with graft failure.[2] The results of 2 retrospective studies evaluating approximately 200 to 300 HPC transplantation recipients each showed a decrease in survival time with either major or minor ABO-mismatched grafts[2], but results of other studies have shown no deleterious impact of donor recipient ABO/Rh(D) mismatching on survival rates.[20] Changing transfusion practice to avoid transfusion of ABO incompatible plasma to HPC transplantation recipients eliminates the effect of ABO donor-recipient incompatibility on survival rates.

If a major ABO incompatibility (ie, donor's erythrocytes are incompatible with recipient's plasma) exists, efforts should be made to minimize erythrocyte content in the HPC graft, even at the expense of a slightly lower HPC content. To minimize risk of exposure to incompatible erythrocyte volume with the collected product when there is major ABO incompatibility between donor and recipients, hematocrit should be kept to less than 2% during aphaeresis collection. If a minor ABO incompatibility (donor's plasma is incompatible with recipient's erythrocytes) exists, plasma may require reduction in the bone marrow product. The volume of plasma that is removed depends on the titer of the offending antibody(s) and the ratio of plasma-to-recipient erythrocyte volume. To minimize risk, many centers will plasma-deplete all minor erythrocyte-incompatible marrow products. HPC products collected by aphaeresis are already plasma- as well as erythrocyte-depleted. For ABO major-minor donor-recipient (bidirectional) mismatches, the bone marrow–derived HPC product must be depleted of erythrocytes and plasma, either through machine mononuclear cell concentration or by density gradient separation.

Because allogeneic HPC transplantations do not require blood group matching between donor and recipients, unique serologic challenges exist for transfusion services.[21] Transfusion services should establish specific guidelines for transfusions that are ABO/Rh (D) compatible with both the donor and the recipient (Table 2). Because transfused erythrocytes may circulate for days to weeks, special consideration for selecting the ABO/Rh(D)- compatible blood components should be instituted as early as possible.

When units of rare erythrocytes and other blood products are required, transfusion services and clinicians must work together to prioritize the competing needs of various patients.[22]

Table 2. Guidelines for selecting ABO blood group for erythrocyte- and plasma-containing components for patients undergoing HPC transplantation with ablative conditioning*

Recipient RBC group	Donor's RBC group	Category of ABO mismatch†	Erythrocyte transfusion	Platelet or plasma transfusion
A	O	Minor	O	A, AB
B	O	Minor	O	B, AB
AB	O	Minor	O	AB
AB	A	Minor	A, O	AB
AB	B	Minor	B, O	AB
O	A	Major	O	A, AB
O	B	Major	O	B, AB
O	AB	Major	O	AB
A	AB	Major	A, O	AB
B	AB	Major	B, O	AB
A	B	Minor and major	O	AB
B	A	Minor and major	O	AB
A	A	None	A, O	A, AB
B	B	None	B, O	B, AB
AB	AB	None	AB, A, B, O	AB
O	O	None	O	O, A, B, AB

RBC indicates red blood cell; HPC, hematopoietic progenitor cell.
*These guidelines apply from time of initiation of myeloablative therapy until reverse and forward erythrocyte typing of the donor.
†Major ("forward") mismatch occurs when donor's RBC-ABO group is serologically incompatible with recipient's plasma. Minor ("reverse") mismatch occurs when recipient's RBC-ABO type is serologically incompatible with donor's plasma.

After transplantation;

In the immediate post transplantation period, considerations for peritransplantation remain in effect, but additional requirements may apply.

Immune hemolysis:

Potential immunohematologic complications after an ABO mismatched allogeneic HPC transplantation include immediate hemolysis, delayed hemolysis, delayed erythrocyte engraftment, and pure red-cell aplasia. Immune hemolysis immediately after HPC transplantation infusion is from recipient-derived antierythrocyte antibodies (eg, major ABO mismatch), whereas delayed hemolysis is probably derived from donor blood-group antibodies (eg, minor ABO mismatch). Table 3 provides a guide to the differential diagnosis of hemolysis in patients after HPC transplantation.[4]

Table 3. Guide to the differential diagnosis of hemolysis in patients after HPC transplantation

Diagnosis	Pathophysiology	Serologic findings
HPC graft-related immune hemolysis		
Major ABO incompatibility between HPC donor and recipient	Hemolysis of transfused erythrocytes, delay in erythrocyte engraftment	DAT positive for C3d, IgG, or both; anti-A and/or anti-B present in eluate
Minor ABO incompatibility between HPC donor and recipient	Hemolysis of patient's erythrocytes caused by transfused donor's plasma or by passenger lymphocyte-derived isohemagglutinins	DAT positive for C3d, IgG, or both anti-A and/or anti-B present in eluate
Major incompatibility: other blood group antigens	Hemolysis of transfused donor's erythrocytes	DAT positive for C3d, IgG, or both; antibody to non-ABO red blood cell antigen(s) identified in eluate and patient plasma
Minor incompatibility: other blood group antigens	Hemolysis of patient's erythrocytes caused by alloantibodies in transfused donor plasma or by passenger lymphocyte-derived alloantibodies	DAT positive for C3d, IgG, or both: antibody to non-ABO red blood cell antigen(s) identified in eluate and patient plasma
Transfusion-related immune hemolysis		
Transfusion of erythrocytes incompatible with donor or patient	Hemolysis of transfused erythrocytes caused by patient's native or graft-derived antibodies	DAT positive for C3d, IgG, or both: anti-A and/or anti-B or antibody to other RBC antigen identified in eluate and patient plasma
Transfusion of plasma incompatible with donor or patient	Hemolysis of patient and/or donor erythrocytes	DAT positive for C3d, IgG, or both; anti-A and/or anti-B or antibody to other RBC antigen identified in eluate and patient plasma
Other causes of immune hemolysis		
Autoimmune hemolytic anemia	Hemolysis and serologic incompatibility of (all) crossmatched donor erythrocytes	DAT positive for C3d, IgG or both; panagglutinin present in eluate and patient plasma
Drug-induced hemolytic anemia	Autoantibody formation induced by drug, hapten mechanism, or drug modification of erythrocyte membrane	DAT positive for C3d, IgG, or both; eluate may react with drug-treated erythrocytes
Nonimmune hemolysis		
Thrombotic thrombocytopenic purpura	Microangiopathic hemolytic anemia	DAT and antibody screen negative
Infusion of cryopreserved stem cell products	Nonimmune hemolysis may be observed during infusion of DMSO-cryopreserved HPC preparations	DAT negative
Clostridium perfringens sepsis	*C perfringens* produces hemolysin toxins, resulting in nonimmune intravascular hemolysis	DAT negative

DAT indicates direct antiglobulin test; C3D, complement factor 3D; DMSO, dimethyl sulfoxide; HPC, hematopoietic progenitor cell; IgG, immunoglobulin G; and RBC, red blood cell.

Passenger lymphocyte syndrome

Amore severe form of immune hemolysis is passenger lymphocyte syndrome. Typically, the passenger lymphocyte syndrome involves ABO incompatibility, but hemolysis resulting from serologic incompatibility in the Rh, Kell, Duffy, or Kidd blood group systems has been reported.[23] If hemolysis increases (rather than decreases) a few days after an HPC transplantation, the possibility of antibody production by the donor's lymphocytes should be considered. Additional risk factors for hemolysis resulting from passenger lymphocyte syndrome include the use of cyclosporine alone in the absence of an antiproliferative agent, such as methotrexate, for post transplantation GVHD prophylaxis, and possibly the use of a reduced-intensity preparative regimen. Usually, immune hemolysis related to passenger lymphocyte syndrome begins at the end of the first week or during the second week after transplantation. Hemolysis may be severe, persist for 5 to 10 days, and then subside as the patient's residual incompatible erythrocytes are eliminated and replaced by transfused or donor derived erythrocytes.

Pure red-cell aplasia

Major ABO-mismatched HPC transplantations may result in immune- mediated pure red-cell aplasia.[24] In this situation, the recipient's lymphocytes and/or plasma cells survive myeloablation and produce antibodies to the transplanted donor-derived erythrocytes, early or late (>100 days) after transplantation. The recipient's antibodies suppress erythropoiesis by destroying erythroid progenitors, leading to anemia (with reticulocytopenia). A diagnosis of pure red-cell aplasia is established if reticulocytopenia persists for more than 60 days and erythrocyte precursors

are absent in the bone marrow aspirate. Treatments for red-cell aplasia not associated with parvovirus B19 infections include plasma exchange to remove the offending hemagglutinins and decreasing the myelosuppressive treatment to induce a graft-versus-host hematopoietic and lymphocyte effect.

Autoimmune hemolytic anemia

Autoimmune hemolytic anemia (AHA) occasionally develops in HPC transplantation recipients, occurring 2 months to 3 years after transplantation. Although reports are mostly anecdotal, late AHA may be more frequent in T cell–depleted transplantation recipients.

Postengraftment:

Engraftment syndrome and diffuse alveolar hemorrhage(DAH); HPC patients with engraftment are at risk for pulmonary complications similar to transfusion-related lung injury. This engraftment syndrome often presents with fever and hypoxia at initial white blood cell recovery and may progress to DAH. If the lung injury is caused by donor-derived antibodies, future platelet products may need to be more closely HLA-matched or washed.[4]

Graft- versus- host disease; Acute GVHD is a major, and frequent, complication of allogeneic HPC transplantations. HPC recipients with acute GVHD may develop cytopenias of 1 to 3 cell lines and an immune-based .hemolytic anemia. The patients with severe liver GVHD may also develop the clotting disturbances associated with end-stage liver disease. All of these patients may require transfusion support.[4]

Hemorrhohagic cystitis; Bladder irrigation and platelet transfusion are the staple of therapy, but if B-K virus is found and the patient has no GVHD, immune suppression tapering should be considered.

Veno-occlusive disease; Incompatible isoagglutinin to ABH blood-group antigens on hepatic sinusoidal endothelial cells may cause toxic injury initiating a sequence of biologic events that may lead to circulatory compromise of centrilobular hepatocytes, fibrosis, and obstruction of blood flow, resulting in VOD, a major cause of post transplantation mortality.[4]

Erythrocyte (blood group) chimerism; Blood group chimerism is an intrinsic characteristic of HPC transplantation. Transfusion services have reported varied incidences of ABO-grouping discrepancies (so-called forward- or reverse-typing discrepancies) or mixed field-agglutination reactions, depending on whether the donor and recipient are ABO identical. Many nonmyeloablative, as well as T cell–depleted, transplantation recipients remain in the microchimeric state for a prolonged time period after neutrophil recovery. Once the patient's blood becomes full-donor chimera, with disappearance of recipientderived antierythrocyte antibodies, the use of blood products consistent with donor ABO typing is logical. Transfusion services should monitor for recurrence of recipient ABO-group erythrocytes after non–ABO-identical allogeneic HPC engraftment.

Infusion of donor lymphocytes; Little has been published about transfusion issues related to lymphocyte infusion. Often, for patients with relapse of the primary disease, the red cells have returned to recipient typing, and donor red-cell typing emerges after the antitumor response. Changes in the status of HPC engraftment will be observed by the transfusion service at the onset of mixed-field agglutination in ABO-blood grouping.

Granulocyte transfusion; Whereas transfusions of granulocyte concentrates are not widely used for management of infections in neutropenic HPC recipients and remain controversial. Granulocyte transfusions have a risk of

transmitting CMV and, usually, potential donors who are CMV-seropositive are excluded. Granulocyte transfusions increase the risk for development of HLA antibodies; if this occur, subsequent granulocyte concentrates should be obtained from HLA-matched donors. Finally, all granulocyte concentrates must be gamma-irradiated before administration to prevent transfusion-associated GVHD.[4]

Long term:

Long-term management of post–HPC transplantation patients requires ready access to pertinent blood transfusion–related medical records. However, often patients return to communities distant from the transplantation center where their most current medical reports are unavailable. Although most hospital transfusion services have computerized records that specify special requirements for their own previously treated patients, these records often do not include special requirements for gamma irradiation, CMV-seronegative components, or group O erythrocytes for HPC patients who require an urgent transfusion. To ensure optimal matching of erythrocytes for transfusion, as well as provision of special transfusion needs for their patients, transplantation physicians have an obligation to communicate to their patients the importance of providing information about their HPC transplantation to local healthcare providers, including transfusion services, and to consider wearing transfusion requirement identification on their bodies in case of an emergency.

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Oral Presentations

OP-01

WHAT SHOULD WE TEACH MEDICAL STUDENTS?

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Adequate teaching of transfusion medicine in medical schools is essential if future doctors are to make the best use of donated blood. Such teaching is far from uniform either within or between countries. Frequently, the blood services are not well integrated with training facilities with a result that teaching is sometimes carried out by non-specialists. Furthermore, the time allocated to teaching in the various aspects of transfusion is commonly very limited and students may graduate without ever being seriously examined in the subject.

Given the recent evidence based clinical information on transfusion, it is clearly appropriate to revise our training schedules in medical schools. This requires an approach that starts earlier in medical training, covering not only the theory of immunohaematology but also the clinical aspects of transfusion, ending in a compulsory specific examination. Teaching is best performed by specialists in Transfusion medicine, who should also have clinical expertise.

More use needs to be made of self-learning programmes rather than didactic lectures. There is however still a small place for lectures, as well as some teaching of practical transfusion procedures. All medical students should have exposure to the blood donation system and attachments to the Blood service for some students should be encouraged.

The nett result may well result in better informed medical graduates who can utilize the gift of blood more appropriately, carry out new research, and raise the status of transfusion medicine.

It is suggested that as part of the programme to use donor blood efficiently and to safeguard patients from harm, every country should review its education of medical students and allocate a greater proportion of curriculum time to the teaching of transfusion medicine.

OP-02

ISOLATION OF AUTOLOGOUS RED BLOOD CELLS USING HYPOTONIC SALINE IN TRANSFUSED β-THALASSEMIA PATIENTS

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OBJECTIVES: The patients with β-thalassemia receive regular transfusions so have a mixture of donors' RBCs in circulation.

AIM: To eliminate the donors' RBCs from the specimen for cell typing on such patients using hypotonic saline.

BACKGROUND: RBCs in β-thalassemia are resistant to osmotic pressure as compared to those from normal individuals. Exposure of RBCs to hypotonic saline would lyse the donors' RBCs leaving behind the patient's native RBCs.

METHODS/MATERIALS: one hundred µL of once washed RBCs from transfused patients were added to 40 ml of 0.3% hypotonic saline with intermittent mixing for 5 minutes. The content was centrifuged and the supernatant was discarded. The sediment RBCs, expected to be the patients' native RBCs, were washed with and re-suspended in normal saline to be used for cell typing. Serological techniques were employed as per reactivity nature of anti-sera, e.g. saline tube test or column agglutinin technique. Blood group antigens, viz. C, c, M, N, P, and Le(b) were included in this study. Corresponding anti-sera used were of commercial origin or detected in our laboratory. Cell typing on 3 sets of RBCs, viz. the patient's post-transfusion, patients' isolated "native" and corresponding donors', was run in parallel.

RESULTS: Post transfusion specimen of RBCs from all the patients tested showed mixed-field agglutination. Upon removal of the donors' RBCs by hypotonic saline, 6 patients were typed negative for the M and P, the antigens being present only on corresponding donors' RBCs. Likewise, after removal of the donors' RBCs, 8 patients were distinctly typed positive for C, c, M and P, for the antigens being absent on respective donors' red cells.

CONCLUSION: Autologous RBCs from the transfused β-thalassemia patients can be separated using hypotonic saline. The method is simple, rapid and affordable by every blood bank.

Thalassemia patient's RBCs treated with hypotonic saline. Patient's autologous RBCs at the bottom.

OP-03

PREVALENCE OF PARVOVIRUS B19 IN HEALTHY BLOOD DONORS FROM GIRESUN PROVIENCE, TURKEY

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AIM: Parvovirus B19 is transmitted by mainly respiratory tract secretions, blood transfusion, organ transplantation and transplacental route. Several transfusion-transmitted infections caused by Parvovirus B19 have been reported. Specific etiologic diagnosisis possible with serological tests or detection of viral nucleic acid via polymerase chain

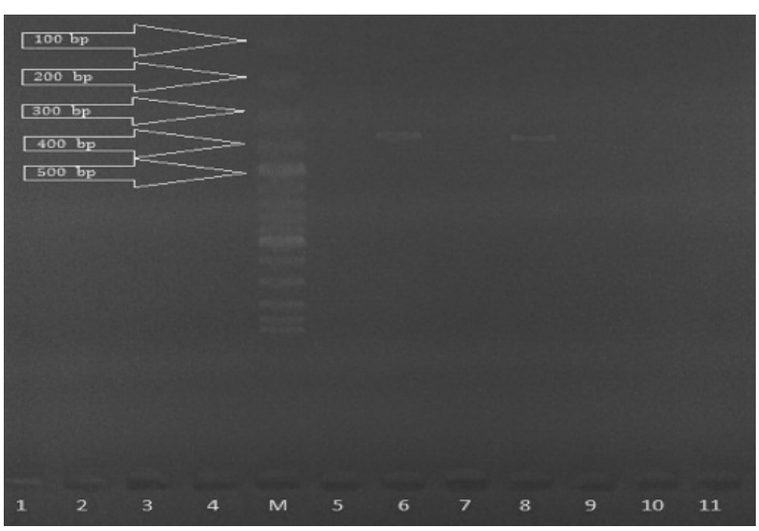
reaction. The aim of this study was to determine the prevalence of Parvovirus B19 among healthy blood donors from Giresun provience.

METHODS: In this study, the plasma samples of 560 healthy blood donors were investigated for the presence of Parvovirus B19 DNA by polymerase chain reaction method. Briefly, ten samples were pooled in a tube and phenol-chloroform extractions method was used for DNA isolation. Inhouse PCR was performed for the nucleic acid amplification according to the methods previously described. PCR products were screened by the gel electrophoresis via1% agarose gel contain ethidium bromide. If a positive result was detected in an individual tube, PCR method was repeated within that group.

RESULTS: The incidence of B19 viremia in healthy blood donors in this study was 3/560 (0.54%). Gel electrophoresis for parvovirus B19 DNA of healthy blood donor samples was shown in the figure 1.

CONCLUSION: According to our results were commend to screen B19 DNA in blood products to prevent transfusion mediated viral infections especially for immunocompromised patients and pregnant women. Further donor-recipient studies, determining transfusion-transmitted B19 infections, are needed from different blood centers.

Gel electrophoresis for parvovirus B19 DNA of healthy blood donor samples



M: marker, column 6 and 8 positive (~350 bp) for parvovirus B19 DNA.

OP-04

REACTIVE BLOOD DONOR NOTIFICATION; RESPONSES AND PERCEPTIONS: AN EXPERIENCE FROM A DEVELOPING COUNTRY

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BACKGROUND: Donor notification of transfusion transmittable infections (TTIs) is important to prevent the spread

of disease. Response of reactive donors to seek confirmation and treatment is a direct reflection of knowledge and attitudes towards transfusion transmittable infections (TTIs).

MATERIALS-METHODS: We evaluated reactive donations in one year, from August 2014 to July 2015 at the blood bank of Liaquat National Hospital, Karachi. The donors were considered sero-positive for HBV, HCV, Syphilis and HIV1 and 2 on positive screening tests done by Chemi-luminescene Immunoassay (CIA) method and Nucleic Acid Tests (NAT). MP-ICT was used to determine the presence of Malaria. All reactive donors were contacted on their provided contact numbers. Failure to notify with reasons and notification response at initial and subsequent follow-ups was judged for repeat and first time reactive donor groups further stratified into primary, secondary and tertiary qualifications. A cross-sectional analytical study, using non-probability purposive sampling was conducted on 350 potential blood donors fulfilling the criteria of donor selection who were interviewed using pre-tested questionnaire regarding demographic information, TTIs awareness, transmission routes, financial implications and disease sensitization. SPSS version 21was used to calculate mean (standard deviation) and frequency / percentages for quantitative and qualitative variables respectively. Pearson's Chi-square test ($p<0.05$) was used to assess relationship of knowledge and attitude scores with demographic variables. Adjusted Odds Ratio (95% CI) was calculated determining socio demographic variables with reference to their knowledge and attitude.

RESULTS: From August 2014 to July 2015, out of 16660 donations 940 donors (5.57%) were rejected on positive screening tests for anti HCV, HBsAg, anti HIV1 & 2, Syphilis or Malaria. Repeat donors (69.5%) with primary to secondary qualifications constituted the bulk of reactive donors. The notification rate was 54.25% and donor response was 28.68%.The survey results showed that overall awareness about grave outcomes of diseases was not up to the mark; 9.52% for primary, 16.66% for secondary and 3.57% for tertiary qualifications. 48% of the respondents were ignorant of disease spread through blood transfusion. 96.6% of donors did not know the financial impact of treatment and 69.7% were unable to afford it when informed. Similarly almost all the donors (94.9%) were not vaccinated against hepatitis B. Multivariate logistic regression analysis for knowledge and attitude scores each after adjustment for age, education and employment status showed that participants with secondary education as compared to those with primary education (OR=0.372, 95% CI: 0.203–0.681, p value < 0.01) had significantly less odds of being adequately knowledgeable whereas higher education was associated with higher odds of knowledge score (OR=4.044, 95% CI: 1.567–10.435, p value < 0.01). Age and employment status were found to have a non significant impact on knowledge score. Attitude score after adjustment for age, education and employment status showed that participants who have secondary education as compared to those who have primary education (OR=2.019, 95% CI: 1.190-3.426, p value < 0.01) had higher odds and significant impact for adequate attitude score.

CONCLUSION: There is a need of pre-donation counseling to sensitize donors about TTIs in a resource limited country where treatment costs are high and out of reach for majority donors. Comprehensive efforts at structural, healthcare provider and individual level are needed to control spread of TTIs.

Reactive Donors Notification Outcome (Aug2014-Jul 2015)

REPEAT DONORS	PRIMARY (n=235)	SECONDARY (n=277)	TERTIARY (n=146)	TOTAL (n=654)
DONORS NOT NOTIFIED	107(45.53%)	107(38.62%)	76(52.05%)	290(44.34%)
Not contacted from Blood Bank	2	10	7	19(6.55%)
No Contact Number	5	1	2	08(2.75%)
Wrong Contact Number	5	5	5	15(5.17%)
Cell phone off/busy/no response	95(88.78%)	101(94.39%)	62(81.57%)	258(88.96%)
DONORS NOTIFIED	132(20.18%)	153(23.39%)	71(10.85%)	356(54.43%)
Donor response(1st visit)	34(25.75%)	47(30.71%)	19(26.76%)	100(15.29%)
Donor response(2nd visit)	04(3.03%)	07(4.57%)	03(4.22%)	14(3.93%)
1ST TIME DONORS	PRIMARY (n=150)	SECONDARY (n=97)	TERTIARY (n=39)	TOTAL (n=286)
DONORS NOT NOTIFIED	68(45.33%)	52(53.60%)	19(48.71%)	139(48.60%)
Not contacted from Blood Bank	3	5	2	10(7.19%)
No Contact Number	10	3	0	13(9.35%)
Wrong Contact Number	8	3	0	11(7.91%)
Cell phone off/busy/no response	47(69.11%)	41(78.84%)	17(89.47%)	105(75.53%)
DONORS NOTIFIED	80(53%)	46(47.42%)	19(48.71%)	145(50.69%)
Donor response(1st visit)	19(23.75%)	14(30.43%)	09(47.36%)	42(28.96%)
Donor response(2nd visit)	02(2.5%)	03(6.52%)	01(5.26%)	06(4.13%)

Description of Knowledge and Attitude regarding Blood Donation

DONOR KNOWLEDGE ASSESSMENT	Score:>10		Score:<10	
	Frequency	%	Frequency	%
GENERAL INFORMATION ABOUT TTIs				
1. Name common transfusion transmittable infections.	92	26.3	258	73.7
2. Name major complications of TTIs	62	17.7	288	82.3
3. Name the common symptoms of TTIs.	38	10.9	312	89.1
4. Name treatment options for TTIs.	284	18.9	66	81.1
5. What is the estimated cost of TTIs?	12	3.4	338	96.6
MODES OF DISEASE TRANSMISSION				
1. Through blood transfusions	182	52	168	48
2. Sharing of food/utensils of affected patients.	210	60	140	40
3. Drinking un-boiled water.	210	60	140	40
4. Getting shaves from barbers using straight razors.	266	76	84	24
5. From affected patient to spouse.	280	80	70	20
6. From affected mother to unborn child.	280	80	70	20
7. Having multiple partners or extramarital relations with sex workers.	292	83.4	58	16.6
8. Using unsterilized syringes.	292	83.4	58	16.6
9. Using unsterilized surgical instruments.	300	85.7	50	14.3
10. Through contact/touch.	294	84	56	16
ATTITUDE VARIABLES				
1. Can you be a carrier of any of these infections?	164	46.9	186	53.1
2. Would you like to be informed about positive screening results?	320	91.4	30	8.6
3. Is the treatment of TTIs possible?	234	66.9	116	33.1
4. Can you afford the treatment?	106	30.3	244	69.7
5. Are you vaccinated against hepatitis B?	18	5.1	332	94.9

Percentage Knowledge and Attitude Score of Blood Donation by Socio-Demographic Variables

Socio Demographic Variables	% Knowledge		Level of Significance P-value	% Attitude		Level of Significance P-value
	Adequate (n=280)	Inadequate (n=70)		Adequate (n=166)	Inadequate (n=184)	
Age (years)			0.266			0.355
21-28	76.4	70		72.9	77.2	
31-34	23.6	30		27.1	22.8	
Educational Status			<0.001*			<0.01*
Primary	22.9	57.1		38.6	21.7	
Secondary	36.4	8.6		25.3	35.9	
Tertiary	40.7	34.3		36.1	42.4	
Employment Status			0.086			0.550
Unemployed	16.8	25.7		19.9	17.4	
Employed	83.2	74.3		80.1	82.6	

Level of significance at < 0.05

Factors Predicting Adequate Knowledge and Attitude of Blood Donation

Socio-demographic Variables	Adequacy of %Knowledge		Adequacy of % Attitude	
	Adjusted OR* (95% CI)	P-value¥	Adjusted OR* (95% CI)	P-value¥
Age (years)				
21-28	Reference		Reference	
31-34	1.55 (0.82-2.91)	0.171	0.78 (0.47-1.29)	0.344
Educational Status		<0.01		
Primary	Reference	<0.01	Reference	
Secondary	0.37 (0.20-0.68)		2.01 (1.19-3.42)	<0.01
Tertiary	4.04 (1.56-10.43)		0.79 (0.47-1.33)	0.384
Employment Status				
Unemployed	Reference		Reference	
Employed	0.65 (0.33-1.29)	0.222	1.05 (0.60-1.84)	0.854

1. Adjusted for age, educational status and employment status 2.¥Level of significance at < 0.05*

OP-05

BLOOD PRODUCTS PROVISION AND DISCARD RATES AT THE BLOOD TRANSFUSION CENTER OF THE KARTAL KOŞUYOLU HIGH SPECIALIZATION TRAINING AND RESEARCH HOSPITAL

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AIM: Provision of blood components is carried out by Regional Blood Centers according to "the Guidelines for the Blood and Blood Products" published in the Official Gazette of Turkey dated 4th December 2008. However, transfusion centers have also been granted the authority to take blood from donors in emergency situations. Since donation, testing, storing and distribution of blood by regional transfusion centers are demanding processes, effective use of blood products is very important. The purpose of this study is to determine and demonstrate the rates of blood products demanded from, provided and discarded by the transfusion center at our hospital.

METHOD: The amounts of the blood products demanded from, provided or discarded by the transfusion center of our hospital between the dates of 1st January 2012 and 31st December 2015 were examined retrospectively.

FINDINGS: Out of 154016 blood products demanded from our hospital's transfusion center between 1st January 2012 and 31st December 2015, a total of 38970 products (25.6% of the demand) were provided by the Red Crescent's Northern Marmara Regional Blood

Center, while 113313 products (74.4% of the demand) were provided by donors having applied to our center.

The rate of provision is the highest by 41.4% for fresh frozen plasma, and the lowest for CRYO by 0.4%. The provision rate is 40.6% for erythrocyte suspension, 12.6% for platelet suspension, and 5.1% for whole blood.

Out of a total of 152283 blood products, 6922 (4.5%) were discarded by our hospital's transfusion center within the time range.

3619 of the discarded products were fresh frozen plasma (52.5% of the discarded products), while 2578 were erythrocyte suspension (37.2%), 666 were platelet suspension (9.5%) and 59 were whole blood (0.08%).

CONCLUSION: Due to the difficulty in providing blood products, lowering the discard rates to the minimum should be aimed at. Our study revealed the fact that the most discarded product was fresh frozen plasma. Consequently, critical stock level at hospitals as well as cooperation with the organization of the Red Crescent in emergency should be provided. It is also important that the blood products demanded from hospitals and those never used and discarded be regularly recorded, and that educational programs in that matter be organized.

FIGURE 1

Years	Erythrocyte Suspension	Fresh Frozen Plasma	Whole Blood	Platelet Suspension	CRYO	Total
2012	procurement::19176 destruction:753 (%3.9)	procurement:17155 destruction:1353 (%7,9)	procurement: 2852 destruction:21 (%0,7)	procurement:3622 destruction:188(%5,1)	procurement: 0 destruction:0	procurement:42805 destruction:2315 (%5,4)
2013	procurement :14280 destruction:638 (%4,5)	procurement:17364 destruction:718 (%4,1)	procurement: 1949 destruction:15 (%0,8)	procurement:5874 destruction:338 (%5,8)	procurement: 14 destruction:0	procurement:39481 destruction:1709 (%4,3)
2014	procurement :13235 destruction:643 (%4,9)	procurement:13191 destruction:781 (%5,9)	procurement: 1845 destruction:15 (%0,8)	procurement:2339 destruction:84 (%3,6)	procurement: 81 destruction:0	procurement:30691 destruction:1523 (%4,9)
2015	procurement :14930 destruction:544 (%3,6)	procurement:15361 destruction:767 (%5)	procurement: 1161 destruction:8 (%0,7)	procurement:7423 destruction:56 (%0,8)	procurement: 431 destruction:0	procurement:39306 destruction:1375 (%3,5)

OP-06

THE PREVENTATIVE MEASURE OF ERYTHROCYTE ALLOIMMUNIZATION IN PATIENTS REQUIRING CHRONIC BLOOD TRANSFUSIONS: RESULT OF A REFERENCE CENTER IN CENTER ANATOLIA, TURKEY

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INTRODUCTION: The compatibility tests (CTs) are obligatory tests that must be done before a blood transfusion. In Turkey, the cross matching tests are the only legal obligatory test that had to be performed between these tests. However, cross matching tests are the final stage of CTs including ABO typing, antibody screening and antibody identifications tests. Recent guidelines advise not to perform cross matching tests even in these screening tests are done correctly. In general, the overall positivity rate of antibody screening were reported approximately 0.5-1%. We aimed to share our experience with reduction of erythrocyte alloimmunization in patients requiring chronic blood transfusions.

MATERIALS-METHODS: Laboratory and medical records of donors, and patients receiving erythrocyte transfusion from Erciyes University Blood Bank were evaluated, respectively. Historical improvements were noted; and results of different time periods were compared.

RESULTS: Routine antibody screening tests were started after 2006. Antibody identification tests were performed in 137565 patients from 2006 to 2012. Gel centrifugation method (DiaMed ID microtyping system) was used for antibody identification. Antibodies were identified and defined in 380 (0.27%) patients. Among these alloimmunized patients

285 (%75) patients have hematological disease, 95 (25%) of them were patients with surgical disease. The 317 (83.4%) of detected antibody was Rh subgroup, and Kell; 63 (16.6%) of them was others (MNS, KIDD, etc). These results showed that the majority of alloimmunazition originated from more antigenic Rh and Kell systems. After 2013 all of our blood donors were routinely screened for ABO + D Reverse typing, and Rh + K (C, c, E, e, K). The antigen typing was done by Neo microplate system, Immucor. The distribution of 60.413 donors in this period showen that at the table. In addition to these laboratory improvements, for prevention of erythrocyte alloimmunization in patients requiring chronic blood transfusions, blood groups, the result of antibody screening-identification tests, and Rh sub group, Kell identifications of patients and donors were electronically recorded between 2013, and 2015. The computer system of donor and recipient antigen typing does not only serve to find suitable donor from previously recorded data but also allow inviting the known donors to donate blood in the absence of suitable blood product in the stock. By this system we only detected antibodies in patients with surgerical or gynecological problems who have history of previous pregnancy or transfusion story. Furthermore we did not encounter any new allo-immunization in patients with hematological disorders such as thalassemia, sickle cell anemia, and recipients of hematopoietic stem cell transplantation between 2013, and 2015.

CONCLUSION: Erythrocyte alloimmunization is one of the important complications of transfusion especially for patients requiring chronic blood transfusions. Our experienced showed that the laboratory and software improvement was resulted in no alloimmunization for 5212 units of erythrocyte suspension for 58 patients with thalassemia, sickle cell anemia; whom the historical erythrocyte alloimmunization was found to be 6 in 11254 transfusions in the same group.

Distribution of 60.413 donors (C,c,E,e,K)

Antijen	Positive	Negative
C	43.657 (%72.3)	16.756 (%27.7)
c	45.964 (%76.1)	14.449(%23.9)
E	17.341(%29)	43.072(%71)
e	58.539(%97.1)	1.774(%2.9)
K	3.826(%6.4)	56.585(93.6)

OP-07

EFFICACY AND SAFETY OF THERAPEUTIC ERYTHROCYTAPHERESIS PROCEDURE PRIOR TO TOTAL HIP REPLACEMENT SURGERY IN PATIENTS WITH SICKLE CELL DISEASE: A CASE SERIES

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BACKGROUND: Patients with sickle cell disease have abnormal red blood cells (RBCs) and are at risk for perioperative complications including acute chest syndrome, renal failure, pain episodes, and stroke. RBC exchange transfusion can, without increasing the whole-blood viscosity, quickly replace abnormal erythrocytes with normal and

raise the hematocrit resulting in improved delivery of oxygen to hypoxic tissues.We intend to review procedural parameters and clinical efficacy of therapeutic erythrocytapheresis procedures carried out in a tertiary care multi-super-speciality hospital.

CASE SUMMARY: Therapeutic erythrocytapheresis (TE) procedures carried out prior to surgery in sickle cell disease patients were reviewed for procedural parameters, any adverse effects, clinical efficacy and clinical outcome. The treatment plan was to reduce the number of defective red blood cells, maintain or alter the patient's hematocrit and control the fluid balance. Two female and one male patient, with baseline mean HbS of 64 % and range (46-82%) were treated with TE procedure using an automated continuos flow cell separator. Critical factors like type of vascular access (central jugular line), anticoagulant to be used (ACD), volume of red cell to be removed, replacement fluid to be used (Leucodepleted, cross-match compatible and Rh and Kell antigen matched RBC units with hematocrit of > 60%) were decided before starting the procedure.The goal was to keep the percentage of HbS <30% and the total hematocrit at around 30% to suppress HbS production. Blood volume processed was mean 3953 ml (2317-5332 ml), mean 1341 ml red cells were removed and the same volume was replaced. Average hematocrit of replacement fluid was 60 %. 100% fluid balance was maintained in all three patients. 334 ml ACD (188-417) was used for anticoagulation and procedure was completed in mean 73 (46-93) minutes. No major or minor procedure related adverse effects were observed. A single volume TE procedure resulted in reduction of the patients HbS level to the desired level of <30% (21% -24%). The planned surgery was done without any complications related to the sickle cell disease in all three patients.

DISCUSSION: Red cell exchange transfusions remain an effective but possibly underutilized therapy in the acute & chronic treatment of sickle cell disease. TE with automated cell separators resulted in rapid correction of anaemia, a rapid decrease in defective red cells and improvement in patients clinical condition enabling the surgical procedure without complications related to the disease. We could achieve better hemodynamic control with no rise in viscosity and Hb was maintained around 10 gms%.

CONCLUSION: The advent and ready availability of automated apheresis equipment may alter significantly the approach to management of patients with sickle cell disease. Currently available apheresis equipment calculates the replacement RBC volume to achieve the desired HbS, hematocrit levels and allows performance of RBC exchange in a very reasonable amount of time, with relative ease, safety and efficiency.

OP-08

A CASE OF TRANSFUSION RELATED ACUTE LUNG INJURY (TRALI)

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BACKGROUND: Transfusion related acute lung injury is recognized as rare but potentially mortal adverse transfusion reaction. It is presented with dispnea, hypoxia and noncardiogenic pulmonary edema, typically occurs in first 6 hours of transfusion. It is known as leukocyte antibody mediated reaction, commonly against human neutrophil antigens and human leukocyte antigens. The diagnosis and management of TRALI is challenging.

CASE: A 43 year-old man was hospitalized for treatment of Hodgkin Lymphoma stage IVB. He had disease associated B symptoms and normal pulmonary examination on admission. He presented with elevated transaminases

and jaundice as a result of hepatic involvement. Laboratory investigation also revealed anemia and coagulopathy related to liver dysfunction. He was transfused with 2 packs of RBC followed with 4 packs of fresh frozen plasma (FFP). Thirty minutes after the last pack of FFP, he developed severe respiratory failure and hypotension. There were no signs of circulatory overload. His O2 saturation dropped to 79% on pulse oximetry. Since high pressure nasal oxygen supplementation could not correct the hypoxia, endotracheal intubation was immediately done and the patient was put on mechanical ventilation with 100% oxygen. Urgent chest X-ray showed bilateral pulmonary infiltrates consistent with acute respiratory distress syndrome(ARDS). (Figure1.) Dexamethasone 40 mg/day was started at the time of intubation and continued for 4 days. The patient rapidly improved clinically and the chest X-ray taken 24 hours after the event showed marked resolution. (Figure2.) The patient was extubated and transferred out of the intensive care unit two days later.

CONCLUSION: Transfusion related acute lung injury is an infrequent and serious adverse transfusion reaction with fatal course. Treatment is based on recognising on time and providing adequate oxygen supplementation. High dose dexamethasone started within the 24 hours' of diagnosis can be life saving in some cases.

Figure 1

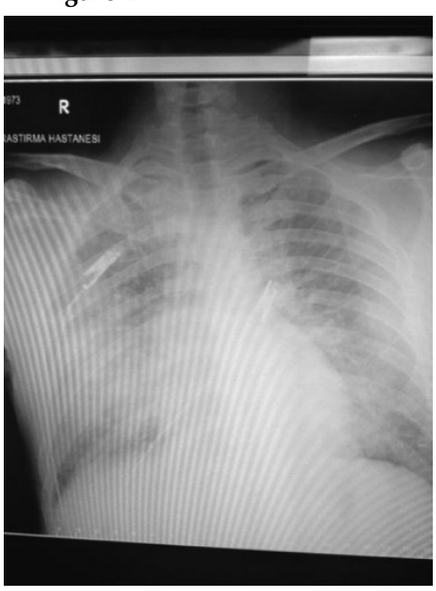
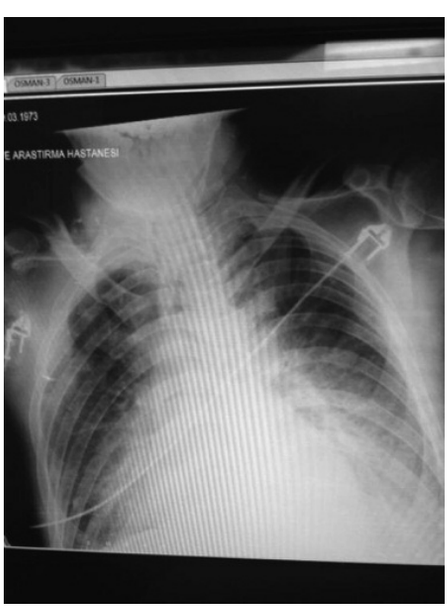


Figure 2



OP-09

THE APPROACH OF THE PHYSICIANS TO FRESH FROZEN PLASMA TRANSFUSIONS

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AIM: Fresh Frozen Plasma (FFP) is accepted as a raw material for fractionation industry. It is used in rare indications, such as factor deficiencies, thrombotic thrombocytopenic purpura, etc. However, in transfusion practices there are some acquired habits from mentors. The purpose of this study is to understand the approach of the physicians to FFP transfusions.

MATERIAL METHODS: In this multicenter study, 73 physicians having different specialities from 13 hospitals were asked to answer a questionnaire. There were 9 questions in questionnaire. They are: Q-1 What are the indications of FFP transfusions? Q-2 Do you request laboratory tests before FFP transfusions? Q-3 If yes, which tests are? Q-4 Do you follow the efficiency of FFP transfusion? Q-5 If yes, how? Q-6 How do you decide the dosage of FFP? Q-7 Which plasma component do you prefer? Q-8 If you don't know the patients ABO blood group, which ABO group of FFP do you choose? Q-9 If you don't know the patients Rh blood group, which Rh group of FFP do you choose? Statistical analyses were done by chi square test.

RESULTS: Among the 73 physicians subject to the survey are; 58 males and 15 females. The average age is 42 (25-65;median value: 41). Among 13 centers; 4 were research and training hospitals (32 physicians), 3 were state university hospitals, 2 were university hospitals established by foundations (20 physicians) and 4 were private hospitals (21 physicians). 3 Research and training hospitals and 1 state university hospital were regional blood centers while the other 9 were transfusion centers. For question 1; 37 (50,7%) physicians selected the ''nutritional, volume expander and supportive treatment'' options. While 11 (15, 1%) physicians stated that there is no need for any follow up before transfusion, 7 (9,6%) physicians stated that there is no need for follow up after transfusion. 27 (37%) physicians selected the platelet count among the test options for FFP transfusion indications. The number of physicians stated the FFP dosage as 10-15 ml/kg were 49 (67, 1%). 20 (27,4%) physicians replied as AB to 8th question; 30 (41,1%) stated that RH was not important in 9th question. There was no statistically significant difference when the results were evaluated according to the physician's age, gender, employer institution, speciality, institution that granted the specialization and

the blood center of physician's hospital.

CONCLUSION: It's a fact that inaccurate indications widely exist in FFP usage. This study shows that there is lack of knowledge and misuse in our country too with regard to this matter. We believe that trainings on the clinical use of blood products should be increased and indications on the FFP usage should be emphasized more often.

OP-10

COMPARISON OF VIABILITIES, MICROPARTICLE LEVELS AND THE HEMOSTATIC ACTIVITIES OF THE PLATELETS CRYOPRESERVED VIA THE NEW METHOD WITH DMSO AND WITHOUT DMSO

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INTRODUCTION: The accumulating literature knowledge suggests that procoagulant phenotypes of cryopreserved platelets may increase the efficacy of goal directed transfusions. However, concerns also exist on their prophylactic transfusion in patients without active bleeding for two main reasons: It may increase thrombotic complications and it may increase dimethyl sulfoxide (DMSO) toxicity with recurrent transfusions. The principle of the new cryopreservation method is the removal of the supernatant (DMSO or 0.9 percent NaCl) before freezing, a modification that eliminates the need for post-thaw washing and simplified the cryopreservation procedure. Frozen of platelets via the new method without DMSO can prevent DMSO toxicity. As such the purpose of our study was to explore whether the new cryopreservation method of platelets without DMSO can be an alternative for the use of cryopreserved platelets on prophylactic transfusion.

METHODS: Apheresis platelet concentrates from 20 donors (APCs) and single donor random platelets (RDPs) from 20 donors have been stored for a day at room temperature with agitation and divided into two equal volumes. One group of the APCs and RDPs were cryopreserved via the new method with %6 dimethyl sulfoxide and the other group with 0.9 percent NaCl only, without DMSO. After the removal of the supernatant via centrifugation at 22 °C and 1250x g for 10 minutes before freezing a platelet pellet of 20-25 mL was obtained and the bag was put into a cardboard freezing box and stored at -80 °C. Cryopreserved APCs were kept at - 80 °C for one day and then kept in 37 °C medium 10 minutes. Thawed and pelleted platelets were diluted with 20 mL of autologous plasma. Specimens were analyzed using platelet thrombin generation tests to test hemostatic activities and flow cytometric analyses to test viabilities of platelets and to determine platelet microparticle levels (PMPs).

RESULTS: The mean platelet counts of APCs and RDPs were 1195,2 ± 153,5 x 10^3/µL and 1008 ± 304,9 x 10^3/µL,

respectively. Interestingly, although DMSO were not used, viability of platelets cryopreserved with 0.9 percent NaCl was significantly higher than the platelets cryopreserved with DMSO both in the APCs and RDPs (Table 1).There were statistically significant differences between the absolute number of activated platelets in APCs cryopreserved either with DMSO (16400 x 10^3/μL) or with 0.9 percent NaCl (1520 x 10^3/μL), (p value: 0,001) while no statistically significant differences was found in RDPs group cryopreserved either with 0.9 percent NaCl or DMSO. Again although DMSO were not used, the absolute number of PMPs cryopreserved with 0.9 percent NaCl were significantly lower than the platelets cryopreserved with DMSO, both in the APCs and RDPs (Table 1). The mean endogenous thrombin potential (ETP) levels and mean peak thrombin levels of RDPs cryopreserved with 0.9 percent NaCl were significantly higher than the RDPs cryopreserved with DMSO (2811 nM.min. vs 2173 nM.min.,p: 001 and 305 nM vs 224 nM, p:0,041, respectively). There were not statistically significant differences between the hemostatic activities, tested with thrombin generation tests in APCs group.

DISCUSSION: Our results showed that platelets frozen via the new method with 0.9 percent NaCl (without using DMSO) has significantly higher viability and lower PMPs levels than the platelets frozen with DMSO in both APCs and RDPs. With regard to our results, it seems that DMSO is responsible from the decline in viability and the increase in PMPs levels in cryopreserved platelets. Although, despite cryopreservation via the new method without using DMSO, there were not a decline in hemostatic activities in both APCs and RDPs. With regard to our results, it seems reasonable to use cryopreserved platelets frozen via the new method with 0.9 percent NaCl (without using DMSO) for the purpose of prophylactic platelet transfusion. Therefore, prospective clinical studies are required to determine the efficacy of cryopreserved platelets, frozen via the new method without using DMSO in well-defined patient cohorts, if their utility is to be expanded from the treatment of battlefield injuries to the prophylactic platelet transfusions.

Table 1. Results of thrombin generation tests and flow cytometric analyses.

	Apheresis platelet concentrates			Random platelets		
	*DMSO group	% 0.9 NaCl group	*p* value	DMSO group	% 0.9 NaCl group	***p value
Viability of platelets (%)	68	82	**0,009**	45	68	**<0,0001**
Absolute number of activated (CD62P positive) platelets (Absolute count/μL)	16400	1520	**<0,001**	1282	614	0,157
Absolute number of PMPs ** (Absolute count/μL)	2763	896	**<0,0001**	558	396	**0,021**
Mean endogenous thrombin potential (nM.min)	3406	2837	0,815	2173	2811	**<0,001**
Mean peak thrombin levels (nM)	288	332	0,153	224	305	**0,041**

* DMSO: dimethyl sulfoxide
** PMPs: platelet microparticles
*** *p* value <0.05 was considered significant in all analyses.

OP-11

SIGNIFICANCE OF NUCLEIC ACID TESTING IN WINDOW PERIOD DONATIONS: REVISITING TRANSFUSION SAFETY IN HIGH PREVALENCE-LOW RESOURCE SETTINGS

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INTRODUCTION: Safe blood transfusion to the people is essential requirement of health care delivery system which can be done through integrated strategy for elimination of transfusion transmitted infection (TTI). Safe blood can be ensured through collection of blood from voluntary, non-remunerated blood donor and screening of all donations for viral markers by highly sensitive tests.

Despite the mandatory screening of blood with newest, very sensitive serological test, considerable risk remains for transfusion transmission of virus due to window period infections, occult infections, viral variants or delayed seroconversion.

AIM: Aim of the study was to analyze the efficacy of Mini pool Nucleic Acid Amplification Testing (MP-NAT) as additional donor screening program, seroprevalence of TTI and its role in improving blood safety in the high prevalence population.

MATERIAL AND METHODS: Study was performed at a tertiary-care, accreditated hospital from June 2013 to December 2015. Donor samples were collected at the time of blood donation for serological and MP-NAT Testing. All negative cases for anti-HIV, anti-HCV and HBsAg by ELISA were subjected to MP-NAT in pools of six on Roche's Cobas Taq Screen MPX assay v2.0 on Cobas System s 201 to detect HIV-1 (groups M and O RNA), HIV-2 RNA, HCV-RNA and HBV DNA.

RESULTS: Total of 20470 donations were received during period of 31 months of which 19932 (97.37%) were males and 538 (2.63%) females. Whole blood donations were 16997 (83.03%) and 3473 (16.97%) apheresis. 779 (3.80%) were voluntary donors and 19691 (96.20%) replacement donors. Out of 16997 donations, 446 (2.61%) were seroreactive of which 139 (0.68%) were HBsAg, 60 (0.29%) anti-HCV, 36 (0.18%) anti-HIV and 211 (1.03%) anti-TP (syphilis) seroreactive donors.

Out of 16551 sero-negative donors subjected to MP-NAT testing, 17 (0.10%) were NAT reactive with NAT yield (1 in 974). Out of 17 NAT yield, 12 (0.07%) were HBV (1 in 1379), 4 (0.024%) HCV (1 in 4138) and 1 (0.006%) HIV NAT reactive (1 in 16551). All NAT yield donors were males, replacement donors.NAT positive donors' age ranged from 19 – 49 years.

CONCLUSION: New technology like NAT has improvised the blood safety by detecting the virus in the pre-sero conversion window period and thereby providing the sensitivity that is much higher compared to the newest generation serological tests. Since viremia precedes seroconversion by several days to weeks, Nucleic Acid Amplification test technologies have the potential to detect viremia earlier than routine screening tests based on seroconversion.Variation in our yield rate from western studies could be due to high prevalence of HBV and HCV in the population as India is considered to be in the intermediate level of HBV endemicity with over 40 million HBV carriers and lesser number of voluntary donations. In countries with high incidence of infection with significant number of window period donations,

NAT can serve as a valuable tool to achieve the goal of zero risk of blood. With clearer benefits of NAT outweighing cost in providing medical care to the infected person, it is recommended that NAT should be made mandatory by policymakers as a part of TTI testing along with other serological testing in high prevalence, resource constrained countries like India.

OP-12

RESULTS OF DETERMINING OCCULT HEPATITIS B VIRUS INFECTION AMONG BLOOD DONORS

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BACKGROUND: Hepatitis B virus (HBV) remains a major public health problem worldwide. Implementation of hepatitis B surface antigen (HBsAg) in routine screening of blood donors in the early 1970s has greatly enhanced transfusion safety. The incidence of transfusion-transmitted hepatitis B has been steadily reduced over the last four decades. However, it was demonstrated that HBV transmission by blood components negative for HBsAg can still occur and HBV transmission remains the most frequent transfusion-transmitted viral infection; thus, the term occult hepatitis B virus infection (OBI) was introduced. OBI is simply defined as serologically undetectable hepatitis B surface antigen (HBsAg-ve), despite the presence of circulating HBV DNA with or without the presence of HBV antibodies.

AIM: To determine the prevalence of occult hepatitis B among blood donors and evaluate the presence of HBV DNA in HBsAg negative plasma samples.

MATERIALS-METHODS: It includes 16700 samples which donated in NCTM in Ulaanbaatar in 2013. We used to "triplex" PCR assay that included the detect of hepatitis B virus HBV-DNA in addition HCV-RNA and HIV1/2-RNA for whom with absence of serological markers of infection. The studies used molecular biology methods were performed with the help of equipment (ROCHE COBAS S 201) and technology based on Real Time PCR (pool size: 6 donation) Then we choose HBsAg negative, DNA positive samples and determined, anti-HBc and anti-HBs by serological methods, of ELISA Wantai HBc and HBs 3.0 tests. After 6 months we re-call HBV DNA positive donors and determined HBsAg, HBV DNA, anti-HBs, anti-HBc.

RESULTS: The 14948 samples were detected serological negative in the total of 16700 samples. PCR test results show 35 (0.23%) positive by HBV-DNA. 26 (74%) of the 35 DNA positive blood donors were alone anti-HBc positive and 3 (9%) were anti-HBs, anti-HBc positive. 6(17%) were seronegative. Of the 35 OBI cases, 28 (80%) were detected the first time they were screened for HBV DNA while 7 (20%) gave one more HBV PCR-nonreactive results before detection. Callback studies we determined 2 cases were pre-HBsAg window period.

CONCLUSION: The prevalence of HBV DNA positive in HBsAg negative blood donors is found 0.23%. HBV NAT needs either extreme sensitivity or to be performed on individual donations to eliminate HBV DNA-containing units.

OP-13

IMPLEMENTATION OF PATIENT BLOOD MANAGEMENT IN THE UK

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AIM: The aim of Patient Blood Management (PBM) in the UK is to build on the success of the previous government 'Better Blood Transfusion' initiatives, but with an emphasis on improving patient outcomes through blood avoidance and the use of alternatives to transfusion where clinically indicated. The main aim is for blood use in England to be <27/1000 head of population and costs associated with blood avoidance reduced by further £18 million by 2018.

MATERIALS: In England, there are two national teams who work for the blood service but support hospitals to drive the PBM initiative:

- The Consultants Team: 10 Consultant Haematologists who have joint posts with large hospitals.
- The Practitioner Team: 13 senior nurses and scientists and a small Education and Audit Team.

METHODS: The PBM Teams have a 3 year Strategic Workplan that outlines the way forward for working in collaboration with the National Blood Transfusion Committee and all the hospitals in England to improve patient care, save money and help sustain the blood supply with a strong emphasis on education, innovation, integration and evidence based clinical practice

The national team works closely with the Transfusion Practitioners in the hospitals and provides support and educational tools for them.

They also liaise with the other UK countries to work on joint initiatives, benchmark themselves and share examples of best practice in transfusion.

RESULTS: In 2015, some "proof of concept pilots" were initiated with several hospitals to develop evidence that a targeted approach to implementing PBM produces faster improvements in transfusion practice and reduces costs. Following the success of these pilots, we aim to implement this model on a national level and carry out further pilots targeting different aspects of PBM.

We also need to understand where and why blood is being used. We aim to establish a clinical benchmarking database collecting data from hospitals to compare practice against key performance indicators. This data will provide real time intelligence on how blood is being used, identify where we need to target PBM initiatives and help inform the demand planning process.

CONCLUSION: PBM is better for patients: national and regional audits show continued inappropriate and excessive use of blood components (>20% of transfusions) with insufficient take-up of transfusion alternatives and poor consent processes. PBM aims to improve practice by putting patients at the heart of blood management.

PBM is better for the blood supply: it supports long-term sustainability of the blood supply and protects patients with rarer blood groups.

OP-15

THE LEVELS OF CD55 AND CD59 IN THALASSEMIA MAJOR PATIENTS WITH AND WITHOUT SPLENECTOMY

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OBJECTIVE: The direct effects of Beta thalassemia major (β-TM) on other organs and tissues are due to the deleterious effects of the profound anemia, the byproducts of hemolysis, and the intramedullary and extramedullary expansion of erythroid progenitors. Massive splenomegaly develops early in the course of β-TM due to increased red cell destruction and the presence of splenic extramedullary hematopoiesis. If the spleen is surgically removed, a minor infection can potentially develop into a life-threatening infection known as sepsis. Studies about the etiopatogenesis of hemolysis β-TM are very low in number. Complement-mediated erythrocyte destruction can cause both intravascular and extravascular hemolysis. Complement regulatory proteins protect cells from such effects of complement system. Intravascular hemolysis is normally blocked by CD59, which prevents the final stage of complement assembly, production of the membrane attack complex that forms a pore in the target cell. Extravascular hemolysis is normally blocked by CD55, which prevents assembly of the C3 and C5 convertases upstream of MAC formation in the complement cascade. We aimed to perform quantitative analysis of membrane-bound complement regulators, CD55 and CD59, on peripheral red blood cells by flow cytometry on β-TM patients.

MATERIALS AND METHOD: The study looks at a total of 45 patients with beta-thalassaemia major, divided into two groups according to the presence (Group 1: 22 β-TM with splenectomy) or absence (Group 2: 23 β-TM without splenectomy) of the spleen. Seventeen healthy volunteers (Group 3: controls) were included in the present study. The EDTA blood sample was processed within one hour. One hundred µL of blood and 10 µL of monoclonal antibodies against to CD55 (PE Mouse Anti-Human), CD59 (FITC Mouse Anti-Human) were transferred into a polystyrene tube. The cells were analysed in the flow cytometer (FACS Canto II, Becton-Dickinson).

RESULTS: The overall mean percentage of CD55 positive RBCs of group 1 (50.72 ± 18.67 %) was significantly lower than group 2 (64.36 ± 13.98 %) and group 3 (89.03 ± 11.75 %) ($p<0.01$). The overall mean percentage CD59 positive RBCs of patients was no significantly different group 1 than group 2 and group 3.

CONCLUSION: Level of CD55 is lower in β-TM patients than healthy population, but CD59 level are not different in two groups. These two findings indicate the presence of extravascular hemolysis in these patients. We think that there is a possible genetic defect in these patients leading to partial deficiency in CD55 levels. Erythrocytes expressing CD55 in normal range are transfused to patients in every 1-2 weeks in routine transfusion programs. We suggest that finding of very low levels of CD55 in splenectomized patients having transfusion in every 3-4 weeks is due to much more large transfusion intervals. We think that CD55 levels are lower than these levels in non-transfused patients, and this may be a very useful indicator to decide the frequency of transfusions. More studies are needed in this field.

OP-16

UNIDENTIFIED FOREIGN OBJECTS IN BLOOD BAGS: {ARE WE ALL HALLUCINATING?}

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BACKGROUND: Any foreign object in a blood bag is obviously a threat to the safety of blood and creates a case to be managed according to scientific principles. We aimed to write a descriptive report of how Turkish Red Crescent managed a crisis in which a number of blood component bags with unidentified foreign objects were noticed by the Regional Blood Center.

METHODS: This study is a retrospective case report showing the course of action taken by Turkish Red Crescent when this crisis unfolded.

RESULTS: The crisis started with the index report (dated May 21st, 2015) of foreign objects being noticed in a number of blood bags (Red Cells, Buffy Coat Removed, in Additive Solution) at the Regional Blood Center. The Regional Blood Center had started to look for the reasons why the number of blood bags which were returned by the hospitals due to presence of clot was unusually high. In return, Turkish Red Crescent Blood Services General Directorate was contacted as for the nature of this object and what had to be done, next. Reactively, The Blood Bag Company was notified of this potentially harmful situation and requested to start their inquiry. All Regional Blood Centers were warned not to use blood bags with the same lot numbers, either for issuing to hospitals or component production. Some blood bags with foreign object were submitted to the company for their inquiry. All Regional Blood Centers were also ordered to contact hospitals for withholding those unused blood components with the relevant lot numbers. The Ministry of Health was also notified. The Infrared Spectrum Analysis Report from the company stated the "object" consisted of blood proteins and no plastic or foreign substances. The report from Ankara University stated the object as "polymeric" and the one from TÜBITAK as "of peptide origin". The final report from the company, with the addition of Electron Microscopy, stated this object consisted of activated platelets, fibrin and denaturated proteins as in a "blood clot". After the recommendations of National Blood and Blood Products Commission of the Ministry of Health, actual donation times and the amount of fibrinogen in FFPs of the same lot numbers were checked and found to be in normal limits. The Regional Blood Centers were notified, on June 8th, that any blood components, in addition to empty blood bags, on withhold at the blood center itself or the hospital, would be started to be used again, after visual control of two persons. The manual for the blood bags were revised as to reflect the root cause analysis result. A number of components had to be disposed due to different reasons in this whole crisis.

CONCLUSION: Blood bag problems have been experienced elsewhere before and for this crisis, a parallel approach, both in terms of the inquiry and the preventive and corrective actions taken, has been taken. The principle of doing no harm was satisfied at all times. No patient was harmed due to any foreign object in the blood bag. There was no shortage of any component as a result of the measures taken by Turkish Red Crescent because there was an adequate stock of blood components at all times. So with lessons learned and experience gained, we can say that this crisis was succesfully managed.

OP-17

FORWARD-REVERSE INCOMPATIBILITIES IN ABO BLOOD GROUP TYPING

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INTRODUCTION: ABO blood group is determined with red blood cell surface antigens and detection of serum antibodies against these antigens, and being consistent with each other. During the immunohematological tests, weak agglutination in forward typing and lack of the expected antibody or detection of unexpected antibody in reverse typing should remind the ABO variations or presence of auto/alloantibodies. In case of forward-reverse nonconformity, further investigation should be considered. The aim of this study, emphasizing the importance of forward-reverse nonconformities encountered during the determination of blood groups in district hospitals with limited capacity and discussing the results.

MATERIALS-METHODS: Three patient samples which blood group could not be determined due to forward-reverse incompatibility were evaluated in Torbalı (Izmir, Turkey) State Hospital Transfusion Center. Blood group examination was performed with gel centrifugation method (Across Gel, DiaPro Medical Products, Turkey) manually by using A, B, AB, DVI +, DVI-, Ctl, N/A1, N/B configurated cards. Patient samples were sent to Dr. Behçet Uz Children's Hospital Transfusion Center for further investigation. For the determination of A1 and H antigens, anti-A1 and anti-H commercial antisera (ALBAclone, Alba Biosicence, the United Kingdom) were used. Reverse groupings were retyped by using a set of A1, A2, B, O red cells(Across Gel, DiaPro Medical Products, Turkey) which was performed at room temperature (RT) and +4°C.

RESULTS: All patients with nonconformity of forward and reverse typing were female. One of the patients for whom transfusion planned, was 37 years old and admitted with ectopic pregnancy and bleeding, the other was 61 years old and had gonarthrosis. The third case was 31 years old pregnant with cesarean birth plan.

The immunohaematological test results were presented in the tables 1 and 2. While it was considered that the ABO subgroups might be responsible for the nonconformity of forward reverse grouping in two cases, anti-M alloimmunization was detected in the third case.

CONCLUSION: Due to nonconformity of forward and reverse groupings, results were reported as undetermined and cross-matching with group O red cell concentrates was performed. It should be considered to further investigation of discrepancies between forward and reverse grouping to improve the transfusion safety even in the transfusion centers with limited capasities.

Forward Grouping Results

Case	A antigen	B antigen	AB antigen	A1 antigen	H antigen
1	+1	Negative	+2	Negative	+4
2	+3	+4	+4	Negative	Negative
3	Negative	+4	+4	Negative	Negative

Reverse Grouping Results

	A1 cells	A1 cells	A2 cells	A2 cells	B cells	B cells	0 cells	0 cells
Case	RT	+4 °C	RT	+4 °C	RT	+4 °C	RT	+4 °C
1	Negative	N/A	Negative	N/A	+3	N/A	Negative	N/A
2	Negative	Negative	Negative	Negative	Negative	Negative	Negative	Negative
3	+4	+4	N/A	N/A	2+	2+	Negative	Negative

RT: Room temperature

Reported Blood Groups

Case 1	Non A1, A subgroup-possibly Ax
Case 2	A2B
Case 3	B (Anti-M antibody positive)

OP-18

VIRTUAL BLOOD CENTERS

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AIM: Social media has been broadly defined to refer to " the many relatively inexpensive and widely accessible electronic tools that enable anyone to public and access information, collaborate on a common effort or build relationships". Social media, which can be used for many different purposes, has become a significant platform where patient relatives use to reach the donors. The hugeness of the member number of a Web-site, which is dintinguished incidentally while searching about blood donation organization, leaded us to research the Web-sites and pages that were performed with the same purpose.

MATERIALS-METHODS: This study was carried on during the whole year, 2015. The Web-sites organizing blood donations in Turkey were reviewed on Facebook, Twitter, Google and Android systems, using keywords; blood donation, blood donors, find donors, etc. Interviews were made with the administrators of some websites; whereas the other sites were signed in to evaluate the principles.

RESULTS: In this study, it was observed that the websites which were about "blood donation organizations" were formed in two groups; as open and closed. Open groups (Tüm kan gönüllüleri, kan hayattır, kan arıyorum yardımlaşma derneği, kan trombosit bağışı, Türkiye kan bankası, acil kan aranıyor, etc) reached all of the target receivers. Closed

groups aimed to reach certain crowd of people by filtering location (like Antalya kan gönüllüleri), occupation/political groups (like Istanbul Barosu), blood groups (like Kan bankası 0 negatifler), etc. It was observed that, there are lots of different websites with varying numbers from 122 to 138800 voluntary members. They reported the most important problem was the lack of the voluntary staff. It was mentioned that, they had difficulties in calling or being called continuously, application of excessive donors and disregarding that the need is over, because of the communication problems. It is understood that, virtual blood centers have the advantages of reaching out to too many volunteers in a short time, having instant feed-back, eliminating the distance between the volunteer and the center and urgent supply of the needs. However, the disadvantages such as; the contact between the relatives and donors, the lack of control mechanisms and standardized procedures, misinformation given by the administrators to donors, ineffective organization of the members are also noted.

CONCLUSION: People can access a lot of independent web pages with wrong and/or missing information just to satisfy their needs on the Web. In daily life, virtual media is actively used by numerous numbers of donors/donor candidates. These people, considered to represent an important and powerful population, should be controlled and organized by a national programme and a centralized management. It is emphasized that, the Turkish Red Crescent, collaborating plenty of institution, Foundation and association, should contact with there virtual formations, to develop the infrastructures for an organised, efficient and national acquisition, to block the abuse and to increase the number of conscious and voluntary donors.

OP-19

FREQUENCY OF RED BLOOD CELL ALLOANTIBODIES IN OUR TRANSFUSION CENTER

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AIM: There is no data about the frequency of red blood cell (RBC) alloantibodies in Turkey. In this study, we analyzed our antibody identification test results.

MATERIAL & METHOD: In this retrospective study, antibody identification test results of 264 patients, between Jan 2010 and Jan 2016, were investigated. The test was done by gel centrifugation method (BIORAD, NaCl enzyme test and cold agglutinins & Coombs cards with Diapanel I-XI; Diapanel I-XIP test cells). The records were investigated according to sex, age, clinics where the patients were treated and direct antiglobulin test results.

RESULTS: Distribution of sex, age and related clinics of 264 patients are listed in Table 1. Two hundred and twenty of the subjects in 264 were positive (83.3%). In these 220 positive test results, 99 (45%) were single RBC alloantibody, 16 (7,3%) were double RBC antibodies and 105 (47,7%) were nonspecific. Nonspecific positivity was later grouped as pan-reactive antibodies (62) and unspecified antibodies (43) by using panel cells. In 33 out of 105 samples of nonspecific positivity group, DAT was performed and 25 were positive. Our laboratory suggested antibody identification tests for 185 samples, due to ABO discrepancy (23), crossmatch incompatibility (45) and positivity in antibody screening tests (116). One of 185 tests belonged to a mother who had a newborn with positive DAT result. Most of the RBC alloantibodies was against to Rh blood group antigens, 60 in 99 as single, 13 in 16 as double antigens. Anti-D antibody was identified in 34, but there were history of passive immunization by anti-D immunoglobulin in 10. The second frequent antibody was anti-M (18 as single, 2 as double antibodies). Anti-M antibodies found in 13 patients were related to ABO discrepancy and in 4 patients they were related to crossmatch incompatibility.

CONCLUSION: The data demostrated that alloantibodies were mainly against Rh blood group antigens. It was interesting to find naturally occured Anti-M as the most frequent RBC alloantibodies. We suppose that this anti-M finding is related to microorganisms such as bacteria, virus etc. As a result, we suggest that investigations should be performed in all ABO discrepancies and crossmatch incompatibilities.

Table 1. Distribution of age, sex & clinics of the patients

Gender	Age Groups	Obst&Gyn	Hemato&Onc	Surgery	Int Med	ICU & Anest	Other	Total
Female (194)	0- 19	0	7	1	1	0	0	9
Female (194)	20- 40	112	0	4	2	2	11	131
Female (194)	41- 60	2	6	4	4	3	4	23
Female (194)	> 60	0	9	7	7	2	6	31
Male (70)	0- 19	0	9	2	1	2	0	14
Male (70)	20- 40	0	2	5	1	0	4	12
Male (70)	41- 60	0	2	8	1	1	1	13
Male (70)	> 60	0	14	4	9	2	2	31
Total		114	49	35	26	12	28	264

OP-20

THE USE OF THE ELECTRONIC CROSSMATCH IN A PRIVATE HOSPITAL, KOCAELI, TURKEY

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BACKGROUND AND OBJECTIVES: Electronic crossmatch (EXM) test needs a well-designed computer program with the use of donor and recipients' previous immunohaemotologic test results. The standard operating procedure (SOP) and the data of Anadolu Medical Center blood bank were presented.

MATERIAL-METHODS: Electronic crossmatch, erythrocyte suspensions (ES) transfusion and whole blood (WB) transfusion were evaluated for the years 2014 to 2015. EXM is only permitted when a valid pre-transfusion sample has been tested for ABO/Rh typing and there are no clinically significant antibodies detectable in the current sample without history of clinically significant antibodies. For this purpose, transfusion practice trainings were given to all the nurses. The blood bank technicians have been trained by the IT specialists. ES and WB release have been allowed during 72 hours when all the related records are complete in the blood bank computer program. The correct fill in of the transfusion follow-up forms and their turn back to the blood bank (BB) in a high ratio as > % 95 has been targeted

which has been further validated.

A comprehensive, validated (according to AABB standards) electronic data management system is in place in the BB. A gel agglutination system (Across Gel®, DiaPro, Turkey) is used in the laboratory. A total of 11254 ES and 15 WB transfusions and the orders and the tests that were done in these years were analyzed.

RESULTS: The total of CXM, indirect coombs (IC) tests and transfused ES were 11599, 9574 and 6896 respectively. Ordered ES and released (transfused) ES were 25009 and 11254 respectively. They are shown at the table 1 and 2. Any major hemolytic transfusion reaction related to ABO/Rh incompatibility in this period of time has not been reported to the BB. The cost of EXM has been found as 20000 tL (average) lower per year compared to serological CXM (in term of test cost).

CONCLUSION: In the "National Blood and Blood Products guideline" (Ankara, 2011) EXM is mentioned but its use is yet not general in Turkey. Electronic crossmatch method has been approved by Anadolu Medical Center (ASM) Transfusion Committee in the use of the standarts of AABB. In most European countries and USA, there may be different requirements for the use of the EXM, the electronic cross-match is much more widely used since 1998[1]. When the proper restrictions for its use are applied, very few problems have been encountered. EXM is therefore considered to be safe in the ASM hospital settings. It saves time and is inexpensive than serological CXM. It seems therefore safe to predict that its use will further increase in Turkey.

REFERENCES:

1- The use of the electronic (computer) cross-match, H. W. Reesink et al; Vox Sanguinis (2013) 104, 350–364

Table 1

Blood product	Order	Transfusion
ES	25009	11254
WB	16	15

Blood product orders and transfusion

Table-2

Tests	No
Total CXM	11599
IC CXM	6896
AHG CXM	2025

BB test numbers

Poster Presentations

PP-001

EVALUATION OF THE RELATIVES OF INPATIENTS WITH CRIMEAN-CONGO HEMORRHAGIC FEVER (SINGLE CENTER EXPERIENCE)

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INTRODUCTION: Crimean Congo Hemorrhagic Fever (CCHF) is a serious disease with a mortality rate of 3-30 % caused by a virus defined in the Nairovirus species of Bunyaviridae family. Thrombocytopenia and disseminated intravascular coagulation (DIC) are the major problems in CCHF (1). The incidence of DIC among the CCHF patients is about 40-50 % (1,2). On other hand, because of there is no specific, antiviral treatment against CCHF, supportive treatments like intravenous hydration, erythrocyte, thrombocyte and fresh frozen plasma transfusion, respiratory and circulatory supports and parenteral nutrition are lifesaving.

Seven days after the onset of complaints IgM and IgG antibodies can be detected by ELISA and IFA tests. Specific Ig M level is reduced to undetectable levels after 4 months from infection, but Ig G levels can be detected for 5 years (3). Infection is caused by contact with infected body fluids of patients without prevention precautions, such as contact with bare hands. So relatives of patients and health workers are under the risk of infection.

AIM: In this study we aimed to evaluate CCHF Ig M, Ig G levels and complete blood counts (CBC) of first degree relatives of 66 patients who were hospitalized for CCHF.

MATERIALS-METHODS: Between the years 2010-2011 at Infectious Diseases Service of Cumhuriyet University Faculty of Medicine, Sivas, Turkey, first degree relatives of 60 adult and 6 pediatric patients hospitalized for CCHF were questioned for age, gender, proximity to the patient, tick exposure, fever and weakness. Complete blood counts and CCHF Ig G and Ig M were examined.

RESULTS: There were 61/66 men (92.42 %) and 5/66 women (7.58 %) in the patient's relative group. Mean age was 42.12 years (19-63). Patients were from rural areas (villages and towns) and city centers of Tokat and Yozgat cities of Turkey. Forty eight (72.72 %) patients were living in the villages, 15/66 (22.72 %) were living in the towns and 3/66 (4.54 %) were living in the city center. Individuals from villages were dealing with animal breeding and farming. Provincial and district residents stated that they went to the village from time to time.

At the relatives of the patients there were no fever, fatigue, headache and bleeding and tick exposure in the last four months. Mean levels of hemoglobin was 15.1±1.0 gr/dl, hematochrit was 46.2±2.5 %, white blood cell count was 7.8 x109/L and platelet count was 274.1±66x109/L. Eight (8/66, 12.12 %) men were positive for CCHF Ig G but their Ig M were negative. Five (62.5 %) of these Ig G positive relatives, have consanguinity as parent and son. Other 3 (37.5 %) were husband-wife and uncle-nephew. All women relatives in our study were negative for CCHF Ig M and Ig G.

CONCLUSION: In our study, 12 % of the relatives of CCHF inpatients were positive for CCHF Ig G. It is understood that these individuals had asymptomatic disease. Of course, it does not possible to arrive at a definitive judgment about way of infection of these individuals living in endemic regions. Considering that 80% of CCHF virus infected cases have sub clinic infection, people living in endemic areas, dealing with animal breeding may developed antibodies as a result of contacts in various ways.

PP-002

SINGLE-DONOR PLATELET APHERESIS: COMPARISON OF TRIMA ACCEL AND HAEMONETICS MSC PLUS CELL SEPARATORS

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BACKGROUND: Platelet transfusion is an important supportive therapy for the patients with hematologic malignancies. Platelet products obtained by aphaeresis are preferred because of lower risk of alloimmunization and transmission of infections. There are variety of plateletpheresis instruments available in the market, all with good effectiveness. In this study, we aimed to compare two plasmapheresis instruments (Trima Accel and Haemonetics MSC Plus) with respect to process time, processed blood, product volume and platelet yield.

MATERIALS-METHOD: In a prospective observational study, platelet products were prepared for the use in the supportive treatment of pediatric blood donor receivers. One of the plasmapheresis instruments was randomly chosen and process time, processed blood, product volume and platelet yield were recorded. When the data of totally 103 products were collected (Trima access, n=65 and Haemonetics MSC Plus, n=38) the means with the standard deviations were calculated and statistically compared using t-test on SPSS. The significance level was accepted as 0.05.

RESULTS: The process time was significantly shorter in Trima (58.7±8.0 vs 65.4±7.9 min, $p<0.001$); platelet yield was significantly higher in Trima (4.2±1.5 vs 3.4±1.2 x1000/µL, $p=0.01$). There was not significant difference in processed blood volume (2989±632.5 vs 2906±497.5, $p=0.484$) and product volume (349.5±104.1 vs 311.6±91.6) between two devices.

CONCLUSION: Our study shows Trima to be more efficient in platelet collection, although both of the devices reach the target yield(3x1000/µL).

PP-003

EVALUATION OF PLATELET APHERESIS USE OF KONYA EDUCATION AND RESEARCH HOSPITAL BETWEEN 2012-2015 YEAR

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OBJECTIVE: Apheresis platelet infusions are used for bleeding and prevention. In this study, the use of apheresis platelets and destruction rates were investigated in our hospital transfusion center.

MATERIALS and METHODS: In our hospital tranfusion center the amount of apheresis platelet which are used and destroyed between 2012-2015 were analyzed.

RESULTS: In total number 1853, 850 of apheresis platelets where obtained from our tranfusion center and 1003 from the Red Crescent Blood Center. 77 units apheresis platelets were destroyed due to expiry term. The apheresis platelets that most commonly used service is medical oncology.

C**ONCLUSION:** We thinking the rate of destruction will decrease if getting apheresis platelets are doing on the time of using. Utilization rate by apheresis platelets is increasing yearly.

PP-004

THE RELATIONSHIP WITH MEAN PLATELET VOLUME AND COLLECTED PLATELET COUNT APHERESIS ON DONORS

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Ankara Numune Training And Research Hospital

INTRODUCTION-AIM: Apheresis is a process that includes these stages: taking blood from the patient or donor, the separation of whole blood to components with cell separator, collection of one or both of the separated components in another place and giving back the residue of blood to the patient or donor. Platelet apheresis is the most common donated apheresis process. In this process the donor's platelet count should be between 150.000-500.000X109/L. Mean platelet volume is a marker of platelet functions. Large platelets are more active, they have dense granules containing more rothrombotic factors and adhere more easily.

In this study we researched mean platelet volume and collected platelet count apheresis on donors applied to the Ankara Training and Research Hospital.

MATERIAL-METHOD: 210 apheresis platelet donors', applied Ankara Numune Education and Training Hospital in 6 months, count of platelets in the first application, mean platelet volume and count of platelet collected by haemonetics MCS device was analyzed retrospectively. Available data were obtained through the file and system maintained in blood banks. One apheresis collected donors were PLT: 150.000-300.000, kilo: <70 KG and double apheresis collected donors were: kilo: >70 KG, PLT: ≥300.000.

FINDINGS: 196 male, 4 female platelet donors applied to the Ankara Numune Training and Research Hospital Blood Center. Donors' average age were 40±20. In the first application 39 donors' platelet count were 150.000-200.000, 70 donors' platelet count 200.000-250.000, 59 donors' platelet count were 250.000-300.000, 26 donors' platelet count were 300.000-350.000 and 6 donors' platelet count were 350.000-400.000. Double apheresis is collected from 44 donors and single apheresis is collected from 156 donors. Compared to the platelet counts and collected apheresis significant correlation was obtained: P:0,00<0,01. But compared to the collected apheresis count and MPV could not obtain a meaningful

RESULT: P:0,296>0,01).

DISCUSSION: Economical using the apheresis platelets' blood products are preferred to prevent alloimmunisation, treatment of patients with platelet refractory, directed donation (neonatal thrombocytopenia). Double or triple dose apheresis platelets that collected from suitable donors is the preferred method for removing the a greater number of patients' need for transfusion. Average platelet volume is a parameter which is easily accessible used in a lot of study. We also analyzed the relationship between MPV and collected apheresis from the platelet donors. Results show that there is a significant relationship between platelet count and collected apheresis count, however there is not a significant relationship between collected apheresis count and MPV.

PP-005

EVALUATION AND COMPARISON OF IN VITRO HEMOSTATIC FUNCTIONS OF APHERESIS VS RANDOM-DONOR PLATELET CONCENTRATES VIA THROMBIN GENERATION TEST

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INTRODUCTION: Platelets can be prepared from single donor via apheresis (APCs), or from whole blood (random platelets, RDPs) via the buffy coat method. The clinical efficacy of these types of platelets remains under debate. Thrombin generation test (TGT) is a global assay that measures the overall tendency of a plasma sample to form thrombin after initiation of coagulation. Currently thrombin generation test is accepted as the most appropriate test for the global assessment of in vivo homeostasis in an ex vivo environment. Because platelet concentrates are also a type of platelet rich plasma, we evaluated the hemostatic effects of APCs and RDPs via TGT to compare their thrombin generation capacity.

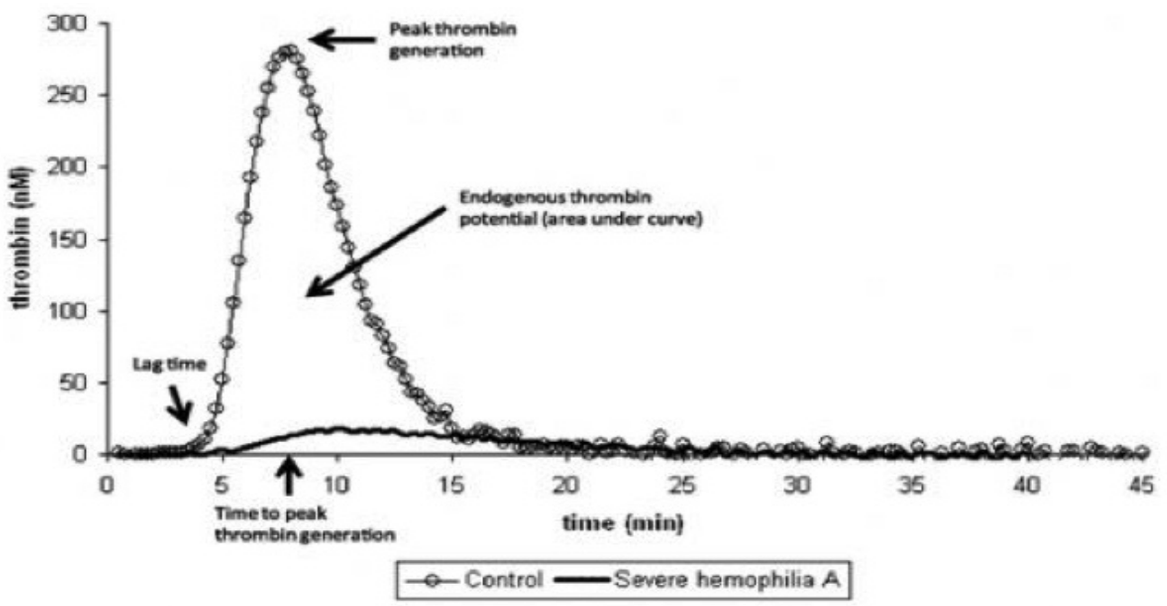
METHODS: Platelets were obtained from whole blood (random platelets) using apheresis procedure (Trima, Caridian BCT, Inc., Lakewood, CO). All of the blood donors met the apheresis donor selection criteria of National

Blood and Blood Products Guide. All blood donors also underwent microbiological screening tests. Apheresis platelet concentrates and RDPs were collected from 20 donors for each product. After the storage of the products for 24 hours, TGT was performed by CAT ® (Thrombinoscope BV, Maastricht, The Netherlands) device. In the current TGT, we used platelet rich plasma reagent (Thrombinoscope BV), which only contains tissue factor (1pmol/L) for assessing the presence of phospholipid in the sample. A 80 µl sample from each separate APC and RDP was taken. Each samples were transferred to three microtitered plates (Immulon 2HB, Thermo Electron Corporation, Milford) that contained 20 µl of platelet rich plasma reactant and 20 µl of thrombin calibrator. After the incubation of the mixture at 37°C for 15 minutes, 20 µl was taken from the mixture and 20 µl of fluo-buffer® was added and the reaction was monitored with a fluorometer. Using the Thrombinoscope® program, thrombogram curve was recorded and endogenous thrombin potential (ETP), peak height, lag time and time to reach the peak thrombin level were measured (Figure 1). The area under the curve, which shows the total thrombin generation capacity of the sample, was recorded as nmol/L x mins. The peak height, which indicates the highest generated thrombin value, was recorded as nmol/L. Lag time and time to peak were recorded as seconds.

RESULTS: The mean platelet counts of APCs and RDPs were 1195,2 ± 153,5 x 10^3/µL and 1008 ± 304,9 x 10^3/µL, respectively and there were no statistically significant differences between them. Endogenous thrombin potential, peak height, lag time and time to reach the peak thrombin level results were adjusted according to platelet levels of the concentrates and compared statistically. There were not statistically significant differences among the parameters of thrombin generation tests, between APCs and RDPs samples (Table 1).

CONCLUSION: Our results demonstrated that there is no statistically significant differences between in vitro hemostatic functions of apheresis vs random-donor platelet concentrates stored for 24 hours. However, definitive conclusions regarding the hemostatic functions of APCs and RDPs can be drawn by conducting large scale prospective clinical trials, adjusted for potentially confounding variables.

Figure 1. Thrombin generation and whole blood viscoelastic assays



From Young et al. Thrombin generation and whole blood viscoelastic assays in the management of hemophilia: current state of art and future perspectives. Blood; March 14, 2013: 121 (11).

From Young et al. Thrombin generation and whole blood viscoelastic assays in the management of hemophilia: current state of art and future perspectives. Blood; March 14, 2013: 121 (11).

Table 1: Thrombin generation test results of APCs and RDPs

Parameter	APC (Mean ± Standard Deviation)	RDP (Mean ± Standard Deviation)	*p* value
Platelet Count (x 10^3/μL)	1195,2 ± 153,5	1008 ± 304,9	0,130
ETP (nmol/L x mins)	2575,6 ± 485,7	2792 ± 668,8	0,315
Peak height (nmol/L)	282,1 ± 29,4	278 ± 85	0,251
Lag time (seconds)	9 ± 2,2	7,8 ± 1,4	0,140
Time to peak (seconds)	14,31 ± 2,44	13,7 ± 2,66	0,426

PP-006

ASSESSMENT OF THE BLOOD PRODUCTS PRODUCED IN BLOOD CENTER OF DICLE UNIVERSITY, FACULTY OF MEDICINE AND OBTAINED FROM RED CRESCENT BLOOD CENTER OF THE REGION

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OBJECTIVE: Dicle University, Medical Faculty Hospitals are the only hospitals providing services as Blood Center of the Region in Southeastern Anatolian Region. Blood product needs of our patients are met by our blood center as well as Turkish Red Crescent Southeastern Anatolian Region Blood Center (RBC). The present study aimed to investigate the production and sufficiency of the blood products used in our hospital.

METHOD: The blood products produced in our blood center and obtained from Turkish Red Crescent between January, 1, 2011 and December, 31, 2015 were examined retrospectively. Between the aforesaid dates, different products were obtained from blood of eligible donors collected into 3-system bags. Apheresis platelet was obtained through Haemonetics apheresis device.

FINDINGS: The blood products produced in our blood center and obtained from Turkish Red Crescent between January, 1, 2011 and December, 31, 2015 were presented in Table 1.

Erythrocyte suspension, random platelet and fresh frozen plasma were obtained only from Turkish Red Crescent RBC. Erythrocyte suspension, random platelet and fresh frozen plasma which were used in our hospital were obtained from Turkish Red Crescent RBC by rates of 8.5% (7033/82474), 28% (6274/22396), 19.8% (16345/82474), respectively.

CONCLUSION: A significant portion of blood products required in our hospital is obtained from our center. within the dates above, random platelet was mostly supplied from Turkish Red Crescent. It is concluded that our center is sufficient with trained technical personnel and developed infrastructure.

Table 1: The blood products produced in our center and obtained from Turkish Red Crescent RBC by years.

	2011	2011	2012	2012	2013	2013	2014	2014	2015	2015
	Number of products obtained from D.Unv. Medical Faculty RBC	Number of products obtained from Turkish Red Crescent RBC	Number of products obtained from D.Unv. Medical Faculty RBC	Number of products obtained from Turkish Red Crescent RBC	Number of products obtained from D.Unv. Medical Faculty RBC	Number of products obtained from Turkish Red Crescent RBC	Number of products obtained from D.Unv. Medical Faculty RBC	Number of products obtained from Turkish Red Crescent RBC	Number of products obtained from D.Unv. Medical Faculty RBC	Number of products obtained from Turkish Red Crescent RBC
Whole Blood	1199	-	614	-	343	-	498	-	259	-
Erythrocyte	13689	2604	14933	614	15899	1181	15377	1651	15543	983
Washed Erythtocyte	32	-	30	-	37	-	40	-	34	-
Random Platelet	1973	929	3001	1567	4180	798	689	2174	6279	806
Platelet by apheresis	2174	-	2259	-	2318	-	2865	-	2672	-
FFP	13689	2604	14933	4349	15899	6171	15377	2259	15543	662
Cryoprecipitates	-	-	7	-	-	-	-	-	94	-

PP-007

USE OF BLOOD COMPONENTS IN CARDIOVASCULER SURGICAL PROCEDURES IN 2 YEARS CAN WE REDUCE THE USE OF WHOLE BLOOD?

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Ankara Numune Training And Research Hospital

In this presentation, the percentage use of blood components and the comparative distribution of blood component groups which were used in the Ankara Numune Training and Research Hospital in 2014-2015 are given.

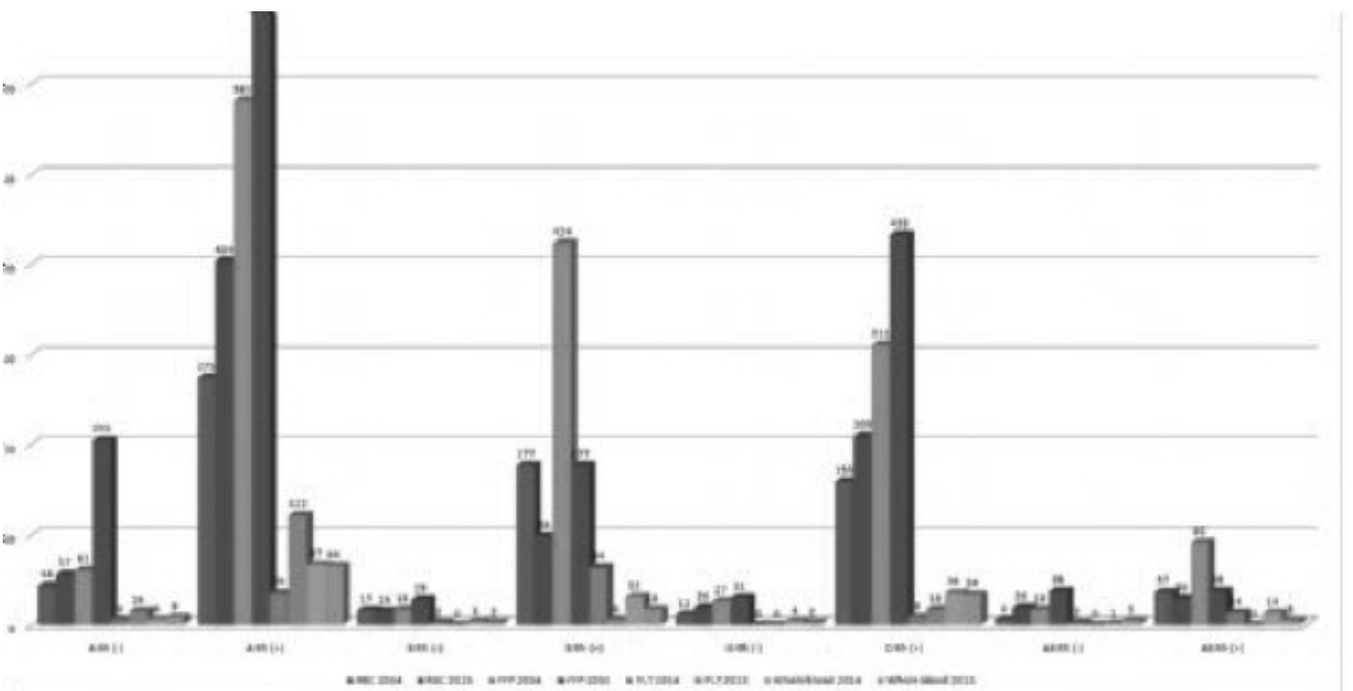
The blood and its components (whole blood suspensions, RBC suspension, apheresis-derived platelets(AD-PLT's), fresh frozen plasma(FFP)) which are routinely prepared before the cardiovascular surgical cases are most used in the process of operations and post operations. In 2014, 727 RBC suspensions, 1533 FFP, 133 Platelet suspension, 2 AD-PLT's and 162 whole blood suspensions were transfused to 905 patients. 2557 unites of bloods and its components were used in total. In 2015, 855 RBC suspensions, 1702 FFP's, 162 Platelet suspensions, 6 apheresis-derived platelets (AD-PLT's) and 141 whole blood suspensions were transfused to 1041 patents. In total, 2866 units of blood components

were used. No significant difference between 2014 and 2015 in terms of the number of units of blood components was observed.

Our center has been operating as a Transfusion Center according to the contract made with the Kızılay Regional Blood Transfusion Center since 2014. Though blood products are primarily supplied by Kızılay Blood Centre, whole blood suspensions and apheresis-derived platelets are collected and prepared by our center in the case of any needs especially for the surgical operations and post-op.

Hence, our findings show that no units of whole-blood suspension is used in 2014 and in 2015, only 3 units of whole-blood suspensions are used, except from Cardiovascular Surgical Clinic. Transfusion Commitee has been intensively working in order to reduce the use of whole blood suspensions.

COMPARISON



PP-008

KONYA EDUCATION AND RESEARCH HOSPITAL TRANSFUSION CENTER DESTRUCTION RATE AND CAUSE BLOOD PRODUCTS

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OBJECTIVE: Blood components, aren't used for various reason and disposed. The aim of our work, is to examine blood destruction rates and causes in transfusion center.

MATERIALS AND METHODS: Between 01.01.2015- 01.02.2016, received blood product, destroyed blood products and disposed of reasons were analyzed retrospectively.

RESULTS: 1051 (% 6,2) of the 17010 total blood components was destroyed. Blood components that destroyed is % 1 blood components, % 2 fresh frozen plasma, % 4,3 random platelets, % 15 apheresis platelets, % 2,5 whole blood.

CONCLUSION: The high rate of platelets destruction is particularly noteworthy. The biggest reason for this situation is that the platelets of storage time less than the oter compounds. If the entering blood isn't used in 72 hours in the blood center,it is foreseen that the rate of destruction will be decreased by ensuring the use of other patients.

PP-009

A NEW ALTERNATIVE FOR PREHOSPITAL HEMORRHAGIC SHOCK RESUSCITATION: LYOPHILIZED PLASMA

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INTRODUCTION: Point-of-injury plasma transfusion has several significant advantages over currently used resuscitation fluids. Lyophilized Plasma (LyP), also known as Freeze-dried plasma (FDP), is a powdery plasma which can be stored at ambient temperatures and ready for transfusion within a few minutes of dissolution. Currently, FDP has been actively used by the German, French and Israel Military. We aimed to share our experience from the processing and the in-vitro hemostatic functions of FDP.

METHODS: The study and the protocol (200 mL plasma containing approximately 36 mL of ACD-A anticoagulant) was approved by the Institutional Review Board.

Plasma supply: Six fresh donor plasma units were obtained from six voluntary male donors in Gulhane Military Medical Academy of Blood Center.

Freeze-drying and storage: Freeze-drying was performed on Christ Gamma 2-20 Lyophilizer (Germany). Twenty milliliter aliquots of plasma were transferred to plastic petri dishes. Samples were frozen to - 40°C at a rate of 18°C/min and were placed on the pre-cooled shelf of the lyophilizer. Primary drying was carried out at 10°C under a pressure of 0.3 mBar for 55 hours.Then, secondary drying was carried out at 15°C under a pressure of 0.03 mBar for 22 hours.

Rehydration: Freeze-dried plasma was rehydrated using 20 mL of pure reagent grade water after resting at room temperature for 15 days. FDP was reconstituted in less than 15 min

Coagulation assays: Before and after the process, prothrombin time (PT), International Normalized Ratio (INR), activated partial thromboplastin time (aPTT), thrombin time (TT), coagulation factors (I, II, V, VII, VIII, IX, X, XI, XII, von-Willebrand Factor), percentage activity of protein C, protein S, antithrombin-III and antiplasmin were were performed on donor plasma samples, using the STA-R (Diagnostica Stago,NJ) automated coagulation device. Total protein, albumin (Beckman Coulter Inc, USA) and immunoglobulins (Ig G, A, M, D) (BN ProSpec®,Siemens,Germany), were also performed according to the manufacturers' instructions.

Clotting time (CT) and clot formation time (CFT), maximum clot firmness (MCF) and maximum lysis (ML) percentage of MCF was calculated by thromboelastometry device (ROTEM®). Except for the thromboelastometry analyses, all coagulation tests were funded by Ankalab® Laboratories in Ankara.

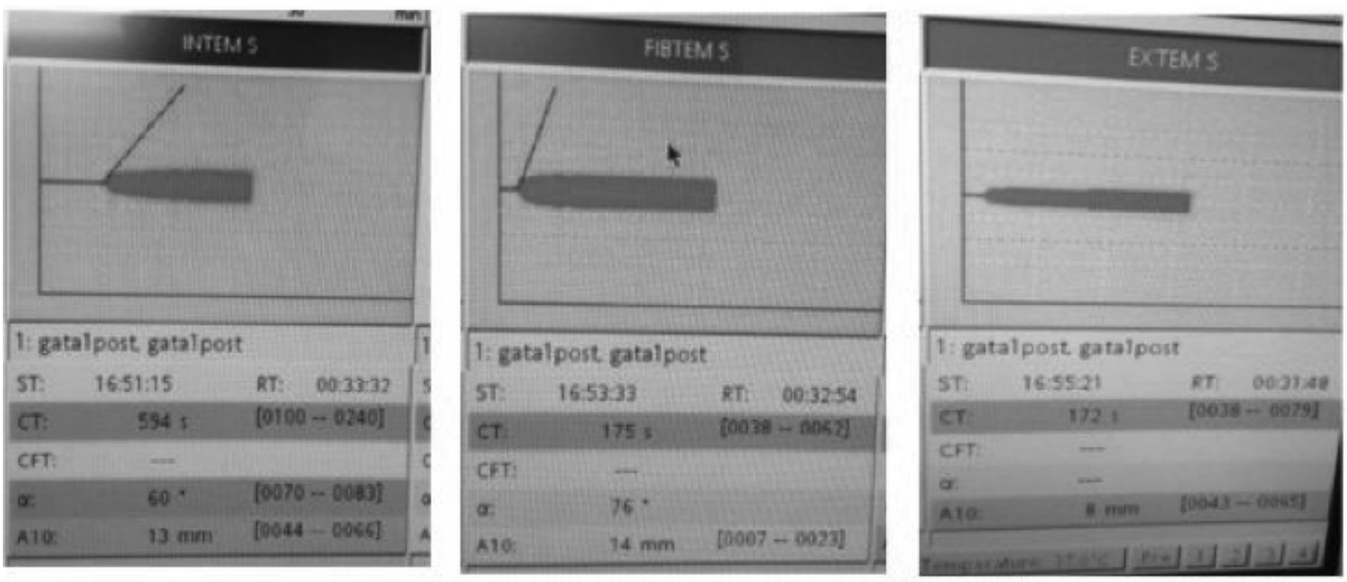
RESULTS: All of the test results of the 6 donors before and after Lyp is seen in Table 1 and Table 2. Because of the low number of the samples statistical analyses were not performed. Median values of the tests performed were seen in Table 3 and Table 4. Activity of all factors, anticoagulant proteins, total protein ann albümin levels were also diminished outside the reference limits in FLyP, except von Willebrand Factor levels, which were also diminished but within the reference limits like Ig levels. Median prothrombin time (12,5 s vs. 52,5s), activated partial thromboplastin time (30 s vs. 300 s) and thrombin time(19 s vs. 80 s) were increased outside the reference limits in LyP. The authors observed an evident increase in the clotting and clot formation time, but there was not an evident change in maximum clot firmness and maximum lysis in the thromboelastometric parameters.

CONCLUSIONS: Although these are preliminary results and the study population is very low, our study results account for a significant decrease of in vitro hemostatic functions of LyP. However, while the gobal capacity to induce in vitro clot formation is prolonged also with thromboelastometric tests, the global capacity to stabilize the in vitro formated clot seems to be preserved. The clinical relevance of these decreased factors is not known. Our study has the limitations of in vitro models: it lacked the contribution of in vivo factors like platelets, other blood cells, endothelial factors and vascular factors. Also it is a pioneering and preliminary study about Lyp in Turkey and needs to be developed with other studies. Consequently, our findings could not be translated directly to the clinical setting and could not be accepted as failed. Nowadays, LyPs are produced commercially and usage of them started actively in German, French and Israel Defense Forces after succesfull clinical trials. To provide the point-of-injury plasma transfusion with LyP plasma also in Turkey, we appreciate that this process shall most effectively be developed and executed by the cooperation of Turkish Red Crescent, Turkish Blood Banks and Turkish Armed Forces.

Figure 1. Freeze-drying and storage

Freeze-drying was performed on Christ Gamma 2-20 Lyophilizer (Germany). Twenty milliliter aliquots of plasma were transferred to plastic petri dishes. Samples were frozen to - 40°C at a rate of 18°C/min and were placed on the pre-cooled shelf of the lyophilizer. Primary drying was carried out at 10°C under a pressure of 0.3 mBar for 55 hours.Then, secondary drying was carried out at 15°C under a pressure of 0.03 mBar for 22 hours. Rehydration: Freeze-dried plasma was rehydrated using 20 ml of pure reagent grade water after resting at room temperature for 15 days.

Figure 2.Thromboelastometry (ROTEM®) analyses



Clotting time (CT) and clot formation time (CFT), maximum clot firmness (MCF) and maximum lysis (ML) percentage of MCF was calculated by thromboelastometry.

Table 1. Test results of coagulation parameters.

	Before the lyophilization process	After the lyophilization process
	Median (Minimum-Maximum)	Median (Minimum-Maximum)
Total protein (g/dL)	6,2 (6,0-6,9)	5,1 (5,1-5,2)
Albumin (g/dL)	4,0 (3.7-4.3)	3.3 (3,0-3,3)
Protein S activity (%)	92(74-109)	67 (58-78)
Anti Plazmin	106,5 (98-122)	78 (26,8-87)
Anti Thromb.3 activity	79,5 (75-84)	60,5 (56-67)
IgA (IU/mL)	141,5(105-218)	139 (94.3-198)
IgG (IU/mL)	753 (594-1140)	644 (537-987)
IgM (IU/mL)	84 (45,6-116)	77,6 (56,3-107)
IgE (IU/mL)	30,8 (7,4-38,5)	21,4 (4,3-26,7)
PTZ (s)	12,5 (12,2-13,1)	52,5 (46,5 -61,3)
INR	0,9 (0,9-0,9)	5,7 (4,9-6,9)
APTT (s)	30 (27-33)	300 (123-300)
VWF antigen (%)	109 (71-138)	85 (49-109)
Thrombin time(s)	19 (18,9-19,9)	80 (55,7-90,7)
Faktör I (%)	250 (212-363)	128 (97-230)
Faktör II (%)	102 (91-116)	44,5 (40-52)
Faktör V (%)	98,5 (90-122)	8 (7-10)
Faktör VII (%)	99 (71-124)	32,5 (24-39)
Faktör X (%)	87,5 (74-101)	21,5 (13-25)
Faktör VIII (%)	109 (72-141)	9,5 (5-11)
Faktör IX (%)	109 (99-140)	39,5 (32-46)
Faktör XI (%)	1434 (120-149)	56 (42-78)
Faktör XII (%)	110 (91-137)	28 (20-38)
Protein C activity (%)	114,5 (99-127)	86,5 (73-99)

Table 2. Test results of thromboelastometry.

	Before the lyophilization process	After the lyophilization process
	Median (Minimum-Maximum)	Median (Minimum-Maximum)
INTEM_CT (s)	228 (186- 238)	558,5 (481-743)
INTEM_CFT (s)	233,5 (162-538)	*ND
INTEM_MCF (mm)	22 (15-27)	17 (12-33)
INTEM_ML (%)	*ND	*ND
FIBTEM_CT (s)	43,5 (4-125)	157,5 (72-214)
FIBTEM_CFT (s)	179,5 (85-1087)	*ND
FIBTEM_MCF (mm)	21,5 (9-40)	16,5 (8-29)
FIBTEM_ML (%)	5,5 (0-18)	5 (3-48)
EXTEM_CT (s)	64 (54-143)	161 (130-173)
EXTEM_CFT (s)	*ND	*ND
EXTEM_MCF (mm)	19 (13-38)	20 (9-32)
EXTEM_ML (%)	*ND	3,5 (2-10)

*CT:Clotting time, CFT:clot formation time, MCF: maximum clot firmness, ML: maximum lysis (ML),*ND: Not determined.*

PP-010

IRRADIATED BLOOD AND BLOOD COMPONENTS RATIO IN CONTINUING BLOOD BANK OF ISTANBUL KARTAL KOŞUYOLU YUKSEK IHTISAS EDUCATION AND RESEARCH HOSPITAL IN 2013-2015 YEAR TERM.

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Istanbul Kartal Kosuyolu Yuksek Ihtisas Training and Research Hospital

AIM: Of our hospital having been the prompt to use the term blood center irradiated blood and blood components, we aimed to compare the rates of the 2013-2015 year.Irradiation of blood components send and have received irradiation services to the Kartal Dr. Lütfu Kırdar Education and Research Hospital in 2013 and 2014 years. In 2015, have received irradiation services in North Marmara Region Istanbul Turkish Red Crescent Blood Bank.

METHOD: In our study were evaluated the rate of irradiation and blood component the desired from the our blood center based on according to year. Were analyzed retrospectively between from 1 January 2013 to 31 December 2015. (Table 1)

SYMPTOMS: In 2013, the rate of number of output ırradiated erythrocyte suspension (ES) to the total number of output ES 1,40 the rate of number of ırradiated whole blood (WB) to the total number of output WB 1,60. In 2014, the rate of number of output ırradiated erythrocyte suspension (ES) to the total number of output ES 1,39 the rate of number of ırradiated whole blood (WB) to the total number of output WB 1,79. In 2015, the rate of number of output ırradiated erythrocyte suspension (ES) to the total number of output ES 1,92 the rate of number of ırradiated whole blood (WB) to

the total number of output WB 3,12.

RESULT: The transfusion of blood and blood constituents saves lives of many people; however, it can induce fatal Graft-Versus-Host disease. The only way to prevent this disease, which is characterized by an increase in the damage of donor's T-lymphocytes that target organs of the receiver, is the radiation of the blood and blood constituents with X and gamma rays.

Figure.1

Years	Total ES Out put	total ES Out put	number of patients to be applied irradiated ES Suspension	Irradiated ES Suspension output	rate	Total number of patients to be given Whole Blood	Total Whole Blood output	Number of patients to be given irradiated Whole Blood	Irradiated Whole Blood output	Rate
2013	2719	13655	9	191	1,4	1138	1935	7	31	1,6
2014	2933	14372	8	200	139	1079	1840	6	33	1,79
2015	3017	15075	9	290	1,92	686	1154	8	36	3,12

PP-011

THE ANALYSIS OF THE USAGE OF PLATELET SUSPENSIONS

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BACKGROUND: Izmir Katip Celebi University and Ataturk Training and Research Hospital with 1100 beds is a university research and training hospital. Since the second half of 2013, the blood and blood products supply actively began to be provided from Regional Blood Center of Turkish Red Crescent (TRC).

AIMS: This study was performed in order to emphasize the importance of blood and blood products diversity by examining distributions of the usage of platelet suspension products in three- year period.

METHODS: In 2013 blood and blood products were both produced in our hospital and as well as provided from TRC. In 2014 and 2015 all of the blood and blood products fully were supplied by TRC. In the hospital, the whole blood drawn from avaible donors was divided into components by removing buffy coat with the blood bag systems (Quadruple Top&Bottom CPD/SAG-M 450 ml SAP 5D; Kansuk, Turkey). The pooled platelet suspensions were obtained using Platelet Pooling Bag with Filter (Kansuk, Turkey). Apheresis platelet suspensions were obtained using automated Haemonetics apheresis device (United States of America). All the products were provided as buffy coat removed from TRC.

RESULTS: In 2013 totally 7504, in 2014 3602 and in 2015 3461 units of platelet suspension were used. The types and the distribution of the platelet suspensions are given in the table.

Table: The types and the distribution of the platelet suspensions.

	2013		2014		2015	
USED PLATELET SUSPENSİONS	Number (n)	Percentage (%)	Number (n)	Percentage (%)	Number (n)	Percentage (%)
Platelet Rich Plasma (PRP)	5055	67.36	1752	48.64	1734	50.10
RPR- Irradiated	1128	15.03	553	15.35	245	7.08
Pooling RPR	107	1.43	-	-	-	-
Apheresis Platelets	1074	14.31	676	18.77	894	25.83
Apheresis Platelets-Irradiated	140	1.87	621	17.24	588	16.99
Total	7504	100.00	3602	100.00	3461	100.00

CONCLUSION: Totally the the platelet rich plasma transfusion was significantly decreased in years. Platelet suspension utilization rate was decreased by half according to the time when the platelet suspension was prepared in our center. The product usage especially is proportional to facilitate its ability to supply. The platelet rich plasma production must be made from all the whole blood despite the increasing workload. Because this application would be provided solutions to meet the patients needs. In addition, the pooled platelet production was not seen that done yet despite last years.

PP-012

THE ANALYSIS OF THE USAGE OF CRYOPRECIPITATE AND FRESH FROZEN PLASMA

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[2]Izmir Katip Celebi University, Ataturk Training and Research Hospital, Medical Microbiology

BACKGROUND: Izmir Katip Celebi University and Ataturk Training and Research Hospital with 1100 beds is a university research and training hospital. Since the second half of 2013, the blood and blood products supply actively began to be provided from Regional Blood Center of Turkish Red Crescent (TRC).

AIMS: This study was performed in order to emphasize the importance of blood and blood products diversity by examining distributions of the usage of cryoprecipitate products and fresh frozen plasma in three- year period including transitional.

METHODS: In 2013 blood and blood products were both produced in our hospital and as well as provided from TRC. In 2014 and 2015 all of the blood and blood products fully were supplied by TRC. In the hospital, the whole blood drawn from avaible donors was divided into components by removing buffy coat with the blood bag systems (Quadruple Top&Bottom CPD/SAG-M 450 ml SAP 5D; Kansuk, Turkey). Cryoprecipitate products were obtained using transfer Bag 300 ml (Kansuk, Turkey) and using sterile hose joining device and blades (Terumo, Japonya) in our hospital. All the products were provided as buffy coat removed from TRC.

RESULTS: The distribution of the cryoprecipitate products and fresh frozen plasma according to years are given in the table.

Table: The changes of used cryoprecipitate and fresh frozen plasma according to the year.

	2013	2014	2015
	Number (n)	Number (n)	Number (n)
Cryoprecipitate	*901*	***708***	***595***
Fresh Frozen Plasma (FFP)	*10480*	***10982***	***8582***

CONCLUSION: The use of cryoprecipitate was decreased each passing year. This reduction has been explained by the non-produced blood products cannot be used. It is an important problem that must be solved to not keeping of stock of cryoprecipitate in TRC. The usage of fresh frozen plasma was substantially reduced in 2015 while it was same in 2013 and 2014. The decreased usage has been linked to the plasmapheresis cannot be done in the hospital in 2015 year.

PP-013

FIVE YEARS OF HEMOVIGILANCE REPORTS OF COMPLICATIONS OF THE BLOOD DONATION REPORTED AT A TERTIARY CARE CENTRE IN KARACHI

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BACKGROUND: There is a minor chance of risk among blood donors. Even though blood donors are usually screened for the presence of risk factors, sometimes blood donations can put a person at panic.

OBJECTIVE: The safety of the blood supply depends on the actions to protect both; blood transfusion recipient and the blood donor. Hemovigilance practice of learning of complications of blood donation and protecting them from such complications is the best way to minimize the risk to blood donor.

STUDY DESIGN AND METHODS: Comprehensive blood donor hemovigilance program was studied at Dr. Ishrat ul Ebad Khan Institute of blood diseases, Karachi from 2010 to 2015. Outlines of reported and communicated complications were collected after whole blood donation. Analysis was done by general logistic regression.

RESULTS: Complications after 30,000 Whole blood donation procedures calculated 1620 total. (54 per 1,000 donations). The majority of the complications were faint and pre-faint reaction with light headedness (58.6 %), Sore arm (24 %), Bruises and hematoma (14.4 %). Minor complications were Agitation/sweating (2 %) and arterial puncture (1 %). Markers of the complications were age, sex, race, weight, blood pressure and donation status. All associated independently after whole blood donation. Age and first-time status were associated with a significantly higher risk of complications with 18-22 years old at higher risk compared to 23 to 50 years old. First-time donor were at higher risk compared to repeat donor.

CONCLUSION: The results of this study are helpful in identifying and understanding the promoter to complication of blood donation. Donor age and status were strong predictors of complications. The remedies and specific areas of care should be provided.

PP-014

THE FIRST DATA OF HAEMOVIGILANCE SYSTEM IN A DAYCARE OF A TERTIARY HOSPITAL IN BANGLADESH

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BACKGROUND: This study is the first report of transfusion errors and adverse reactions recorded in Bangladesh. It's a new approach to collect, collate, and analyze the data to speak of the issues associated with blood transfusion in the day care. It's also an alert for the physicians of developing country who are only tagged for whole blood transfusion.

AIMS: This study is aimed to perceive the frequency of adverse reaction and the errors associated with its barrier.

METHODS: Total 9,984 patients were included. Clinical and laboratory data were collected,analyzed and intended to gather information on near miss and clerical errors.

RESULT: 936 adverse reactions were reported, equivalent to 0.093 reactions/9,984 units of transfused blood components. 1.06% adverse events reported; acute were 0.94 %. Among them febrile reactions were 0.22% due to transfusion of RCC plus FWB and 0.20% were due to PC. Allergic reaction (urticarial and anaphylactic reactions) were 0.52% and 0.21% were due to platelet transfusion from RD, 0.31% were due to transfusion of FFP. Additional failure were 0.09% due to excessive lipemic plasma and 0.03% were tearing of plasma bags. Red cell alloimmunization were 11.11% to 12.12%. Clerical and near miss errors come 3.5% to 4.1% and 3 reports of mismatch blood transfusion, 2 is about misidentification of the patient group due to severe myelosuppresion owing to leukaemia and 1 is for subgroup. However, it's not always possible to analyze the relevance of all the transfusion and the outcome of the patient.

CONCLUSION: Now, a developing country like Bangladesh has to face and notify the errors and to solve them in parallel. It may be slow in moving ahead but the team is aware to guard and share this with all the departments which are also reliant on transfusion.

PP-015

BLOOD TRANSFUSION IN DEVELOPING COUNTRIES: HEMOVIGILANCE OR ULTRA-HEMOVIGILANCE

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BACKGROUND: Blood transfusion saves lives and improves health. Developing and underdeveloped countries, however, face tremendous shortage of life the saving fluid. These countries comprise bulk of the world population (75-80%). These are the countries with poor socio-economic systems, political instabilities, high illiteracy and more recently extremism/terrorism etc. The main WHO regions in this regard are EMRO, SEAR, Africa and some countries from European and American region.

INTRODUCTION: There is marked difference in availability and level of access of blood in advanced countries and under resource countries. Of the 110 million donations collected globally, about half of them is collected in high income countries which is home to just 1/4th of world population. Donation rate in low income countries is just 3.9/1000 population compared to high income countries (36.8/1000). Replacement and directed donations remain the main mode of donation in countries with limited resources. In our part of the world picture is dismal and SERO countries face the deficit of 8-10 million units annually. BTS is generally fragmented and whole blood is still used in > 60% places and lot of use of blood is unjustified. Hemovigilance is almost non- existent and transfusion committes are seen at few centers only. Thailand, Siri-lanka, Turkey and Indonesia are probably having the best BTS in the region.

Ultra-hemovigilance: Health is directly linked to overall socio-economic status of the country. Providing adequate safe blood should be a part of every country's national health care policy. This, however, is not possible without socio-economic uplift. Trying to attain everything in transfusion systems appears a futile practice in resource constraint countries. We need to prioritize areas of great concern and optimize them within the given resources. Unlike hemovigilance, which is there to prevent unwanted events related to transfusion, ultra-hemovigilance is a strategedy to increase the availability of blood particularly in resource constraint world; to educate the youngsters for regular donation, fractionate the blood into desired components, justified use of the component required, Establishment of transfusion committees in hospitals, consideration of alternatives to blood and educating the community to best avoid the use of blood.

SUMMARIZING: Blood is a common wealth and developing countries can attain adequacy in availability and actual transfusion through ultra-hemovigilance. It addresses the people, practitioners and patients at very basic level so that availability and usage of blood could be optimized in under resource countries.

PP-016

AN AUDIT OF WRONG BLOOD TRANSFUSIONS AND INTERVENTION WITH BEDSIDE ABO TYPING AND TIME OUT

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BACKGROUND: Blood transfusion is a life-saving option but is associated with various hazards. One of them is wrong blood transfusion due to ABO mismatch which is potentially life threatening. Hemovigilance of tranfusion processess is required through a team of colloborated work to minimize adverse effects of blood transfusion. Hospital transfusion committees are instrumental in monitroing the policies and practices for achieving hemovigilance.

OBJECTIVES: To audit frequency and causes of wrong transfusion of red cell units during 2010 to 2016 and to develop strategies for minimizing recurrence of such hazards.

SUBJECTS AND METHODS: All patients who received red cell blood transfusion in Aga Khan University during January 1, 2010 to December 301 2015 were studied. Standard used was in-house with zero tolerance policy for wrong transfusions.The total number of red cell transfusions was estimated. Wrong transfusion and the reasons for the same were determined. Mortality ratio was also evaluated. This was discussed in hospital transfusion committee and multiple interventions were discussed. Based on these, time out and bedside ABO typing was initiated. Nurses training was considered for determining ABO group.ABO group card was saved in medical chart after performing the test. Using

barcoding for patient identification was also programed. This has yet to be initiated.

RESULTS: During the study period, 133888 red cell units were transfused. Eight wrong transfusions and three deaths were observed. Wrong transfusion and mortality ratio was 1:16000 and mortality ratio was 1:67000. Final bedside error and wrong addressograph were identified as the main reasons. During March to September 2015, 1400 nurses were trained for bedside ABO typing through 50 nurse coordinators. From October 1 to January 2016, 2003 bedside ABO typing have been performed. Time out before transfusion was also initiated. We observed 100% concordance between bedside and laboratory ABO grouping. However, 21 medical records checked for ABO cards showed issues like lack of proper filing, biosafety issues and incomplete recording of date and time for the test. In these four months, no wrong blood transfusion was reported.

CONCLUSIONS: Our limited experience showed time out and bedside ABO typing as effective interventions for minimizing wrong red cell transfusions. Training of nurses and maintaining cards properly in medical charts were challenging.

RECOMMENDATIONS: We need a follow-up audit to monitor competency of nurses and to identify issues in performing bedside ABO typing by nurses

ABO card

This is the pouch with ABO card and consumables with instructions to follow by nurses. This was sent with each red cell unit dispense from blood bank.

Nurses doing bedside ABO typing

Two nurses verify blood unit identification and one performing bedside ABO typing

PP-017

REPORT OF UNWANTED SERIOUS ADVERS EFFECT AND SERIOUS ADVERS EVENT RESULTS FOR THE LAST SEVEN YEARS AT OUR TRANSFUSION CENTER

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OBJECTIVE: Hemovigilance describes entire procedures by which unwanted serious advers effect and events and the epidemiological followup of blood donors and blood receivers is carried out. At this study, data is collected and evaluated in order to prevent the repetition of unwanted serious advers effect and advers events caused by procedures done at our transfusion center.

MATERIALS-METHODS: Early unwanted serious effects can be stated as; hemolysis, nonhemolitic febril reaction, rash, erythemia, urticaria, anaphylactic shock, bacterial contamination, transfusion-related acute lung injury. Delayed serious unwanted effects on the other hand might be stated as; hemolysis, transfusion-associated graft vs. host disease, post-transfusion purpurea, ALT elevation.Alloimmunization development against erythrocyte, platelet antigents or HLA and virus,parasite,pyrion contamination are evaluated as other serious effects. Meanwhile unwanted serious events are described as eventsthat might cause death or life threat,permanent and important morbidity or loss of working power or need for hospitalization or lengthening of hospitalization period.Mistakes made in ABO type defining and wrong labeling of blood samples are assessed as examples of this type of events. As a subgrup; ''Events avoided at the last

moment'' and ''Transfusion mistakes without a serious event'' have also been studied.

Check- forms for unwanted serious events have been filled at wards possibility levels has been set. The terminology was noted in such a way that if data is not sufficient to analyze the situation; inevaluable, if the suspected serious effect was proved to be caused by any reason apart from transfusion or despite the fact that there aren't any certain evidence but the serious effect is thought to be due to another reason; impossible, if the evidence is not sufficient to attribute the unwanted serious effect to blood and blood products or not sufficient to link it to other reasons; possible, if the serious effect can be attributed to blood or blood products; probable and if the unwanted serious effect can be related to blood or blood products beyond reasonable suspicion; certain possibility levels were identified.

RESULTS: In our transfusion center, 192348 units blood components output was made between the dates of 01.01.2009 and 31.12.2015. In the meantime, unwanted serious effects 157 (% 0.08)in total, events avoided at the last moment and transfusion mistakes without a serious event was found at the rate of 86(%0.04) Unwanted serious events has not seen. Unwanted serious effects are determined in and after 2010 by the check-forms. It has been determined as 55 % of it inevaluable, 20 % of it possible, 21% probable, 4 % certain. According to years and blood products, unwanted serious effects can be seen on the first chart. According to years and reasons, unwanted serious event and its subgroup can be seen on the second chart.

CONCLUSION: Attention should be paid to prevent unwanted effects and repetition of events in regards of some mistakes on the transfusion process. Surveillance of unwanted serious effects and events contribute the safety of transfusion.

Chart 1: Unwanted serious effects according to years and blood products Chart 2.Unwanted serious events according to years and reasons

Chart 1: Unwanted serious effects according to years and blood products.

UNWANTED SERIOUS EFFECTS		2009	2010	2011	2012	2013	2014	2015	TOTAL
RED CELL CONCENTRATE	Febrile non-hemolytic transfusion reaction	16	15	12	10	9	18	10	90
	Immunologic hemolysis related to alloantibodies	-	-	-	1	7	2	-	10
	Immunologic hemolysis related to incompatible ABO	-	-	-	-	1	-	-	1
	Erythema	1	2	2	-	7	-	-	12
	Urticaria	4	-	-	-	3	1	-	8
	Anaphylaxis	-	-	-	3	-	-	1	4
FRESH FROZEN PLASMA	Erythema	-	-	-	-	2	2	3	7
	Urticaria	-	-	2	-	1	1	-	4
	Post-transfusion purpura	-	-	-	-	-	4	3	7
	Anaphylaxis	-	-	-	-	-	2	-	2
PLATELET, APHERESIS	Erythema	-	1	-	-	1	-	-	2
	Urticaria	-	-	-	2	1	-	1	4
	Febrile non-hemolytic transfusion reaction	-	-	-	-	-	-	1	1
PLATELET CONCENTRATE	Febrile non-hemolytic transfusion reaction	1	-	-	1	-	2	-	4
	Anaphylaxis	-	-	-	-	-	1	-	1
TOTAL		22	18	16	17	32	33	19	157

Chart 2.Unwanted serious events according to years and reasons

UNWANTED SERIOUS EVENTS	REASONS		2009	2010	2011	2012	2013	2014	2015	TOTAL
UNWANTED SERIOUS EVENT			0	0	0	0	0	0	0	0
EVENTS AVOIDED AT THE LAST MOMENT (NEAR MISS)	Blood sample not related to patient	Different label	2	6	11	6	5	9	10	49
		Blood sample taken from different patient	1			3	4	3	7	18
	Labeling mistake on request forms						7		1	8
	Blood component output to a different patient		1		1					2
	Labeling mistake			1	1		1			3
	Recorded donor's blood goup differently								1	1
TRANSFUSION MISTAKES WITHOUT A SERIOUS EVENT	Transfused blood component which belongs to a different patient						1		1	3
	Recorded patient's blood group differently								2	1
	Transfused blood component which is different group								1	1
TOTAL				4	7	13	9	18	12	23

PP-018

THE FREQUENCY OF ACUTE TRANSFUSION REACTIONS DUE TO USAGE OF BLOOD PRODUCTS

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OBJECTIVE: Blood transfusion can be described as a special tissue transplantation. Although acute transfusion reactions are considered as the reactions which develop during or 24 hours following the transfusion, most of the reactions occur during or couple hours following the transfusion. This being the reason, patients should be monitored closely for the first 15 minutes to an hour after the transfusion. In-line leukocyte filtered blood bags are used in our clinic. It is known that blood products devoid of leukocytes reduce the transmission of CMV, occurence of febrile non-hemolytic transfusion reactions and alloimmunization to an extent. In this study, we examined the frequency of acute reactions due to usage of blood products throughout a year in our hospital.

MATERIALS-METHODS: In our hospital, transfusions are monitored by our transfusion control nurses. If it is suspected that the reactions during the transfusion occurred because of the transfusion, the process is terminated by the nurses or the doctors and a blood sample from the patient and the blood product baggiven to the patient are sent to the blood transfusion center for an examination. Reasons to the reactions are investigated with blood type, cross-match, Rh sub-type and indirect coombs tests. In our study, the inputs are elicited retrospectively from our transfusion follow-up forms.

RESULTS: The results are stated in the table below.

CONCLUSION: The reactions that are mostly seen in patients include rash, erythema, trembling and itchiness. Fever, tachycardia, hypotension, nausea and vomiting are following these findings. The reactions are treated with antihistamines and antipyretics. None of these reactions are found to be life treating. Even though febrile non-hemolytic transfusion reaction is the most common one, due to our usage of in-line leukocyte filtered blood bags, it is reduced significantly. Blood banks serve to provide blood securely. It is vital to reduce the complications and intervene promptly if a complication takes place. All these given, it is essential that the health care provider who is maintaining the transfusion is careful, educated and talented.

Results Table

Types of product	Number of products	The number of reactions(%)	FNHTR (%)
Whole blood	79	0(%0.00)	0(%0.00)
Red blood cell suspension	16325	15(%0.09)	3(%20)
Fresh frozen plasma	8150	16(%0.20)	2(%16)
Random platelets	2074	0(%0.00)	0(%0.00)
Aferez platelets	1429	3(%0.20)	0(%0.00)
Cryoprecipitate	420	0(%0.00)	0.(%0.00)
Washed red blood cells	19	0(%0.00)	0(%0.00)
Total	28496	34(%0.12)	5(%14.7)

PP-019

ISTANBUL CEKMECE DISTRICT PUBLIC HOSPITALS ASSOCIATION OF THE GENERAL SECRETARIAT OF THE HOSPITAL TRANSFUSION FOLLOW TRACEABILITY ASSESSMENT SCOPE OF NURSING ACTIVITIES

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INTRODUCTION – AIM: Each one from donors with the traceability of the preconditions for the creation of Hemovijilans network unit of blood or blood components until its final destination and is defined as the ability to follow the direction opposite.

Prepared component of blood outside the blood service units in order to ensure data security to ensure that the patient has to be given to the professional to do this task.

Following the April 20, 2015 in our hospital transfusion Nursing (Nursing Hemovijilans) service was introduced with a staff of 12 people and was assessed 8 months of data.

MEANS METHOD: Transfusion to ensure the standard of follow-up data submissions were prepared to nurses. In 8 months in our 8 hospitals patients on behalf of all blood components made out, was evaluated on Form Follow transfusion.

RESULTS: Seen in our 8 hospitals at 39 344 number of blood transfusions evaluated the eight-month period of service units to a total of 43253 units of the number of products made out on behalf of patients. Our service units of blood products derived from the study of legal documents before and after the transfusion, patients were allowed to be filled, these documents were examined and the most common deficiencies and errors were detected. Looking into the red blood cells examples;

In April, the number of forms that can not be considered 336 Transfusion follow-December, the number of forms is not reached to form Follow transfusion was found to be 43.

CONCLUSION: Hemovijilan are about 60 000 years our blood component due to the use of public hospitals was provided to obtain secure data for traceability, one of the priorities. Hospitals and clinics are determined based on the number of blood use, and most often the faults and deficiencies, corrective and preventive actions are planned.

PP-020

DOES ABO AND RH INCOMPETIBLE APHERESIS PLATELETS TRANSFUSION RESULTS INCREASE IN TRANSFUSION RELATED REACTIONS

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This paper is aimed to investigate weather ABO and Rh incompatibility increases the transfusion related reactions or not during apheresis platelets transfusion at our hospital? Results are matched by two proportion T Test.

Medstar Antalya Hospital is a special center for the Hematological and Oncological Diseases. 5248 apheresis platelets transfused to 3098 patient 01.01.2015 – 31.12.2015 at our center. At this period random platelets usage is zero. ABO and Rh compatibility is primerly chosen during platelets transfusion but if not other group transfusion preferred.

4249 fullmatched, 479 ABO incompatible, 520 Rh incompatible platelets tranfusion done at this period. 22 transfusion related reactions developed at 18 patient. ABO incompatible 2 patient 3 reaction, Rh incompatible 1 patient 1 reaction. Itching, urticaria like mild transfusion reactions seen all patients, antihistaminic and corticosteroid treatment reversed the symptoms

For the first patient 8 full compatible, 7 Rh incompatible, 2 ABO incompatible 17 apheresis platelets tranfusions done. 1st and 5th transfusions of the patient are ABO incompatible 6th- 10th and 16th-17th transfusions are Rh incompatible. 2 ABO incompatible transfusions are both reacted. Second patient 1 ABO incompatible, 9 ABO compatible totally 10 transfusion done. Incompatible transfusion result with reaction. Third patient 128 full compatible, 7 Rh incompatible, 3 ABO incompatible transfusion done. 139th transfusion reacted. After that 19 compatible and 2 Rh incompatible transfusion done. Totally 160 transfusion (Table 1).

Transfusion related reactions of our hospital is 0.41%, compatible transfusion 0.42%, ABO incompatible transfusion 0.62% (P=0.7927), RH incompatible 0.19% (P=0.6752).

Not statisticaly significant difference determined.

Both ABO and Rh Incompatible Transfusion Reactions At Medstar Antalya Hospital 2015

Patient Name	Used PLT	Compatible PLT	RH Incompatible PLT	ABO Incompatible PLT	Reacted PLT
Y .Y	17	8	7	2	ABO Incompatible 1st PLT/1st Transfusion
					ABO Incompatible 2nd PLT/5th Transfusion
E. D	10	9	0	1	ABO Incompatible 1st PLT/1st Transfusion
Ü. K	160	147	10	3	Incompatible Rh at 139th PLT
Total	187	164	17	6	4

PP-021

CROSS UNMATCHED ERTYROCYTE SUSPENSION TRANSFUSION EFFECTS TO TRANSFUSION REACTIONS

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This paper investigate cross unmatched Erithrocyte Transfusion Reactions in our hospital. Results are matched by two proportion T Test.

Medstar Antalya Hospital is a special center for the Hematological and Oncological Diseases. At the center 8505 erithrocyte suspension (ES) used between 01/01/2015-31/12/2015 for 4763 patients. 8363 cros matched ES transfused to 4741 patient, 142 cross unmatched ES transfused to 22 patients.

14 Transfusion Reactions occured just two of them are cross unmatched. Cross unmatched transfusions and transfusion related reactions shown in Table 1. Cross unmatched transfusion without transfusion related reactions are shown at Tablo 2.

Transfusion related mild reactions like fever, tachycardia, dizziness, rush seen all patients. Corticosteroid and antihistaminic treatments are reversed these mild symptoms.

Transfusion related reactions of our hospital 0,16%, cross matched transfusions 0,14% cross unmatched 1,4% (P=0,0079) are found statistically significant.

Cross unmatched transfusions should be carefully fallowed.

Table 1: Cross Unmatched Transfusions and Transfusion Related Reactions

Patient Name	Used ES	Cross Matched ES	Cross Unmatched ES	Reacted Blood
S.Y	10	5	5	2nd Unmatched ES (7th Transfusion)
M.S	20	18	2	2nd Unmatched ES (4th Transfusion)
Total	30	23	7	2
135 Cross unmatched ES transfusions to 20 patients, none reacted.				

Table 2: Cross unmatched Transfusion Without Transfusion Related Reactions

Patient Name	Used ES	Cross Matched ES	Cross Unmatched ES
N.E	20	0	20
A.D	8	3	5
N.T	24	22	2
Ö.Ö	15	0	15
S.A	3	0	3
F.S	7	1	6
M.Ö	5	4	1
R.A	2	0	2
M.Y	2	0	2
S.K	9	2	7
G.K	55	6	49
S.G	5	1	4
M.Y.Ö	6	4	2
D.A	43	41	2
İ.H.H	1	0	1
H.G	10	8	2
M.Ç	38	32	6
T.E	4	3	1
R.D	5	2	3
A.Ö	29	27	2
Total	291	156	135

PP-022

WHAT'S THE FILLING QUALITY OF TRANSFUSION OBSERVATION FORMS

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Aim of this paper is to dedicate filling quality of transfusion observation forms in our hospital using at services, operating room and reanimation. 15389 transfusion 01.01.2015-31.12.2015 period at Medstar Antalya Hospital, all these observation forms are screened. Results are matched by single proportion T Test. After transfusion finished the Observation Forms put in schedule at service, transfusion nurse control the form and take a copy for herself everyday. Mistakes shown to service nurse, after correction the mistake registered by the Transfusion Nurse. Ten services of our hospital, intinsive care unit and operating room are included the research. Number of forms and true fullfilling forms statistics documented monthly at Table 1. Statistical percentages of true form filling of the services documented monthly at Table 2.

The percentace of filling the forms has been detected as 85.1% for the entire hospital. When the clinics were examined separately, the percentage of filling the forms was significantly low in intensive care unit, operating theater and 8th floor ward. The percentage was significantly high in 10th and 12th floor ward. The rest of the wards came up to the average.

While the percentage was statistically significantly low in January and February. The low results that are seen at the beginning of the year has been achieved to desirable results with the education.

Table 1: Medstar Antalya Hospital Transfusion Observation Form Trueness Monthly 2015/Total

MONTHS	R		OP		3rd S		4th S		5th S		6th S		7th S		8th S		9thS		10th S		11th S		12th S	
	FFN	TFFN	FFN	TFFN	FFN	TFFN	FFN	TFFN	FFN	TFFN	FFN	TFFN	FFN	TFFN	FFN	TFFN	FFN	TFFN	FFN	TFFN	FFN	TFFN	FFN	TFFN
January	174	110	73	41	37	19	20	18	70	57	6	6	200	174	148	132	98	82	211	187	110	84	143	124
February	160	114	62	38	21	17	18	14	55	38	20	15	136	114	82	67	98	85	250	219	93	81	117	105
March	182	134	55	39	22	16	31	24	74	65	4	4	187	164	125	108	144	129	233	210	45	37	142	133
April	140	101	28	18	18	16	32	30	54	45	11	10	117	101	187	154	87	70	160	140	172	150	203	171
May	135	104	31	23	21	17	23	20	37	32	18	17	90	72	103	86	113	91	204	178	140	116	155	133
June	182	143	70	52	15	15	18	17	45	42	3	2	189	153	92	76	151	125	249	228	117	104	181	160
July	161	122	39	27	20	17	19	14	42	40	5	4	129	114	114	96	204	179	271	248	194	167	173	154
August	178	136	43	38	33	29	24	23	47	42	13	13	173	151	177	152	202	167	204	188	121	107	191	176
September	156	133	50	44	20	15	20	17	39	30	3	3	171	142	101	88	150	134	208	185	190	157	193	183
October	130	100	46	40	18	16	19	15	64	59	11	10	138	114	166	137	176	147	140	132	189	149	208	201
November	178	153	39	29	31	29	8	7	51	50	7	6	158	145	153	127	178	151	261	236	172	149	162	157
December	167	139	85	72	17	16	15	14	60	54	10	9	137	107	153	118	161	131	195	184	141	124	230	224
Total	1943	1489	621	461	273	222	247	213	638	554	111	99	1825	1551	1601	1341	1762	1491	2586	2335	1684	1425	2098	1921

Filled Form Number (FFN)
True Fullfilled Form Number (TFFN)
Reanimation (R)
Operation Room (OP)

Table 2: Trueness Percentages According Months At Medstar Antalya Hospital-2015

MONTHS	January	February	March	April	May	June	July	August	September	October	November	December	Total	Total True Form	Total Form #	Total Trueness Ratio:
R	%63	%71	%73	% 72	% 77	% 78	% 75	% 76	% 85	% 76	% 85	%83	% 76			
OP	%56	%61	%70	% 64	% 74	% 74	% 69	% 88	% 88	%86	% 74	% 84	% 74			
3rd S	%51	%80	%72	% 88	% 80	% 100	% 85	% 87	% 75	% 88	% 93	% 94	%81			
4th S	%90	%77	%77	% 93	% 86	% 94	%73	% 95	% 85	% 78	% 87	% 93	%86	13102	15389	% 85
5th S	%81	%69	%87	% 83	% 86	% 93	% 95	% 89	% 76	% 92	% 98	% 90	% 86			
6th S	%100	%75	%100	%90	% 94	% 66	% 80	% 100	% 100	% 90	% 85	% 90	% 89			
7th S	%87	%83	%87	% 86	% 80	% 80	% 88	% 87	%83	%82	% 91	% 78	%84			
8th S	%89	%81	%86	% 82	% 83	% 82	% 84	% 85	% 87	% 82	% 83	% 77	% 83			
9th S	%83	%86	%89	%80	% 80	% 82	% 87	% 82	% 89	%83	% 84	% 81	%84			
10th S	%88	%87	%90	% 87	% 87	% 91	% 91	% 92	% 88	% 94	%90	%94	%90			
11th S	%76	%87	%82	% 87	% 82	% 88	% 86	% 88	% 82	% 78	%86	% 87	%84			
12th S	%86	%89	%93	% 84	% 85	% 88	% 89	% 92	% 94	% 96	%96	%97	%91			

Reanimation (R)
Operation Room (OP)
Service (S)

PP-023

SUCCESSFUL DONOR LYMPHOCYTE HARVEST AND INFUSION (DLI) WITH LIMITED SUCCESS IN OUTCOME: A CASE REPORT

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AIMS AND PURPOSE: Allogenic stem cell transplantation is the only known curative therapeutic option for CMML patients and there is even less information available related to the use of Donor Lymphocyte Infusion (DLI) in these patients to prevent post transplant relapse of the disease. Here we report a case of CMML who underwent hematopoietic progenitor cell – apheresis (HPC-A) transplant; had falling donor chimerism six months after the transplant. Escalating doses of DLI was administered to prevent disease relapse.

MATERIAL-METHOD: A 49 year old female of African origin, who was negative for JAK2 and bcr-abl PCR, was diagnosed with myeloproliferative chronic myelomonocytic leukemia (MPN-CMML) on flowcytometery and cytogenetic analysis of bone marrow aspirate. After an elaborate discussion about various treatment options available, allogenic hematopoietic stem cell transplant (HSCT) was decided as a course of action. Patient's sister, a 10/10 HLA match, was selected as Peripheral Blood Stem Cell (PBSC) donor and patient was started on reduced intensity conditioning regimen (RIC) [1].

Patient was administered a dose of 5 million CD34+cells per kg on day Zero. Neutrophil and platelet engrafted on day +16 and day +13 respectively. Post-transplant donor chimerism decreased from 90% on day +55 to 4.49% on day+187. DLI [2, 3, 4] was an option to treat relapse by virtue of Graft Vs Tumor (GVT) effect and therefore after discussion with patient, escalating DLI therapy was planned. Patient was administered infusions of DLI on day+209, day+320 and day+407 with three consecutive harvests of donor lymphocytes. One, five and ten million donor lymphocytes per kg body weight of patient was successfully harvested with no discomfort or adverse reaction to the donor. The infusion of these donor lymphocytes was uneventful. There was no contraindication to DLI in form of signs or symptoms of GvHD. However, after 0% donor chimerism on day+488, patient was labelled as post HPSCT relapse-

case of CMML (Graph). Though the patient could be managed without aggressive chemotherapy or re-transplant for almost a year, there was disease relapse. However, Relapse ultimately occurs in 10 to 40 percent of allogenic HPSCT patients and discontinuation of immunosuppression followed by immunotherapy.

CONCLUSION: With this case study we conclude that DLI harvest can be successfully harvested in our country and it is safe for both the donor as well as patient.

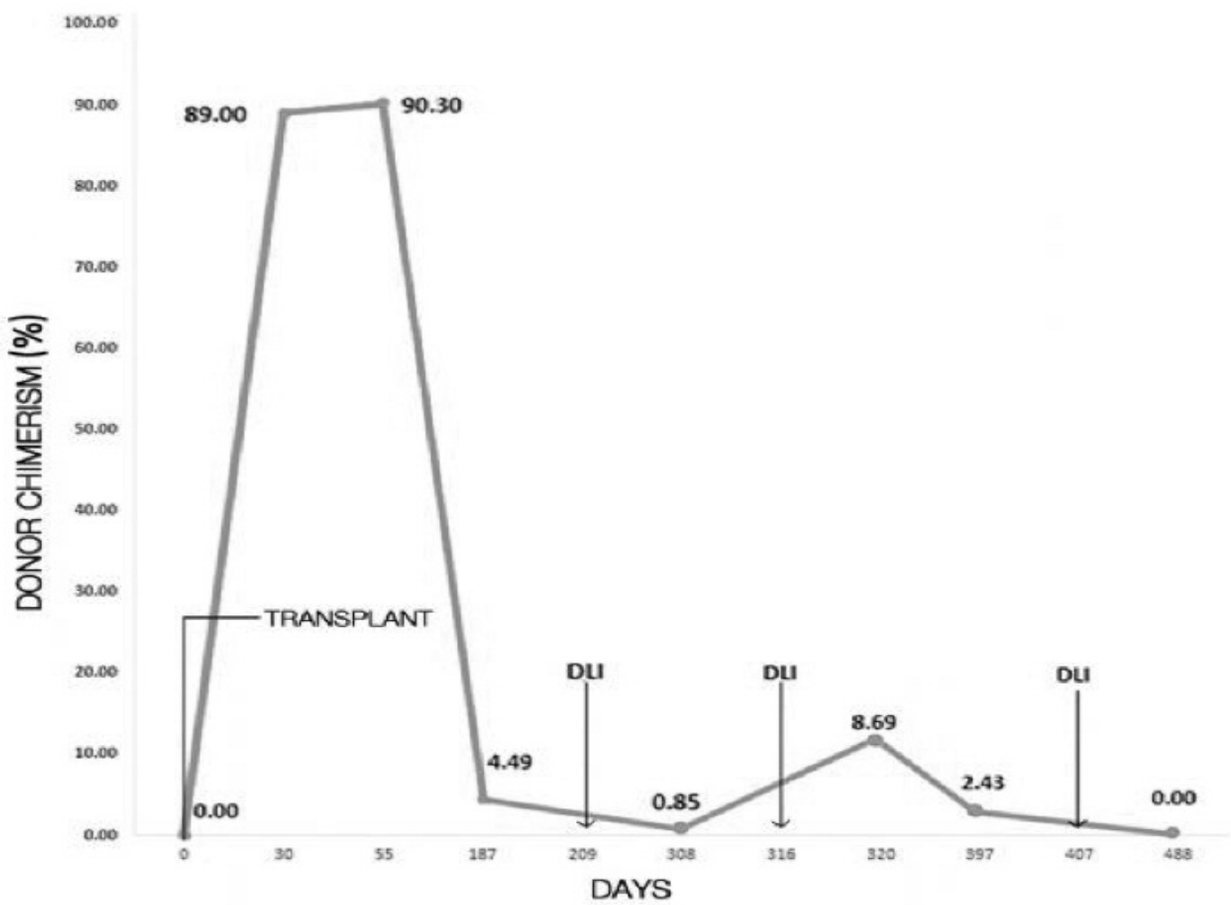
1. Martino R, Caballero MD, Canals C, Simon JA, Solano C et al. Allogeneic peripheral blood stem cell transplantation with reduced-intensity conditioning: results of a prospective multicentre study. Br J Haematology 2001 Dec; 115(3): 653-9.

2. Deol A, Lum LG. Role of donor lymphocyte infusions in relapsed hematological malignancies after stem cell transplantation revisited. Cancer Treat Rev 2010; 36:528.

3. Kolb HJ, Schattenberg A, Goldman JM, et al. Graft-versus-leukemia effect of donor lymphocyte transfusions in marrow grafted patients. Blood 1995; 86:2041.

4. Collins RH Jr, Shpilberg O, Drobyski WR, et al. Donor leukocyte infusions in 140 patients with relapsed malignancy after allogeneic bone marrow transplantation. J Clin Oncol 1997; 15:433.

Graph 1



Graphical presentation of Transplant day (day 0), percentage of donor chimerism in follow up days, Days on which DLI was administered

PP-024

TÜRKÖK DONOR CENTERS STEM CELL DONOR COUNTS AND RATES

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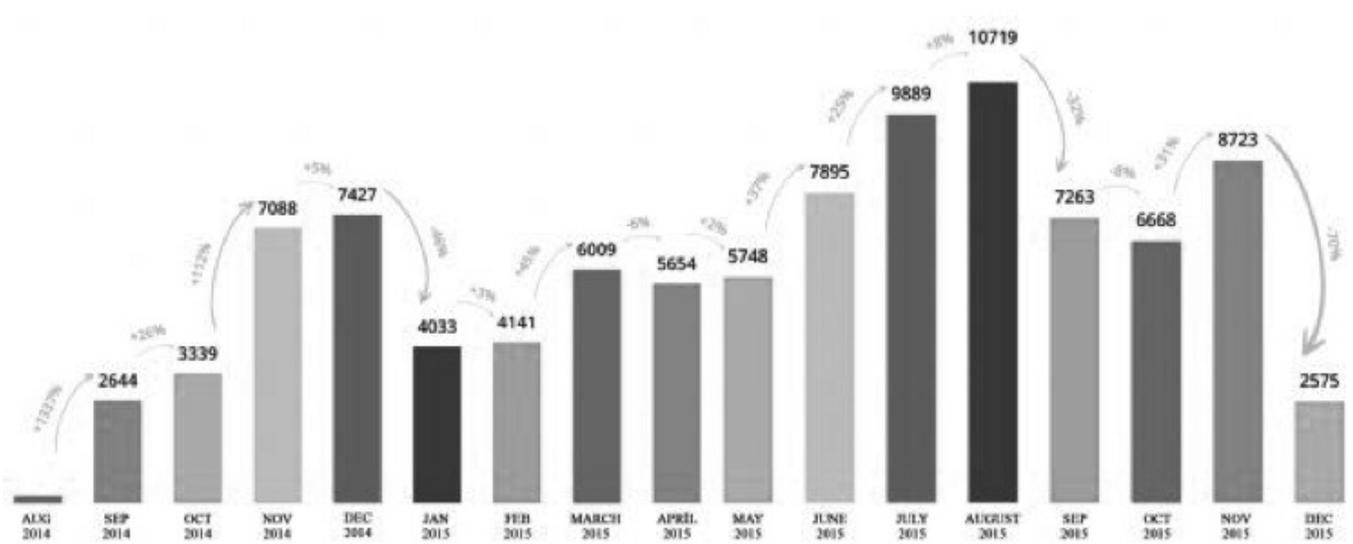
Main objective of this operation is to find potential donors wishing to donate peripheral stem cell or bone marrow to TÜRKÖK Bone Marrow Bank which was founded for the patients in need of homoeopathical stem cell transplant.

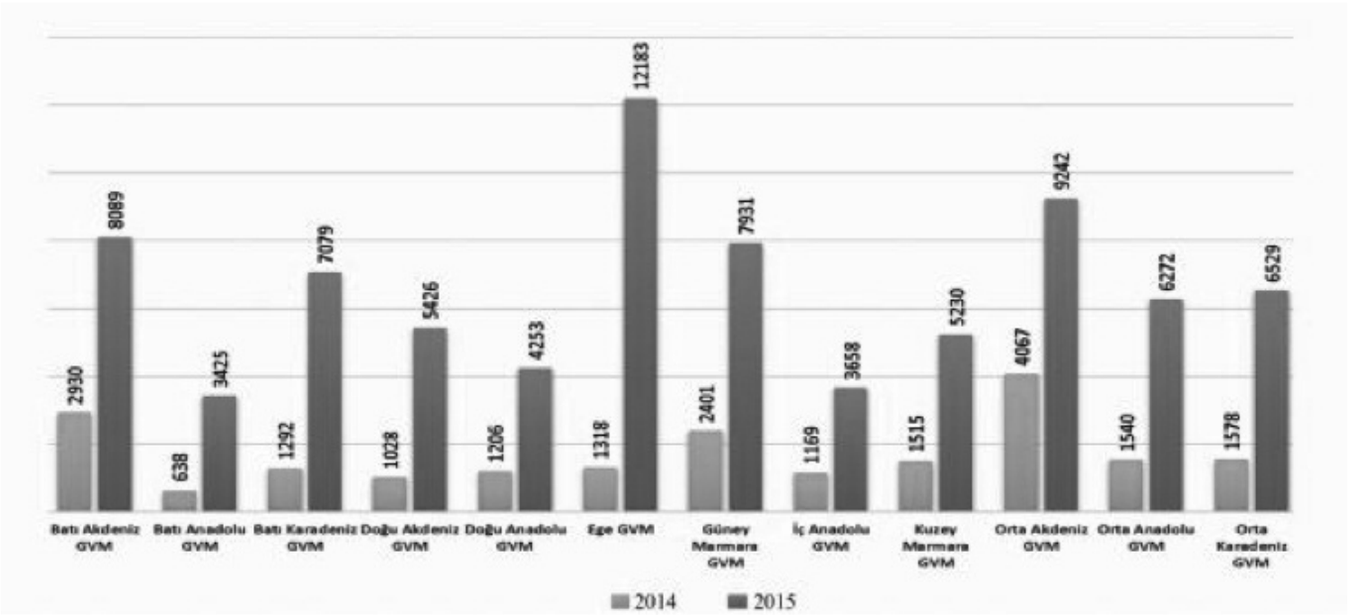
Moreover, the procedures of transplantation operations and reaching the donors through the scanning tests-carried out by Turkish Ministry of Health-at TÜRKÖK are both included as the main objectives of TÜRKÖK project. In 2015, 43 succesful transplantation operations were carried out of 239 matches.

Considering the rate of success in the field of Stem Cell Donation, the operations conducted by the Ministry of Health and Turkish Red Crescent as part of TÜRKÖK Project have made Turkey one of the top countries in the field of Stem Cell Donation. Furthermore, stem cell transplantations carried through by TÜRKÖK Bone Marrow Bank will contribute to the decrease of the need for foreign help for homoeopathical stem cell transplantation.

Stem Cell Donor Distribution According to Monthly in 2014-2015

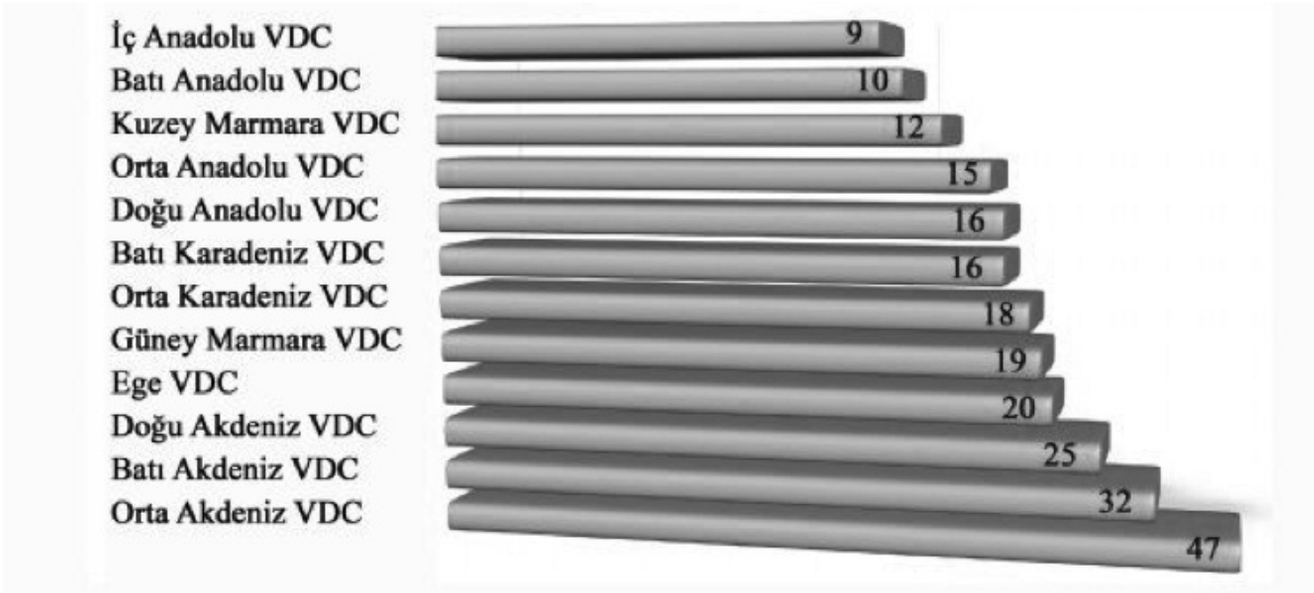


Stem Cell Donor Distribution According to Volunteer Donor Centers in 2014



Turkok Information Poster

Volunteer Donor Center Matching Graphic in 2014



PP-025

COMPARISON OF ANTIBODY TITERS USING CONVENTIONAL TUBE TECHNIQUE VERSUS COLUMN AGGLUTINATION TECHNIQUE FOR ABOI RENAL TRANSPLANT

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INTRODUCTION: Measurement of alloantibody titer to a red cell antigen is an essential semi-quantitative tool in ABO blood group incompatible (ABOi) renal transplants. Titers are usually determined by serial double-fold dilution method. Different centers have their 'cut-off' titers pre-transplant, which they target with plasma exchange or antibody adsorption.

AIM: To compare and correlate the alloantibody titers against red cell antigen by conventional Tube technique (CTT) and column agglutination tecnique (CAT) in ABO blood group incompatible renal transplants (ABOiRT).

MATERIAL & METHOD: During work up of ABOi renal transplants, the 'cut-off' titer of 1:8 by the CTT was targeted for renal transplant. All patients underwent series of alloantibody titer estimation against donor antigens at baseline and then after every second plasma exchange or after every session of antibody adsorption. Antibody titers of sequential recipient's serum were done in parallel by both tube and gel methods.

RESULTS: A total of 67 samples were processed in parallel for anti-A/B antibodies by both tube and gel methods. The mean titer by CTT was 38.5 + 96.6 and by the CAT was 96.4 + 225. The samples correlated well with Spearman rho correlation coefficient of 0.94 ($p = 0.01$). However, the Lin's concordance coefficient was 0.58. The sensitivity of gel method was greater than that of tube method, with the gel results being approximately two and half fold higher (one more dilution) than that of tube method.

CONCLUSION: One should be careful in interpreting the results of anti A/B titers in ABOiRT depending upon the method used for titer estimation. Gel card for anti A/B titer estimation in an ABO incompatible kidney transplant is more sensitive and easy method. The 'cut-off' titers would be at least a dilution higher, if estimated by Gel columns.

Alloantibody titers in ABOi Renal Transplant

	IgM	IgG (CTT)	IgG (CAT)	pearson Correlation
Mean	24.7 plus-minus 77	96.4 plus-minus 225	38.5 plus-minus 96.6	0.849
Range	0-512	0-1024	0-521	

PP-026

SIGNIFICANCE OF ANTIBODY SCREENING AND IDENTIFICATION IN PRE TRANSFUSION AND ANTENATAL TESTING-A RETROSPECTIVE STUDY

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BACKGROUND: Genetic disparity of RBC Antigen between donor and recipient is responsible for RBC alloimmunisation.Though RBC transfusion is a lifesaving therapy in most of the patients, risk of alloimmunisation is always a concern for patients receiving multiple transfusion. Pregnancy also carries the risk of alloimmunisation. Very few studies on alloimmunisation are done on the general Indian Hospital patients.

AIM: The study was aimed at assuming the frequency and type of unexpected red cell antibodies in both patients going to receive transfusion and antenatal cases at a multispecialty tertiary care hospital in Bangalore.

METHODS: It is a retrospective study. Antibody screening was carried out in 1912 patients including inpatients and antenatal mothers from January to December 2014.All positive cases were subjected to antibody identification. In patients receiving transfusion antigen negative red cells were cross matched and given. Antenatal cases were followed up every month with antibody titre till the time of delivery.

RESULTS: It is a retrospective study in which evaluation of 1912 cases (870:45.5% males and 1042:54.5%females) done.. Antibody screening was positive in 19 patients (0.99%). In the serum samples of 37 patients only autoantibodies were identified, 4 cases revealed autoantibody also with underlying alloantibody. The total alloimmunisation rate was 0.99%, alloimmunisation in antenatal females was 0.15%.Among the antenatal females anti D was the most common (4 cases) Anti E and Anti K one each.

INTERPRETATION AND CONCLUSION: Since clinically significant antibodies are frequently detected in our patient population, antibody screening and identification is mandatory to ensure safe transfusion practice. Since antibody against Rh, Kell and Le group antigens are more common and clinically significant, provision of Rh and Kell matched cells may be of protective value.

Clinically significant unexpected antibodies are capable of causing hemolytic transfusion reactions secondary to accelerated destruction of a significant proportion of transfused red blood cells. Therefore, screening for unexpected

antibodies should be part of all pretransfusion testing, with antibody identification in the event of a positive result.

Antenatal detection of the non-anti-D causes of HDN requires Red cell antibody screening. If RCAS is positive, the following steps are to be taken. Antibody Identification should be done to identify the antibody. The spouse has to be screened for the presence of offending antigen and the pediatrician has to be alerted about delivery of a potentially sensitized infant. The blood bank should find a suitable antigen-negative donor for transfusion to baby and mother.

PP-027

ANALYSIS OF ANTIBODY SCREENING & IDENTIFICATION USING A FULLY AUTOMATED SOLID PHASE METHOD

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BACKGROUND: There are several methods & technology available to detect irregular antibodies in patient or Blood donor but they are in limitation to detect its clinically significance & specificity. In our facility we have implemented Immucor Gailieo-NEO (Fully automated immunohematology analyzer) for antibody screen testing & automated antibody identification by solid phase method. This is an analysis of the antibody types & number of antibodies detected, to determine the effectiveness of solid phase antibody identification for routine antibody screening for patient & donors.

AIM: To establish routine antibody screening and identification on a fully automated solid phase method, and to minimize the risk of immunization or provide safest blood to immunized patient seeking for blood transfusion.

METERIAL & METHOD: One year study was carried on total no. of 35680 samples (Both patient & donors), which were tested for 3 cell antibody screening by solid phase method using Immucor Capture-R Ready Screen 3. Out of them, 38 patients requiring blood transfusion with a positive antibody screen, was further tested for antibody identification using Immucor Capture-R Ready-ID Panels. Wherever necessary, additional testing was carried out by coombs method using Immucor capture-R Panocell-10, Ficin Treated Panocell-10 & Panocell-20. For advance immunohematology work-up i.e. elution & adsorption, Immucor's Elukit & WARM reagents were used. Multiple panels and additional reagents were only used for any unresolved or auto antibody case. Extended panels were used to rule out antibodies specificities.

RESULTS: Out of 38 samples 63% of total identified antibodies were Rh & Kell type (anti-E-34.2%, anti-c-13%, anti-D-5.3%, anti-C-2.6, anti-e-2.6%, and anti-K-5.3%), 21% of warm auto antibody, 6% of other clinically significance antibodies (i.e. anti-Fya, anti-S) and 10% of non-clinically significant antibodies (i.e. anti-M, anti-Leb).

SUMMARY/CONCLUSION: Antibody Identification work-up is stills a big task for major Blood Bank facility in India. To minimize the immunization risk and provide safe blood to an immunized patient as soon as possible is a big challenge by routine testing. We have identified about 79% of cases by using a fully automated method. Liquid panels were used for completion of 21% of samples. Most of the clinical significant antibodies can be detected and identify on solid phase automation using Capture R technology without any additional resources. These data demonstrate that although this method automates the antibody identification process; however one fourth of the samples require multiple panels for resolution.

PP-028

ABO DISCREPANCIES AND ERRORS IN A ROUTINE BLOOD BANK

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INTRODUCTION: - ABO discrepancy exist when red cell antigen grouping result do not correlate with serum grouping result.

OBJECTIVES: - The study is done to identify the incidence and type of ABO discrepancies and errors leading to wrong results.

MATERIAL-METHODS: All the data of ABO grouping from June 2012 till June 2013 was collected at Ishrat ul Ebad Khan institute of blood disease, Dow university of health sciences, Karachi, Pakistan.

ABO discrepancies, pre-analytical, analytical & post-analytical errors in routine blood grouping were noted and recorded on a Performa designed for the study and results were tabulated.

RESULTS: -30 discrepancies (0.3 %), 18 (0.18 %) pre & post analytical errors were identified from a total of 10,000 blood group tests performed during the study period. The commonest of all was ABO discrepancy due to sub groups n 26 (86.6 %) followed by auto-antibodies n 4 (13.3 %)

CONCLUSION: ABO discrepancy is not an infrequent finding in routine blood banking while pre-analytical, analytical & post-analytical errors are also seen in routine practice and are small but very important source of mistakes which can lead to serious hazards of transfusion. Measures should be taken to identify and resolve these discrepancies while ensuring proper collection, labeling, analysis and reporting of results for safe blood transfusion.

PP-029

RED CELL ALLOIMMUNIZATION IN MULTI-TRANSFUSED PATIENTS: A BI-CENTRIC STUDY IN INDIA

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BACKGROUND: It is well known that alloimmunization to red cell (RBC) antigens resulting from the genetic disparities between donor and recipient is one of the risks of blood transfusion. The antibody screening cells are used to detect unexpected antibodies.

The risk of alloimmunization is higher in patients who have received multiple blood transfusions like thalassemia, other hematological disorders, Renal failure patients on dialysis who receive blood transfusions and females with bad obstreitic history.

The antibody screening cells are used to detect unexpected antibodies.If antibody screening is positive, additional tests are carried out to specifically identify antibody using the antibody identification panel and red cell antigen typing. Antibody screening test using 2-3 cells panel is not a mandatory pre transfusion testing in India and is performed routinely in limited blood centers.

MATERIAL-METHODS: This bi-centric study was carried out at two regional blood transfusion centers,one in North India(referred as Centre-I) which collects 25000 units in a year & another from South India(referred as Centre-II) which collects 35000 units in a year.Aim of the study was to look at prevalence of antibodies in multi-transfused patients who have higher risk of alloimmunization like patients who have received multiple blood transfusions like thalassemia, other hematological disorders, Renal failure patients on dialysis who receive blood transfusions and females with bad obstreitic history.

This study was conducted during 1st February, 2012 to 31st March, 2012 at both the centers in parallel. The pre transfusion testing protocol followed at both the centers was Blood typing, Indirect anti globulin test (IAT) & cross match. The antibody screening using 3 cells is not a routine practice at both the centers.Total 4569 cases were analyzed and 258 patients were selected for antibody screening & identification.

The patients included in the study were thalassemia, other hematological disorders, renal failure patients on dialysis who receive blood transfusions and females with bad obstetrics history. These samples underwent initial antibody screening using commercial 3 cell panel. The samples with positive antibody screening were tested for antibody identification using 11 cell panel. The antibody screening cells and antibody identification cell panel used were procured from Diagast (DIAGAST251-Avennue Eugene Avinee-BP 9-59374 LOOS, FRANCE) and test was performed on Qwalys3, fully automatic machine working on Erthrocyte magnetization technology and software to interpretate the results.

RESULTS: Out of total 4569 patients, 258 multi-transfused patients were studied. Among these 7 patients (2.71%) were found alloimmunized. The risk of alloimmunization was 2.90% in Thalassemia, 0% in chronic renal failure patients, 3.77% pregnant females with bad obstetric history & 2.78% other multi- transfused patients like cancer.

DISCUSSION: Multi- transfused patients are always at higher risk of alloimmunization & this creates difficulty in their pre transfusion testing. Regular monitoring through antibody screening & transfusion of blood matched for minor erythrocyte antigens are recommended in these patients.

Rate of RBC alloimmunization & antibodies

Centre	Total pre transfusion testing done	No of cross matches	No of cases selected for study(n)	No of positive antibody screening	Rate(95% confidence interval)
I	2315	3760	154	02 (1.2%)	1.3(0-3.1%)
II	2254	3667	104	05 (4.8%)	4.8(0.7-8.9%)

PP-030

DISTRIBUTION OF BLOOD GROUPS IN THE TWO YEAR PERIOD IN THE GIRESUN PROF. DR. A. ILHAN OZDEMIR GOVERNMENT HOSPITAL

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AIM: Determination of the frequency of blood groups in a particular region facilitates timely provision of blood and blood products. In this study, we aimed to find out the rates of ABO and Rh blood groups in Giresun province.

METHODS: This retrospective study was conducted by investigating the records of 13150 person who admitted to Giresun Prof. Dr. A. Ilhan Ozdemir Government Hospital, Blood Bank between 1st January, 2014 and 31st December, 2015. ABO and Rh blood groups were examined by gel centrifugation methods.

RESULTS: In this study, the frequency of blood groups A, O, B, AB were found 41.81%, 38.00%, 14.27%, 5.92% respectively. Rh (+) positivity was determined in 11.401 cases (86.70%) and Rh (-) negativity was determined in 1749 cases (13.30%). The frequency of Rh intra-group was found Rh (+) 87.47% and Rh (-) 12.53% in blood group A, Rh (+) 86.35% and Rh (-) 13.65% in blood group O, Rh (+) 85.68% and Rh (-) 14.32% in blood group B, Rh (+) 85.99% and Rh (-) 14.01% in blood group AB. Gender distribution of their blood group determination was 58.79% men and 41.21% women.

CONCLUSION: ABO and Rh blood groups distribution in our region was similar to general rates of Turkey. There was a positive correlation between frequency of ABO blood group type and Rh positivity rate in each group. We believe that present study will contribute to the literature in terms of database of blood groups.

Distribution of blood groups in Giresun Prof. Dr. A. Ilhan Ozdemir Government Hospital, Blood Bank in the two year period

Blood group	Male	Percentage	Female	Percentage	Total
O Rh (+)	2532	58.7	1782	41.3	4314
O Rh (-)	401	58.8	281	41.2	682
A Rh (+)	2828	58.8	1981	41.2	4809
A Rh (-)	389	56.5	300	43.5	689
B Rh (+)	919	57.1	690	42.9	1609
B Rh (-)	175	65.1	94	34.9	269
AB Rh (+)	410	61.3	259	38.7	669
AB Rh (-)	77	70.6	32	29.4	109
Total	7731		5419		13150

PP-031

PARTIAL D STUDIES IN TURKISH RED CRESCENT NORTHERN MARMARA REGION BLOOD CENTER LABORATORIES

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AIM: Anti-D is one of the antibodies which have a clinical importance for erythrocyte surface antigens. In the National Guide of Blood and Blood Products, it is pointed out that standards identifying category D VI in patients should not be used whereas standards identifying category D VI in blood donors should be used. Accordingly, the cards which identify Weak D and DVI are routinely used in our labs. In this study, the blood donors whose weak D reaction was detected one positive were also examined in terms of partial D.

MATERIAL AND METHOD: BioRad gel centrifugation kit is routinely used for typing of ABO/Rh in our blood donors. The Rh (-) negative ones out of these are studied by BioRad kit which can detect Weak D/D VI. Particularly, D variants of the blood donors who could not be ultimately decided to be negative/positive during their previous donations and the ones whose Weak D result was +1 or indefinite were attempted to be identified using BioRad, Extended Partial RhD Typing Set and 12 different series of Anti-D antibody. During 11 months of period we conducted the study (01 April 2015 – 01 March 2016), blood groups of 1.053.085 blood donors in total were studied. On 144.381 blood donors with Rh (-) negative out of these, weak D/D VI was studied and 914 Weak D was detected.(Table 1.) On 149 blood donors whom we were unable to decide, Partial D's were studied. The obtained results are presented in table 2.

RESULTS: Even it is theoretically known that Weak D individuals can not generate Anti-D antibody whereas partial D individuals are able to generate Antibody, it is accepted that some weak D phenotypes can produce anti-D as well as provide Anti-D production. D antigenic structure in the donated blood should be revealed. As result of not approving the 149 ±, +1 Weak D, D IV samples in our study as positive with respect to Weak D and studying by Extended Partial RhD Typing Set and 12 different Anti-D antibody series, 68 samples were identified true negatives. These 68 samples which were not evaluated as wrong positive, were able to be delivered to the needers as Rh (-) negative. Weak D and D VI were detected in 14 of the remaining 81 samples, and 67 samples were revealed as partial D. As we consider all those circumstances; we think that within the laboratories such as Northern Marmara Region Blood Center laboratories that study a large number of blood groups, kits should be available where D variant can be examined and this would help in such type of circumstances which might arise at the decision stage.

Table 1. Number of blood donors studied during 11 months period between 01 April 2015 – 01 March 2016

Dates of 01 April 2015– 01 March 2016	Blood Donor	% Value
Number of Total Blood Groups Studied	1.053.085	
Number of the ones on whom Rh (-) was detected and weak D was studied	144.381	13.71%
Number of the ones on whom Weak D was identified	914	0.63%
Number of the ones on whom Partial D was studied 149 0.10%	149	0.10%

Table 2. Partial D Evaluation table

Obtained results	Identified sample
D VI detected	2 samples
Weak D detected	12 samples
Rh (-) Negative detected	68 samples
DAR-E detected	4 samples
DFR detected	60 samples
D IV	1 samples
D III	2 samples

PP-032

INDETERMINATED ABO BLOOD GROUP ANTIGENS IN NEONATES

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INTRODUCTION: Neonatal blood type grouping is one of the first laboratory tests to be performed after birth in Turkey. This test is used routinely to determine the blood group antigens in neonates. Blood group antigens are not fully

formed and isohemaglutinins are not present in the serum at the birth. Mother's antibodies are dominant in the first six months of life. Weaker agglutination reactions are observed with newborn infants' red blood cells (RBCs) compared to the mature RBCs of adults due to the number and strength of A and B antigen sites being less. In this study, we aimed to find out the ratio of indeterminate blood groups in the neonates.

METHOD: This study was done in Goztepe Medical Park Hospital (Istanbul, Turkey) transfusion center where neonatal blood group typing is performed by micro-column gel typing system using forward grouping only (Diana Processor, Hemakim, Turkey). If the clear result is obtained, it is reported with the note" In babies, we recommend the blood type grouping to be repeated after 6 months of age."; if the result is not clear, it is reported as "ABO antigens undetermined". The data of blood group types in infants under 6 months old was obtained retrospectively from the laboratory information system. We evaluated all blood grouping results of the target patients (n= 6961) between 2011 January and February 2016.

RESULTS: In total, 537 indeterminate results among 6961 neonates (7.71%) were found. According to the years, 77 indeterminate cases among 1627 patients (4.7%) were found in 2011, 88 in 1307 (6.7%), 135 in 1397 (9.7%), 105 in 1325 (7.9%), 120 in 1118 (10.7%) and 12 in 187 (6.4%) were the cases determined for 2012, 2013, 2014, 2015 and 2016 respectively.

CONCLUSION: In newborns, 5-10 % of the cases have ABO antigens that are not detected by standard gel centrifugation method.

PP-033

NEONATAL HEMOLYTIC ANEMIA DUE TO ALLOIMMUNIZATION OF MINOR GROUP INCOMPATIBILITY OF ANTI-E

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INTRODUCTION: Blood group incompatibility is the most common cause of hemolytic anemia in the early newborn period. Because of using anti-D gammaglobulin in the last four decades the rate of minor blood group incompatibility has relatively increases in the etiology of newborn hemolytic anemia. In this article, we report a patient with symptoms of anemia who developed hemolytic disease of the newborn due to anti-e alloimmunization.

CASE: A female newborn having the B, Rh positive blood type was admitted for jaundice on the 36th day after being born. At the time of admission, the patient had jaundice with mild hepatosplenomegaly. The laboratory tests were as follows: the blood type of the baby: B Rh(+), the blood type of the mother: BRh (+), direct Coombs test: ++++. Indirect coombs was (+). Hemoglobin: 10.2 gr/dL, hematocrit: 32%, leukocyte: 12440 /mm3, platelets: 17400/mm3 and reticulocyte: 6%. Peripheral smear revealed 55% neutrophils, 33% lymphocytes, 12% normoblasts and fragmented erythrocytes. The subgroups typing, antibody detecting/identification tests of the mother, and the newborn were studied; anti-e antibody was found in the mother. Intravenous immunoglobulin (1 g/kg) and metilprednisolone was administered

to the patient. On the 7th day of treatment, the metilprednisolone treatment was decreased and stopped without any complications.

DISCUSSION: The most common causes of pathological neonatal jaundice are hemolytic diseases due to blood incompatibilities including ABO, Rh and subgroup incompatibilities. The clinical picture with minor blood group incompatibility may vary from subclinical hemolysis to active hemolysis and newborn jaundice. The best known ones among these antigens which are responsible of 3% of the cases of neonatal hemolytic disease include Kell, Duffy, Diego, Kidd, MNS, C and E and they may lead to a hemolysis picture in the neonatal period similar to Rh disease.

CONCLUSION: It should be kept in mind that minor blood groups may lead to neonatal jaundice and minor blood groups should be tested in newborns with pathologic jaundice with unknown etiology and in newborns with hemolytic disease.

PP-034

WEAK D DETECTION RATES IN A BLOOD CENTER FROM BLOOD DONORS

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AIM: According to current National Blood and Blood Components Guideline blood donors have to be tested with a Weak D test when they are negative for DVI+ test. In this retrospective study we aimed to find out the Weak D detection rates between 01.09.2015 and 30.12.2015 from blood donors in Gulhane Military Academy, Haydarpasa Training Hospital, Blood Center.

METHOD: DVI+ test was performed with gel centrifugation method using "DiaClon ABO/D + Reverse Grouping for Donors" Cards (Biorad, Switzerland) and Weak D test was performed again with gel centrifugation method using Coombs Anti-IgG cards (Biorad, Switzerland) and ID-DiaClon Anti-D serum (Biorad, Switzerland).

RESULTS: 68 blood donors were negative for DVI+ test among 615 voluntary blood donations during four months. Three (0.4%) of the 68 DVI+ test negative blood donors were positive for weak D test. The rate of positive weak D positive donors among all donors was found as 0.4% (3/615).

CONCLUSION: D antigen is a complex erythrocyte antigen possessing the highest antigenicity after A and B antigens. Weak D positive erythrocytes have D antigens with a normal intact antigenic structure but in fewer numbers. They have all the D epitopes but their genomic expression is low. In this study, Weak D detection rate among healthy donors was found as 4.4%. People with this rare D antigen type should be accepted as Rh positive when they are donors and Rh negative when they are patients.

PP-035

DISTRIBUTION OF BLOOD GROUPS AMONG BLOOD DONORS IN A BLOOD CENTER OF A TRAINING HOSPITAL

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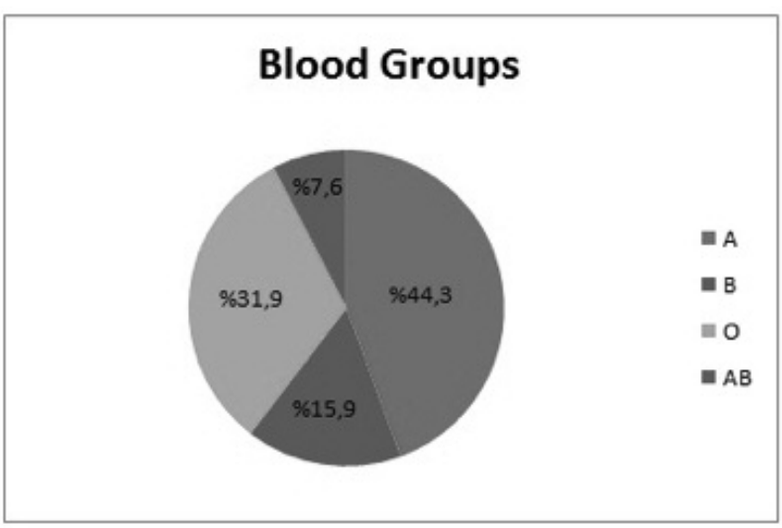
AIM: In this retrospective study we aimed to evaluate the rates of ABO and Rh blood groups and to compare with national data in voluntary blood donors between 01.01.2011 and 01.01.2016 in Gulhane Military Medical Academy, Haydarpasa Training Hospital, Blood Center.

METHOD: Medical records of a total number of 11.650 blood donors were evaluated for ABO and Rh blood groups during a five year period. Blood typing was performed with gel centrifugation method using "DiaClon ABO/D + Reverse Grouping for Donors" card (Biorad, Switzerland) based on detection of forward A, B and DVI+ (Rh) antigens and reverse A1 and B antibodies.

RESULTS: Among the total study group of 11.160 blood donors, 4.590 (44.3%) have Blood Group A, 3.570 (31.9%) have blood group O, 1.785 (15.9%) have blood group B and 855 (7.6%) have blood group AB. Rh antigen was detected in 9.620 (86.2%) of the study population and the remaining 1.540 (13.7%) were Rh negative.

CONCLUSION: The rate of blood group A is between 39-47%, blood group O is between 29-36%, blood group B is between 15-19% and blood group AB between is %5.5-14 in national studies. Rh negativity rate is reported between 8-16% and Rh positivity rate is reported between 84-92% again in those studies. Our data obtained from voluntary donors of our center is consistent with national data. Detection of blood group distribution rates of donors locally for each center might be useful in determination of critical stock levels.

Distribution of Blood Groups among Blood Donors



PP-036

NEWBORN BLOOD GROUP DETECTION RATES

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AIM: Blood group typing of newborns is among the responsibilities of a Blood Center. But sometimes it can be quite challenging and confusing and requires re-testing a few months later. In this retrospective study we aimed to find out the reported blood group typing rates and their distribution in newborns requested from Obstetrics and Gynecology Service between 01.09.2015 and 30.12.2015 in Gulhane Military Academy, Haydarpasa Training Hospital, Blood Center.

METHOD: Medical records of a total number of 1570 newborns were evaluated for ABO and Rh blood groups during a five year period in our blood center. Blood typing was performed with gel centrifugation method using "DiaClon ABO/Rh for Newborns DVI-" card (Biorad, Switzerland) based on detection of forward A, B, AB and DVI-(Rh) antigens and direct antiglobulin test (DAT).

RESULTS: Among the total study group of 1.570 newborns, 165 (10.5%) of them were undetermined for both ABO antigens and Rh antigen. In 195 (12.4%) of the newborns Rh group typing could be done but ABO antigens were undetermined due to double population. 150 (76.9%) of these newborns were Rh positive and 45 (%23) of them were Rh negative. In 1.210 of the newborns blood groups could be determined. And among these 1.210 newborns, 520 (%42.9) have blood group A, 363 (%30) have blood group O, 175 (%14.4) have Blood group B and 84 (%6.9) have blood group AB. Rh antigen was detected in 1.028 (85%) of them and the remaining 181 (14.9%) were Rh negative. 15 (0.9%) of the newborns among 1.570 were DAT positive. ABO and Rh antigens were undetermined in all of these 15 DAT positive newborns.

CONCLUSION: In newborns blood group antigen levels are low when compared to adults and the presence of antibodies from the mother in the newborn prevents the usage of reverse grouping. Because of these reasons blood group typing can be problematic in newborns. In 360 (22.9%) of the newborns ABO and/or blood typing could not be detected due to double population and re-testing after three months is recommended.

PP-037

DISTRIBUTION OF BLOOD GROUPS AMONG PATIENTS IN A BLOOD CENTER OF A TRAINING HOSPITAL DURING FIVE YEARS PERIOD

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AIM: In this retrospective study we aimed to evaluate the rates of ABO and Rh blood groups between 01.01.2011 and 01.01.2016, in patients with blood grouping requests from various clinics in Gulhane Military Medical Academy, Haydarpasa Training Hospital, Blood Center.

METHOD: Medical records of a total number of 4.295 patients were evaluated for ABO and Rh blood groups and for the clinic requesting the test during a five year period. Blood typing was performed with gel centrifugation method using "DiaClon ABO/Rh for patients" card (Biorad, Switzerland) based on detection of forward A, B, AB, CDE (Rh) and DVI- (Rh) antigens.

RESULTS: Among the total study group of 4.295 patients, 1.295 (44.8%) have Blood Group A, 1.460 (33.9%) have blood group O, 625 (14.5%) have blood group B and 285 (6.6%) have blood group AB. Rh antigen was detected in 3.730 (86.8%) of the study population and the remaining 565 (13.1%) were Rh negative. Distribution of test numbers according to clinics was as follows: Obstetrics and Gynecology; 1.295 (44.8%), Cardiovascular Surgery; 700 (16.2%), Pediatrics; 515 (%11.9), Internal Medicine; 385 (8.9%), Infectious Diseases; 330 (%7.6), other internal branches; 225 (5.2%), other surgical branches; 215 (5%).

CONCLUSION: Among the total number of 4.295 requests, 44.8% of them were from Obstetrics and Gynecology. Our data obtained from patients of our center is consistent with national data. Detection of blood group distribution rates of patients locally for each center might be useful in determination of critical stock levels and help to improve the management of blood and blood components.

PP-038

FORWARD AND REVERSE BLOOD TYPING DISCREPANCIES IN A BLOOD CENTER

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AIM: There are two ways of ABO blood group typing. In the first one A and B antigens on erithrocytes are evaluated and it is called Forward typing. In the second one Anti-A and Anti-B antibodies in serum or plasma are evaluated and it is called reverse typing. These two methods are used in combination and generally they are expected to be consistent with each other. But sometimes discrepancies may occur between forward and reverse blood typing results. In this study we aimed to evaluate forward and reverse discrepancies between 01.01.2016 and 01.03.2016 in our Blood Center.

METHOD: Forward and reverse discrepancy was detected in six patients during two months period. Blood typing was performed with gel centrifugation method using "DiaClon ABO/D + Reverse Grouping " card (Bio-Rad, Switzerland) based on detection of forward A, B and DVI- (Rh) antigens and reverse A1 and B antibodies. After the observation of the discrepancy samples are re-tested with same system at room temperature and +4°C. Patients are evaluated for C3, C4, IgA, IgM and IgG levels for a possible hypogammaglobulinemia. All patients were tested for Direct Antiglobulin test (DAT) with Anti Human Globulin.

RESULTS: Demographic Data and Test Results of the patients are presented in the table

CONCLUSION: Forward and reverse discrepancies while ABO group typing can be seen in newborns, elderly patients and immunocompromised patients due to low or weak antibodies. Elderly patients have low antibody levels and in hypogammaglobulinemia seen in immunocompromised patients antibody production can be severed.

Demographic Data and Test Results of the patients

Patient Number	Gender	Age	Clinic	C3	C4	IgA	IgM	IgG	DAT
1	Male	89	IMICU	Normal	Normal	High	Normal	High	Negative
2	Male	65	Oncology	Normal	Normal	Low	Normal	Low	Negative
3	Female	83	IMICU	Normal	Normal	Normal	Normal	Normal	Negative
4	Male	74	Anesthesiology	Low	Low	Normal	Normal	High	Negative
5	Male	79	Thoracic Surgery	Normal	Normal	Normal	Low	Normal	Negative
6	Female	80	Neurology	Normal	Normal	Normal	Low	Normal	Negative

DAT: Direct Antiglobulin Test, IMICU: Internal Medicine Intensive Care Unit

PP-039

PROBLEMS OF IRON

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Maintaining iron levels in blood donors is of major importance to all blood services. With an increasing reliance of blood donor services on regular repeat blood donors, the loss of iron from the donor into the blood donation may become significant, sometimes to the extent of depleting donor iron stores. In countries with low per capita incomes, and with populations that may be dominantly vegetarian, have inadequate diets, or educational and financial poverty, a lowering of iron levels by blood donation may be serious enough to result in clinical anaemia. It is even a problem in some developed countries, reducing the pool of active blood donors.

Usually the inexpensive copper sulphate method for estimating haemoglobin levels is commonly used in less developed countries. Even when this is performed according to all directions, it is not a good indicator of iron levels. The requirement for blood donations can encourage blood collection from a potential donor sometimes when the test is only marginally successful.

If we want to provide the best care for our volunteer blood donors, we should develop procedures to minimise and even treat iatrogenic iron depletion. Iron stores are best estimated using the relatively inexpensive serum ferritin assay and more use of this test in repeat donors and those who have marginal haemoglobins or who fail the haemoglobin test is advocated. At a basic level we need to increase the information on methods to increase the iron intake to our donors, explain aspects of diet and the need for medical supervision if iron levels are low. The problem is particularly

relevant to women blood donors as they normally have other causes of iron loss and thus reduced iron stores. A case can be made for the blood service to provide iron therapy to selected donors if other causes for lowered levels of iron have been eliminated. If we can do this, it will facilitate the supply of regular blood donors and protect their health.

It is proposed that all countries in the region review or create policies aimed at reducing the frequency of iron depletion in blood donors as part of their overall package of blood donor care. Blood service physicians should be alert to the problems of iron reduction or depletion in their donor population and provide follow-up care to all those who volunteer for blood donation. It may require a more inclusive system of blood donor care by blood service physicians.

PP-040

EXTERNAL QUALITY ASSESSMENT IN TURKISH RED CRESCENT LABORATORIES

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AIM: Reliability of our blood products are increased by the routine check of their tests studied in Turkish Red Crescent laboratories through external quality control programs.

MATERIAL and METHOD: For each MicroEIA plaque studied in our serology laboratories, one piece of Run Control serum is utilized. Run Controlls were validated by being studied in our laboratories and the results obtained were defined. Run Control plaques, which are out of the ranges determined after validation, are deemed invalid and repeated again. For each cell and line studied in our NAT laboratories, one piece of Run Control is utilized at the beginning of the day. Tests for the cells, UDEC results of which are positive, are approved.

Samples of external quality control of our serology laboratory are made by UK NEQAS (England), BIO-DEV (Italy) control program. Our laboratories are included in "CD-P-TS coded B-PTS019, B-PTS020, B-PTS021, B-PTS022 frame programme regarding labotaratory work prepared by European Union Biological Standardization Department, OMCL Network & HealthCare (DBO) Blood Transfusion Division". External quality controls of our NAT laboratories are made by SISTRA (Italy) control program.

CONCLUSION: All external quality control programmes carried out in Turkish Red Crescent Laboratories are checked by laboratory experts, and registered if they are compliant or not. In non-compliant results, process improvement is initiated. Results are presented in Table 3.

Various kits are used in blood centers of our country. When the kits used and laboratory conditions are taken into consideration, it is anticipated that standardization of the studied tests and their check by external quality control programmes shall positively affect the work carried out by the laboratory and make contribution to prevent infections which might transmit by transfusion as well as prevent labour and financial losses.

Table 1. Our RUN Control samples

LABORATORY	METHOD	SUPPLIER	RELEVANT INFECTION	MATERIAL
SEROLOGY	Micro EIA	BioQControl	HBV,HCV,HIV	SeraQ Murex
SEROLOGY	Micro EIA	BioQControl	HBV,HCV,HIV	SeraQ Enzgynost
SEROLOGY	Micro EIA	BioQControl	Syphilis	SeraQ Murex Syphilis
SEROLOGY	Micro EIA	BioQControl	Syphilis	SeraQ Enzgynost Syphilis
SEROLOGY	Macro EIA	BioQControl	HBV,HCV,HIV	SeraQ LIAISON Murex
SEROLOGY	Macro EIA	BioQControl	Syphilis	SeraQ LIAISON Murex Syphilis
NAT	PCR	NIBSC*	HBV,HCV,HIV	UDEC

**NIBSC / England (National Institute for Biological Standards and Control)*

Table 2. Our external quality samples

LABORATORY	METHOD	SUPPLIER	PERIOD	NUMBER OF SAMPLES	MATERIAL
SEROLOGY	Micro EIA	UK NEQAS	12	3	Serum
SEROLOGY	Micro EIA	EDQM*	2	3	Serum
SEROLOGY	Macro EIA	BioDEV	4	4	Serum
GROUPING	Jel centrifugation	K NEQAS	4	3	Full Blood
NAT	PCR	SISTRA**	2X2 faz	12	Plasma

**EDQM/Fransa (European Directorate For The Quality of Medicines & Health Care) **SISTRA / Italy (Sistema İnformativo dei Servizi Trasfusionali)*

Table 3. The external quality control results in our Istanbul (NMBRC), Ankara (MARBC), Izmir (EGERBC), Erzurum (EARBC) laboratories.

	REQUIRED TO BE	NMRBC	MARBC	EGERBC	EARBC
Cumulative Point	150	150	150	150	150
Performance	%100	%100	%100	%100	%100
Score	2	2	2	2	2
Score	2	2	2	2	2
Result	Compliant	Compliant	Compliant*	Compliant*	Compliant

Table 4. Results with "*" are explained in Table 4.

	MARBC	EGERBC
Non-compliance	Non-compliance was found once only in NAT external quality control.	Non-compliance was found once only in NAT external quality control.
Reason	HIV RNA false positivity	HIV RNA false positivity
Occured at	In NAT Phase-1, we identified HCV RNA positivity in the 6th Sample as well as HIV RNA test as positive.	In NAT Phase-2, we identified HCV RNA positivity in the 2nd Sample as well as HIV RNA test as positive.
Activity Performed	According to the criteria, the non-compliance is at "low" level and since no performance improvement is required, only the process was reviewed.	According to the criteria, the non-compliance is at "low" level and since no performance improvement is required, only the process was reviewed.
Other	Not available	Not available

PP-041

EXAMINING THE RESULTS OF THE ERRORS REPORTED BY ANTALYA TRAINING AND RESEARCH HOSPITAL TRANSFUSION CENTER TO WESTERN MEDITERRANEAN REGIONAL BLOOD CENTER

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AIM: The quality control studies of the blood components supplied by Turkish Red Crescent are periodically conducted in accordance with the national legislation, and the accredited quality management systems with the method and amounts defined in National Blood and Blood Products Guide. The error reporting mechanism between Transfusion Centers (TC) and Regional Blood Centers (RBC) initiates with the error reporting over Error Reporting Form and results in Retrospective Blood Component Analysis Report. With this system it is aimed to detect the errors, to identify the sources of the errors and to prevent the repetition of the errors.

The aim of this study is to examine the error reports conducted by Antalya Training and Research Hospital Transfusion Center to Western Mediterranean Regional Blood Center between 2013-2015 and to contribute to the determination of these errors' causes and the improvements for the measures to be taken.

METHOD: The error reports made by Antalya Training and Research Hospital Transfusion Center between 2013-2015 and the results reported by the Western Mediterranean Regional Blood Center are examined retrospectively.

The data are obtained from Error Reporting Forms and Western Mediterranean Regional Blood Center Quality Control Laboratory examination reports.

RESULTS: All error reports conducted regarding the erythrocyte suspension (ES) from blood products.

In the years 2013, 2014 and 2015, samples received respectively 23836, 23933 and 23138, the ES relevant error

reports are grouped under two headings such as clotted blood and direct antiglobulin test (DAT) positivity.

As a result of the examination conducted by Western Mediterranean Regional Blood Center Quality Control Laboratory, for the year 2013, 12 of 23836 products (0.05%) are reported with clotted blood, and 7 of these reports (58.34%) are confirmed. For the year 2014, 7 of 23933 products (0.03%) are reported with clotted blood, and 3 of these reports (42.86%) are confirmed. For the year 2015, 8 of 23138 products (0.04%) are reported with clotted blood, and 4 of these reports (50%) are confirmed.

DAT positive error reporting is conducted for 9 ES (0.03%) and each result (100%) is reported as DAT positive. DAT positive error reporting is not conducted for the years 2014 and 2015.

CONCLUSION: Considering the confirmed error counts, our study shows that there are some improvements needed for the preparation of blood components and laboratory testing phases.

PP-042

ANALYSIS OF BLOOD DONATION CENTER MEDICAL STAFF APPROACH AGAINST RISK AND DANGER FACED IN WORK ENVIRONMENT BY SOCIO-DEMOGRAPHIC FEATURES

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INTRODUCTION: Work environment sinclude risks with health and safety hazards. The dangers and risks include occupational diseases and work accidents that can directly affect the health of the person. Dangers are threats which occurs against human health. Risk is a concept which is related with probability and it is defined as the probability of occurrence of a negative event in a dangerous situation.

OBJECTIVE: This study was made in Northern Marmara Regional Blood Center (NMRBC) and subordinates (Kartal Blood Donation Center and Zeynep Kamil Blood Donation Center), for determination of clinical staff approach according to their socio demographic characteristics, against the dangers that they face during blood donation processes.

METHOD: The sample data of the survey was collected from NMRBC medical staff between 01.03.2016 and 07.03.2016. In the study questionnaire was used to collect data. The survey consists of four separate descriptor table that contains statistical information.

60 employees participated in the survey; Socio-demographic characteristics of employees are shown in Table 1

FINDINGS: When the answers of the participants has been considered it was seen that 58 % wash their hands before working and 73 % of those who wash their hands also dry them.

It was determined that the thirty-three percent of respondents use hand sanitizer besides male participants preferred hand sanitizer more than hand washing.

The majority of the medical staff (85%) were found to give importance to the use of gloves but they don't have the same sensitivity in the use of protective lab coats and glasses.

Participants' sensitivity of working in body forcing positions was found low.58 percent of medical staff haven't experienced an occupational accident however group that had an occupational accident are mostly below 25 years old and all of them are associate degree graduate and single.

When basic security (physical and biological) measures asked, 5% of respondents reported finding adequate measures.

Participants have been asked about the educational needs of occupational health and safety; despite 70% of them have been trained before, wanted to repeat the education. (personal hygiene, diseases transmitted through blood and prevention methods, blood and body fluid contacting precaution instructions, biosafety instructions and management procedure of medical waste)

When Employees' Approach Against Psychosocial Risk is analyzed; physical conditions affect business productivity, staff assignments are suitable for the job done and workload is not too heavy, but it was determined that business productivity decreases if there is insufficient rest period.

Flexible working hours negatively affects 73% of the medical staff.

CONCLUSION: Occupational safety culture should be created in healthcare business. In order to adopt the new hires to security culture, healthcare management should give more serious information about the risks and dangers.Also; adapting the working environment to the health conditions, elimination of some danger possibility, regulation of working hours, suitable working order for physiological characteristics, ensuring compliance of the tools with the person and work should be the main objective.

Table 1

Age	Percentage
Below 25	20%
25-34	39%
35-44	13%
45 and over	15%
No Answer	13%
Gender	Percentage
Female	58%
Male	42%
MaritalStatus	Percentage
Married	67 %
Single	33 %
EducationalStatus	Percentage
Primary School	0%
High School	0%
AssociateDegree	48%
Degree	35%
Postgraduate	17%

PP-043

FREQUENCY OF ABO AND RHESUS BLOOD GROUPS IN PREOPERATIVE PATIENTS OF CABG SURGERY IN LOCAL POPULATION OF DISTRICT RAWALPINDI (PAKISTAN).

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INTRODUCTION: Blood transfusion has been a vital piece of coronary artery bypass graft surgery (CABG) since its starting. Transfusion rates in cardiovascular surgery stay high in spite of real advances in CABG surgery. Cardiovascular Disease (CVD) is one of the most critical problems now a days. 15 million deaths are caused due to CVD every year and most of the people who die are below 65 years of age. Pakistani population also has one of the highest risks of coronary heart diseases (CHD) in the world. In Pakistan, 30-40% of all deaths are due to CVD. as it takes nearly 200,000 lives in Pakistan every year.

OBJECTIVES: The purpose of this study is to demonstrate the distribution of ABO and Rh blood groups in a large population of patients undergoing for CABG. To identify the Blood group most common in patients going for CABG surgery which may help in blood & blood products stock management.

MATERIALS-METHODS: The study was carried out at Rawalpindi Institute of Cardiology (RIC) to collect data of coronary heart disease patients on the basis of ABO blood group and Rh factor. This study included 633 patients with the minimum age of 31 to the maximum age of 75 having CAD and were about to go for Coronary artery bypass graft surgery. (Table1) Standard tube agglutination method was adopted for the identification of ABO and rhesus blood group by using commercially available antiseras A, B and D, along with appropriate positive and negative controls. All statistical analysis was performed on SPSS software version 21.0.

RESULTS: A target sample population of 633 patients aging from 31-75 years were enrolled in this study. The mean SD age of participants was (52.8) ±10.9 years out of which 434 (68.6%) were male while 199 (31.4%) were females. According to our research CVD prevalence between both sexes was largest among the subjects ≥41-60 years of age. Of the 633 patients which were included in the analysis showed phenotypes A, B, O and AB as 26.7%, 34.1%, 31.3% and 7.9% respectively. Present study shows that out of 633 patients, 581 (91.8%) were RH positive while only 52 (8.2%) were RH negative. (Table 2)

CONCLUSION: The data suggest that blood group "'B'' is most common in patient going for CABG surgery. The data also suggest that phenotype ''B'' might be associated with Coronary heart disease but there is need to confirm effect of blood group on the development of cardiac diseases. With respect to this study it is proposed that blood banks should maintain stock of Blood Group B and Rh Positive as compare to other ABO blood groups.

Distribution of CVD in different Age Groups

Age Group	Frequency	Percentage (%)
31-40	114	18.0
41-50	167	26.4
51-60	191	30.2
61-70	138	21.8
71-80	23	3.6
Total	633	100

Distribution of ABO & Rh. Blood Groups in CVD Patients

ABO & Rh. Blood Group System	Frequency	Percentage (%)
A	169	26.7
B	216	34.1
O	198	31.3
AB	50	7.9
Rh. Positive	581	91.8
Rh. Negative	52	8.2

PP-044

THE ASSESSMENT OF THE INCIDENCE AND REASONS OF BLOOD DONOR DEFERRAL - A STUDY FROM TERTIARY CARE INDIA

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BACKGROUND: A key to retention of donors is to know the cause donor deferral.

AIMS: To review and assess the incidence and reasons of blood donor deferral. To use the information to amend and adept a consistent donor recruitment and selection process.

MATERIAL-METHODS: A retrospective study was conducted in the AIIMS, Bhubaneswar hospital over a period of one and half year. A retrospective analysis of donor records of all donors including those in outdoor camps from July 2013 to December 2014 was carried out to assess the incidence and reasons of donor deferral. The inclusion and exclusion criteria of donors will be as per the rules laid down by Drugs and Cosmetics Act, Ministry of Health and Family Welfare, Govt. of India.

Data were coded, entered, and analyzed using SPSS Version 20.

RESULT: During the study period a total of 11376 donors donated blood in house and in outdoor camps at AIIMS and the district blood bank.. Among these, 427 patients were deferred. Majority of the deferred donors were male and

belonged to the age group of 25 to 39 years. The most common causes of deferral were low hemoglobin 174(40.8%) followed by recent use of medication 104(24.4%), alcohol intake 29(6.8 %) and underweight 26(6.1 %).

DISCUSSION: Donor deferral is logical for reducing the risk of disease transmission through blood transfusion and its enactment should be assured when recruiting blood donors. However unneedful deferral of blood donors may be at the cost of potential donors. Nonetheless it is crucial to analyze the reasons of donor deferral for the retention and re-entry of the donors deferred due to various causes and addressing the issue and ameliorating the cause if possible.

Causes Of Deferral in Blood Donors

Cause of deferral	Male	Female
LOW HEMOGLOBIN	7 (4.0%)	167 (96%)
INTAKE OF ANTIBIOTICS	100 (96.2%)	4 (3.8%)
ALCOHOL INTAKE	29 (100%)	0 (0%)
UNDER WEIGHT	10 (38.5%)	16 (61.5%)

causes of deferral

Donor Deferral According to Age Group

Cause of deferral	AGE GROUP <18 YEARS	AGE GROUP 18 – 24 YEARS	AGE GROUP 25 – 39 YEARS	AGE GROUP 40 – 54 YEARS	AGE GROUP > 55 YEARS
LOW HEMOGLOBIN (40.8%)	0 (0 %)	86 (49.4 %)	74 (42.5 %)	13 (7.5 %)	1 (0.6%)
. INTAKE OF ANTIBIOTICS (24.4%)	0 (0 %)	32 (30.8 %)	53 (51.0 %)	17 (16.3 %)	2 (1.9%)
ALCOHOL INTAKE (6.8%)	0 (0 %)	10 (34.5 %)	14 (48.3 %)	05 (17.2 %)	0 (0.0%)
UNDER WEIGHT (6.1%)	0 (0 %)	24 (92.3 %)	01 (3.8 %)	01 (3.8 %)	1 (0.6%)

donor deferral according to age group

PP-045

MANAGEMENT OF BLOOD SUPPLY TO THE HOSPITALS THAT THE CASUALTIES HAVE TRANSPORTED AFTER A TERRORIST ATTACK

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The quantities of blood supplies, distribution of blood groups, and elapsed time until delivery to hospitals were collected retrospectively and evaluated.

Twenty-nine citizens have lost their lives and numerous others were injured and hospitalized after the terrorist attack on 17th of February, 2016 at 18:32 in Ankara.

There were a total of 2023 units of erythrocyte suspension, of which 1107 units were ready to use, and 916 were at quarantine.

The informations of hospitals that casualties have been transported were obtained from 112 emergency coordination center, and those hospitals were contacted immediately after the blast. The routine demands other than emergency needs of other hospitals were stopped, and blood and blood products were transferred to the injured citizens immediately.

After the attack, 350 units of ES in 90 minutes, and a total of 379 units of ES until 00:00 same night has been transferred to the hospitals. Total number of products was 517 units, when other blood products were accounted.

High numbers of O Rh(-) ES were requested from the hospitals due to high numbers of injured people. Seventy-five units of O Rh(-) ES, which are reserved in the stocks of Middle Anatolian Regional Blood Center for exceptional circumstances like this, were circulated immediately to the hospitals.

Until 00:00 of the attack day, a total of 589 units of erythrocyte suspension were transferred from the 17 Regional Blood Centers that operated under the body of Turkish Red Crescent, which 299 units of them were negative blood groups and AB(+) blood type. Eventually, the reserved stock against extraordinary occasions, particularly the O Rh(-) reserve, has been re-established.

The number of ESs in the inventory of Middle Anatolian Regional Blood Center at 09:30 a.m. on the day after the attack was 2396 units.

The number of reserved O Rh(-) ES in the stocks of Turkish Red Crescent Regional Blood Centers for the circumstances like terrorist attacks has been increased and stock plans were revised after the second half of 2015.

Stocked amounts of O Rh(-) ESs were sufficient, but some problems have encountered in transportation of the supplies to the hospitals after the terrorist attack on 10th of October, 2015, at the meeting in front of the Ankara central train station. The priority of the demands from the hospitals could not be evaluated adequately due to the hurry to

respond to all demands, and Ankara Numune Hospital, which the majority of the casualties were transferred, could not took the blood supply proportional to its need. Nevertheless, the internal stocks of the hospitals have covered the demand and no problems have emerged.

By the lessons learned from this case, the demands from the hospitals after the attack on February 17th, 2016 were first confirmed from the 112 coordination center, and blood supply plans were based on the information of patients that transported to each of the hospitals, to reply all the demands effectively and adequately.

Number of blood products according to blood groups, which were delivered to hospitals in 90 minutes after the blast

	ES	PLT	FFP	TOTAL
O Rh(-)	70			70
O Rh(+)	65	20		85
A Rh(-)	14			14
A Rh(+)	130	12		142
AB Rh(-)	1		20	21
AB Rh(+)	30	5	20	55
B Rh(-)	5			5
B Rh(+)	35	20		55
TOTAL	350	57	40	447

Numbers of ES (erythrocyte suspensions), that transferred from other Regional Blood Centers to Middle Anatolian Regional Blood Center

	ES
O Rh(-)	80
O Rh(+)	150
A Rh(-)	65
A Rh(+)	130
AB Rh(-)	25
AB Rh(+)	95
B Rh(-)	34
B Rh(+)	10
TOTAL	589

PP-046

ROLE OF MONITORING BLOOD SERVICES IN IMPROVEMENT OF PROVISION SAFE BLOOD - INDIAN EXPERIENCES

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[2]National Blood Transfusion Council

AIM: Efficiency and effectiveness in National Blood Services is of vital importance. National Blood Transfusion Council, India (NBTC) was established in 1996 with vision of improving the blood transfusion services in the country. Monitoring & Evaluation are necessary to ensure efficiency and effective uses of measure. Programmatic monitoring and evaluation of blood services should be performed to ensure that health activities are implemented as planned and to assess whether desired results are being achieved.

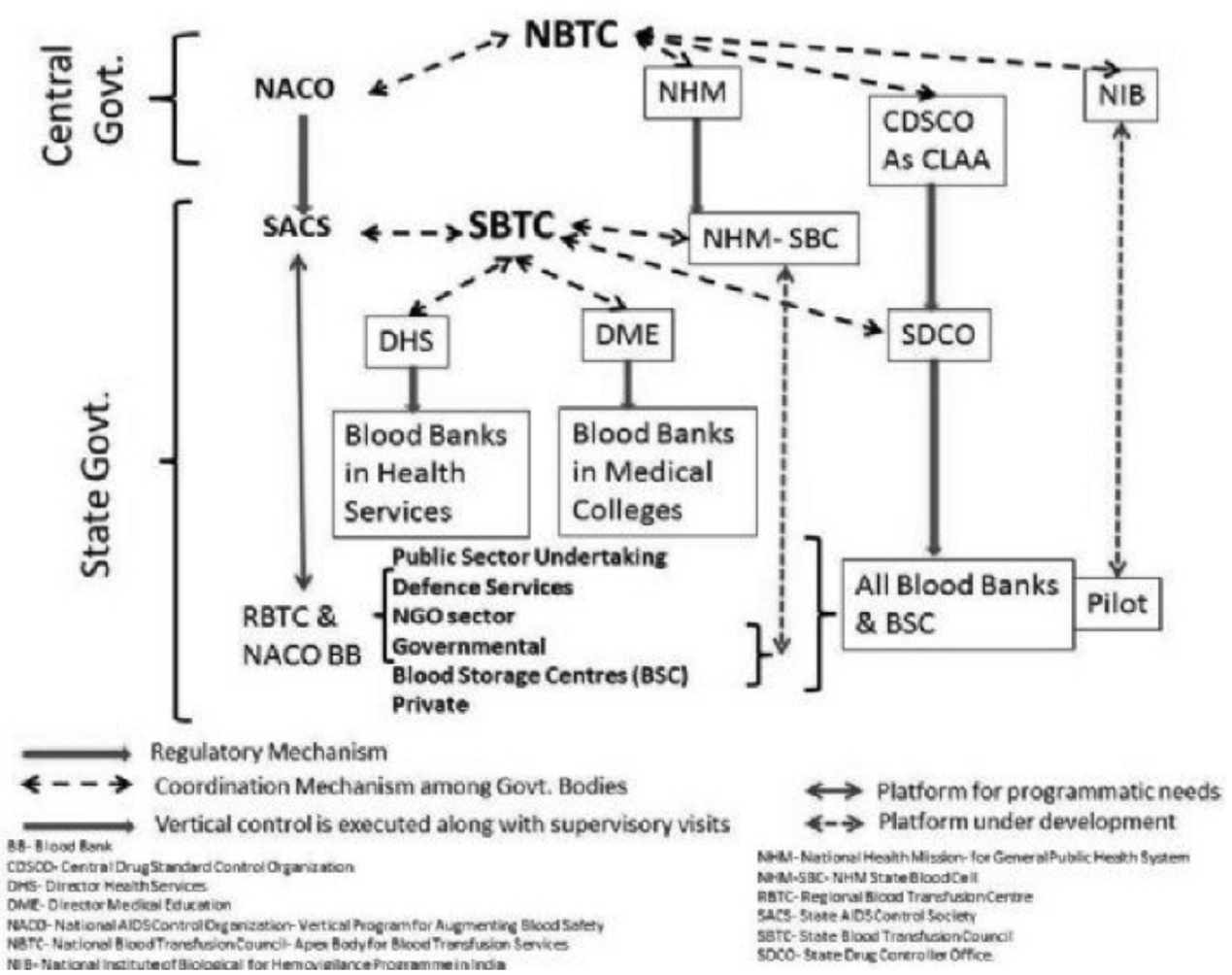
MATERIAL-METHODS: Major parameters of blood services in the country before and 20 years after establishment of National Blood Transfusion Council in the country were measured against the desirable.

CASE STUDY: Monitoring mechanism is complex in the country with Federal Government. Blood Transfusion Services is managed by State (provincial government). National Blood Transfusion Council (NBTC) - defines the policy consisting of objectives, goals, devise strategy. Blood Transfusion Services at National AIDS Control Organization (NACO), prepares annual action plan and allocate necessary resources consistent with NBTC. State (provincial) govt. counterparts of NBTC and NACO designs how can they are getting desired output from the inputs that are being utilized. Blood Bank Facilities define actual supervision, operations and ensures that planned activities are being carried out as per schedule. With continuous monitoring following results have been achieved in last 2 decades;

RESULTS: These improvements have been evaluated with various time frames involving short term, midterm and long term strategies. As evident from table, continuous monitoring & evaluation improve blood transfusion services availability has increased and access of safe blood and blood component is evident. Governmental commitment is evident by establishing National Blood Transfusion Council. Government has allocated timely resources, among competing priorities, for current and future program of Blood Transfusion services. Continuous monitoring and evaluation of program has resulted in more relevant, more efficient, safe and more effective blood transfusion services. Regulatory amendments have paralleled to growth and technological advancements in the country.

DISCUSSION: The purpose of monitoring is to ensure that programs are implemented as planned. Therefore, Monitoring of blood program provides concurrent feedback on the progress of predefined activities/ norms of performance. Level of performance becomes measurable and it can be compared with established standards or norms. It helps in identifying deviations and explains the reasons for the deviation for taking necessary corrective action. Thus, monitoring is part of planning cycle which starts with preparation of action plan. Inadequacy in planning will result in inadequacy in monitoring. Monitoring of blood program is at different levels aligned with policies and implementation strategies.

Monitoring Mechanism of Blood Transfusion Services in India



Status of blood transfusion services before and after establishment of National Blood Transfusion Council

S.No.	Parameters	Before NBTC (1996)	2015
1	Whole Blood Collection	Approx. 1 Million	10.8 Million
2	Total No. of Blood Banks	< 500	Around 2700
3	Blood Component Separation Units	<50	1163
4	Apheresis center	None	503
5	Infection Screening as per Norms	Not routinely done	100%
6	Licensing of Blood Banks	Not Mandatory	100%
7	Availability of plasma for plasma derived medicinal products in an Year	<10 thousand Liters	> 3 lac liters

PP-047

THE EVALUATION OF THE USE OF BLOOD PRODUCTS AND THE DISTRIBUTION OF THEM ACCORDING TO BLOOD GROUPS IN KONYA DR FARUK SÜKAN GYNECOLOGY, OBSTETRICS AND CHILDREN HOSPITAL

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OBJECTIVE: Blood and blood products are essential components in the medical management of patients in almost every field of clinical practice. In this study, it is aimed to determine the number and the rate of used blood products and the distribution of them according to blood groups in our hospital.

MATERIALS AND METHODS: Between September 2015-February 2016, the data of blood products obtained from Kızılay Regional Blood Center was investigated retrospectively. The number and the rate of obtained, used and eliminated blood products were determined. Blood groups were detected by using gel centrifugation method with commercial diagnostic kits on the immunohematology automated analyser (Autovue Innova, Ortho Clinical Diagnostics, USA) according to manufacturer's instructions.

RESULTS: A total of 893 blood products were obtained from Kızılay Regional Blood Center for clinical practice in our hospital. The most used blood product was detected as erythrocyte suspension with the rate of 67.7%. Platelet suspension was the most eliminated blood product with the rate of 73.1%. While A Rh + and 0 Rh + were found as the most common blood groups among erytrocyte suspension and fresh frozen plasma, AB Rh + was prevalent for platelet suspension. AB Rh – and 0 Rh – were the most rare blood groups for all blood products as reported in other studies carried out in our country.

CONCLUSION: The determination of the rate of used and eliminated blood products is important for detecting and updating of critical stock level. Blood transfusion centers in hospitals should have good practice in all aspects of blood grouping, compatibility testing, the storage and transportation of blood and blood products to clinics. If blood transfusion therapy is appropriately used, it can improve the quality of life and prevent morbidity and mortality.

Table 1: Distribution of blood products according to utilization, elimination and obtaining from Kızılay Regional Blood Center

BLOOD PRODUCTS	OBTAINED FROM KRBC*	USED	ELIMINATED
	n %	n %	n %
Erythrocyte suspension	542 60.7	506 67.7	36 24.9
Platelet suspension	160 17.9	54 7.2	106 73.1
Fresh frozen plasma	191 21.4	188 25.1	3 2
TOTAL	893 100	748 100	145 100

**KIZILAY REGIONAL BLOOD CENTER*

Table 2: Distribution of blood products according to blood groups

BLOOD GROUPS	Erythrocyte suspension	Platelet suspension	Fresh frozen plasma	TOTAL
	n %	n %	n %	n %
A Rh +	155 28.6	9 5.7	58 30.4	222 24.9
A Rh -	38 7	4 2.5	12 6.3	54 6
B Rh+	94 17.4	4 2.5	28 14.7	126 14.1
B Rh -	26 4.8	2 1.2	5 2.6	33 3.7
AB Rh+	60 11	127 79.3	24 12.6	211 23.6
AB Rh -	14 2.6	1 0.7	2 1	17 2
0 Rh+	134 24.8	13 8.1	62 32.4	209 23.4
0 Rh -	21 3.8	0 0	0 0	21 2.3
TOTAL	542 100	160 100	191 100	893 100

PP-048

RESEARCHING TEMPORARY REASONS OF VOLUNTEER BLOOD DONOR DEFERRALS WHOM APPLIED TO BLOOD CENTER OF ISTANBUL KARTAL KOSUYOLU YUKSEK IHTISAS TRAINING AND RESEARCH HOSPITAL

Sibel Doğan Kaya, Arif Şenel, Hamit Kaya, Adem Erengül, Nur Uylar, Tulay Karabürk, Aslıhan Özmen, Meral Ulığdogan, Emine Erengul, Hüseyin Yüce, Tuğba Gevrek, Bülent Arınç

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BACKGROUND: The only source of blood and its components is human, and there is no alternative modality when it can not be provided. In developed countries, while the volunteer blood donation's rate for general population is reaching 5%, this ratio is about 1,5% in Turkey due to deferral of donors because of various reasons.

MATERIAL-METHODS: In the present retrospective study 34128 volunteer blood donors admitted to Istanbul Kartal Kosuyolu Yuksek Ihtisas Training and Research Hospital between 01 January 2014–01 March 2016 were examined in terms of number of donors deferred temporarily from blood donation and the causes of deferral. The causes of temporary deferral are classified into 12 main groups.

RESULTS: The highest blood donation was taken in March 2015 (1693 blood donations, 4,96%) and March 2014 (1608 blood donations, 4,71%), while the lowest blood donation was taken in December 2015 (815 blood donations, 2,38%) and Semterber 2014 (922 blood donations, 4,70%). 7,8% of donors (2662/34128) were deferred temporarily from blood donation. The three uppermost reasons for temporary deferral were anomalies of white blood cells (19,4%) infectıons (27,8%), and problems of tooth treatment (%6,89)

CONCLUSIONS: The temporary deferral rate of our center is 19.2%, and the anomalies of blood count and varioushealth problems are the leading causes. Early diagnosis and treatment of these causes may increase already low blood donation rates to desired levels.

FIGURE 1

WHY RED	TOTAL
INFECTION	702 (% 29,88)
SURGERY ENDOSCOPY	197 (% 6,85)
PINPRICK	18 (% 0,76)
TATTOO	37 (% 1,57)
DENTISTRY	162 (% 6,89)
VACCINE	69 (% 2,93)
DRUG	23 (%0,97)
HYPER-HYPO TENSION	60 (%0,55)
LOW HEMOGLOBIN	456 (%1,96)
RISKY SEX	17 (%0,72)
AGE	53 (% 2,25)
KILO	48 (% 2,04)
DRUG USE	306 (% 13,02)
OTHER	507 (% 21,58)

PP-049

A COMPARISON OF THE APHERESIS PLATELET DATA BETWEEN YEARS 2012-2015

Canan Eren

Deparment of Blood Bank, Marmara University Pendik Training and Research Hospital, Istanbul, Turkey

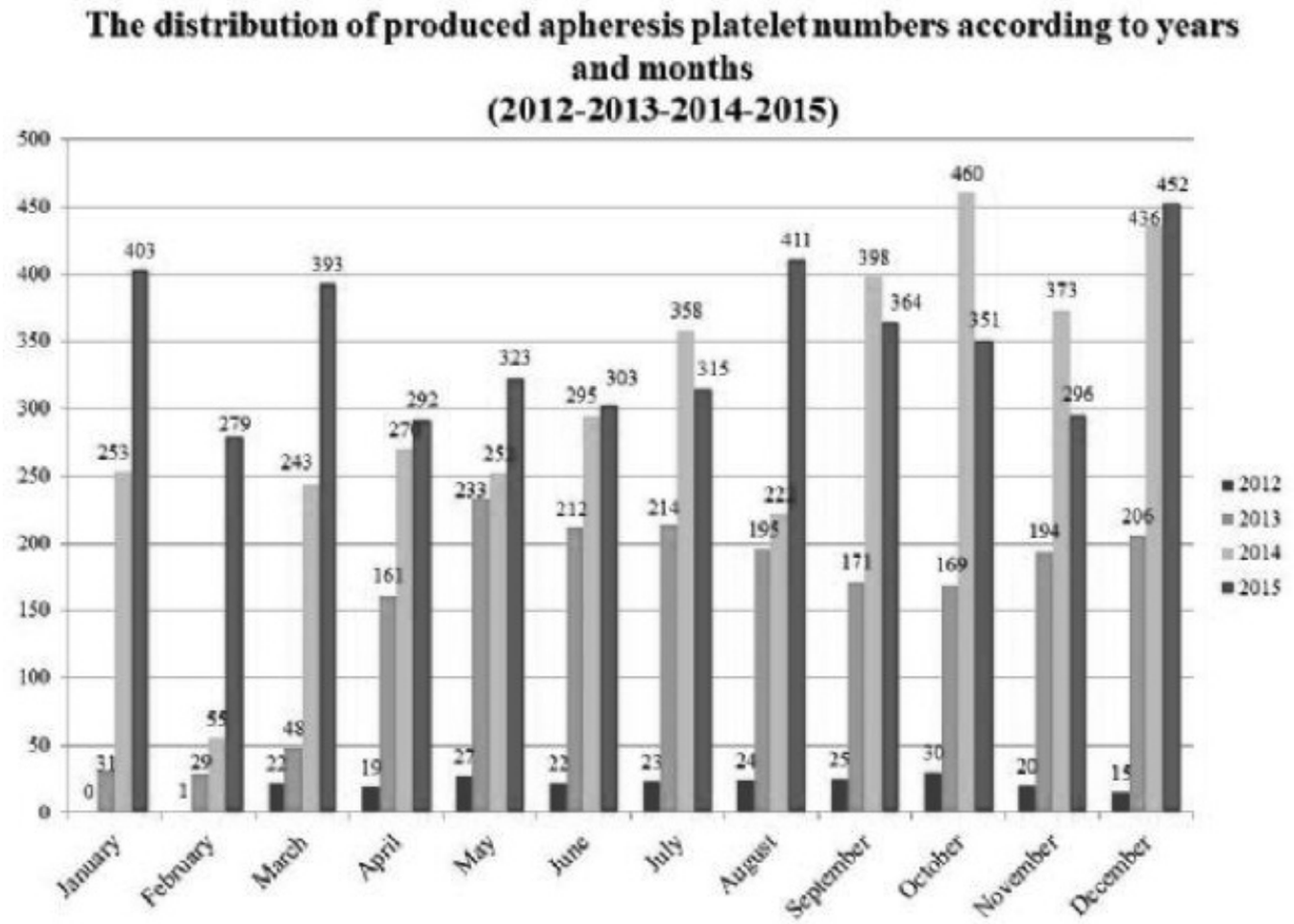
AIM: The evaluation of the effect of blood donations hours on apheresis platelet donations numbers.

MATERIAL- METHOD: The produced apheresis platelet counts between 2012-2015 were analyzed and compared with the times of accept blood donations in Marmara University Pendik Training and Research Hospital.

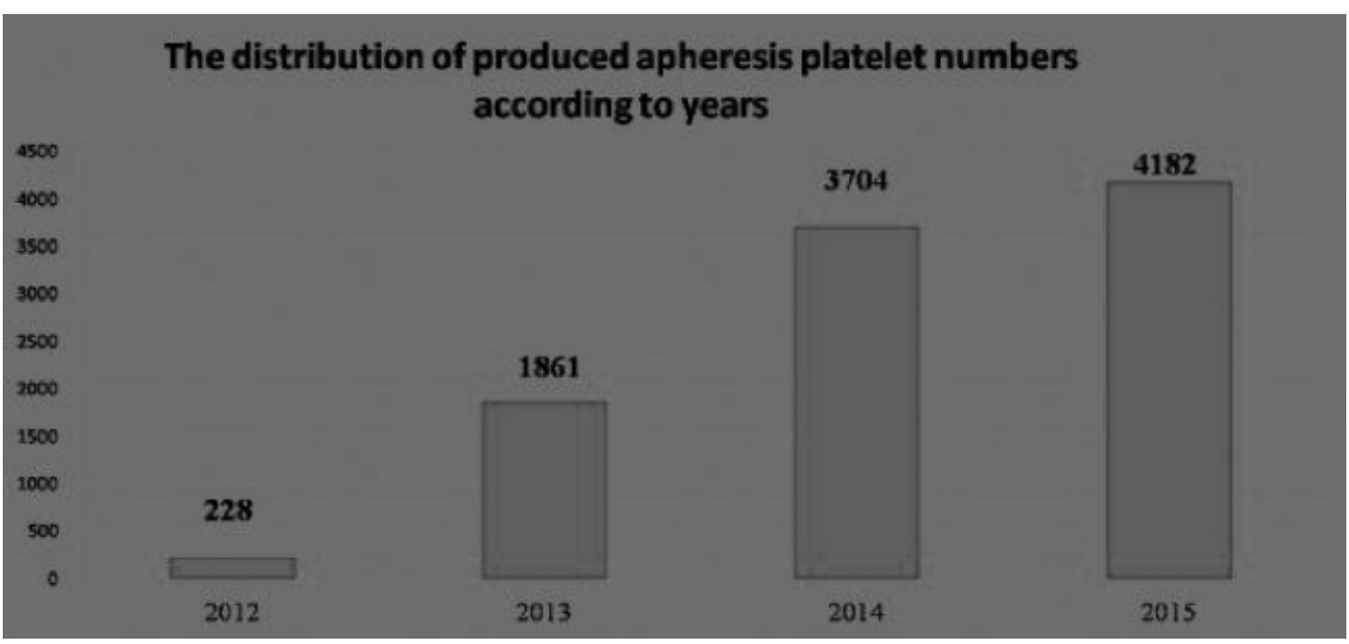
RESULTS: In 2012, platelet apheresis donation is only possible between 09:00 and 12:00 a.m. on weekdays and during this period total produced apheresis platelet number was 228. In 2013, platelet apheresis donation accept time was between 09:00 a.m and 17:00 p.m. and total produced apheresis platelet number was 1861. In 2014, with the start of acceptance apheresis platelet donation 24 hours, 7 days as from month of March, the total produced apheresis platelet number was 3704. In 2015, throughout the year with the accept of apheresis platelet donations 24 hours, 7 days, the total produced number of apheresis platelet reached 4182.

CONCLUSION: With the opening apheresis platelet donation time 24 hours, 7 days led to the a significant increase in the number of apheresis platelet produced. This situation has provided grate satisfaction and relief for the doctors, the patients and their relatives.

Comparison of the apheresis platelet numbers between 2012-2015



The distribution of produced apheresis platelet numbers according to years



PP-050

DISTRIBUTION OF USE OF BLOOD PRODUCTS AT THE KARTAL KOŞUYOLU HIGH SPECIALIZATION TRAINING AND RESEARCH HOSPITAL

Sibel Doğan Kaya, Aslıhan Özmen, Hamït Kaya, Tuğba Gevrek, Nur Uylar, Arïf Senel, Tülay Karabürk, Hüseyïn Yüce, Songul Karabulut, Meral Ulugdogan, Emïne Erengül, Bülent Arïnç

Istanbul Kartal Kosuyolu Yuksek Ihtisas Training and Research Hospital

Our aim in this study is to examine the distribution of the use of blood products at the Cardiovascular Surgery Intensive Care Unit, the Cardiovascular Surgery Services, the Cardiology Services, the Coronary Intensive Care Unit and the Emergency Service at our hospital.

Within the scope of the study our hospital was studied retrospectively for the period between 1st January 2012 and 31st December 2015. In this period fresh frozen plasma product was used most and the unit in which it was used most was the Cardiovascular Surgery Intensive Care Unit. It has been observed that fresh frozen plasma has been widely used to make up for the volume deficit in our hospital.On the other hand, erythrocyte suspension has been used to replace acute and chronic blood loss.

As a result, the rate of whole blood use in our hospital is the highest among all blood products.That our hospital has surgery intensive care unıt (with 60 beds), a pediatric intensive care unit (with 12 beds), a coronary intensive care unıt (with 27 beds) and a transplantation unit in which liver and heart transplantations are available increases the rates concerning the use of blood and blood products.

Figure 1

2015 year	Emergency Cardiology	Emergency Surgery	Surgıcal Intensive	Pediatrıc Service	Surgery Service	Cardiology Services	Pediatrıc Intensive care	Coronary Intensive Care	Transplantatıon Service	Total
Whole Blood	3	1	877	18	137	10	85	9	6	1146
Rate	0,26 %	0,08 %	76,5 %	1,8 %	11,9 %	0,8 %	7,4 %	0,7 %	0,5 %	
Red Cell Suspension	401	121	8422	424	3050	840	958	985	174	15375
Rate	2,6 %	0,7 %	54,7 %	2,7 %	19,8 %	5,4 %	6,2 %	6,4 %	1,1 %	
Fresh Frozen Plasma	593	234	10174	549	3304	191	1238	366	147	16796
Rate	3,5 %	1,3 %	60,5 %	3,2 %	19,6 %	1,1 %	2 %	2,1 %	0,8 %	
Plalelet S uspension	20	10	9697	37	193	22	1376	156	78	11589
Rate	0,17 %	0,08 %	83,6 %	0,3 %	1,6 %	0,18	11,8 %	1,3 %	0,6 %	

PP-051

EVALUATION OF THE DONOR QUESTIONNAIRE FORMS IN GIRESUN PROF. DR. A. ILHAN OZDEMIR GOVERNMENT HOSPITAL, BLOOD BANK IN TWO YEAR PERIOD

Şahin Direkel[1], Nejla Cebeci Güler[1], Ömer Emecen[2], Saliha Kesti[3]

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[3]Department of Medical Microbiology, Health Sciences Institute, Giresun University, Giresun, Turkey

AIM: The blood donor history questionnaires was designed to aid blood establishments in evaluating a prospective donor's history relative to current known blood safety risks. In Turkey, blood donors must complete a donor history questionnaire (DHQ). In this study, we aimed to evaluate donor questionnaire forms who admitted to Giresun Prof. Dr. A. Ilhan Ozdemir Government Hospital, Blood Bank in Giresun province.

METHODS: This retrospective study was conducted by investigating the records of 607 blood donor history questionnaires who admitted for donation to Giresun Prof. Dr. A. Ilhan Ozdemir Government Hospital, Blood Bank between 1st January, 2014 and 31st December, 2015.

RESULTS: Total 607 people (34 women, 573 men) were apply to our hospital for blood donation. These blood donor history questionnaire form was evaluated. Total 494 (81.33%) donation according to blood donor history questionnaires were accepted. But 113 (18.67) donation were unaccepted. Reasons for rejection were such as low weight, influenza, diarrhea, hepatitis, low hemoglobin, high WBC, antibiotic use, diabetes, 18 in their young age. Rate of donation accepted or unaccepted according to blood donor history questionnaire in different age groups was shown in the table.

CONCLUSION: Blood and blood products needs of our hospitals are supplied from regional blood center of the Turkish Red Crescent. If, enough blood is not found in the hands of the Turkish Red Crescent, we supplies our own blood and blood products needs in the our blood transfusion center. Blood donors can fill sometimes giving no answer to all questions without reading the questions. They can sometimes give misleading answers to questions. The removal of some questions blood donor history questionnaire and a revised according to international standards is necessary. Such as "Have you been abroad in the last 3 years?"

Rate of donation accepted or unaccepted according to blood donor history questionnaire

	Accepted women	Accepted men	Unaccepted women	Unaccepted men	Accepted total	Unaccepted total
18-25 age	9	88	1	21	97	22
26-30 age	1	59	1	13	60	14
31-35 age	2	87	3	24	89	27
36-40 age	2	83	3	22	85	25
41-55 age	7	145	3	19	152	22
56-60 age	2	8	0	3	10	3
Over 60 years	0	1	0	0	1	0
Total	23	471	11	102	494	113

PP-052

CONSEQUENCES AND RESULTS OF DECREASING RESERVE PERIOD OF ERYTHROCYTE SUSPENSIONS FOR PATIENTS FROM 7 TO 3 DAYS

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INTRODUCTION: The aim of this study is to compare the disposal rates of erythrocyte suspension (ES) due to expiration, in 2010 and 2015.

FINDINGS: Monthly used erythrocyte suspension count, and amount of disposals in 2010 and 2015 were obtained from database. Also, cross-match counts were also obtained from the database.

In the practice of Ankara Numune Research and Training Hospital Blood Center in 2010, cross-match was studied for each ES, and individually reserved for patient for 7 days. But, this duration decreased to 3 days since 5th month of 2014. By this change, cross-match rates were significantly increased ($p<0.005$) and disposal of ESs significantly decreased ($p<0.05$), without a significant difference in the average number of ES used.

CONCLUSION: This retrospective research revealed that decreasing the reservation period of erythrocyte suspensions for patients resulted in decreased number of disposals. As a consequence, cross-match numbers have increased, but disposal rate decreased from 2.57% in 2010 to 1.45% in 2015.

ES count, cross match rate anddisposal rate in 2010

2010	ES n	Cross match n	Cross match ratio	ES Disposal n	ES Disposal %
January	1356	3109	2.29	29	2.14
Fabruary	1268	2558	2.02	57	4.50
March	1097	2071	1.89	44	4.01
April	1156	2320	2.01	42	3.63
May	1213	2441	2.01	65	5.36
June	1279	2867	2.24	54	4.22
July	1431	2781	1.94	35	2.45
August	1260	2987	2.37	11	0.87
September	1433	2769	1.93	11	0.77
October	1604	3056	1.91	7	0.44
November	1238	2314	1.87	7	0.57
December	1278	2682	2.10	24	1.88
AVERAGE	1301	2662	2.04	32	2.57

ES count, cross match rate anddisposal rate in 2015

2015	ES n	Cross match n	Cross match ratio	ES Disposal n	ES Disposal %
January	1126	3667	3.262.94	15	1.33
February	1061	3118	2.94	16	1.51
March	1107	3248	2.93	11	0.99
April	1147	1997	1.74	27	2.35
May	1154	2235	1.94	32	2.77
June	1233	3480	2.82	27	2.19
July	1374	3082	2.24	21	1.53
August	1368	3501	2.56	8	0.58
September	1058	2586	2.44	6	0.57
October	1509	3419	2.27	15	0.99
November	1139	3370	2.96	20	1.76
December	1141	3217	2.82	9	0.79
AVERAGE	1201	3076	2.56	17	1.45

PP-053

FEAR OF BLOOD DONATION

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AIM: Blood is a very critical component in human life. Blood transfusion has a significant role in today's healthcare operations. The blood donor system in Turkey depends mainly on voluntary donors. Volunteered blood donation occurs from 1.5-2% of the population in Turkey. This ratio is very high (5-10%) in developed countries. Compared to worldwide applications, Turkey has not been reached yet to a desired level. In the present study, we aimed to evaluate the factors influencing fears of blood donation among the Giresun University students.

METHODS: We applied a questionnaire to students who are eligible to donate blood. The group consisting of 371 students (234 male, 137 female) in different academic departments of the University was performed questionnaire work. The average age was found 20.4 years.

RESULTS: "Why are you afraid from blood donation" to question students were answered as 14.3 % large blood collection needles, 7 % see the blood, 12.7% transmission of the blood diseases, 6.2% meet positive test results for HIV, hepatitis B and C, and syphilis, 17.5% faint during blood donation, 2.7% because of my parents who don't allow blood donation, 11.6% loss of blood after blood donation, 4.4% weight loss after blood donation, 18.3% because of not feeling healthy enough for blood donation, 8.6% incompetence and bad behavior of health staff, 3.2% weight gain after blood donation, 0.5% because of religious causes, 17.5% because of feeling psychologically not ready for blood donation, 11.1% rupture of the blood vessel during donation, 16.7 % other reasons. According to the questionnaire, 118 students have donated blood before, but 253 students were not at any blood donation.

CONCLUSION: Firstly public awareness for the importance of the voluntary blood donation should be increased. It's necessary to inform all the students about the need to ensure a supply of safe blood to the health system in order to encourage them to become the voluntary and regular blood donors of the future. The reasons for why afraid from blood donation of healthy individuals should be determined and found the solutions to this problem.

BLOOD DONATION QUESTIONNAIRE

BLOOD DONATION QUESTIONNAIRE

Age :

Gender :

Have you ever donated blood before? □ Yes □ No

Why are you afraid of blood donation? What scares you the most during blood donation?

- □ Large blood collection needles
- □ See the blood
- □ Transmission of the blood diseases
- □ Meet positive test results for HIV, hepatitis B and C, and syphilis
- □ Faint during blood donation
- □ Because of my parents who don't allow blood donation
- □ Loss of blood after blood donation
- □ Weight loss after blood donation
- □ Because of not feeling healthy enough for blood donation
- □ Incompetence and bad behavior of health staff
- □ Weight gain after blood donation
- □ Because of religious causes
- □ Because of feeling psychologically not ready for blood donation
- □ Rupture of the blood vessel during donation
- □ Other (Please write):

PP-054

STUDY ON REASONS OF REJECTION FOR DONORS APPLIED TO OUR BLOOD CENTER FOR YEAR 2015

Hatice Erdoğan, Tunay Gül

Blood Transfusion Center of Haseki Training and Research Hospital, Istanbul, Turkey

AIM: By investigation the reasons of rejection for donors applied to our blood center, to take attention to missing and failing points in donor questioning.

METHOD: In this study; donor questioning forms for the last year and our statistical informations have investigated retrospectively.

EVIDENCES: The reasons of rejection for donors for year 2015 are shown in Table 1 below.

CONCLUSION: Our rejection rate has found as 8,48%. In the first place, the reason of rejection is caused by low Hgb as of 39,50% and 86% of this number created by women donors. The major part of 23,12% Health problems are composed of hypertension, diabetes and passed viral infections. Other reasons are composed of drug abuse, tattoo, acupuncture, overseas travel and detention. The prevention of unnecessary donor rejection is planned by reviewing the rejection reasons according to the last updated guide.

The reasons of rejection for donors for year 2015

Reasons of rejection	Number	Percentage %
Low Hgb	332	39.50
Health problems	194	23.12
Serology positive	111	13.20
Others	99	11.79
Inappropriate age	60	7.15
Risky sexual intercourse	25	2.97
Use of drug	18	2.14
Total rejection	839	8.48
Total donor	9890	

Evidence: shown in Table1 below

PP-055

EVALUATION OF KNOWLEDGE LEVEL IN OUR SOCIETY FOR BLOOD DONATION

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Turkish Red Crescent Regional Blood Center North Marmara, Kartal, Istanbul, Turkey

AIM; The foundation of blood banking is a safe blood donor. Ensuring safe blood donation in the community is possible with increasing the number of regular, voluntary and conscious blood donors. Starting from the fact that there are not enough voluntary, regular and conscious blood donors in our country yet, with the survey to assess people's attitude, behavior and knowledge towards blood donation, it is intended to contribute to recovery and training activities of blood donors.

METHOD; In December 2014, with people who came to the blood donation campaign in Burak Bora Anatolian High School, found in Kartal district of Istanbul province, a face-to-face survey with 10 questions was completed. The purpose and content of the study done was explained to all participants. Blood donor information brochures were given to the total of 624 people surveyed at the end of the survey.

FINDINGS;

Table 1

Gender

73% of our survey respondents were male, 27% female.

Table 3

EDUCATIONAL STATUS

82% of people who participated in our survey reported that they have a high school and over level education. Still studying are classified according to their most recent school graduates.

Table 6

FREQUENCY OF YOUR BLOOD DONATION

55% of people surveyed said they came to donate blood for the first time.

Table 8

WHO CAN NOT DONATE BLOOD?

%11 level of knowledge about the conditions that prevent the blood donation, has been identified.

RESULT; 55% of people surveyed consists of people who applied for the first time as blood donors. 97% of them consider the blood donation campaigns to be an effective way in our society for getting blood donors. Despite coming to a blood donation campaign as volunteers, people surveyed were found not to have sufficient knowledge about blood donation.

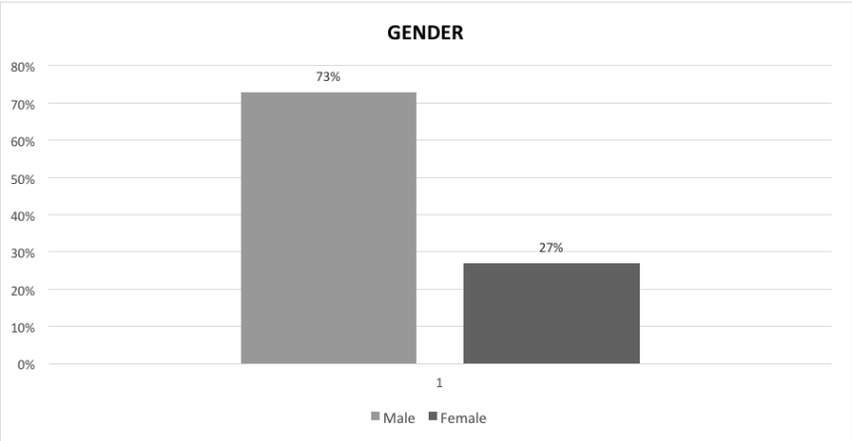
Considering %82 of respondents have the high school and over level of education;

- To increase the number and regularity of blood donors, realizing blood donation campaigns which are announced effectively
- Raising awareness and consciousness using media and press and social media tools
- Within a national program, blood donation information training should be given at all levels starting from primary school to high school, college and apprenticeship training schools
- Considering the target audience (aged 18 – 65 years), the implementation of appropriate training modules for all levels to the areas where people live and work as a whole.
- Training must be the first step of the corporate blood donation campaign
- Implementation of education, encouragement and motivation programs to get the people who donated blood for the first time as regular blood donors
- Based on information that we have average 11% of knowledge about disability to blood donation, which were specified in 8 main title, giving information about the risks and the importance of blood for the person to be donated blood transfusion to those who apply to donate blood
- In addition to raising public awareness of blood donation, working to raise awareness of the joy of helping other people, is a need to be made.

One that gets educational awareness can be gained as voluntary blood donor, and also can give accurate information about the risks associated with.

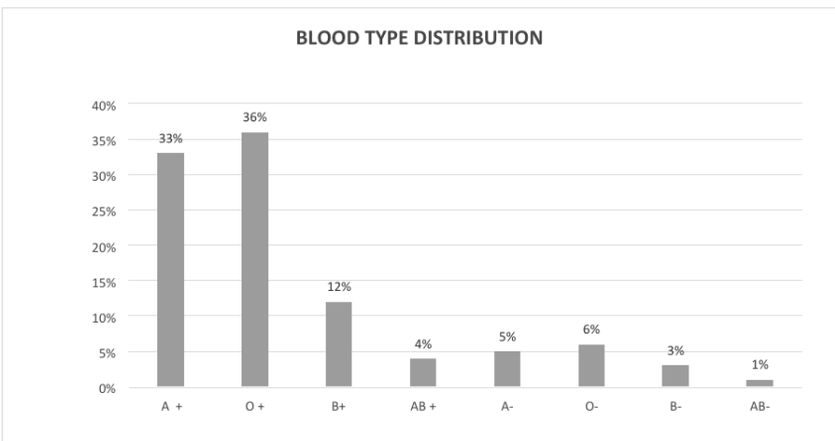
Only in this way, the most active ring will be completed to reach the safe blood.

Table 1



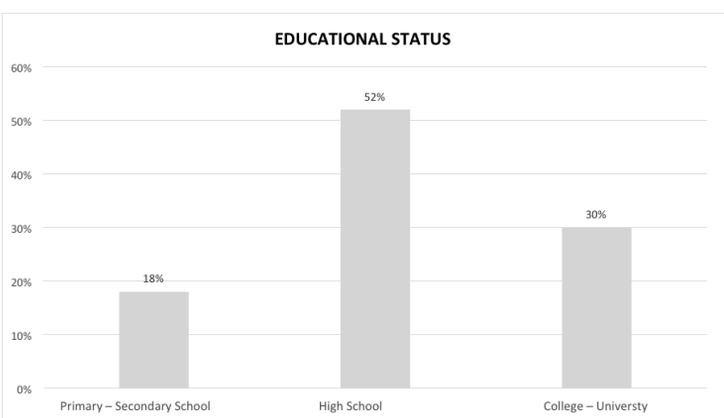
GENDER Male / Female 73% of our survey respondents were male, 27% female. (Table 1)

Table 2



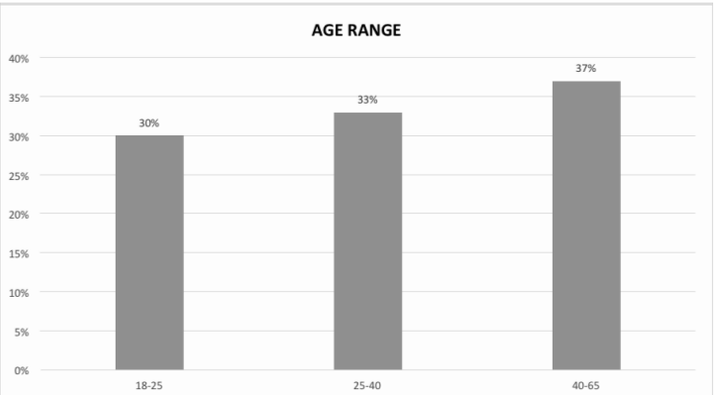
BLOOD TYPE DISTRIBUTION All of the people who participated in our survey know their blood type. With the ratio of %36, O Rh positive is the most, and with the ratio of %1, AB Negative is the least reported blood type. (Table 2)

Table 3



EDUCATIONAL STATUS Primary – Secondary School / High School / College – Universty 82% of people who participated in our survey reported that they have a high school and over level education. Still studying are classified according to their most recent school graduates. (Table 3)

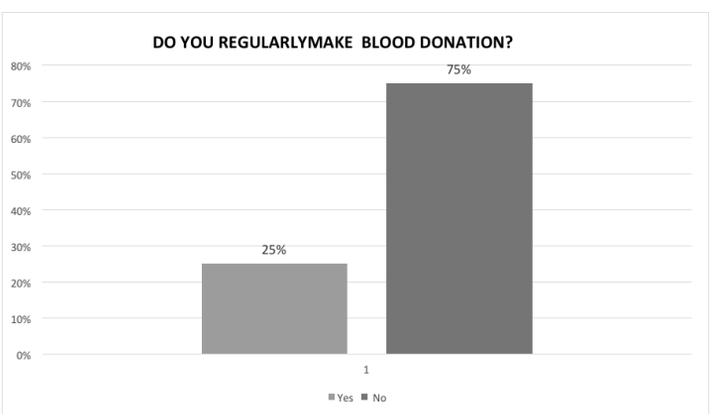
Table 4



AGE RANGE 30% of people who participated in the survey are aged 18-25 years; 33% of them are 25-40 years and %37 are at the range of 40– 65 years. (Table 4)

Table 5

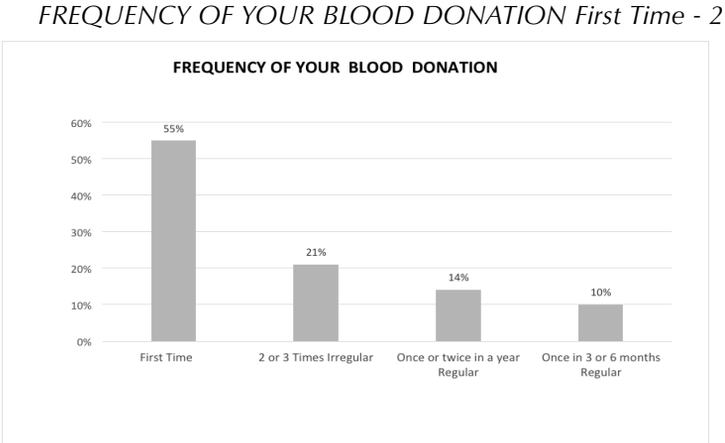
DO YOU REGULARLY MAKE BLOOD DONATION? 25% of people surveyed said they are regular blood donors.



People who donate blood twice or more in a year are considered to be regular blood donors. (Table 5)

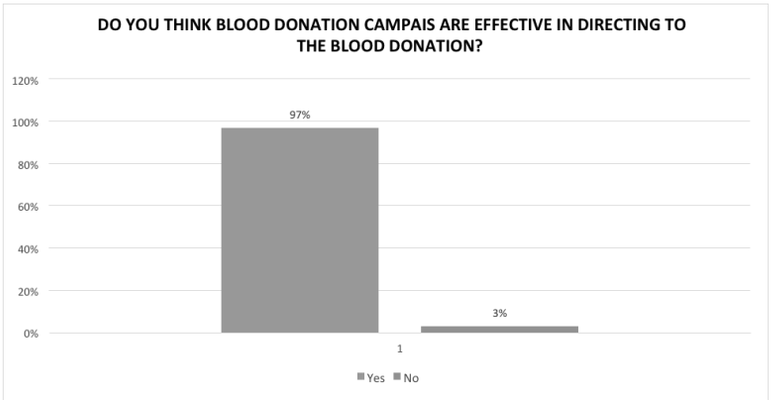
Table 6

FREQUENCY OF YOUR BLOOD DONATION First Time - 2 or 3 Times - Once or twice in a year - Once in 3 or 6



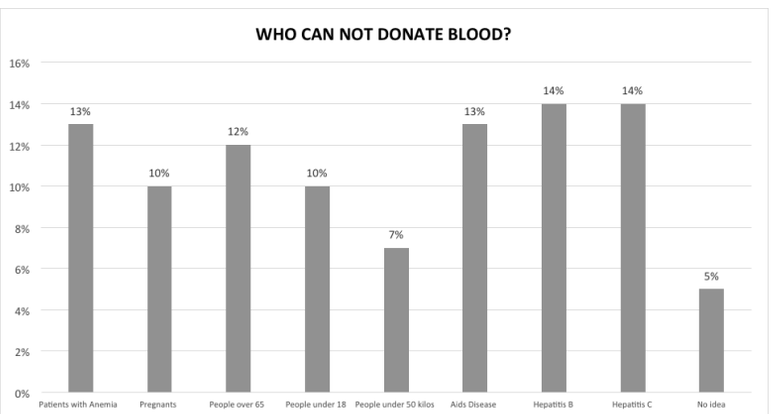
months Irregular Regular Regular 55% of people surveyed said they came to donate blood for the first time. (Table 6)

Table 7



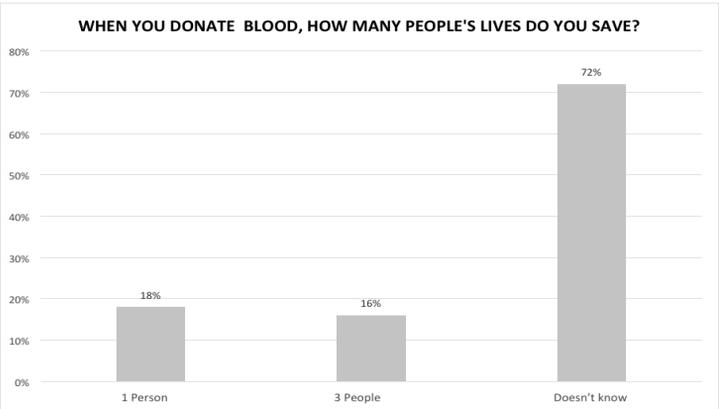
DO YOU THINK BLOOD DONATION CAMPAIGNS ARE EFFECTIVE IN DIRECTING TO THE BLOOD DONATION? %97 of people surveyed reported that blood donation campaigns are effective in directing to the blood donation. (Table 7)

Table 8



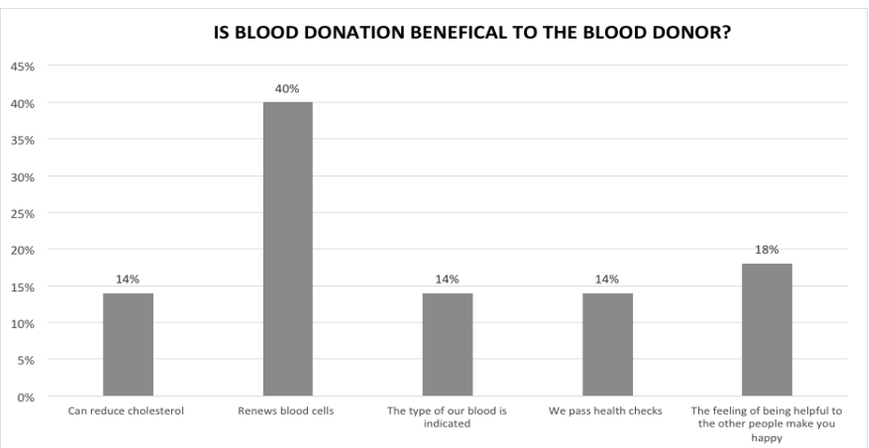
WHO CAN NOT DONATE BLOOD? Patients with Anemia / Pregnants / People over 65 / People under 18 / People under 50 kilos / Aids Disease / Hepatitis B / Hepatitis C / No idea Notifications of people surveyed related to disability to the blood donation are as follows. 07% Being under 50 kg 10% Being under 18 years of age 10% Being pregnant 13% Patients with anemia 13% Aids Disease 14% Hepatitis B %14 Hepatitis C are the answers. (Table 8)

Table 9



WHEN YOU DONATE BLOOD, HOW MANY PEOPLE'S LIVES DO YOU SAVE? 1 person / 3 people / Doesn't know 72% of people who participated in our survey reported having no information on blood products obtained after blood donation. (Table 9)

Table 10



IS BLOOD DONATION BENEFICAL TO THE BLOOD DONOR? Can reduce cholesterol / Renews blood cells / The type of our blood is indicated / We pass health checks / The feeling of being helpful to the other people make you happy 82% of people surveyed think there is a benefit to the donor of the blood donation. 18% reported that there are only spiritual dimensions of blood donation. (Table 10)

PP-056

ANALYSIS OF DISCARDING BLOOD AND BLOOD COMPONENTS IN A HEMATOLOGY AND ONCOLOGY HOSPITAL IN TWO YEARS PERIOD

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[1]Department of Infectious Diseases and Clinical Microbiology, Istanbul Bilim University, Turkey
[2]Department of Hematology, Istanbul Bilim University, Turkey

OBJECTIVE: There are no substitutes for human blood. Thus proper utilization of blood is necessary with minimal wasting.In the present study, we aim to find out the rates of discarding whole blood and components in our blood bank.

MATERIALS-METHODS: A retrospective study was carried out in the blood bank of Istanbul Bilim University Avrupa Florence Nightingale Hospital,from 1st of January 2014 to 1st of January 2016.Total numbers of blood and blood components and discarded blood and components were analysed in two years period.

RESULTS: It was observed that a total of 8599 blood supplied, out of these 389 (4,5%) were discarded. The most common blood components discarded were platelets (6,4 %),followed by fresh frozen plasma (3,7%), packed red cells (2,9%), and cryoprecipitate (2,6%).

CONCLUSION: Platelet concentrates with a short shelf life were discarded the most when not utilized. Our study revealed that the discard rate of whole blood bags was 4,5% and the most common components discarded were platelets with the rate of 6,4%, due to short shelf life as the literature.

PP-057

SIGNIFICANCE INCREASE IN THE NUMBER OF RBC-SUSPENSIONS PROVIDED BY KIZILAY BLOOD CENTRE AND DECREASE IN THE DESTRUCTION RATE DUE TO CHANGE IN THE DURATION OF RESERVES IN ANKARA NUMUNE TRAINING AND RESEARCH HOSPITAL IN 3 YEARS

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BACKGROUND: Since March of 2013, our Blood Bank has been serving as a Blood Transfusion Centre where it provided 12319 RBC-suspensions out of 15608 used, and the rest were provided by Kızılay Blood Bank. The number of destructed RBC-suspensions was 415 out of 16023 provided in total. Hence, the research showed that the rate at which Kızılay Blood Centre provided RBC- suspensions turned out to be 23% and the destruction rate was realized as 2.59 %. In the year of 2015, the number of RBC-suspensions used in the hospital was 14210. 2387 of which were supplied by our Blood Bank whereas the remaining 12411 were supplied by Kızılay Blood Centre. 207 out of 14417 RBC –suspensions were eradicated. Considering in percentage term, it is observed that rate of RBC-suspensions supplied by Kızılay Blood Centre and of destruction were 86 % and 1.43 % respectively.

This significant decrease in the eradication rate is the results of the detailed researchs and the studies carried on with the help of our Transfusion Commitee,which supported putting in practice the decisions taken earlier on. In earlier conventions, after practicing cross match tests RBC suspensions were waited in reserves for 7days, while in the new application this were restricted to 3 days.

METHOD: The findings of this study is the outcomes of retrospective analysis of data recorded by the Blood Transfusion Centre of the Ankara Numune Training and Research Hospital.

CONCLUSION: 1) Eventhough we have not been able to reach a 100% rate of the RBC-suspensions supplied by Kızılay Blood Bank, it has gone up significantly from 23% in 2013 to 86% in 2015.

2) Due to reducing the waiting time of RBC- in reserves from 7 days to 3 days, the destruction rate has fallen substantially. Considering 5% as an acceptable rate of destruction, the efforts of our centre attracts attentions owing to the efficient use of the blood components.

PP-058

THE DISTRUBUTION OF COMPONENT USE ACCORDING TO CLINICS: SINGLE CENTER EXPERIENCE

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AIM: The aim of this study to investigate the distribution and usage of blood components according to departments in our hospital during 2015.

METHODS: The components type and number that belong to 2015 was evaluated respectively.

RESULTS: In the last one year total 13868 units blood components including 6980 unit red blood cell (ES), 2479 units random thrombocytes (rTS), 20 units apheresis thrombocytes (aTS), 3777 units fresh frozen plasma (FFP) and 512 units cryoprecipitate (cryo) has been used. The erythrocyte suspension has been used in following departments; emergency service (22%), orthopedics (14.1%), intensive care unit (11.5%), hematology (6.7%), general surgery, oncology, urology, obstetrics and gynecology and internal medicine (4.2%). The least ES usage belongs to ear-nose-throat and endocrinology services. While fresh frozen plasma has been used in emergency service (30%), intensive care unit (29.5%), oncology (11.2%), and hematology (5.6%), it has not been used at all in ear-nose-throat and endocrinology services. The thrombocyte suspension need according to departments is hematology (50%), oncology (17.3%), intensive care unit (16.1%) and emergency service (11.8%). No thrombocyte suspension has been used in endocrinology, ear-nose-throat, hemodialysis, plastic surgery, cardiyology, orthopedics and neurosurgery in the last one year. Cryoprecipitate has been mostly used in intensive care unit (51.6%) and hematology services (20%). It has been used approximately 4% in oncology, general surgery, internal medicine and cardiovascular surgery departments. The rate of aferesis thrombocyte number is 20 which has been used in our hospital.

DISCUSSION: According to our data whole blood cel transfusion has not been used in our hospital. As a policy random thrombocyte suspension has been preferred over apheresis thrombocytes. Apheresis thrombocyte usage is very low. While in some departments ES transfusion rate is high, in the others TS transfusion rate is high. This finding reveals that the indications of component transfusion education should be given and repeated as needed.

PP-059

THREE YEAR EXPERIENCE: TRANSITION FROM REGIONAL BLOOD CENTER TO TRANSFUSION CENTER

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AIM: The transfusion center, previously known as regional blood center, has been serving in the last three years. The center receives components from Central Anatolia Regional Blood Center, Kizilay, Ankara. The aim of this abstract

is to share our experience, the problems that we have been faced and propose solutions regarding these problems.

RESULTS: There have been some problems following the transition of Blood Center to Transfusion Center which has been resolved. The difficulties while receiving components has been resolved with good communication. Our hospital with 500 beds, 3rd step health center and annual component requirement is around 20.000 units. As seen on table, 73% to 93% of our component request has been received from Regional Blood Center. While the lowest rate belongs to erythrocyte suspension (73%), fresh frozen plasma has the highest rate (93%). All the blood products have been supplied by Regional Blood Center since transfusion center does not get any donations.. If the first request was not supplied by the blood center then the component was requested again. This explains why supply rate does not met with the demand rate on table.

DISCUSSION: The components are picked up twice daily from regional blood center. In case of emergency; additional pickups are arranged. Even though some problems occur during this transaction, they are solvable with good communication. If regional blood center has difficulties to sent component, transfusion center arranges donations or sometimes mobile blood donor bus is sent to hospital.

CONCLUSION: This three year experience proved that the new system is adequate and we do not have any more hesitations.

Table: Transfusion Center component request rate from Regional Blood Center and the supplication rate

type of components	requested component amount (n)	provided component amount (n)
erythrocyte suspension	35809	26195 (73%)
thrombocyte suspension	12893	11235 (87%)
fresh frozen plasma	20455	19100 (93%)
apheresis thrombocyte	89	67 (75%)
cryopresipitate	3794	3049 (81%)

PP-060

EVALUATION OF THE FACTORS EFFECTING THE PRODUCTIVITY OF THE BLOOD PRODUCTS BY ANALYSING THE BLOOD PRODUCTS PRODUCES, OBTAINED AND USED IN BETWEEN 2012 – 2015

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PURPOSE: In the present study factors effecting the productivity of the blood products produced in our blood center and blood products obtained from the Red Crescent in between 2012-2015 were analyzed and evaluated.

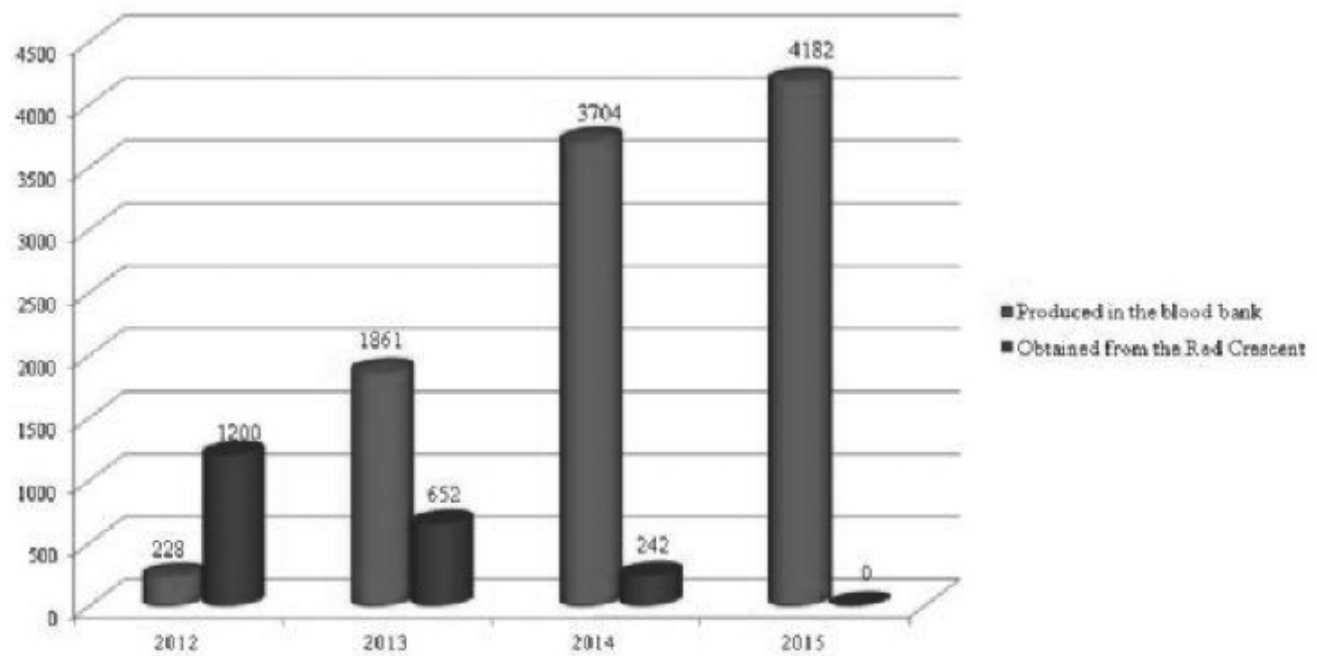
MATERIALS AND METHOD: Blood products produced in Marmara University Pendik Education and Research Hospital Blood Center in between 2012-2015, blood products obtained from the Red Crescent and used blood products were evaluated. Factors effecting the increase in the numbers for production were evaluated. Whole blood taken from appropriate donors to T&B system blood bags were decomposed by buffy coat removal. Erythrocyte suspension (ES), Plasma and Randomize platelet (RPLT) were obtained. Apheresis platelet (APLT) were produced by

using automated haemonatics.

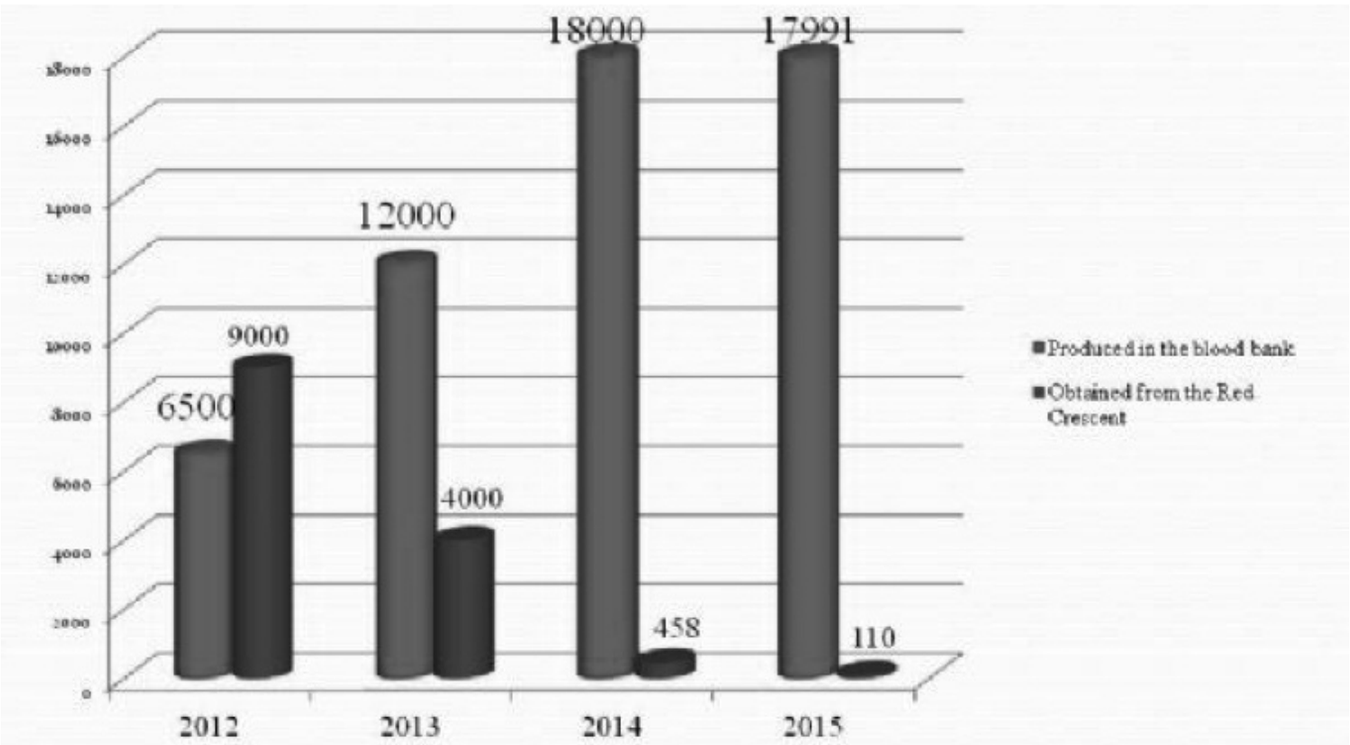
RESULTS: In 2012 ES produced in our center were 6500 and obtained from the Red Crescent were 9000 while ES increased to 17991 and demand from the Red Crescent decreased to 110 in 2015. In 2012 total number of 19.670 RPLT were obtained from the Red Crescent while there were no production in our facility. In 2015 RPLT produced in our center were 9278 while demand from the Red Crescent decreased to 3533. In 2012 APLT produced in our center were 228 while total number 1200 were obtained from the Red Crescent. In 2015 our center's APLT production quantity reached to 4182 while demand from the Red Crescent decreased to zero. In 2012 total number of fresh frozen plasma (FFP) were 6500 while supply level from the Red Crescent was 7253. In 2015 FFP produced in our center were 16.173 while the demand from the Red Crescent was decreased to 1211. (Graphs 1, 2, 3, 4).

CONCLUSION: While our center were dependent greatly to the Red Crescent in 2012 now produces blood and blood products by itself by increasing its performance as increasing the donoring times by considering the donoring durations, improvement on the physical conditions, increasing the total number of employees and renewal of the equipment.

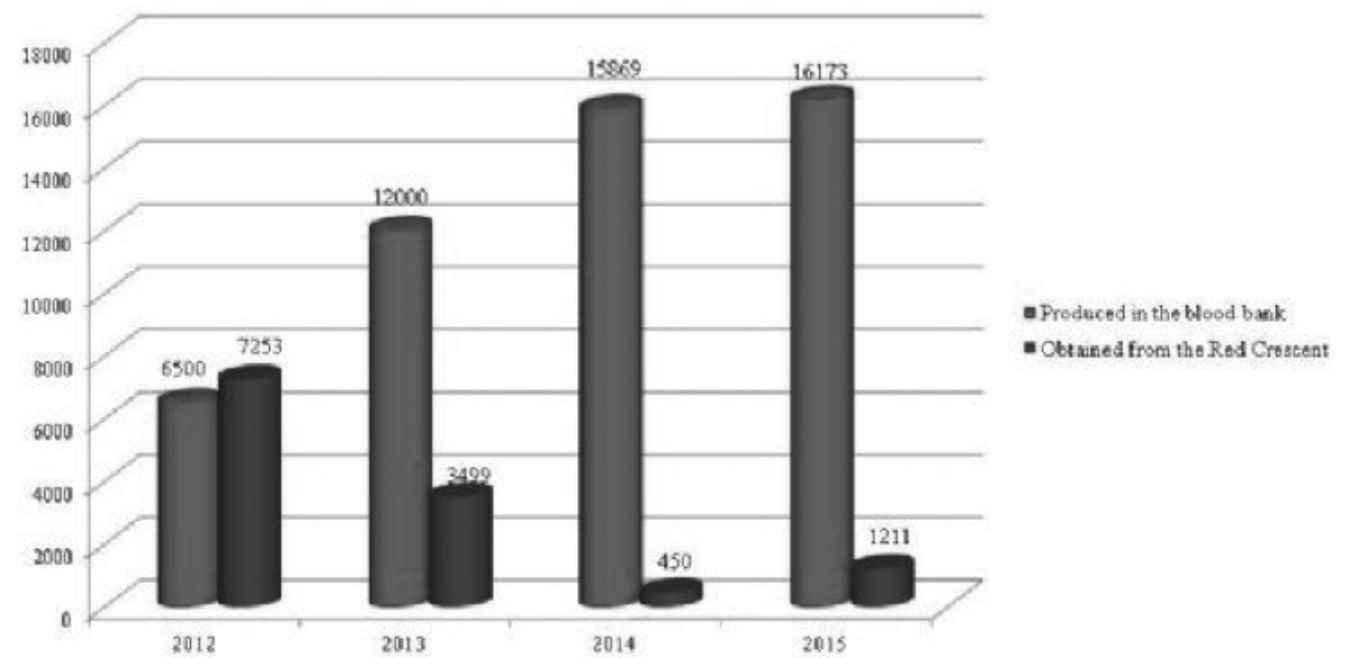
The distribution of produced apheresis platelet in the blood bank and obtained from the Red Crescent according to years



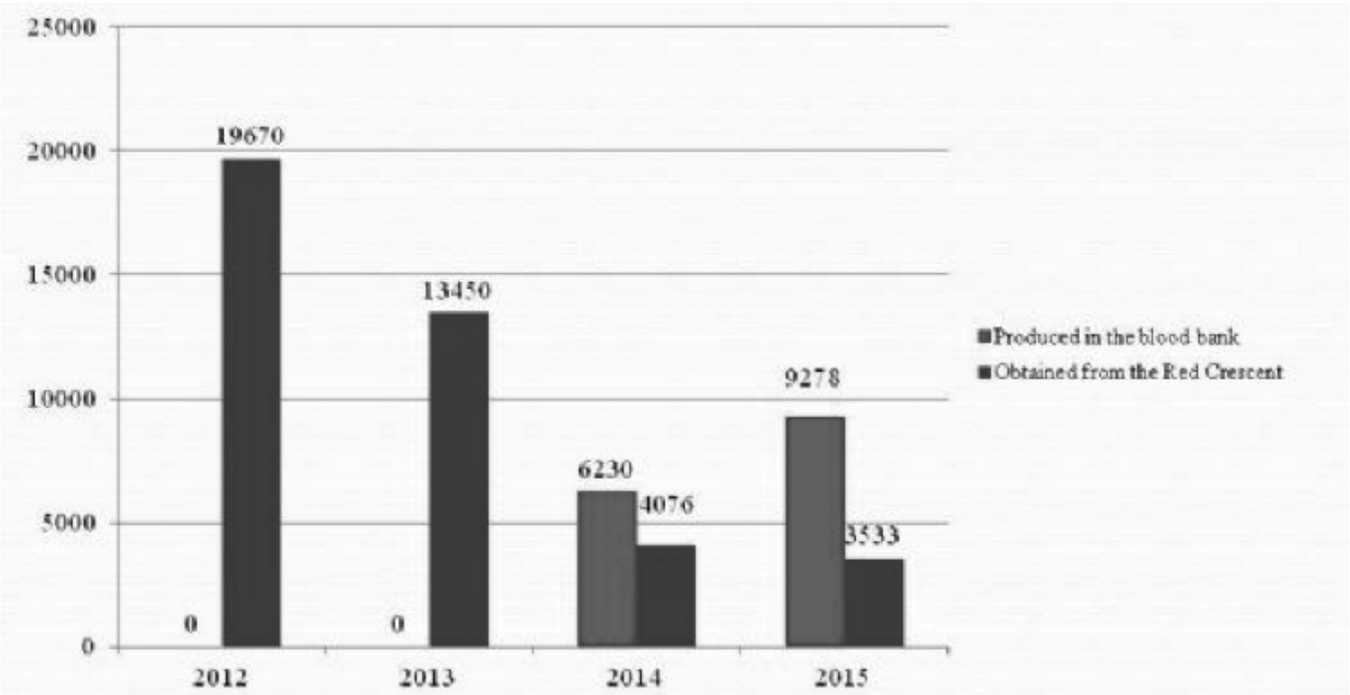
The distribution of produced ES from the blood bank and obtained from the Red Crescent according to years



The distribution of produced FFP in the blood bank and obtained from the Red Crescent according to years



The distribution of produced RPLT in the blood bank and obtained from the Red Crescent according to years



PP-061

COUNTRY NEED FOR BLOOD IN 2015

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AIM: To determine the country need for blood in 2015.

METHOD: Calculations have been performed using data gathered from "The Blood Component Identification and Traceability System". Country need for blood is calculated as the sum of; (1) the number of products (Erytrocyte Suspension + Apheresis PLT + Apheresis Erytrocyte Suspension + Apheresis Granulocyte Suspension + whole blood) Turkish Red Crescent delivered to hospital transfusion centers and hospitals which have Temporary Regional Blood Centers and (2) the number of the same products produced by the hospitals themselves.

RESULTS: In 2015 1.143 hospitals have used blood and blood components country-wide. Blood need has been realized as approximately 2.600.000 units. Out of this total number Istanbul's share was 20%, Ankara's share 9% and Izmir's was 8%.

DISCUSSION: When the likely number of illegally produced and transferred products are added to the need gathered using the Blood Component Identification and Traceability System, country-wide blood need in 2015 is estimated as 2.850.000 units.

PP-062

EVALUATION OF REJECTION REASONS AMONG BLOOD DONATION VOLUNTEERS IN A BLOOD CENTER OF A TRAINING HOSPITAL

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AIM: Blood transfusion is a life saving process when it is done for appropriate indications and donors are the sole source of blood. Healthy donors are the first step to improve blood safety. Donors have to be chosen carefully. It is important to select healthy donors but it is also important not to lose them unnecessarily while making this selection. In this study we aimed to evaluate the reasons of rejection among blood donation volunteers between 01.01.2010 and 01.01.2015 in Gulhane Military Medical Academy, Haydarpasa Training Hospital, Blood Center.

METHOD: A total number of 12.326 blood donation volunteers are evaluated during five years period according to National Blood and Blood Components Guideline.

RESULTS: 480 (3.8%) of the volunteers were rejected due to various reasons. Reasons of rejection are presented in the table.

CONCLUSION: The most common reason of donor rejection was leukocytosis (30.8%). 148 volunteers were rejected due to leukocytosis. Adverse donor reactions were in the second place with a rate of 16.8% and previous temporary rejection was in the third place with a rate of 8.7%. Our donor rejection rates are lower than the rates reported in other national studies. Most of our blood donation volunteers are healthy young adults that passed a detailed medical examination for their current occupation. And this may be the reason for lower rejection rates

Reasons of Rejection Number of Rejections

Reasons of Rejection	Number of Rejections
Leukocytosis	148
Adverse Donor Reaction	81
Previous Temporary Rejection	42
Low Hemoglobulin	39
Treponema pallidum Positivity	35
Previous Permanent Rejection	34
Anti-HCV Positivity	31
Period from previous donation too short	26
HbsAg Positivity	22
Anti-HIV Positivity	15
Low trombocyte levels	7
Total	480

PP-063

ANNUAL DISTRIBUTION OF TRANSFUSED BLOOD COMPONENTS IN A TRANSFUSION CENTER

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BACKGROUND: Estimation of critical stock levels is obligatory for transfusion centers in Turkey. Besides, it is significant to document the total amount and distribution of transfused components to plan the activities and goals of the center.

AIMS: In this study, it is aimed to document the annual distribution of transfused blood components provided by Regional Blood Center of Turkish Red Crescent (TRC).

METHODS: The amount and distribution of blood components used for transfusion in Izmir Katip Celebi University, Ataturk Training and Research Hospital Transfusion Center were retrospectively investigated for the year 2015.

RESULTS: The total number of blood components transfused was 34809 units for the yaer 2015. Distribution of the components were given in the table.

CONCLUSION: Estimation of critical stock levels is significant for stock management of transfusion centers in daily practice. But documentation of the total amount and distribution of transfused components is important both for planning the requirement of transfusion centers and the goals of regional blood centers. As a facility of one of the largest hospitals in Izmir, Turkey, our transfusion center demands an extensive variety of blood components from the Regional Blood Center of TRC. The documentation of data for transfused blood components promotes the cooperation of transfusion center and regional blood center for the stock management.

Annual distribution of transfused blood components

USED BLOOD PRODUCT (2015)	Number (n)	Percent (%)
Cryoprecipitate	595	1,7
Fresh Frozen Plasma (FFP)	8582	24,66
Platelet Rich Plasma (PRP)	1734	4,98
PRP- Irradiated	245	0,7
RBC Concentrate- Washed and irradiated	17	0,05
Apheresis Platelets	894	2,57
Apheresis Platelets -Irradiated	588	1,69
Red Blood Cell (RBC) Concentrate	19739	56,7
RBC Concentrate-Irradiated	131	0,38
RBC Concentrate-Leukoreduced	1272	3,65
RBC Concentrate-Leukoreduced and irradiated	971	2,8
RBC Concentrate- Washed	4	0,01
Whole blood	37	0,11
Total	34809	100.00

PP-064

STOCK MANAGEMENT PRACTICES IN TURKISH RED CRESCENT BLOOD SERVICES -{2015 EXPERIENCE}

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AIM: The aim of this study is to introduce the New Stock Management System within the scope of Distribution and Stock Management Project of Turkish Red Crescent (TRC) in general terms, and, analysis of stock level's increase and decrease periods.

METHOD: TRC's 2015 stock level figures were filtered from Hemonline Stock Management Module database, Blood Component Identification and Traceability System database and TRC General Directorate of Blood Services daily stock reports. The study is based upon the comparison of TRC's average erytrocyte suspension (ES) stock figures of each 365 days with total ES demand of hospitals country-wide.

RESULTS: Minimum ES stock level for 2015 was 33.000 units. In March, April, May donors' tendency to donate was higher and ES supply/ES demand ratio was satisfactorily high. However, obviously due to the lower donation attitude in winter, during Ramadan and religious holidays, stocks were lower than the minimum stock level. As a result, ES supply/demand ratio was low.

DISCUSSION: It is understood that the findings related to the periodical level of the stock can be taken as a reference point in terms of both the TRC stock levels and hospital stock levels in determination and creation of the stock turnover level, optimum stock level and minimum stock level. Practices carried out based on the stock levels such as call for blood donation campaigns, transfers between Regional Blood Centers (RBCs) and/or temporarily stopping the invitation applications for blood donations (SMS delivery, etc) are important for minimum stock level protection and avoiding possible ES destructions due to expiration date.

PP-065

EVALUATION OF DESTRUCTION RATES OF BLOOD AND BLOOD COMPONENTS USED IN A MATERNITY AND CHILDREN'S HOSPITAL

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AIM: To assess on a yearly basis the destruction rate of blood and blood components used at the transfusion centre of a Maternity and Pediatrics Training and Research Hospital and initiate the necessary corrective actions based on the destruction rates.

METHOD: Retrospective study of blood and blood components provided for our hospital between January 2013 and December 2015 based on hospital data entry forms and Hospital Information Management System.

FINDINGS: Between January 2013 and December 2015 our hospital transfusion centre was provided 14,949 units of blood and blood components total. Erythrocyte suspension, thrombocyte suspension, all the fresh frozen plasma was obtained from Red Crescent Blood Centre. When we look at the supply of whole blood in 2013, all was provided by Red Crescent Blood Centre. In 2014, 22units were obtained from Red Crescent Blood Centre and 3 units were obtained at our hospital. In 2015, 43 of them were obtained at the hospital. 510 units of the total of 14,949 units of blood was destroyed and the destruction rates of blood and blood components was found to be 3%. Destruction rates by year are shown in the table.

RESULTS: When blood and blood components destruction rates by year were assessed, it was observed that the destruction rate in 2014 increased compared to previous years. It is believed ths stems from the fact that the hospital entered a period of renovation, there has been a change in the number of patients and staff and the use of random thrombocytes. In 2015, a reduction in the destruction rate was aimed for and this objective has been reached thanks to the implementation of the decisions taken at the hospital Blood Transfusion Committee, receiving of requests based on requirements, raising of awareness among the entire staff by increasing in service training of staff.

Blood Components

Erythrocyte Suspension				Whole Blood			Thrombocyte Suspension			TDP			
Years	Number taken	Total number of destroyed units	%	Number Taken	Total number of destroyed units	%	Number Taken	Total number of destroyed units	%	Number taken	Total number of destroyed units	%	% of Annual number of destroyed units
2013	3227	67	2.07	8	2	25	629	72	11.44	1334	5	0.37	2.80
2014	2553	83	3.25	25	18	72	610	104	17	1420	7	0.49	4.60
2015	2448	62	2.53	43	4	9.3	994	81	8.14	1658	5	0.30	2.95
TOTAL	8228	212	2.57	76	24	31.57	2.233	257	11.5	4412	17	0.38	3.41

PP-066

TRENDS AND PREVALENCE OF TRANSFUSION TRANSMISSIBLE INFECTIONS IN BLOOD DONORS IN A TERTIARY LEVEL CARDIAC HOSPITAL IN PAKISTAN: A 02 YEAR EXPERIENCE.

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BACKGROUND: The Safe Blood Transfusion Pakistan (SBTP) and World Health Organization (WHO) suggest that the screening of blood donors for the main transfusion-transmissible infections (TTIs): human immunodeficiency infection (HIV), hepatitis B Virus (HBV), hepatitis C virus (HCV), syphilis and malaria are compulsory. The study goals were to observe the prevalence of these TTIs among apparent healthy blood donors at the tertiary level cardiac center.

PLACE OF STUDY: A retrospective cross sectional study was conducted at Department of Pathology & Blood Bank of Rawalpindi institute of cardiology, a tertiary level cardiac hospital in Pakistan

MATERIALS & METHODS: Blood units collected from physically healthy blood donors during January 2014 to December 2015 were screened for anti HIV 1 and 2, anti HCV and HBsAg by enhanced chemiluminescence assay on VITROS® ECiQ immunodiagnostics system and Syphilis and Malaria Parasite by Immunochromatographic Technique (ICT).

RESULTS: Of the 6053 consenting blood donors (98.7% replacement donors), were infected with HCV, HBV, HIV, Syphilis and Malaria were 1.71% (n=104), 1.32% (n=80), 0.16% (n=10), 1.47% (n=89) and 0.0% respectively. In 2014, seroprevalence of HCV, Syphilis and HIV were 2.02% (n=67), 1.26% (n=42) and 0.12% (n=4) respectively, while in 2015, the frequency of infected donors with HCV, Syphilis and HIV were 1.35% (n=37), 1.71% (n=47) and 0.21% (n=06) respectively (1). The annual rates indicated decreasing trends in case of HCV infection, but in case of Syphilis and HIV, there was a linear increase. There were no positive donor suffering with Malaria reported because of donor History form was properly filled by blood bank staff.

CONCLUSIONS: Taking into account the seroprevalence study, we presume that screening of blood and blood component should be done by dual testing methodology like enhanced chemiluminescence technology and NAT. Our study raises genuine concerns with respect to the Syphilis and HIV pervasiveness in our country. We archived higher-than-anticipated syphilis and HIV seroprevalence rates in apparent healthy donors. As per our outcomes, the national arrangement for syphilis and HIV control in Pakistan must be changed. It could be avoided by promoting the culture of Voluntary blood donation, screening of blood and its components by highly sensitive markers and through continuous awareness campaign.

Prevalence of Transfusion transmissible infections in Blood Donors

Year	Total Donation	Reactive HCV	Reactive HBV	Reactive Syphilis	Reactive HIV
2014	3312	67	41	42	04
2015	2741	37	39	47	06
Total	6053	104 (1.71%)	80 (1.32%)	89 (1.47%)	10 (0.16%)

PP-067

A TEN-YEAR EVALUATION OF THE SCREENING TESTS OF HEALTHY BLOOD DONORS: DATA FROM MALATYA

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AIM: Screening tests are one of the key points for preventing the transmission of infectious diseases though the blood transfusion process. In our country, donors have to be screened for HBsAg, anti-HCV, anti HIV1/2 and anti-syphilis. In this retrospective study, we aimed to determine the seroprevelance rates of the HBsAg, anti-HCV, anti HIV1/2 and anti-syphilis test and seropositivity rates for 10-year period.

MATERIALS AND METHODS: During the ten-year study period (2005-2015), the total numbers of 42622 healthy volunteer blood donors were evaluated at the transfusion centres of the Malatya State Hospital and Inonu University Turgut Ozal Medical Centre. HBsAg, anti-HCV and anti HIV1/2 of the donors were determined by using the chemiluminescence microparticle immunoassay (CMIA) method. For screening of syphilis VDRL or RPR method and CMIA were used.

RESULTS: The overall seropositivity rates for the HBsAg, anti-HCV, anti HIV1/2 and anti-syphilis were determined as 0.96%, 0.33%, 0.02% and 0.23%, respectively. The seroprevalence rates for the years 2005, 2010 and 2015 were given in table.

DISCUSSION / CONCLUSIONS: In this study, we determined that seropositivity rates of HBsAg, anti-HCV, anti HIV1/2 and anti-syphilis were decreasing except for HBsAg and anti-HCV in 2010. In highly developed countries risk of transmission of the infections via blood donations is dramatically decreased in recent years. To achieve such success national strategies and national guidelines should be implanted in developing countries such as use of improved counselling forms and new generation screening tests to avoid life-threatening complications of the blood transfusions.

Table. Seropositivity rates among blood donors for the years 2005, 2010 and 2015

Years	Hbs Ag	anti-HCV	anti-HIV 1/2	anti-Syphilis	Total
2005	96 (0.83%)	29 (0.25%)	4 (0.03%)	33 (0.29%)	11549
2010	263 (1.35%)	88 (0.45%)	2 (0.01%)	43 (0.22%)	19342
2015	51 (0.43%)	23 (0.20%)	3 (0.03%)	21 (0.18%)	11731
Total	410 (0.96%)	140 (0.33%)	9 (0.02%)	97 (0.23%)	42622

PP-068

EVALUATION OF REPEATED MICROBIOLOGICAL TESTS DUE TO INSTRUMENT ERRORS

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AIM: According to National Blood and Blood Components Guideline; Blood Centers have to test the donated blood with HBsAg, Anti-HCV, Anti-HIV 1/2 and Treponema pallidum antibody tests for the detection of transfusion transmissible diseases. In this study, we aim to evaluate the number of microbiological test repeats due to instrument errors between October 2015 and March 2016 in Gulhane Military Medical Academy, Haydarpasa Training Hospital, Blood Center.

METHOD: Microbiological Tests for HbsAg, Anti-HCV, Anti-HIV 1/2 and T. pallidum detection are performed with chemiluminescent micro particle assay method in Architect i1000SR instrument (Abbott, USA). 756 blood donors were evaluated with all these four parameters during five months period.

RESULTS: During this timeline 14 HBsAg, 7 Anti-HCV, 6 Anti-HIV and 5 T. pallidum tests were repeated two times due to instrument error. All of the errors were solved after re-centrifugation of blood samples.

CONCLUSION: Sometimes even with the most technologically advanced test systems errors may occurs. This problem can easily be solved by re-centrifugation of blood samples. Sometimes remaining clot particles and bubbles can plug the aspirator. Centrifugation process is very important to prevent this errors. With sufficient centrifugation and proper instrument care these errors could be prevented and re-testing costs can be reduced.

PP-069

EVALUATION OF MICROBIOLOGICAL TEST RESULTS IN A BLOOD CENTER OF A TRAINING HOSPITAL

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AIM: Maintaining blood safety is the major concern of transfusion medicine. WHO defines the “safe blood” as blood supply free of harmful substances or infectious agents, and properly typed and cross-matched to insure serological compatibility between donors and recipients. Microbiological tests required for “safe blood” may vary from country to country. According to current national guideline HBsAg, Anti-HCV, Anti-HIV 1/2 and Treponema pallidum antibody tests are mandatory. In this retrospective study we aimed to evaluate HBsAg, Anti-HCV, Anti-HIV 1/2 and Treponema pallidum seroprevalance between 01.01.2010 and 01.01.2015 in Gulhane Military Medical Academy, Haydarpasa Training Hospital, Blood Center.

METHOD: A total number of 11.846 donated bloods were tested for HBsAg, Anti-HCV, Anti-HIV 1/2 and T. pallidum screening with chemiluminescent micro particle assay method in Architect i1000SR instrument (Abbott, USA).

RESULTS: Among total number of 11.846 donors, 41(%0.34) of them were HBsAg positive, 49 (%0.41) of them were Anti-HCV positive, 9 (%0.07) of them were Anti-HIV positive and 28 (% 0.23) of them were T. Pallidum antibody positive.

CONCLUSION: According to our microbiological test results of our Blood Center, Anti-HCV positivity and thereby Hepatitis C was the most encountered infectious agent. Recently by the introduction of nucleic acid amplification tests detection time from exposure is getting shorter. Even with these tests there is still risk of false negative results. Selection of blood donors by medical evaluation and proper use of donor inquiry form is still of utmost importance.

PP-070

COAGULATION PROFILE AND ANALYSIS OF OUTCOME OF BLOOD COMPONENT THERAPY IN SNAKE BITE VICTIMS

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BACKGROUND: Bites from poisonous snakes cause substantial human morbidity and mortality in tropical and subtropical countries. Hemotoxic envenoming is quite common in many parts of India, but only limited data exist on its accurate incidence in the country, and clinical effects. Herein we present findings from an observational study on coagulation profile and outcomes of blood component therapy in patients with hemotoxic snake bites.

AIMS: To assess the coagulation profile and outcome of blood component therapy in snake bite victims

METHODS: We undertook an observational study between January 2013 and June 2014, on patients admitted to the medical ICU of our tertiary hospital, with a history of snake bite and satisfying the inclusion criteria. The patients underwent detailed evaluation of envenoming by clinical and laboratory investigations. The patients were screened by a standard, 20-minute Whole Blood Clotting Time (WBCT) test (repeated four times at 30 min. intervals) and prolongation of at least one test result indicated hemotoxic envenoming. Routine blood counts, Bleeding Time (BT), Prothrombin Time (PT), International Normalized Ratio (INR), activated Partial Thromboplastin Time (aPTT), fibrinogen and D-dimer levels were also monitored. Samples of plasma separated from acitrated blood sample collected at the occurrence of deranged WBCT were flash frozen and assayed for coagulation factors. Blood component therapy and its outcomes were also monitored in the patients.

RESULTS: Among 595 patients reporting with snake bites, 445 were adults. Absence of signs of envenoming suggested non-venomous bites 282 patients. One hundred and sixty three patients manifested features of envenoming, and received Anti-Snake Venom (ASV). Species identification of the biting snake was not possible in 50% of cases. Among the rest, Russel's viper and Pit viper accounted for 66 and 9 cases, respectively. Only the cases where the biting species could be identified were studied further.

Delayed treatment resulted in severe local and systemic manifestations in patients. Hematological manifestations developed following bites from Russel's viper, pit viper and unidentified species as well. Acute Renal Failure (ARF) due to Disseminated Intravascular Coagulation (DIC) and capillary leak syndrome developed only in patients with bites from Russels viper, and necessitated hemodialysis.

Coagulopathies occurred in most patients with bites from Russel's viper and pit viper. Patients bitten by Russel's viper manifested severe deficiency of Factor V and Factor X, while it did not occur in pit viper bites. Qualitative testing for Factor XIII revealed its deficiency specifically in cases of Russel's viper bite.

Most patients with hemotoxic envenomation received transfusion of fresh frozen plasma (FFP), 24 hours after administration of ASV. Severe thrombocytopenia necessitated the administration of platelet concentrate in seven patients.pPacked Red Blood Cells (PRBC) was administered in 4 patients with anemia. Blood component therapy significantly increased hospital stay of the patients. No statistically significant complications or mortality occurred after transfusion therapy.

SUMMARY/CONCLUSION: Rural areas had higher incidence of snake bites. Though BT and CT were sufficient to identify hemotoxicity, costlier and time-consuming assessment of PT, aPTT, serum fibrinogen and D-dimers had more sensitivity. Hematological manifestations occurred following bites from Russel's viper and pit viper, while the former produced major bleeding diatheses and a higher incidence of DIC and ARF. The public need to be made aware of the need for early identification and appropriate treatment of snake bites

PP-071

THERAPEUTIC PLASMA EXCHANGE MODALITIES IN ABO INCOMPATIBLE LIVING DONOR RENAL TRANSPLANT (ABOI LDRT)

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AIMS: The authors have evaluated the various Therapeutic Plasma Exchange (TPE) modalities in ABOi LDRT in reducing the pre operative titers of ABO antibodies to an acceptable titer of 16 or below

METHODS: 3 cases of ABOi LDRT from February to December 15 were included in the study. The patient's demographic and other details are as mentioned (Table I). All the patients were diagnosed as CKD stage 5 for renal transplant. Recipient's baseline antibody titers were established using column agglutination technology (CAT; Ortho Clinical Diagnostics). HLA crossmatch was negative. Immunosuppression was commenced with Rituximab. After informed consent, TPE procedures were performed using cascade (CP) and conventional plasmapheresis (C) alone or in combination over a period of few days exchanging 1-1.5 plasma volume during each procedure. CP consisted of separating patient's plasma using a plastic disposable kit (PL1, Fresenius Kabi, Germany) on the apheresis equipment COM.TEC (Fresenius Kabi, Germany) and passing it through pore size based filter column 2A 20 (Evaflux, Kawasumi Laboratories, Japan). Each CP and C procedures were followed by 5 gm IVIG. ABO antibody titers were performed after each procedure using CAT (Table II). The patients were transplanted when the titers dropped to 16 or below. Triple drug immunosuppression was also commenced prior to surgery. Follow up post transplant titers are as mentioned (Table III).

RESULTS: The various TPE modalities resulted in gradual reduction in ABO titres. The patient A, where CP was exclusively used and Patient B where both CP and C were used, a delayed decrease in titres was observed with CP as seen in table II. The conventional TPE procedures using FFP/Albumin as replacement fluid in patient C however showed a rapid and satisfactory decline in titres requiring only 2 procedures as compared to 9 and 8 procedures required by patient A and B respectively. Use of Albumin is considered superior to FFP due to allergic reactions with the latter as observed in our patients, B and C. Follow up post transplant titers remained below 16 indicating a stable graft function.

CONCLUSION: TPE is an effective desensitization modality in ABOi LDRT. Though CP is more selective in removing high molecular weight substances mainly immunoglobulins, the procedure however is considered less effective than conventional TPE in the number of procedures required to bring down the antibody titers.

Table I

Patient	Age/Sex	Blood Group of Patient	Blood Group of Donor	Number of TPE procedure Pre Transplant	TPE Modality
A	63/M	O POS	AB POS	9	Cascade PP
B	21/F	O POS	B POS	8	Conventional & Cascade
C	24/M	A POS	AB POS	2	Conventional

Demographic and other details

Table II

Patient	Titer	Baseline	P1*	P2*	P3*	P4*	P5*	P6*	P7*	P8*	P9*
A	Anti A (IgG)	256	128	128	64	32	32	32	16	16	16
A	Anti B (IgG)	128	64	64	32	8	8	8	8	8	8
B	Anti B (IgG)	256	256 (C)**	128 (CP)***	64 (CP)	64 (CP)	64 (CP)	32 (C)	16 (C)	8 (C)	-
B	Anti B (IgM)	64	16	8	8	4	4	4	2	2	-
C	Anti B (IgG)	32	4	4	-	-	-	-	--	-	-
C	Anti B (IgM)	64	8	8	-	-	-	--	-	-	-

*Pre Transplant Titers *P= Procedure day **(C) = Conventional ***(CP) = Cascade*

Table III

Patient	Titer	D1*	D2*	D3*	D4*	D5*	D6*	D7*	D8*	D9*	D10*
A	Anti A (IgG)	8	8	8	8	8	8	16	16	16	8
A	Anti B (IgG)	2	2	2	2	2	2	2	2	2	2
B	Anti B (IgG)	8	8	8	16	8	8	8	8	16	8
B	Anti B (IgM)	2	2	2	2	2	2	2	2	2	2
C	Anti B (IgG)	4	2	2	2	2	2	2	2	2	2
C	Anti B (IgM)	8	4	4	4	4	2	2	2	2	2

*Post Transplant Titers *D= Post operative day*

PP-072

DETERMINATION OF WEAK D ANTIGEN IN RH-D NEGATIVE PAKISTANI BLOOD DONORS A MULTICENTER STUDY

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OBJECTIVE: Determination of Rh-D Status have a significant importance in the field of transfusion medicine. Because weak Rh-D phenotype is capable of causing alloimunization in Rh-D negative individuals. Molecular genetics of Rh-D gene revealed that weak D antigen is a Rh-D phenotype that possess less numbers of complete D antigen on surface of red cells. Present study was conducted to determine the Prevalence of weak D (Du) phenotype among Rh-negative Pakistani blood donors. So that recommendations can be formulated at the district level for considering weak D testing as mandatory procedure for RH negative subjects.it will reduce the risks associated with RH Alloimmunization.

METHODS: ABO/Rh typing was performed by manual hema-aglutination testing techniques by using commercially available monoclonal anti-sera. The specimens without agglutination with anti-D were further analyzed on surface of red cells by using indirect anti-globulin test for detection of weak-D antigen in blood.

RESULTS: Out of total 55,874 healthy donors 5,123 (9.16%) were Rh negative. Among these Rh negative samples, 5,076 samples were negative even after AHG phase of testing. Only 47 (0.91%) was weak D positive, in Rh negative samples.

CONCLUSION: we conclude that every RH negative individual should process for weak D antigen detection by indirect anti globulin technique. Because, it may not detected by immediate spin tube method.

PP-073

ALLIANCE OF BLOOD GROUP ALONG WITH CORONARY ARTERY DISEASE IN PATIENTS WITH CORONARY ARTERY BYPASS GRAFT SURGERY

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BACKGROUND & AIMS: Blood pays a vital premise in different populations. The frequency of blood group in Bangladesh is parallel with that of India. Pakistan and other South Asian countries. This study has conducted to determine the frequency of blood group in patients with coronary artery disease evaluated in a tertiary level hospital in Bangladesh. This is designed to investigate the distribution of ABO blood group and its association with the risk of various diseases. It is focused to determine the most regular blood groups for the high incidence of coronary arterial disease in the blood group carriers without any association with other co morbidity like smoking, obesity, diabetes mellitus, high triglyceride etc. To establish a possible correlation with ABO blood group among the Coronary Artery Disease (CAD) in well documented patients and in patients awaiting for Coronary Artery Bypass Graft (CABG) surgery.

MATERIAL-METHODS: A cross sectional observational study was made in a tertiary level hospital (National Institute of Cardiovascular Disease) from March '14 to September '14. Total 52 patients were preferred to establish the relationship of ABO blood groups with coronary artery disease.

RESULTS: This study is consisted with 52 patients. Among them, 38 (78.08%) were male and 14 (26.92%) were female. Mean age 47.21 ± 8.00 and 46.74 ± 11.98 years respectively. Furthermore, blood group O was (34.62%), group B was (26.92%) and group A was (25.00%). This result also demonstrates that the prevalence of coronary artery disease in blood group O is higher than all other blood groups and it is male predominant.

CONCLUSION: Thus is conclusion reveals that the O phenotype have a positive association which substantially increased a risk for coronary arterial disease. Though the entire disease occurs due to thrombotic occlusion at the site of a ruptured or erosive atherosclerotic plug which is the main cause of death in adults. This learning may also alarm the patients who are of group O. At present, the mechanisms underlying this observation are unknown. Therefore, more work will be needed. Moreover, the prevalence of blood group O shows a well documented correlation with advancing of the entire disease process. Though group B is higher in Bangladeshi population but the risks reveals more in group O patients. This also advocated that coronary artery disease risks are allied with group O phenotype that seems to be a independent of conventional cardiovascular risk factors therefore assumed in this observation and can be extrapolated in Bangladeshi population.

PP-074

ASSESSMENT OF RETURN OF THE TRANSFUSION FOLLOW-UP FORMS IN THE BLOOD CENTER OF ISTANBUL MEHMET AKIF ERSOY EDUCATION AND RESEARCH HOSPITAL OF THORACIC AND CARDIOVASCULAR SURGERY

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OBJECTIVE: Studying of the distribution of proportions of the follow-up forms sent to our blood center following transfusion to the number of the blood and blood products which are transfused after sending to our hospital's units from our blood center by months, performing the transfusion procedures in accordance with the national guidelines and recording all the transfusion procedures by filling in the follow-up forms, and providing new data are the objectives of our study.

METHOD: Pre-operative blood products preparation form and specimen of the patient requested by the hospital's units are prepared and reserved. While the product which is reserved by the request from operating room, intensive care unit and inpatient clinics is sent over hospital information system together with a copy of the request form for blood and blood products issued in two copies, the other copy is kept in our center for following up the blood products. One copy of the transfusion follow-up form which is revised in accordance with the national guideline, appropriately filled-in and signed by two clinic nurses is delivered to our center. The forms are filed by the transfusion follow-up nurse depending on the units by stapling them together with blood request forms. Improvement studies are conducted by informing the relevant units after the monthly assessment meetings by following up the returns of the transfusion follow-up forms by units. Accordingly, the number and distribution by units of the transfusion follow-up forms which were returned to our center after identifying their conformity by performing the blood group and cross-match tests by means of the micro-plaque method from the blood specimens with EDTA from 01.04.15 to 01.02.16 from our blood center and sent to our hospital's units, i.e. transfused blood and blood products were studied retrospectively.

FINDINGS: While exit of 16708 blood products in total was made from 01.04.2015 to 31.01.2016 from our

hospital's blood center, return of the transfusion follow-up forms of the 14095 (84.36%) blood products was performed. The rate of return of the transfusion follow-up forms was identified as 22.98% in the operating room, 59.91% in the intensive care units, and 83.03% in the inpatient clinics, it was arisen to 93.25% in the operating room, 97.49% in the intensive care units, and 100% in the inpatient clinics. The rate of return by the units was showed in Table 1 and 2.

CONCLUSION: It is possible to have information about what products were used for the patient, occurrence of reaction during the transfusion, and completion of the transfusion for the blood products exited from our blood center and by filling in the transfusion follow-up forms and then submitting to our side. As of April 2015, the transfusion procedures could be followed up closely and significant success was achieved in a short period by information and educations, and we believe, all the transfusion procedures can be recorded through the ongoing studies.

Distribution of blood and blood products' output and TFF return by month

		OPERATING ROOM	INTENSIVE CARE	SERVICES	Total	Rate
2015 APRIL	BLOOD OUT	483	928	218	1629	9,75%
2015 MAY	BLOOD OUT	553	509	156	1218	7,29%
2015 JUNE	BLOOD OUT	723	871	198	1792	10,73%
2015 JULY	BLOOD OUT	452	859	242	1553	9,3%
2015 AUGUST	BLOOD OUT	664	1026	162	1852	11,08%
2015 SEPTEMBER	BLOOD OUT	441	901	141	1483	8,88%
2015 OCTOBER	BLOOD OUT	662	898	168	1728	10,34%
2015 NOVEMBER	BLOOD OUT	807	910	192	1909	11,43%
2015 DECEMBER	BLOOD OUT	759	906	206	1871	11,2%
2015 JANUARY	BLOOD OUT	681	798	194	1673	10%
	Total Output	6225	8606	1877	16708	
	Rate	37,26%	51,51%	11,23%		100%
2015 APRIL	TFF RETURN	111	556	181	848	6,02%
2015 MAY	TFF RETURN	299	388	871	1558	11,05%
2015 JUNE	TFF RETURN	417	702	184	1303	9,24%
2015 JULY	TFF RETURN	311	659	226	1196	8,49%
2015 AUGUST	TFF RETURN	368	787	152	1307	9,27%
2015 SEPTEMBER	TFF RETURN	281	804	139	1224	8,68%
2015 OCTOBER	TFF RETURN	540	841	167	1548	10,98%
2015 NOVEMBER	TFF RETURN	673	905	191	1769	12,55%
2015 DECEMBER	TFF RETURN	643	890	202	1735	12,31%
2015 JANUARY	TFF RETURN	635	778	194	1607	11,41%
	TOTAL TFF RETURN	4278	7310	2507	14095	
	Rate	30,35%	51,86%	17,79%		100%

TFF:Transfusion Follow-up Form

Percentage of TFF RETURN(On a monthly basis)

	2015 APRIL	2015 MAY	2015 JUNE	2015 JULY	2015 AUGUST	2015 SEPTEMBER	2015 OCTOBER	2015 NOVEMBER	2015 DECEMBER	2015 JANUARY
	TFF RETURN	TFF RETURN	TFF RETURN	TFF RETURN	TFF RETURN	TFF RETURN	TFF RETURN	TFF RETURN	TFF RETURN	TFF RETURN
OPERATING ROOM	22,98%	54,07%	57,68%	68,81%	55,42%	63,72%	81,57%	83,4%	84,72%	93,25%
INTENSIVE CARE	59,91%	76,23%	80,6%	76,72%	76,71%	89,23%	93,65%	99,45%	98,23%	97,49%
SERVICES	83,03%	94,87%	92,93%	93,39%	93,83%	98,58%	99,4%	99,48%	98,06%	100%

PP-075

DISTRIBUTIONAL EVALUATION OF BLOOD PRODUCTS USE BASED ON THE BLOOD PRODUCT USE BY SERVICE, INTENSIVE CARE UNIT AND NUMBER OF OPERATIONS IN ISTANBUL MEHMET AKIF ERSOY THORACIC AND CARDIOVASCULAR SURGERY HOSPITAL

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OBJECTIVE: Istanbul Mehmet Akif Ersoy Thoracic and Cardiovascular Surgery Hospital is the only hospital cardiovascular surgery of the European side of Istanbul.Providement of data about the possible need and the use of blood and investigation of the amount of blood product use by Operating rooms, Intensive Care Unit and inpatient services as well as statistical determination of relationship of blood product use with operation and number of lying patients are intended.

METHODS: The relation between the amount of blood and blood products used, number of inpatients and their distribution according to the clinics, the number of operations and their distribution regarding their sort and the amount of blood products used for patients in the duration between 01.04.2015-31.01.2016 was analyzed retrospectively

RESULTS: Between the dates 01.04.2015-31.01.2016, 13 606 patients who received inpatient services (service 9045 (47.21%), intensive care unit 4561 (23.81%) 5552 (28.98%) operations were carried out (2439 class, 572B, 1536 C 104D, 151, 134 robotics, 561-day operation) Within this period, the number of blood products sent to the relevant units by Blood Center is 16708 units.Maximum use of the product occurred in the intensive care unit (8606, 51.51 %),then respectively service (1877, 11:23 %) and use in the operating room (6225, 37.26 %).The month we had most patients in our hospital is November 2015 and 1909 (11:43 %) patients were operated. The month we had the lowest number of patients is May 2015 and 1218 patients (7.29 %) were operated.The.month has the highest blood use is December 2015 (12:21 %), the least was September 2015 (7.98%).Blood product use rate according to the departments and number of operations are presented in Table 1.Blood use per operation is about 1, in intensive care is 2, while in the service is below 1.

CONCLUSION: The use of blood products obtained from our blood center has the maximum value in intensive care,and the minimum in the services.It is found out that the blood use is uncorrelated to number of patients and the

number of operations.A decrease in blood product use is observed with controlled blood use, trainings, robotic surgery and it is believed that these data are significant in terms of blood product planning.

Distribution of blood and blood products' output and number of patients

		OPERATING ROOM	INTENSIVE CARE	SERVICES	Total	Rate
2015 APRIL	BLOOD OUT	483	928	218	1629	9,75%
2015 MAY	BLOOD OUT	553	509	156	1218	7,29%
2015 JUNE	BLOOD OUT	723	871	198	1792	10,73%
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2015 JANUARY	BLOOD OUT	681	798	194	1673	10%
	Total Output	6225	8606	1877	16708	
	Rate	37,26%	51,51%	11,23%		100%
2015 APRIL	NUMBER OF PATIENTS	577	322	985	1884	9,83%
2015 MAY	NUMBER OF PATIENTS	445	303	863	1611	8,41%
2015 JUNE	NUMBER OF PATIENTS	571	309	937	1817	9,48%
2015 JULY	NUMBER OF PATIENTS	526	444	849	1819	9,5%
2015 AUGUST	NUMBER OF PATIENTS	586	488	704	1778	9,28%
2015 SEPTEMBER	NUMBER OF PATIENTS	436	456	637	1529	7,98%
2015 OCTOBER	NUMBER OF PATIENTS	517	493	986	1996	10,42%
2015 NOVEMBER	NUMBER OF PATIENTS	587	538	972	2097	10,95%
2015 DECEMBER	NUMBER OF PATIENTS	686	582	1071	2339	12,21%
2015 JANUARY	NUMBER OF PATIENTS	621	626	1041	2288	11,94%
	Total Number of Patients	5552	4561	9045	19158	
	Rate	28,98%	23,81%	47,21%		100%

PP-076

LABORATORY STUDIES IN THALASSEMIA PATIENTS BEFORE TRANSFUSION

Asım Sabıtogulları, Ahmet Meral, İlknur Avcı, Hatıce Nedret Saatcıoglu, Aydek Sultan Ozdemır, Fatma Orhan, Haluk Ipek, Bakı Baskan, Nejmı Arı, Melek Reyhan, Dursun Ayverdıata, Orhan Tuncer, Meltem Demırbas, Funda Ceren, Sımten Dagdas, Gulsum Ozet

Ankara Numune Eğitim Ve Araştırma Hastanesi , Kan Bankası

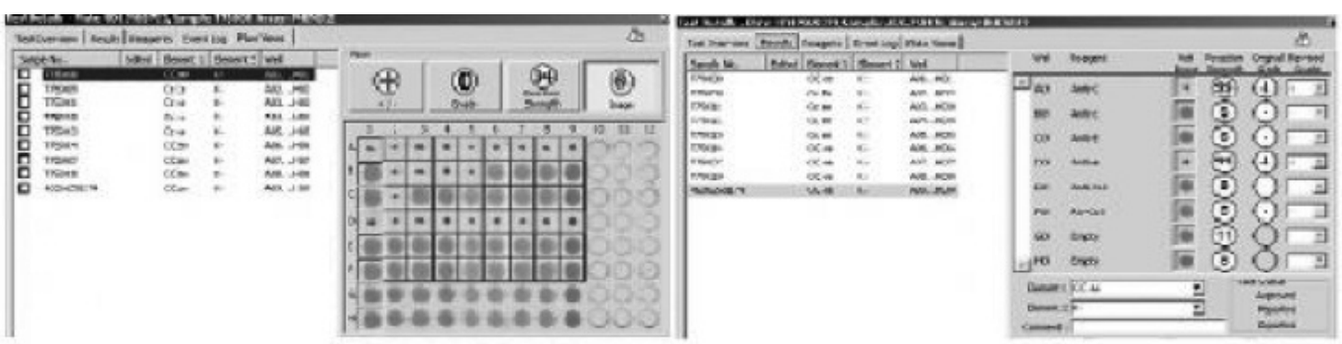
INTRODUCTION: Blood transfusion is a form of treatment in thalassemia patients that requires continuity. Thalassemia diagnosed people who undergoing frequently transfusion patients. To follow-up these patients, it is necessary to ensure the transfusion with compatible subset of the erythoricite suspension by identifying sub-groups of these patient's Rh and other groups.

PRACTISE: Preparation of blood products demanded by clinic for thalassemia patients, blood group and Rh sub-groups typing obtained by microplate method primarily and saved to HIMS.(Hospital Information Management System) Maximum of 5 (five) day erythrocytes suspensions compatible with blood group patients, Rh typing sub-groups by working with the microplate method and erythrocyte suspensions are determined with the same sub-groups of patients needed for erythrocyte suspensions. Blood samples of patients with Rh sub-group matching red blood cell suspension crossmatch tests in compliance, erythrocyte suspensions are reserved on patients identified as suitable. Reserved erythrocyte suspensions are performed by leukocyte filtration process to get ready for transfusion.

RESULT: In order to provide healthy transfusion for Thalessamia patients, it is convenient to follow by the same center of these patients. As a result of cause the formation different antibodies Rh sub-groups can not be determined erythrocyte suspensions have transfused to the patients, also caused problems in handling crossmatch testing blood compatible in the next transfusion and transfusion requirements intervals will shorter for patients.

SUGGESTION: It is important in terms of the treatment process to establish a data bank which includes the country and follow-up to be done through this data bank for follow-up the thalassemia patients and to prevent the improper blood transfusions with non-compatible Rh sub-groups.

Rh Sub-Groups Study In Thalassemıa Patıents



PP-077

EVALUATION THE USE OF BLOOD PRODUCTS IN OUR HOSPITAL

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AIM: We aim to evaluate the amount and distribution of blood and blood products according the departments in our hospital.

MATERIAL-METHODS: Retrospective examination of data registry including request and use of blood and blood products by departments between 1January-31 December 2015 was performed.

RESULTS: During one year period an amount of 34.014 blood products have been used. Of them was 15.893 (46.72 %) erythrocyte suspension, 7.058 Ü (20.75 %) fresh frozen plasma, 10.195 (29.97 %) platelet suspension. The rest of 3% included apheresis platelet, granulocyte apheresis, whole blood and cryoprecipitate. Table 1 shows the rates of blood products used by the departments. Whereas table 2 reflects the proportion of blood products used.

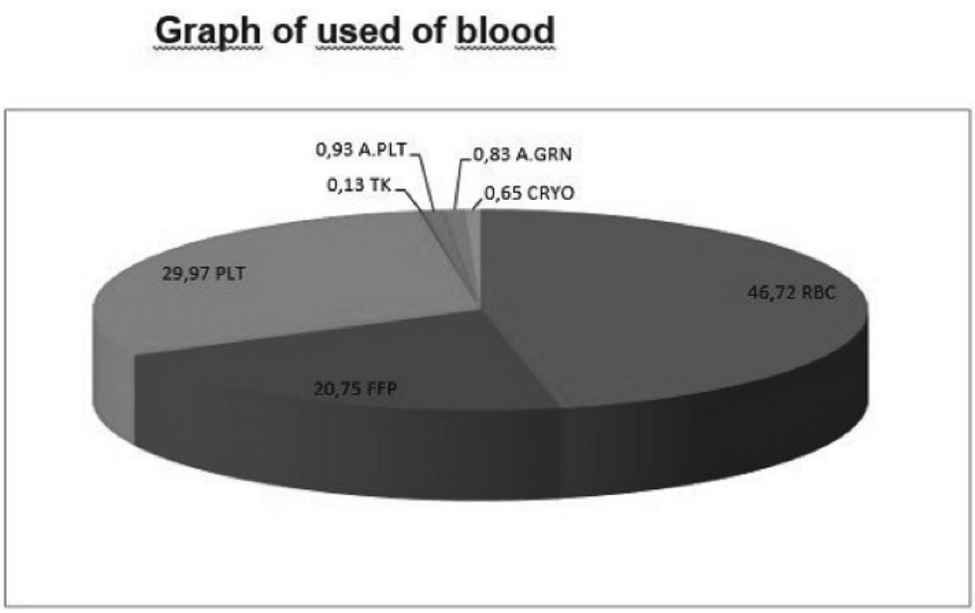
CONCLUSION: Blood transfusion is needed mostly because of chronic anemia and rarely in the case of bleeding. In general indication for blood product supply are like follows, erythrocyte suspension for the treatment of signs due to severe hypoxemia, platelet suspension in thrombocytopenia with a count under 50000/mm3, fresh frozen plasma in the case of multiple coagulation factor deficiencies, massive erythrocyte transfusion, bleeding diathesis during the course of disseminated intravascular coagulopathy. Products used among departments were like follows, in proportional quantity for erythrocyte suspension was like pediatric hematology (27.21 %), gynecology and obstetrics (19.12 %), adult emergency (11.51 %). Platelet suspension use was like pediatric hematology (54.28 %), pediatric intensive care unit (12.96 %), pediatric clinic (12.27 %). Fresh frozen plasma use was like neonatal intensive care unit (35.08 %), adult intensive care unit (20.02 %), gynecology and obstetrics clinic (12.99 %) (table1).

It was remarkable that adult emergency unite used erythrocyte suspension on third frequency with a rate of (11.51 %). Adult emergency unite has a critical role and effects directly blood banking logistic activity and blood component storage regulation. Monitoring and preventing misuse of blood components on adult emergency unite is an essential strategy for blood bank inventory management.

An erythrocytes/ fresh frozen plasma utilization rate of 2 or over is reported to be appropriate in a centre where blood components are used. Our data reflects a rate of 2.51 which suggests an appopriate use in our hospital. On the other hand the use of fresh frozen plasma on certain departments was relatively rather high (table2). These units were pediatric intensive care unit, adult intensive care unit and neonatal intensive care unit. A wider indication assesment is thought to be the cause of this data. Anyway, evaluation should be done to make sure that blood products are used on true indications in the light of Blood and Blood Products Guidelines and evidence-based medicine. The main objective of treatment with blood transfusion is to provide maximum benefit with minimum harm to the patient.

Blood transfusion indication should be guided by main principles of evidence-based medicine and current knowledge.

Graph of used of blood



RED CELL SUSPENSION AND FRESH FROZEN PLASMA BY CLINICAL USE OF COMPARISON

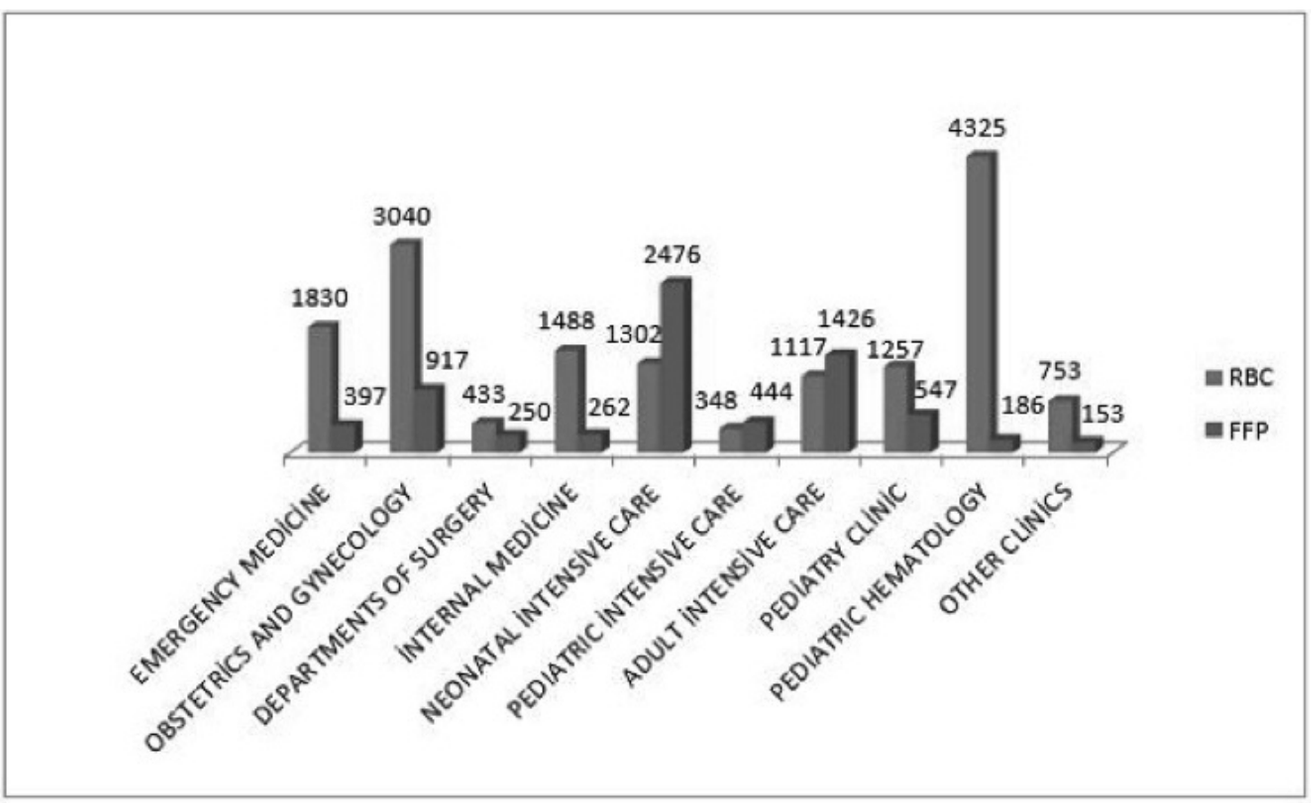


Table 1 - According to an annual distribution of clinical blood use

TABLE 1	RBC		FFP		PLT		W.B	A.PLT	A.GRN
	n	%	n	%	n	%	n	n	n
EMERGENCY MEDİCİNE	1830	11,51	397	5,62	203	1,99	0	0	0
OBSTETRİCS AND GYNECOLOGY	3040	19,12	917	12,99	296	2,9	6	0	0
DEPARTMENTS OF SURGERY	433	2,72	250	3,54	16	0,15	0	0	0
İNTERNAL MEDİCİNE	1488	9,36	262	3,71	156	1,53	0	3	0
NEONATAL İNTENSİVE CARE	1302	8,19	2476	35,08	411	4,03	2	3	0
ADULT İNTENSİVE CARE	1117	7,02	1426	20,2	990	9,71	35	27	0
PEDİATRY CLİNİC	1257	7,9	547	7,75	1251	12,27	0	22	3
PEDIATRIC HEMATOLOGY	4325	27,21	186	2,63	5534	54,28	0	231	219
OTHER CLİNİCS	753	4,73	153	2,16	16	0,15	2	2	0
PEDIATRIC İNTENSİVE CARE	348	2,18	444	6,29	1322	12,96	0	31	61
TOTAL	15893	46,72	7058	20,75	10195	29,97	45	319	283
							0,13	0,93	0,83

RBC: Red blood cells **FFP:** Fresh Frozen Plasma **W.B:** Whole Blood **PLT:** Platelet concentrates **APLT:** Apheresis platelet concentrates **AGRN:** Apheresis Granulocyte concentrates

Table 1 - According to an annual distribution of clinical blood use

Table 2 - Evaluation of plasma by comparing the concentrates of the erythrocyte concentrates in clinical

TABLE 2	RBC	FFP	RBC/FFP
	N	N	%
EMERGENCY MEDİCİNE	1830	397	4,6
OBSTETRİCS AND GYNECOLOGY	3040	917	3,31
DEPARTMENTS OF SURGERY	433	250	1,73
İNTERNAL MEDİCİNE	1488	262	5,67
NEONATAL İNTENSİVE CARE	1302	2476	0,52
PEDIATRIC İNTENSİVE CARE	348	444	0,78
ADULT İNTENSİVE CARE	1117	1426	0,78
PEDİATRY CLİNİC	1257	547	2,29
PEDIATRIC HEMATOLOGY	4325	186	23,25
OTHER CLİNİCS	753	153	4,92

Table 2 - Evaluation of plasma by comparing the concentrates of the erythrocyte concentrates in clinical

PP-078

MAY WHOLE BLOOD CONSUMPTION IN CARDIAC SURGERY BE LOWERED TO ZERO?

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AIM: Blood transfusions are life saving precedures but also have serious complication risks. These risks and hardening supply due to limited resources causes limitations in blood tranfusions all over the world. Our aim was to evaluate the results of our modifications on blood consumption in patients subjected to cardiac surgery which speciality known with relatively higher rate of blood transfusions.

METHODS AND RESULTS: Patients who have had open cardiac surgery (n=1099) between 01.01.2011-12.31.2015 in our institution were enrolled in the study. Yearly number of operations, blood and blood products used were detailed in Table 1.

Some precautions were performed to lower the rate of whole blood consumption to levels recommended in guidelines. Division visits, committee meetings, doctor breifings, quality management and educations were carried out. Whole blood transfusion indications were reviewed with cardiovascular surgery team. Indications and contraindications were detailed, risks/benefits were discussed with the whole team and the decisions were taken on concensus. Surgical techniques on blood preservation were revised according to the guidelines which in turn lead to a significant lowering especially on whole blood consumption.

DISCUSSION AND CONCLUSION: As seen in our study, effective education, inter disciplinary coordination and blood preservation surgical techniques may help reducing whole blood consumption to zero Current transfusion practices according to rules and international guidelines may have significant benefits on medical, financial and social results. Responsive supervision of the whole procedure beginning from the indication to post transfusion follow up mainly by doctors and the dedicated effords of the all members of the medical team causes improvement in the results.

Whole blood is only for one patient but if it's processed into products, may be used for 4 different patients. As the one and only source of this precious liquid is humans, blood should be transfused with extreme caution and ungenerously. Costs of blood transfusion is high by itself and with related complications (infections, reactions, acute renal failure, immune modulation etc.) costs have potential for a financial disaster. Whole blood was the preferred choice mostly because of availability. Large scale hospitals with major surgical units like cardiovascular surgery should have the facilities and legal permissions to process blood and blood products to lower the rate of whole blood comsumption nationwide. As a conclusion, education and informative actions with interdisciplinary integration of guidelines may help reducing the blood transfusions to internationally accepted levels.

Table.1

	2011	2012	2013	2014	2015
CVS OPERATIONS	213	210	196	259	221
WHOLE BLOOD (Total)	40	12	1	1	0
WHOLE BLOOD (Average)	0,19	0,06	0,01	0,00	0,00
ES (Total)	277	242	121	259	259
ES (Average)	1,30	1,15	0,62	1,00	1,17
FFP (Total)	369	373	131	311	234
FFP (Average)	1,73	1,78	0,67	1,20	1,06
PLT- RANDOM(Total)	64	66	0	39	24
PLT -RANDOM(Average)	0,30	0,31	0,00	0,15	0,11
PLT- Apheresis(Total)	0	0	0	1	0
PLT -Apheresis (Average)	0,00	0,00	0,00	0,00	0,00

CVS: Cardiovascular Surgery, ES: Erythrocyte suspension, FFP:Freshly Frozen Plasm, PLT: Platelet

PP-079

BLOOD MANAGEMENT APPLICATIONS OF SCRUP SURGERY NURSES

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Blood transfusion is widely used during procedures of cardiac surgeries, especially cardio pulmonary bypass (CPB). Cardiac surgeries consume 10% to 15% of national blood source and due to the significant increase in complexity of cardiac surgery procedures, this portion progressively increases according to the existing findings. Open cardiac surgeries have been performed for forty years in our country.

At least 10, sometimes 20, 30 units of blood per surgery had to be presented at the first years of these surgeries.The major causes of these were technical inability of the heart lung machines and blood usage was considered as an innocent operation. Blood usage has decreased to 8-10 units due to growth technology in the mid of 1980s.

After the mid of 1990s, information about disadvantages of blood usage started to be announced. Despite of this, applications about blood usage decrease did not exist in scrup surgery nurses task descriptions. In this study, we investigated scrup nurse (sterile) sircule nurse (roving) inoperative responsibilities and required nursing functionalities

in blood usage and bleeding control.

After 2000s, techniques to reduce blood usage in cardiac surgeries were improved and blood usage was questioned by perfusion surgery teams and anaesthesia teams.

Nurses who are indispensable of the surgeries can take a great role in reducing blood usage such as good control of bleeding, leading the team in choosing the safen extraction technique, to perform tissue closure operation faster. Leg bandage and protection of the leg after safen removal in reducing blood loss are part of nursing roles. In cardiovascular clinics, each surgery team and nurse, who does not have blood protecton and blood usage procedure, perform different applications. Reducing blood usage and bleeding subjects should exist in curriculum in nursing education and in service education.

PP-080

BLOOD USAGE AND DISTRIBUTION TO THE CLINICS IN HASEKI TRAINING AND RESEARCH HOSPITAL FOR YEAR 2015

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AIM: We intended to study on consumption and distribution rates of Haseki Training and Research Hospital (HTRH) blood and blood products according to the clinics.

METHOD: In this study; blood obtainment for the last year (from our blood center and Red Crescent), usage according to the clinics and erythrocyte extermination data have calculated retrospectively from the hospital blood center's computer aided operation system.

EVIDENCES: Totally 9162* donations realized in our hospital's blood center. Transfusions realized for totally 11931 patients in our hospital's clinics. The transfused products and their distribution according to the services are shown in Table 1 below. Number of erythrocyte exterminations and reasons are shown in table 2.

CONCLUSION: As of the most product consumption in the departments of HTRH are seen as in the first place Internal Diseases, the second place General Intensive Care and the third place Cardiovascular Surgery. Since Hematology Department is in the Internal Diseases Department, it affects this result. Because of our Blood Transfusion Center had Authorized Blood Center feature in year 2015; 13,2% of our total products and 8,4% of erythrocyte suspensions were supplied by Red Crescent. The number of Erythrocyte exterminations are appropriate according to the numbers planned yearly in quality standards.

Table 1 – CONSUMPTION OF BLOOD AND BLOOD PRODUCTS ACCORDING TO THE DEPARTMENTS IN HTRH

Services	Full blood U*	Erythrocyte U	Plasma U	Platelet U	Total U
Emercency observation	11	949	165	121	1246
Orthopedy	2	851	-	13	866
Intensive care	-	1025	1048	558	2631
Cardiovas culer surgery	-	704	648	325	1677
Gynecology	-	493	124	-	617
Internal diseases	-	3512	985	1417	5914
Urology	11	641	401	52	1105
Gastroenterology	-	246	-	41	287
Nefrology	-	228	1370	15	1613
General surgery	-	838	361	145	1344
Others*	-	328	125	132	585
Neurochırurgia	-	243	-	54	297
Total	25	10058	5227	2873	18183
HTRH Donation	25	9207	4861	1678	15771
Red crescent	-	851	366	1195	2412

**U: Unite **Others: Dermatology,Infectional diseases,Pediatry Neurology,Cardiology,Otorhinolaryngology,Oncology*

Table 2 – Number of Erythrocyte exterminations and reasons

Extermination (out of) Total ER: 10220 U	Serology (+)	Equipment error	Product defects	Expiration
ER 162 U (%1.58)	11	17	2	32

PP-081

BLOOD GROUP INCOMPATIBILITIES AND HEMATOPOETIC CELL TRANSPLANTATION

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INTRODUCTION: There are ABO incompatibility between recipient and donor pairs on average of 40-50% in hematopoietic stem cell transplants (HCT). ABO incompatibility can cause variety of clinical scenarios such as delayed RBC engraftment, pure red cell aplasia and increased risk for acute and delayed hemolytic reactions.Given the fact that it can cause serious clinical problems, it is required to determine the type of ABO incompatibility (major, minor, or bidirectional incompatibility) and make a treatment plan prior to transplantation. Here we share our clinical experience

in HCT with ABO incompatibility.

RESULTS: We reviewed HCT patients with ABO incompatibility between 2014-2015 in our clinic. We had 6 cases of ABO incompatibility. Two of them (33.3%) had major incompatibility while four (66.6 %) had minor incompatibility. We studied isohemagglutinin titration in all our cases. In two of these patients who had major incompatibility with a titration of 1/128 and above, plasmapheresis was done prior to allogeneic HCT to reduce anti-donor A/B antibodies in recipient plasma. The isohemagglutinin titers were followed after stem cell transplantation in every 15 days. Plasma reduction was applied in 4 cases with minor incompatibility. At the same time, isohemagglutinin titration, direct and indirect Coombs, and blood groups were studied. We found that, time to RBC engraftment and RBC transfusion requirement was higher in patients with minor and major incompatibility compared to other HCT cases. We prefered O type blood whenever erythrocyte transfusion was needed.

DISCUSSION: Even though blood group compatibility is not a must for allogeneic stem cell transplantation, blood group incompatibility can cause serious clinical problems when it is not evaluated properly. Different clinical presentations like delayed RBC engraftment, hemolytic reactions and pure red cell aplasia can be observed. It is crucial to run, properly evaluate and repeat tests for type of ABO incompatibility, isohemagglutinin titers, and direct/ indirect coombs. Incompatibility type, blood type of the donor and recipient are the main determinants in blood product transfusions. By sharing our clinical experience in allogeneic HCT with ABO incompatibility, we want to emphasize the importance of follow-up of these patients.

PP-082

A RESEARCH ON KNOWLEDGE LEVEL OF THE NURSES FOR TRANSFUSION PROCEDURES

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OBJECTIVE: A significant part of complications of blood transfusion is known to be caused by knowledge deficiency of the implementers. In the present study, knowledge level of the nurses who perform transfusion on blood transfusion and efficiency of the training were measured.

METHOD: Knowledge level of 61 nurses working in Dicle University Hospitals about blood transfusion procedures was measured. Rates of correct answers were compared according to the school graduated, working period, age groups and transfusion implementation subjects. A training about transfusion implementations was given to the nurses, knowledge levels of the nurses were measured again and knowledge level before and after the training was measured. Pooled sample t test and χ^2 test were used for data assessment.

FINDINGS: A questionnaire including 10 questions was applied to the nurses who participated into the research. Rates for correct answers were 60.52% /115/190) for Medical Vocational High School graduates, 67% (67/100) for 2-year Vocational School of Higher Education graduates, 60.93% (195/320) for 4-year Vocational School of Higher Education. ($p>0.05$)

When the results were assessed according to working period, rates of correct answers were 60.95% /128/210) for the nurses who work less than 5 years and 62.25% (249/400) for the nurses who work more than 5 years. ($p>0.05$)

When the results were assessed according to age group, rates of correct answers were 59.72% (215/360) for the nurses who were younger than 30 years and 64.8% (162/250) for the nurses who are older than 30 years. (p>0.05)

By the questionnaire, questions measuring the knowledge level on transfusion reactions, transfusion periods for blood products, storage conditions for blood products and transfusion procedures were asked to the nurses. The rates of correct answers about reactions developing after transfusion of a wrong blood type and temperature degrees that whole blood and erythrocyte suspensions are stored were lower (21.31% and 41%, respectively). Higher rates of correct answers were detected about the topics that erythrocyte suspensions to be transfused under elective conditions are not required to be heated up to body temperature and in which intervals that vital functions would be written on transfusion monitoring form during transfusion (81.96 and 98.36, respectively).

The total knowledge level before training was found 61.96% (378/610) whereas an increase to 96.55% (589/610) was detected following intervention by training. (p<0.001)

CONCLUSION: In the present research, no significant difference was detected between the schools graduated, working period as a nurse and ages for transfusion procedures. Rates of correct answers about transfusion procedure were found significantly lower on some topics and significantly higher on some topics. A significant increase on knowledge level was detected after intervention through training. From this point of view, training the personnel within certain intervals is suggested to reduce the complications of transfusion.

PP-083

RETROSPECTIVE ANALYSIS OF UTILIZATION OF BLOOD COMPONENTS IN A HEMATOLOGY ONCOLOGY HOSPITAL IN TWO YEARS PERIOD

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OBJECTIVE: More blood components are required in Hematology- Oncology centers than in most other disciplines.Usually all of the components are necessary for patients with malignancy.We aimed to investigate the rates of the blood components which were utilized in our hospital.

MATERIALS-METHODS: A retrospective analysis of the utilization of blood components in the Istanbul Bilim University Avrupa Florence Nightingale Hospital was performed two years period between 1st of January 2014- 1st of January 2016.

RESULTS: It was observed that a total of 8210 blood components were used in our hospital during two years period.The most common blood components utilized were random donor platelets (52.9%), followed by packed red cells (30.2%), apheresis platelets (11.3%), fresh frozen plasma (3.8%) and cryoprecipitate (1.8%)

CONCLUSION: Thrombocytopenia frequently occurs in patients with hematologic malignancy or solid organ tumors, resulting from the underlying disease processes or a complication of cancer treatments.Platelet transfusions are used to treat people who have active bleeding or at a high risk of bleeding. In our hospital the most utilized component of blood was random donor platelets in accordance with our patients properties.

PP-084

EVALUATION OF THE TRANSFUSION CHECKLISTS IN THE REGIONAL BLOOD CENTER OF ISTANBUL MEHMET AKIF ERSOY EDUCATION AND RESEARCH HOSPITAL OF THORACIC AND CARDIOVASCULAR SURGERY

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OBJECTIVE: The aim of this study is to evaluate transfusion forms for improving traceability and transfusion safety in compliance with the national guidelines.

METHOD: Transfusion checklists appropriately filled-in and signed by two clinic nurses are delivered to our Regional Blood Center. These forms and blood request forms are filed together depending on the units by transfusion nurse. Transfusion checklists of blood products transfused between 1 April 2015 and 1 January 2016 were studied retrospectively.

FINDINGS: Only 12.488 (83.06 %) checklist of 15.035 transfusions are returned to Blood Center between 01.04.2015 to 3.01.2016. 2547 transfusion checklists forms of blood products are unfilled. 12488 of transfusion checklists forms were examined and errors were analyzed. Incomplete filling details are listed in Table1.

CONCLUSION: Medical records of transfused patients must be accurate. The first step is to use and fill in transfusion checklists completely. Since april 2015 the presence of Transfusion Nurse made possible to monitor transfusions more closely in our hospital. Due to our data, it is more easy to give feedback and continuously educate the staff. An improvement in transfusion safety is only possible, when traceability and compliance reaches very high levels.

The numbers and percentage of incomplete filling of transfusion forms

Incomplete filling of:	Numbers	Percent (%)
Demographic details of patients	55	0,44%
Ward / Unit	1902	15,23%
Blood group type	144	1,15%
Required blood component	254	2,03%
Expiry date of product	1458	11,67%
Component check	536	4,31%
Pretransfusion check	546	4,37%
Planned Time of transfusion	4422	35,41%
Pretransfusion checkers (staff ID)	625	5%
Time and duration of transfusion	1700	13,61%
Transfusion follow	3267	26,16%
Name or signature of staff performing transfusion	745	5,97%
Transfused volume	1309	10,48%
Adverse effects	786	6,29%

PP-085

DESTRUCTION RATE OF HUMAN BLOOD AND BLOOD COMPONENTS IN OUR HOSPITAL BLOOD TRANSFUSION CENTER

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AIM: Determining the rate of destruction was destroyed blood and blood products for various reasons. It was aimed to make the necessary efforts to reduce these rates.

METHOD: It was retrospectively data between the dates 01.01.2015-31.12.2015 of Tokat State Hospital Blood Transfusion Center. Erythrocyte suspension, platelet suspension, fresh frozen plasma and cryoprecipitate was obtained by Samsun Red Crescent Society Regional Blood Center. In an emergency, we were taken full blood by our Blood Transfusion Center.

FINDINGS: Total 13471 piece blood and blood products used for patients in the 2015, There off 45 (%0.33) many products are various reasons was destroyed. Because off the full postmature 10(%0.07) many erythrocyte and full blood, because the bag explosion 22(%0.16) many fresh frozen plazma, due to return to service 11(%0.08) many erythrocytes, platelets and whole blood was destroyed (t

RESULT: The blood request must be made for Patients who confirmed the decision to transfuse In order to prevent unnecessary destruction of blood and blood products should be done Plan to pass in front of the destruction caused by the filling miata. "last in, last out''policy of strictly enforced in blood storage.

Destruction rates for 2015

	Fresh frozen plasma	Erythrocyte suspension	Platelet suspension	Full blood	Total
Miata stuffed	-	8	-	2	10
Bag explosion	22	-	-	-	22
Return to service	-	7	2	2	11
Incorrect products	-	2	-	-	2
Total	22	15	2	4	45

PP-086

LEAST INCOMPATIBLE RED BLOOD CELL UNIT USING; HOW SAFETY DECISION?

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INTRODUCTION: Haemolytic transfusion reactions caused by alloantibodies canbe troubesome in patients with autoimmune haemolytic anaemia(AIHA).Transfusion is essential when anemia is life treatening.However, finding a compatibile red blood cell (RBC) unit is a complicated process in patients with alloantibodies.Mostly, least incompatibile RBC unit is selected for transfusion.

The purpose of this study is to demonstrate validity and safety of using least incompatible cross-matched group specific blood by invivo transfusion.

METHODS: In two years time, a total of 27.109 RBC units were cross-matched in our transfusion centre. Cross-match incompatibility was found only in nine patients whose direct antiglobuline test (DAT) positive.

Indications of transfusion were; anemia with life threatening severity and one preoperative preparation. Least incompatible RBC units were chosen and transfused to patients.Patients were moniterized closely for any signs or sympthoms of acute hemolysis. Before transfusion low dose dexamethazone and antihistaminics were administered. Totally, 48 units of least incompatible RBC packs were transfused to patients. All transfusions were observed for acute haemolysis signs like as dispnea, flank pain, hypotension, headache. Laboratory tests showing hemolysis such as total-indirect bilurubin, lactat dehidrogenase and complete blood count to ensure sufficient increment of hemoglobine were obtained after transfusion.

CONCLUSION: None of the patients experienced acute hemolytic transfusion reaction. Laboratory evaluation of hemolysis parameters did not reveal any significant increase in hemolysis. As a conclusion; whenever transfusion is required in patients with AIHA, ıt should not be cancelled because of cross-match incompatibility.Least incompatible RBC units can be safely transfused.

Table 1. Laboratory results before transfusion

Patient no	Gender	Age	hb (g/dl)	Hct	T.bil(U/L)	D.bil(U/L)	LDH(U/L)
1	Female	58	7.5	20	20	12	1763
2	Male	78	6.1	18	0.8	0.4	249
3	Male	59	3.9	11	4.4	0.6	946
4	Female	71	5.4	18	3.0	0.9	345
5	Female	63	4.5	12	2.6	0.6	1247
6	Female	61	6.4	20	2.6	0.7	802
7	Male	74	6.0	17	0.8	0.3	164
8	Female	68	5.4	17	3.3	1.3	915
9	Female	72	3.8	9	4.4	0.6	508

Table 2. Laboratory results after transfusion

Patient no	RBC unit transfused	hb(g/dl)	hct	T Bil(U/L)	D Bil(U/L)	LDH(U/L)
1	4	8.9	24	6.2	4.8	1342
2	8	10	30	NA	NA	NA
3	12	8.8	26	3.4	1.0	881
4	2	8.9	28	2.9	0.9	358
5	4	9.9	20	1.2	0.3	1230
6	2	9.6	30	2.4	0.8	757
7	8	9.4	29	NA	NA	NA
8	3	8	21	1.8	0.7	944
9	4	11.8	36	2.0	0.6	542

PP-087

A SURVEY OF PHYSICIANS' KNOWLEDGE AND AWARENESS ABOUT TRANSFUSION

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OBJECTIVE: To determine the level of knowledge and awareness about transfusion process to contribution of transfusion safety for the physicians at the clinics whose transfusions are mostly made.

MATERIALS-METHODS: Izmir Tepecik Education and Research Hospital is a tertiary healthcare service using blood and blood components frequently. (More than 15000 unit red cell concentrate in a year)A questionnaire study was organized between the dates of 01.10.2015 and 30.10.2015 with 22 questions to the physicians who has been working and willing to attend at the transfusion frequently was made clinics in our hospital. The questions were about blood components, compatibility tests, practice of transfusion and transfusion reactions. The information note including the answers has been delivered to the clinics with the same topic title.

Defining analysis has been done on the survey forms. IBM SPSS version 20.0 was used as a package.

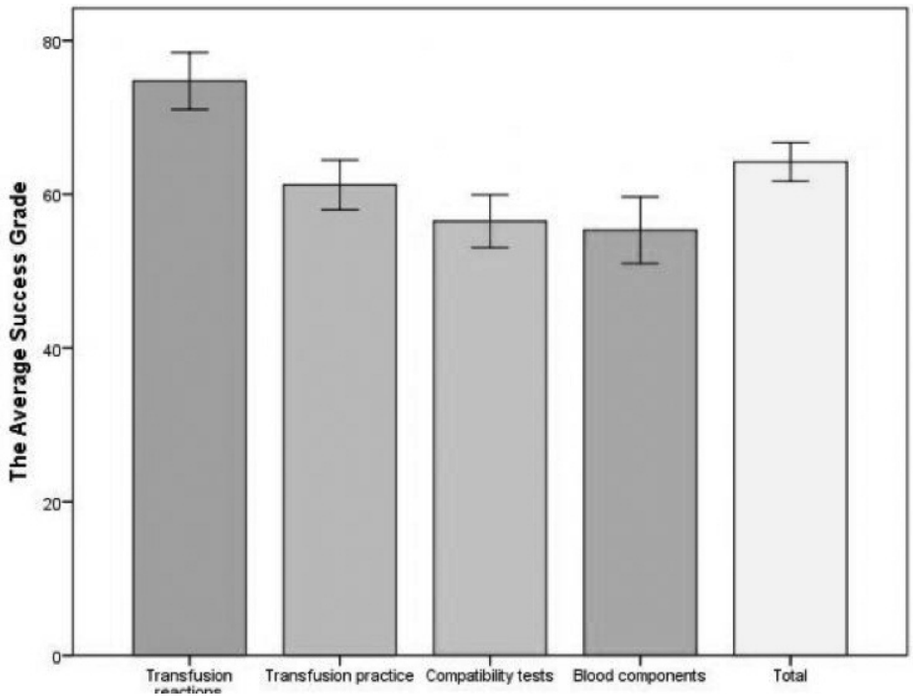
RESULTS: 150 physicians attended to the survey (49,5 % of the physicians who attended to the survey at the clinics.)

It was seen that, 62 % of participants was from surgical clinics and 38 % of it was from internal clinics.

In terms of the statistics of tranfusions center, 58,66% transfusions were given at the clinics those attended to the survey. In totall, the average success grade is found 64,2. In regards of the topic title average points respectively, transfusion reactions (74.75), transfusion practice (61.2), compatibility tests before transfusions (56. 5), information for the blood component (55.3) was found.

CONCLUSION: Attending to this type of surveys helps to improve knowledge and awareness on the transfusions process for nurses in charge and technicians beside of physcians. For this, in service training activities can be organised. All of this works would help positively to the transfusion safety.

Graphic 1. According to the topic titles, avarage success in total



Graphic 1. According to the topic titles, avarage success in total

	Transfusion reactions	Transfusion practice	Compatibility tests	Blood components	TOTAL
Average	74,8	61,2	56,5	55,3	64,2
Standard deviation	22,96	20,02	21,36	26,79	15,50
Minimum	0	0	0	0	18,18
Maximum	100	100	100	100	100

PP-088

MANAGEMENT OF PATIENTS WITH ACUTE LEUKEMIA WHO HAD ALLOIMMUNE THROMBOCYTOPENIA UNTIL RECOVERY PERIOD

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INTRODUCTION: Refractoriness to platelet transfusion is one of the important complication of platelet transfusion therapy for cases with acute leukemia. Refractoriness to platelet transfusion can be separated into immune and non-immune causes. Immune causes include alloimmunization to HLA and/or platelet-specific antigens due to prior exposure from pregnancy, transfusions and/or transplantation. According to Legler TJ. et al.; the proportion of patients with platelet refractoriness due to alloantibodies alone has been estimated at approximately 18 percent. Non-immune causes, based on studies in patients with acute myeloid leukaemia (AML) or haematopoietic progenitor cell transplants, include fever, sepsis, splenomegaly, disseminated intravascular coagulation (DIC), bleeding, venoocclusive disease

(VOD), graftversus-host disease (GVHD) and medications. Here, we describe to cases developing platelet alloimmunization in patient followed by acute leukemia, as retrospectively.

MATERIALS AND METHODS: In our clinical data includes From 2010 to 2016 years, 9 patients in 118 acute leukemia cases had platelet alloımimunızatıon. We used to a corrected count increment (CCI) for measuring response to platelet transfusion. The corrected count increment (CCI) has also been used to measure the response to platelet transfusion based on a platelet count obtained 10 minutes to one hour post-transfusion. CCI = [PPI x BSA (m2)] x 1011/ number of platelets transfused PPI is post-transfusion platelet count minus pre-transfusion platelet countBSA is body surface area measured in square metersOur approach is consistent with that of the American Society of Clinical Oncology, which defines refractoriness to platelet transfusion as a CCI of <5000/microL on at least two sequential occasions.

RESULTS: In this group of patients was identified demographic characteristics such as the type of leukemia, age, gender. Allloimmünization occurred in 7 patients during induction and in 2 patients during the consolidation. Alloimmunization has improved 12th day average since the beginning of the chemotherapy. Number of the platelet transfusions are indicated until platelet refracterness in Table 1. All patients are treated with frequent intervals platelet transfusions (4-6 hours) plus 400 mg/kg day IVIG, we specified which day of platelets recovery and IVIG treatment response, in table 2. The mean duration of platelet transfusion support was 12 (min 6- max 18) days.

CONCLUSION: However, once it is determined that a patient is alloimmunized, HLA-matched platelets improve platelet count increments. Other strategies for managing refractoriness were also attempted and generally met with limited success. A variety of drug therapies have been attempted based, at least in part, upon their efficacy in autoimmune thrombocytopenia. Intravenous immune globulin (IVIG) has been proposed as a strategy for immune modulation, but the results have generally been unimpressive. The supportive therapy should be performed HLA-matched platelets in cases with platelet alloimmunization. However, in clinical practice, the administration can be done in limited cases. Because, HLA-matched donor is not possible for every patient. Data on the IVIG administration for alloimmune thrombocytopenia treatment are not sufficient, but it should be emphasized as an alternative option. Consequently, as in our cases, IVIG therapy plus frequent intermittent transfusions seems to be usefull.

Table.1

patient	age (years)	gender	Leukemia Type	The initial count of platelets	Time of hospitalization(day)	Time of death (month)	Cytotoxic treatment
1	41	F	AML	75000	36		Ida-ara c
2	36	M	AML	17000	21	10	Ida-ara c
3	70	M	AML	24000	40	9	ATRA
4	30	M	AML	40000	20	1	Ida-ara c
5	66	M	AML	76000	16	1	Ida-ara c
6	46	F	AML	35000	28	20	Ida-ara c
7	39	F	AML	25300	26	4	Ida-ara c
8	36	F	AML	12000	24		Ida-ara c
9	42	F	ALL	75000	36		CALGB

dermographic data

Table.2

Patient	Alloimmünization time(day of chemotherapy)	Number of the day Plt> 50 000 after IVIG	Number of the day plt>100000 after chemotherapy (recovery day)	Number of platelets transfusion until alloimmünization
1	14	18	26	68
2	12	10	24	70
3	15	8	31	36
4	1	22	22	70
5	15	16. DAY EX	16. DAY EX	69
6	5	10	22	4
7	17	5	26	36
8	15 (First concolidation)	6	23	109
9	14	12	26	68

Data of platelets transfusion

PP-089

THE CRYOPRECIPITATE REPLACEMENT FOR THE ACUTE PROMYELOCYTIC LEUKEMIA CASES WHO PRESENTED WITH HYPOFIBRINOGENEMIA

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Acute promyelocyticleukemia (APL) is a subtype of acute myeloid leukemia (AML) characterized by distinctive morphology of blast cells, a life-threatening coagulopathy and a specific balanced reciprocal translocation t(15;17) which fuses the PML (promyelocyte) gene on chromosome 15 to the RAR (retinoic acid receptor) gene on chromosome 17. The dominant clinical manifestation of the disease was indeed severe and life-threatening bleeding, which proved to be the major cause of early mortality in every report. Disseminated intravascular coagulation (DIC) is frequently present at diagnosis or occurs soon after the initiation of cytotoxic chemotherapy in patients with APL. This complication constitutes a medical emergency, since, if left untreated, it can cause pulmonary or cerebrovascular hemorrhage in up to 40 percent of patients and a 10 to 20 percent incidence of early hemorrhagic death. Treatment of the coagulopathy (DIC) associated with APL may be difficult and should be managed expectantly. Coagulation parameters, including fibrinogen, D-dimer, PT, aPTT, and platelet counts, should be monitored closely. Transfusions of platelets and cryoprecipitate or fresh frozen plasma are used to maintain the platelet count above 20,000 to 30,000/microL and the plasma fibrinogen concentration above 150 mg/dL. Higher platelet counts of 30,000/microL may be beneficial to control overt bleeding. Inaddition, anecdotal evidence supports attempting to maintain the platelet count above 50,000/microL during periods of DIC, as reflected by falling fibrinogen or high D-dimer levels. Here, we examined cryoprecipitate replacement count and efficacy in APL patients which was presented with hypofibrinogenemia. Patients who had cryoprecipitate replacement was compared with patients without replacement.

MATERIAL AND METHODS: Between the years 2009-2015, it was screened for patients admitted with acute promyelocytic leukemia. A total of 18 patients with APL were identified in the study, Fibrinogen levels of cases were monitored every day following initial diagnosis. In patients with hypofibrigonemia, ıf there is bleeding, fibrinogen level were removed of 150 mg / dL whereas there isn't bleeding, fibrinogen level were removed of 100 mg / dL.

RESULTS: Five APL cases was presented with hypofibrinogenemia in initial diagnosis. Cryoprecipitate was made replacement in these cases. Among the five patients admitted with hypofibrinogenemia, three patient had the intermediate risk group characteristics, two patient had the high risk group characteristics. However, in the 13 cases in without hypofibrinogenemia, six patient had the low risk group characteristics. For five cases, Total of cryoprecipitate replacement were made 143 ünits. There were not new cases who developed hypofibrinogenemia after initial diagnosis. Support of cryoprecipitate was made between the first and eighteenth days.

CONCLUSION: APL cases are more prone to disseminated intravascular coagulation. Especially, if patients present with hypofibrinogenemia, patients should be supported by cryoprecipitate until promyelocytes has been cleared up from the bone marrow. Our clinic, we had cases who had performed with cryoprecipitate replacement until the 18th day of treatment. As a result, the clinical course was no difference the groups that received cryoprecipitate between the groups that are not support for cryoprecipitate.

PP-091

THE INCOMPATIBLE CROSSMATCH BLOOD TRANSFUSION

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INTRODUCTION: The aim of blood transfusion is to provide an appropriate immunologic and serologic blood components to a patient. Initial examination includes ABO and Rh compliance in the patient and donor blood sample. Crossmatching and antibody screening tests are performed to detect the presence of antibodies in patients plasma. If there are allo-antibodies in patients plasma, it is very difficult to find proper blood product and loss of time is a major problem. Crossmatching is the last control in compatibility of the transfusion. The crossmatching refers to the test that is performed prior to a blood transfusion in order to determine if the donor's blood is compatible with the blood of an intended recipient. We aimed in this article to report the crossmatching incompatible transfusions and the incompatible blood transfusion results.

RESULTS: Microplate method was used for the determination of blood type, crossmatch and indirect antiglobulin test. Gel-filtration method was used for direct antiglobulin test. Brand of neo were used as instruments for all tests. The incompatible crossmatch resutls of patients were investigated in our transfusion center in 2015. A total of 3984 patients were treated with blood transfusion. Crossmatching in 6640 donors. The crossmatch incompatible transfusions gave in 9 patients (5 female, 4 male). The average age was 59.4 years. Five patients had hematologic malignancies. Two patients with acute life threatening bleeding transfused O Rh (-) blood group. Sub-group compatible blood transfusion was given to all other patients. Antibody screening and identification was done all patients except for emergency cases. All patients had previously received blood transfusion. Acute hemolytic reactions can be seen after incompatible crossmatch blood transfusion. Therefore vital signs of patients (bloodpressure, pulse, respiratory, fever), laboratory

findings of hemolysis (haptoglobulin, indirectbilirubin, lacticdehydrogenase, hemoglobinuria), urine output monitoring followed carefully. Hemoglobinuria measurements were performed every five minutes in a urine. Immune hemolysis was not observed in any patient.

DISCUSSION: The incompatible crossmatch is a major problem for both the blood bank and the patient's physician. The major concerns are, difficulies in finding the appropriate blood products, hemolytic reaction that may occur after the application of blood products and time issues. Subgroup compatible blood transfusion might given to patients with incompatible crossmatch but it should be closely monitored for hemolysis. In case of emergency O Rh (-) blood replacement can given if there is no time for the determination of blood group.

Table 1

patients	age	sex	blood type	Direct antiglobulin test Ig-G	Direct antiglobulin test C3-d	Indirect antiglobulin test	Disease
1	72	k	A (+)	(++)	(++)	(+++)	myelodysplastic syndrome
2	64	e	0 (+)	(+++)	(-)	(+++)	chronic lymphocytic leukemia
3	65	k	A (+)	(+++)	(-)	(++++)	Knee surgery
4	64	e	A (-)	(+)	(-)	(+++)	myelodysplastic syndrome
5	68	e	O (+)	(++)	(-)	(+++)	multiple myeloma
6	81	e	O(+)	(-)	(-)	(+++)	Upper gastrointestinal bleeding
7	42	k	A (+)	(+++)	(-)	(+++)	Chronic renal failure
8	38	k	B (+)	(+++)	(++)	(++++)	systemic lupus erythematosus
9	41	k	B (+)	(+++)	(++++)	(-)	myelodysplastic syndrome

: futures of patients

PP-092

THE ANALYSIS OF THE USAGE OF RED BLOOD CELL COMPONENT

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BACKGROUND: Izmir Katip Celebi University, Ataturk Training and Research Hospital is a large entity with 1100 bed capacity. As a consequence of changing policy for blood supply at national level, blood components for transfusion are provided by the Regional Blood Center of Turkish Red Crescent (TRC) since second half of 2013.

AIMS: In this study, it is aimed to analyze the distribution of red blood cell concentrates transfused between 2013-2015 in Izmir Katip Celebi University, Ataturk Training and Research Hospital.

METHODS: In 2013 blood and blood products were both produced in our hospital and as well as provided from TRC. In 2014 and 2015 all of the blood and blood products fully were supplied by TRC. In the hospital, the whole blood taken from avaible donors to donate blood was divided into components by removing buffy coat with blood bag systems (Quadruple Top&Bottom CPD/SAG-M 450 ml SAP 5D; Kansuk, Turkey). All products were provided as buffy coat removed from TRC.

RESULTS: In 2013 totally 23953, in 2014 22336 and in 2015 to 22127 units of red blood cell components were used. The types and the distribution of the red blood cell components are given in the table.

Table: The types and the distribution of the red blood cell components.

	2013		2014		2015	
USED ERYTHROCYTE SUSPENSİON	**Number (n)**	**Percent (%)**	**Number (n)**	**Percent (%)**	**Number (n)**	**Percent (%)**
Red Blood Cell (RBC) Concentrate	*21736*	***90.74***	***21343***	***95.55***	***19739***	***89.20***
RBC Concentrate-Leukoreduced	*1588*	***6.63***	***277***	***1.24***	***1272***	***5.74***
RBC Concentrate-Irradiated	*101*	***0.42***	***435***	***1.95***	***131***	***0.58***
RBC Concentrate-Leukoreduced and Irradiated	*521*	***2.18***	***236***	***1.06***	***971***	***4.38***
RBC Concentrate- Washed	*7*	***0.03***	***43***	***0.19***	***4***	***0.02***
RBC Concentrate-Irradiated and Washed	*-*		***2***	***0.01***	***10***	***0.05***
RBC Concentrate-Leukoreduced and Irradiated and Washed	*-*		***-***		***7***	***0.03***
Total	*23953*	***100.00***	***22336***	***100.00***	***22127***	***100.00***

CONCLUSION: Totally the usage of the erythrocyte suspensions was decreased in years but varieties of processed erythrocyte suspensions were increased. The variety of used products especially is proportional to ease of its ability to supply. For supplying optimal blood products, The Red Crescent Regional Blood Centers would be producing benefits to planning according to the data of the transfusion centers of the hospitals in the supply of specialized materials.

PP-093

ZEYNEP KAMIL MATERNITY AND PAEDICATRICS TRAINING AND RESEARCH HOSPITAL ATTENDANCE RATES OF TRAINING GIVEN TO DOCTORS ON SAFE TRANSFUSION AND ITS IMPORTANCE

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AIM: Blood transfusion is defined as a tissue transplantation. In clinical practice, doctors must determine the right

indication for transfusion, correct blood and blood components must be used, possible adverse reactions must be recognised at an early stage and early intervention must be applied and early notifications and feedback must be provided. Education is also important in lowering the blood destruction rate. Therefore, it is envisaged to reach 90% participation rate in this training.

METHOD: Efforts are made to enable physicians working at Zeynep Kamil Maternity and Paediatrics Training and Research Hospital to participate in training regarding safe transfusion, blood and blood components etc. In order to find the retrospective rate of participation in the aforementioned training program, participant evaluation forms were studied for the December- January 2015 period in order to assess the quality of the training given and the number of physicians participating in the program.

FINDINGS: It is critically important to use the correct components when it is medically necessary to use such components for a patient. To create awareness regarding safe transfusion practices, it is envisaged to facilitate a greater number of physicians' access to in service training in 2015 in order to raise awareness regarding blood transfusion. In service training plans have been designed so as not to encounter any problems during the program. Training is planned to take place in 12 components and necessary coordination has been effected with the relevant units when making the participant lists so as not to experience any problems during the training. During the year 214 out of 230 physicians received training and the participation rate was determined as 93%.It was observed that the 7% of the physicians who were unable to attend the training were either on unpaid leave, on pre or post maternal and being on job rotation. The results of the end of training evaluation forms filled in by participants regarding the evaluation of the trainer and the training was found to be 94.7% satisfactory.

RESULT: Following the in service training, making requests based on the appropriate component, and complete filling in of forms for transfusion will contribute to a change in outlook to transfusion implementations and enable participants to believe that the transfusion implementation is as important as organ donation. It was observed that there was a reduction in the rate of blood components destruction compared to the previous year. Safe transfusion is important as regards transfusion results. These training programs will contribute to safe transfusion implementations.

PP-094

TRANSFUSION TRANSMISSIBLE INFECTIONS IN BLOOD DONORS FROM NORTHERN PAKISTAN: THREE YEARS EXPERIENCE (2010-2012)

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AIM and PURPOSE: To determine seroprevalence of transfusion transmissible infections (TTIs) in blood donors from northern Pakistan and to provide data for future monitoring of the trend in seroprevalence of these infections.

MATERIALS-METHODS: The study was conducted at Armed Forces Institute of Transfusion (AFIT), Rawalpindi, from January 2010 to December 2013. All the blood donors who donated blood at AFIT during the study period were included in the study. Prior to blood donation at the institute, all the donors were subjected to a preset, structured questionnaire to determine their eligibility for donation as per the criteria set by the institute. Serum samples from each donor were collected in serum separator tubes and were tested each day as one single batch, within 24 hours of

collection. These serum samples were screened for HBV, HCV, HIV and syphilis (HBsAg, anti-HCV, HIV antigen-antibody combination assay and syphilis antibody, respectively). The repeatedly reactive samples were considered as true reactive and the blood products of these donors were separated from inventory and incinerated.

RESULTS: A total 160552 blood donors were screened during the study period. The mean age of the donors was 29 ±10.2 years (Range: 18 - 60 years). Out of these, 158144 (98.5%) were male donors and 2408 (1.5%) were female donors. 7385 (4.6 %) donors were volunteer and 153167 (95.4%) donors the replacement donors. The seroprevalence of TTIs in the donors for HBV, HCV, HIV and syphilis was 2385 (1.48%), 4194 (2.61%), 26 (0.02%) and 1520 (0.95%), respectively. The seroprevalence of HBV was higher and statistically significant (p value <0.05) in Gp-II (31-45 years) and the seroprevalence of both HCV and Syphilis was higher and statistically significant (p value <0.05) in both GP-II (31-45 years) and GP-III (46 years and above) when compared with overall seroprevalence of the respective infections in all age groups.

CONCLUSION: This study highlights that the seroprevalence of hepatitis B and hepatitis C is decreasing in our blood donors, but still it is an important risk factor for spread of these infections. The seroprevalence of HIV is rising gradually in the blood donors. The study will also help in monitoring future trend of syphilis infection.

Table.1 Gender based seroprevalence of TTIs in blood donors

Gender of donors	No of donors	HBsAg	anti-HCV	anti-HIV/Ag	anti-syphilis abs
Male	158144	2376 (1.50%)	4166 (2.63%)	26 (0.02%)	1503 (0.95%)
Female	2408	9 (0.37%)	28 (1.16%)	0 (0.00%)	17 (0.70%)
Total	160552	2385 (1.48%)	4194 (2.61%)	26 (0.02%)	1520 (0.95%)

Table.2 Age based seroprevalence of TTIs in blood donors

Age group of donors (Years)	No of donors	HBsAg	anti-HCV	anti-HIV/Ag	anti-Syphilis abs
Gp-I (18-30)	108567	1491 (1.37%)	2549 (2.35%)	18 (0.02%)	896 (0.82%)
Gp-II (31-45)	48143	825 (1.71%)	1517 (3.15%)	8 (0.02%)	561 (1.16%)
Gp-III (46 and above)	3842	69 (1.80%)	128 (3.33%)	0 (0.00%)	63 (1.64%)

PP-095

FREQUENCY OF REACTIVE BLOOD DONORS IN DR. ISHRAT UL EBAD KHAN ISTITUTE OF BLOOD DISEASES

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Human Immunodeficiency Virus (HIV), hepatitis C virus (HCV), and hepatitis B virus (HBV) are blood-borne viruses and share transmission routes among at-risk populations, specifically injection drug use and remote blood transfusions before modern donor screening for these pathogens, making co-infection common. Morbidity and mortality from

infection with HCV in HIV-infected patients are increasing and have become a major challenge in the management of such patients. In recent years, number of patients infected with HBV or HCV or HIV or co-infected with either of the two viruses, has increased tremendously in Karachi population. IDUs (intravenous drug users), MSM (Men who have Sex with Men) and individuals having unsafe sex are among the people who are identified as groups at higher risk of contracting these infections than others. But these studies does not give an exact picture of prevalence and frequency of these infection in Karachi's population as focus of most of these studies were individuals already involved in behaviors (intravenous drug use and unsafe sex) regarded as high risk behaviors. In order to that we screened 6996 blood donors, who visited Dr Ishrat-ul-Ebad Khan Institute of blood diseases (DIEKIBD) from January 2013 to December 2014, for HIV, HBV and HCV. We found that out of 6996 donors; 214 were positive for HBV (3%), 231 for HCV (3.3%) and 26 blood donors were found positive for HIV (0.37%).

PP-096

NAT TESTING IN BLOOD DONOR SAMPLES-A WAY AHEAD

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BACKGROUND: Blood banking in present era has seen many developments but even today the safety of blood and blood components is of great concern worldwide. Enzyme linked immunosorbent assay (ELISA)/chemiluminiscene (CLIA) relies on detection of serological markers that may not appear until upto 3 months of infection leaving window period increasing risk of transmission of infection. Nucleic Acid Testing (NAT) decreases window period by early detection. Over the past few decades, NAT has become a routine part of blood donor infectious screening in developed countries and progressively in some developing countries.

NAT yield refers to samples which are seronegative but positive on NAT when repeated in duplicate and then discriminatory. Serological yield is defined as sample repeatedly positive (may be false positive) on Chemi but negative by NAT. With the implementation of NAT in countries around the world, there is growing pressure on the transfusion services in India to adopt NAT testing. India has more than 2500 licensed Blood Centres including both the private and the Government blood centres. The Transfusion Services in India are fragmented, variably regulated and the quality standards are variably implemented.

This study was undertaken to assess impact of implementation of NAT testing in resources limited country like India with a population of around 1.23 billion and a high prevalence rate of HIV (0.29%), HBV (2-8%) and HCV (≈ 2%) in general population based on parameters of NAT yield and serological yield.

AIM: To calculate NAT yield on blood samples tested

MATERIALS & METHODS: As a cost effective measure, based on Hub and spoke model >10 blood banks across Delhi/NCR are procured for testing at single place. Sufficient care is taken to maintain confidentiality and samples/ donor information are coded.

STUDY PERIOD: 2010 till 2015(6 years)

RESULTS: A total of 0.24 million(approx.) donor samples to date have been tested from various centres without any

lapses. Discriminated NAT exclusive reactive infectious units have been 186 (1 per 1313 units), with 146 HBV, 14 HCV, 0 HIV-1 and 2 HBV-HCV coinfections.

CONCLUSION: In this modern era, one blood unit is bifurcated to three, so transmission of TTI infection in case of NAT yield becomes 3 times. NAT combines the advantages of direct detection of the viral genetic material with sensitivity several orders of magnitude higher than that of traditional methods. Also, with the number of Regular Repeat Voluntary Donors being limited in India, there is a higher percentage of reactive samples, for which NAT testing is useful.

Advantages of centralization and consolidation:

- Optimization of resources
- Standardization of GMP/ GLP
- Integration of logistics and laboratory expertise

PP-097

PREVALENCE OF HBSAG, ANTI-HCV, ANTI-HIV AND VDRL AMONG THE BLOOD DONORS AS AGE AND GENDER BETWEEN THE YEARS OF 2010 AND 2015 AT THE BLOOD CENTERS OF MEDICAL FACULTY OF ANKARA UNIVERSITY

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Blood and blood components are the products obtained from voluntary donors. Blood transfusion is life-saving therapy, but it is a risky approach in transmitting some infectious diseases. Blood donors must be questioned, and screened for the infectious disease to prevent the transmission of infection to the recipient by blood transfusions. Infectious agents transmitted by the transfusion of the blood and the blood products constitute a serious risk factors not only for the recipient's health but also public health. Therefore, it is important to investigate the sero-prevalence of infectious agents via blood to determine the risk factors of the transmission and development of infection and reduce these risks. In our study, we evaluated the test results in the donors who came to the Blood Centers of Ankara University in last 5 years for the blood donation. We investigated the prevalence of HBsAg, anti- HCV, anti - HIV and syphilis among the blood donors as age and gender. A total of 140 037 donors were screened of which 129 766 were men and 10 270 were women. As the results of screening tests the positivity were 656 donors for HBsAg (0.46 %), 575 donors for anti-HCV (0.39 %), 66 donors for anti-HIV (0.047 %), and 1489 donors for Syphilis. The prevalence of anti-HCV and HBsAg were significantly different as the donors' genders ($p=0.003$, $p=0.002$, respectively). There were no statistically significant differences in the prevalence of anti- HIV and syphilis as the genders ($p= 0.691$ and $p=0.397$, respectively). When we evaluated the results as the donors' age, anti-HCV and anti-HIV were similar prevalence among the blood donors ($p=0.121$ and $p=0.15$, respectively). But the sero-prevalence of HbsAg and Syphilis were found in a difference as the age groups ($p<0.001$ and $p<0.001$, respectively). According to the verification test results, the positivity was detected as 21 for anti-HCV (0.01 %), 2 for anti-HIV (0.0001 %), and 54 for Sypilis (0.03 %). The determination of donors with positive test has very important to evaluate early treatment possibilities for the donor and public healthy. The costs of follow-up and controlling these diseases are very high, so epidemiological studies should be more comprehensive and continuous.

COMPARE OF TEST RESULTS

S=140036	Antibody Screen (ELISA)		Confirmation Tests	
	S	%	S	%
HBsAg*	656	0,46	-	-
Anti HCV	545	0,39	21	0,01
Anti HIV	66	0,047	2	0,0001
Sifiliz	222	0,15	54	0,03

PP-098

SEROPOSITIVE/NAT NEGATIVE HIV INFECTION: A CASE REPORT

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AIM: Samples of Blood Donors arriving at Turkish Red Crescent Northern Marmara Region Blood Center Laboratories are subjected to Blood group, Micro EIA and Mini Pool 6 – Nükleik Asit Test (MP6-NAT) tests according to ISBT Barcode numbers. The samples having positive MP6-NAT test results are subjected to resolution. The resolution result is evaluated as the test result, blood and blood products of the reactive sample are disposed of, the sample is sent to Confirmation laboratory. Again, the samples that result negative in Micro EIA are repeated 2 times more. If at least one of the repeated tests results positive; it is evaluated as repeatedly reactive, blood and blood products are disposed of and sent to sample Confirmation laboratory for conclusion.

MATERIAL AND METHOD: Samples of the Blood donor with T005415098169 Barcode number, who donated blood to Kadıköy Square team by Zeynep Kamil Blood Donation Center on the date of 5 December 2015 Saturday, arrived at our Laboratory on the same date at 22:30 hour. According to our routine test algorithms, it was observed as A Rh (+) positive, HBsAg, Anti HCV, T.pallidium antibody Nonreactive, Anti HIV ½ reactive, MP6-NAT Nonreactive when put into process (Table. 1).

Anti HIV ½ was repeated 2 times more and reactivity was identified as to continue. Since MP6-NAT is non-reactive, the ID-NAT test made to sample was also found non-reactive Table. 1).

It was delivered to the sample Confirmation laboratory. Anti-HIV imBlot test was studied by the INNO-LIA HIV I/II kit and Anti-HIV reactivity was confirmed (Table. 2). Again in accordance with our algorithms, it was sent to the sample Ministry of Health laboratories for WB test. For identity verification, new blood sample was demanded from the blood donor. WB positive result returned from Ministry of Health laboratories, then Form D86 B of the person was filled in

and sent to Provincial Directorate of Health.

Although Anti-HIV positivity was confirmed, non-reactive result of MP- NAT ve ID-NAT test has atttacted our interest. As we made a literature review to evaluate the case, we realized that HIV RNA becomes negative in HIV positive cases receiving treatment and HIV-DNA tests should be studied in order to make Confirmation. When we tried to reach the blood donor, the address and phone numbers provided turned out to be false. The Blood Donor could not be reached. As we made a research afterwards by code from the Ministry of Health, it was revealed that the Blood Donor was registered as HIV positive in 2013 and receiving treatment.

CONCLUSION: It is another research subject how the person's psychological condition is after receiving the treatment. But we have seen that we could encounter such type of cases in reliable blood transfusion studies. Therefore, we believe that it is very important that anyone who is confirmed as Anti-HIV positive in any way should be subjected to Permanent Deferral by entering them into blood donor system. The people, whose transfusion transmitted infection test results are confirmed, should be included in Permanent Deferral list in Blood Donor system.

Table 1. Results obtained from the sample with T005415098169 Barcode number according to our algorithms

Line	Sgp120	Gp41	P31	P24	P17	Sgp105	Gp36
Rating	2+	3+	3+	2+	1+	-	-

INNO-LIA HIV I/II Score

Table 2. Results obtained from the kit with 401538 lot number on the date of 07.12.2015

Date of Study	Method	Appliance Used	O.D.	S/CO, Cut-Off
06.12.2015	Micro EIA	Tecan 15	1.666	6.763 0.246
06.12.2015	Micro EIA	Tecan 14	3.281	14.518 0.226
06.12.2015	Micro EIA	Tecan 13	3.108	13.263 0.234
06.12.2015	Macro EIA	Liaison XL	HIV Ab 124 Reactive HIV Ag 0.237 Nonreactive	
08.12.2015	Macro EIA	Liaison XL	HIV Ab 118 Reactive HIV Ag 0.267 Nonreactive	
06.12.2015	MP-NAT	Roche Cobas S201	Nonreactive	
07.12.2015	ID-NAT	Roche Cobas S201	Nonreactive	

PP-099

HBSAG, ANTI-HCV AND ANTI-HIV SEROPREVALENCE OF BLOOD DONORS IN DIYARBAKIR

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OBJECTIVE: Infection caused by transfusion of blood and blood products is an important health problem. The blood donors should be investigate in terms of infectious agents which may spread by blood transfusion at regional and national level to be able to obtain a reliable blood and blood product.

METHOD: HBsAg, Anti-HCV and Anti-HIV analysis results of blood donors referring to Dicle University, Faculty of Medicine, Blood Center between January, 1, 2011 and December, 31, 2015 were assessed retrospectively. χ^2 test was used for variables. Results with a P value <0.05 were accepted significant.

FINDINGS: Number of blood donors referring within such period was 92,393. HBsAg, Anti-HCV and Anti-HIV was detected in 1607 (1.73%), 255 (0.75%) and 2 (0.0021%) donors, respectively.

The donors included 89,353 (96.71%) males and 3,040 (3.29%) females. In male donors, number of HBsAg-positive donors was 1,583 (1.77%) whereas number of HBsAG-positive female donors was 24 (0.79%).

HBsAg positivity rates were detected 5.70% in 2011, 5.95% in 2012, 3.81% in 2013, 3.07% in 2014 and 2.03% in 2015. (p<0.001)

When HBsAg positivity was analyzed depending on the age range, positive HBsAg rates were 0.77% between 18 and 24 years of age, 1.89% between 25 and 49 years of age and 4.11% for the donors older than 49 years of age. (p<0.001)

Anti-HCV positivity rates were detected 0.35% in 2011, 0.34% in 2012, 0.29% in 2013, 0.23% in 2014 and 0.16% in 2015. (p<0.001)

Within a 5-year period, Anti-HIV was confirmed in two donors (0.0021%) only.

CONCLUSION: When state of the blood donors in the region was investigated, a significant difference was observed between male and female gender. Number of female donors is quite low. Lower number of female donors is considered to be associated with cultural characteristics of the region. However, carrier rates for HBsAg were found significantly lower in female donors than male donors. A significant decrease is observed in positivity rates for HBsAg and Anti-HCV, according to the years. Such decrease is associated with vaccination, gradual recovery of hygiene conditions and raising awareness of the community about hepatitis. When age characteristics of the donors were taken into account, rates of positivity in HBsAg and Anti-HCV were detected significantly lower than older donors.

PP-100

EVALUATION OF CONFIRMATION RESULTS FOR ANTI-HIV POSITIVE CASES

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OBJECTIVE: The aim of this study was to evaluate confirmation results of anti-HIV positive samples detected in our blood center and to search correlation with ELISA results.

METHOD: Data obtained between 2011 and 2015 were reviewed retrospectively. Our blood center analyzes samples of the donors as well as anti-HIV tests referred from inpatients and outpatients. Anti-HIV was analyzed with microparticle enzyme immunoassay (Architect i 2000 SR Abbott, USA) method. Samples with positive results were re-analyzed twice through same method and samples with at least one positive result were accepted as "repetitive reactive". Confirmation tests were performed by Western.Blot method in Reference Laboratory of Public Health Agency.

FINDINGS: Repetitive reactivity and confirmed HIV results of the donors were presented in Table 1; results of inpatients and outpatients were provided in Table 2. Rates of positivity by confirmation tests in the samples with "repetitive reactivity" were found 11.7% (2/17) in donors and 33.3% (33/99) in the patients. The lowest optic density value detected from positive results by confirmation test was 200 IU/ml.

CONCLUSION: Blood donors are investigated by standard questionnaire forms; data are analyzed rigorously and risky groups are rejected. In our blood center, positivity by confirmation tests was detected in 2 blood donors within 5-year period. However, 33 cases exist among inpatients and outpatients within same period. This is an important finding indicating that HIV positivity increases in our region in line with our country. The community should be informed about transmission and personal protective methods to prevent gradual increase of HIV infection.

Higher rates of false positive results in patients (33.3%) may be associated with the drugs or cross reaction of antibodies because of their disease with HIV antibodies. Higher rates of false positive results in Anti-HIV (ELISA) tests cause problematic processes for blood centers and donors because of negative perception of HIV infection. Since all samples which are close to Optic density from "repetitive reactive" samples were found negative, such results should not be shared with the donor before conclusion of confirmation tests.

Table 1. Dicle University, Faculty of Medicine, Blood Center HIV Results of Donors

Years	HIV ELISA number of tests (n)	Repetitive Reactivity (n)	Repetitive Reactivity (%)	Confirmed HIV(+) case (n)	Confirmed HIV(+) case (%) %
2011	17519	3	0.017	1	0.005
2012	18405	3	0.016	-	-
2013	18939	1	0.005	-	-
2014	19109	2	0.010	-	-
2015	18421	8	0.043	1	0.005
Total	92393	17	0.018	2	0.002

Table 2. Dicle University, Faculty of Medicine, HIV Results of Inpatients and Outpatients

Years	HIV ELISA number of tests (n	Repetitive Reactivity(n)	Repetitive Reactivity(%)	Confirmed HIV(+) case (n)	Confirmed HIV(+) case (%)
2011	8734	18	0.206	2	0.022
2012	10682	17	0.159	4	0.037
2013	13861	15	0.108	6	0.043
2014	13595	19	0.139	13	0.095
2015	12509	30	0.239	8	0.063
Total	59381	99	0.166	33	0.055

PP-101

RELATIONSHIP BETWEEN ABO/RH BLOOD GROUPS AND URINARY TRACT INFECTION

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AIM: The ABO blood group system is the most important blood type system in human blood transfusion. Found on platelets, epithelium, and cells other than erythrocytes. There are many studies demonstrated a correlation between blood group antigens and susceptibility diseases such as bacteria, fungi, parasites and viruses. Interactions of some parasites, viruses and bacteria with human cells have been shown to depend on the presence of certain blood group antigens, especially carbohydrate antigens. The objective of our study is to assess the susceptibility of ABO/Rh blood groups to the isolated bacteria and fungi in urinary tract infections (UTI) in our hospital.

MATERIAL-METHODS: Study was designed retrospectively. Seven hundred fifty two patients with acute UTI and 225 patients with recurrent UTI totally 977 patients were enrolled in the study between the years 2014-2015. Urine culture results and ABO/Rh groups were obtained from hospital documented system for each patient. Blood groups were studied in these three years with gel centrifugation (Grifols, Wadiana, Spain) method. Urinary tract infection was defined in the presence of a positive urine culture (>104 CFU/ml of a urinary pathogen). The identification tests were performed on the automated BD Phoenix system (BD Diagnostics, Sparks, MD).

RESULTS: Demographic data of two patients group has been shown in Table-1. Both groups were similar in terms of demographic data (mean age, gender and blood group distribution). The most common blood type was identified as group A in both patients group, 42% and 46% respectively. The distribution of the blood groups in people with urinary tract infections is similar to blood group ratio in Turkey. The distribution of different blood group and the main bacterial/fungal pathogens isolated from 752 patients was determined as following, as shown in the Table-2. The most common bacterial/fungal agents in the acute urinary tract infection among UTI group were Escherichia coli, Klebsilla pneumoniae, Non-albicans Candida, Enterococcus faecalis, Enterococcus faecium respectively. E.faecalis was second place after E.coli in the Rh (-) group. K.pneumoniae was detected in blood group AB and in group Rh (+) more than the other groups. Rh (-) group was more sensitive to E.coli. K.oxytoca was more isolated in urine of patients with blood group O than other ABO groups.

CONCLUSION: The distribution of blood groups in patient with acute and recurrent UTI's was found similar to the distribution of blood groups in our country. The most common bacterial/fungal agents in the urinary tract infection were E.coli. Isolating of different bacteria and fungi from patients with acute urinary tract infection reveals that it is required more studies to improve the relationship between blood groups and urinary tract infections.

Table-1. Demographic data of two patients group

Parameters	Acute UTI group (n = 752)	Recurrent UTI group (n = 225)
Gender Male, n (%) Female, n (%)	 294 (39%) 458 (60.9%)	 94 (41.7%) 131 (58.2%)
Mean age + STD (years)	47.8 + 31.47	53.8 + 30.61
Group A	354 (42.5%)	104 (46.2%)
Group O	220 (29.2%)	65 (28.8%)
Group B	119 (15.8%)	34 (15.1%)
Group AB	59 (7.8%)	22 (9.7%)
Rh (+) group	675 (89.7%)	199 (88.4%)
Rh (-) group	77 (10.2%)	26 / (11.5%)

Table-2. Different blood group and main bacterial/fungal pathogens in acute UTI group

Bacteria	Group A (n = 354)	Group O (n = 220)	Group B (n = 119)	Group AB (n = 59)	Rh (+) group (n = 675)	Rh (-) group (n = 77)
E.coli	150 (42.3%)	102 (46.3%)	57 (47.8%)	26 (44%)	293 (43.4)	42 (54.5%)
K.pneumoniae	43 (12.1%)	28 (12.7%)	15 (12.6%)	12 (20.3%)	93 (13.7%)	5 (6.4%)
Non- albicans Candida	39 (11%)	16 (7.2%)	11 (9.2 %)	6 (10.1%)	67 (9.9%)	5 (6.4%)
E.faecalis	30 (8.4%)	12 (5.4%)	6 (5%)	5 (8.4%)	43 (6.3%)	10 (12.9%)
C.albicans	21 (5.9%)	5 (2.2%)	4 (3.3%)	1 (1.6%)	30 (4.4%)	1 (1.2%)
E.faecium	16 (4.5%)	6 (2.7%)	5 (4.2%)	0	26 (3.8%)	1 (1.2%)
Two bacterial /fungal isolates	15 (4.2%)	10 (4.5%)	2 (1.6%)	3 (5%)	28 (4.1%)	2 (2.5%)
E.cloacae	13 (3.6%)	9 (4%)	1 (0.8%)	3 (5%)	23 (3.4%)	3 (3.8%)
K.oxytoca	5 (1.4%)	10 (4.5%)	1 (0.8%)	0	14 (2%)	2 (2.5%)
Others	22 (6.2%)	22 (10%)	17 (14.2%)	3(5%)	58 (8.5%)	8 (10.3%)

PP-102

THE PREVALENCE AND TREND OF TRANSFUSION TRANSMITTED INFECTIONS IN BLOOD DONORS IN KOSOVO DURING 2006-2015

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The aim & purpose of the paper was the investigation of the prevalence and trends of Transfusion Transmitted Infections (TTI) among blood donors in Kosovo.

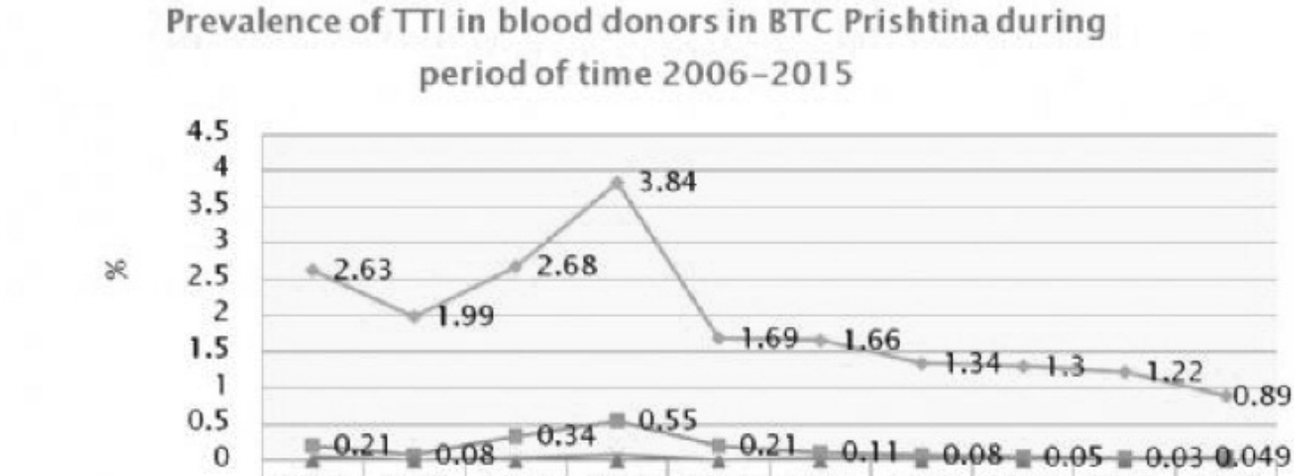
MATERIALS & METHODS: TTI screening of 221900 donations between 2006 and 2015 at National Blood Centre of Kosovo were analysed. The seroprevalence of hepatitis B virus (HBV), hepatitis C virus (HCV), human immunodeficiency virus (HIV), and Syphilis infections were expressed in percentages for the entire study group as well as groups by demographic characteristics and by type of blood donation.

RESULTS: From total number of tested blood donors, 2889 (2.124%, 95% CI 1.363–2.885%) that were donated in Blood Centre of Pristina (BCP) and had serological evidence of infection of TTI and 2916 (3.798%, 95% CI 2.826–4.770%) showed evidence of TTIs in blood donors at Regional Blood Centres (RBC). Total prevalence of TTI was 2.62% (5805 Blood Donors).

The mean seroprevalence of HBV, HCV, HIV, and syphilis infections was 2.368% (95% CI 1.77–2.96%), 0.3% (95% CI 0.17–0.42%), 0.0009% (95% CI -0.004–0.002%), and 0.05% (95% CI 0.028–0.07%) respectively. Trend analysis for the total prevalence of TTIs in blood donors showed a significant decrease, from 4.269% to 1.513%. The trend prevalence of HBV in blood donors in BCP (3.84 to 0.89%) and RBC (5.68 to 1.96%) during the period of time 2006-2015 was represented by gradual decrease. Also the prevalence of HCV is relatively low with a tendency of gradual reduction by year (BCP 0.55 to 0.049% respectively RBC 1.52 to 0.22%). HIV prevalence is very low only 3 cases during 10 years investigation. The prevalence of TTIs is higher in men than in women (2.42% respectively 0.99%). The TTIs prevalence was found to be lower in Voluntary Blood Donations compared to Family Blood Donations (1.4% respectively 2.98%, p value =0.05).

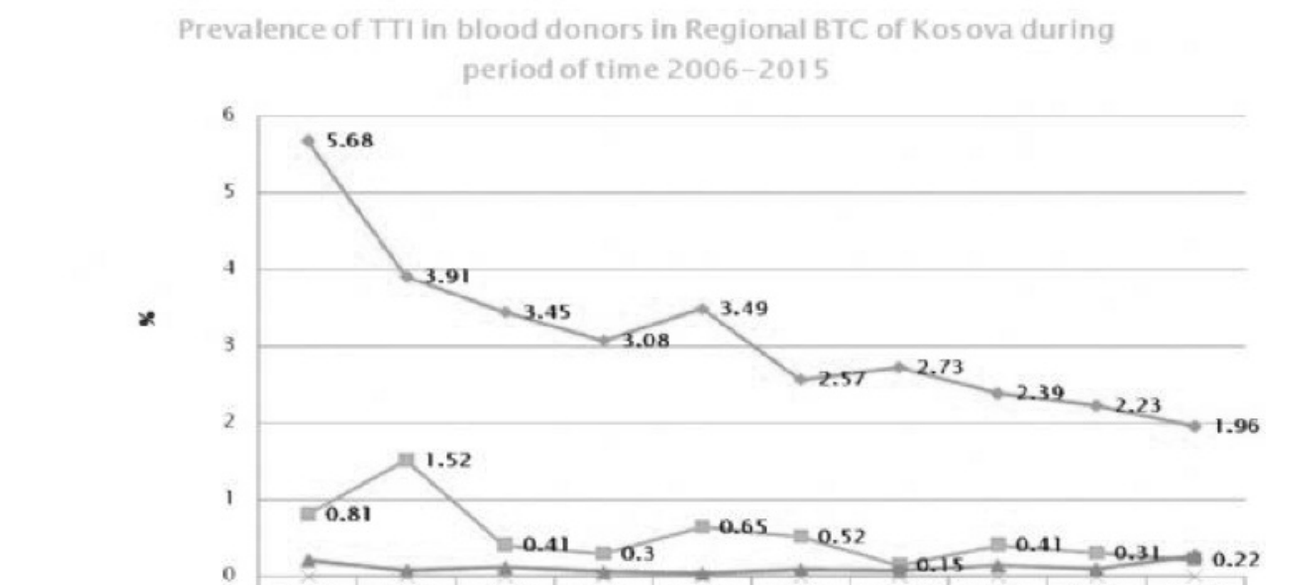
CONCLUSION: Based on our results we can say that during 2006-2015, the prevalence of TTIs shows a significant negative trend despite increasing number of voluntary blood donations. TTI prevalence was significantly lower among blood donors at the blood transfusion centre than in donated blood at regional centres.

Figure 1 Prevalence of TTIs in Blood donors in BTC Prishtina during period of time 2006-2015



	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
%HBsAg pos	2.63	1.99	2.68	3.84	1.69	1.66	1.34	1.3	1.22	0.89
%Anti HCV pos	0.21	0.08	0.34	0.55	0.21	0.11	0.08	0.05	0.03	0.049
%Anti HIV pos	0.008	0	0	0	0	0.007	0	0.006	0	0
%Sifilis pos	0.06	0	0.02	0.08	0	0.03	0.02	0.03	0.02	0.025

Figure 2 Prevalence of TTIs in Blood donors in Regional BTC of Kosova during period of time 2006-2015



	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
% HBsAg pos	5.68	3.91	3.45	3.08	3.49	2.57	2.73	2.39	2.23	1.96
%Anti HCV pos	0.81	1.52	0.41	0.3	0.65	0.52	0.15	0.41	0.31	0.22
%Sfilis pos	0.21	0.08	0.12	0.06	0.04	0.09	0.08	0.14	0.099	0.273
%HIV neg	0	0	0	0	0	0	0	0	0	0

PP-103

SEROPREVALENCE AND TRENDS IN TRANSFUSION TRANSMITTED INFECTIONS AMONG BLOOD DONORS: 10 YEAR DATA, SAKARYA/TR

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AIM: Pretransfusion testing and screening of blood donors is essential for reducing risk of acquiring transfusion transmitted infections. Screening for hepatitis B, hepatitis C human immune deficiency virus and Trepenama pallidum is mandatory in Turkey. We aimed to determine the seroprevalence rates of HBsAg, anti-HCV, anti HIV1/2 and anti-syphilis among healthy blood donors and evaluated the trends for the last decade in this retrospective study.

MATERIALS AND METHODS: We collected the records of healthy blood donors covering the period between January 2005 and December 2015 at the Transfusion Centre of the Sakarya University Hospital. Samples of the donors were screened for HBsAg, anti-HCV and anti-HIV1/2 by using the chemiluminescence microparticle immunoassay (CMIA) (Architect i2000, Abbott) method. For screening of syphilis VDRL or RPR method and CMIA were used.

RESULTS: A total of 40609 healthy blood donors were tested during the 10-year study period. Overall seroprevalences of the HBsAg, anti-HCV, anti HIV1/2 and anti-syphilis were 1.98%, 0.32%, 0.03% and 0.11%, respectively. Seroprevalence rates through the years were listed in the table.

DISCUSSION / CONCLUSIONS: We determined that the seroprevalence rates of the screened tests of HBsAg, anti-HCV and anti HIV1/2 were declining through the years. Main reasons for this declining trend may be attributed due to (1) improved enquiries and pre-donation counselling, (2) doctors employed only in the Transfusion Centre and (3) online tracing system of Red Crescent and the hospital which prevents re-admission of the inappropriate donors. It is obvious that National Guides for the Blood and Blood Products implanted in 2009 until 2015 and National Guides for the Blood and Blood Component Preparation, Use and Quality Assurance implanted in 2015 have additive contribution to these declining sero-trends. As a conclusion use of improved enquiries and pre-donation counselling together with careful examination of the donors by the doctors are as important as the screening of the donors in preventing transfusion transmitted infections.

Seropositivity rates for the screening tests through the years

Table. Seropositivity rates for the screening tests through the years

Years	n	HbsAg		Anti HCV		Anti HIV 1/2		VDRL	
		n	%	n	%	n	%	n	%
2005	6443	228	3.54	21	0.34	1	0.02	7	0.11
2006	3950	94	2.38	7	0.18	0	0.00	4	0.10
2007	2714	77	2.84	5	0.18	0	0.00	4	0.15
2008	5310	129	2.43	14	0.26	0	0.00	8	0.15
2009	3842	83	2.17	18	0.47	4	0.10	2	0.05
2010	5896	101	1.71	30	0.50	5	0.08	3	0.05
2011	2610	33	1.26	13	0.49	2	0.07	1	0.03
2012	909	7	0.77	2	0.22	0	0.00	3	0.33
2013	3145	27	0.85	6	0.19	0	0.00	2	0.06
2014	1678	9	0.53	7	0.41	0	0.00	4	0.23
2015	4113	15	0.36	3	0.07	0	0.00	8	0.19
Total	40689	803	1.98	128	0.32	12	0.03	46	0.11

PP-104

SEROPREVELANCE OF HEPATITIS B, C AND HIV AMONG TALASEMIA PATIENTS IN TEPECIK EDUCATION AND RESEARCH HOSPITAL

Şükran Köse, Ayşe Özkan, Hazal Albayrak, Didem Deştioğlu, Bengü Gireniz Tatar

Izmir Tepecik Eğitim ve Araştırma Hastanesi

Thalassemia patients need to get multiple blood transfussion during life time. That increases the risk of enfections caused by blood transfussions, such as hepatitis B, hepatitis C and HIV.

According to datas from Turkish Hematologia Association, there are 1.300.000 thalasemia minor patients and 4.500 thalasemia major patients in our country. We had aimed to determinate seroprevalance of Hepatitis B,C and HIV on adult and pediatric patients whom follow up our hematologia clinics.

METHOD: Our study consists of patients' informations who applied our hematologia clinic between years 2007-2016, includes age, sex, transfussion story and viral test results. We had studied retrospectively on that datas. We used ELISA(Liaison, Diasorin, Italy) method to study HBsAg, AntiHBs, AntiHCv, AntiHIV.

RESULTS: We had detected 284 thalasemia major patients in our hospital. 141(%49.6) of them are female and average age is 45. There is at least one blood transfussion story in their lifetime. 4 (%1.4) patients of them have possitive

HbsAg result and 3 (%1.05) patients of them have possitive AntiHCV results, and only 1 (%0.3) patients of them have possitive AntiHIV results. Negative AntiHbs test results determined on 58 (%20.4) patients. We couldn't add informations of AntiHBc IgG possitivity.

CONCLUSSION: Thalassemia patients are in high risk groups for infections of hepatitis B,C and HIV. According to our study, we detected that there is no difference of seroprevalance between thalassemia patients and healthy community. On the result of this study; We aim to take attentions of health-worker to vaccination for AntiHbs negative thalasemia patient, and importance of close examinations.

1.Information of talasemia patients

GENDER	n(%)
Female	141
Male	143
SEROLOGICAL MARKER	
HBsAg positive	4 (1.4)
Antı-HBs positive	226 (79.5)
Antı- HBs negative	58 (20.5)
Anti- HCV	3 (1.05)
Antı-HIV	1 (0.3)

PP-105

WORK HEALTH AND SAFETY RISK ASSESSMENT FOR DIFFERENT OCCUPATIONAL GROUPS WORKING IN BLOOD TRANSFUSION CENTER, FACULTY OF MERAM MEDICINE NECMETTIN ERBAKAN UNIVERSITY

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OBJECTIVE: Determination of occupational health and safety risks that faced in the work environment of employees in the Blood Transfusion Center in the Faculty of Meram Medicine, Necmettin Erbakan University.

METHODS: Risk analysis results have been expressed with graphics. Employees in the Blood Transfusion Center have been assessed in terms of four different vocational categories and interprofessional risk differences have been revealed. Risk analysis have been made by occupational health and safety specialist.

RESULTS: Employees are at risk with most blood and blood products. Hazards will caused without distinction interprofessional to employees of physical risk factors is lesser. Encounter with communication and psychosocial risks of employees is demonstrated varies between occupational groups. Ergonomic risks is make up different health and safety risks are according to the quality of the work performed.

CONCLUSIONS: Identification of the risks faced by workers in work life and the implementation of preventive actions will has been decrease significantly occupational accidents,occupational diseases and deaths.. Measures to be

taken against the identified risk significantly will have been reduced the effects of an accident or occurring occupational disease.

PP-106

HISTORICAL DEVELOPMENT OF BLOOD BANKING IN MILITARY MEDICINE IN TURKEY

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Blood banking, which is one of the most important elements of the healthcare system, has developed through history and reached the present state. “Blood”, which is especially required during wars, has held a significant place during the development process.

Within the scope of blood banking in the world, it is stated that a blood transfusion center has been established for the first time 1921, under the name of “Blood Transfusion Service” in London. Then, the small scale enterprises established in the United States of America (USA) in 1928 have left their places to large and organized structures named “Blood Banks” in 1938. It is stated that the first blood bank has been opened in 1937 at the Chicago Cook County Hospital in USA.

On this subject, İsmail Kâzım Gürkan, one of the intern medical lieutenants of Gülhane in Turkey, has published a brochure regarding blood donation for the first time. Prof. Dr. İsmail Kâzım Gürkan, who has become a faculty member at the Istanbul University Cerrahpaşa School of Medicine in the following years, has emphasized the need to collect blood and store it in order to be used when needed, with respect to blood banking.

In the letter, dated December 6, 1948, sent to the Turkish Red Crescent Society by the Ankara School of Medicine Deanship, in line with the highly important decision and request of the Military School of Medicine Board of Professors; it is stated, “We are delighted to notify that Blood Donation Center and Blood Bank is established at the Military School of Medicine in Ankara, with the authorization of the Ministry of Defense Health Affairs Department Presidency, in order to meet the blood needs of military and civilian patients in peace and the injured during war” and it is emphasized that blood banking has started before December 1948 in military medicine. In this respect, Mr. Bedii Nuri Şehsuvaroğlu also states that a Blood Bank was available at the Cebeci Hospital since 1945.

For the development of blood banking in Gülhane, Dr. Kazım KURTAR has been sent to the USA by the Ministry of National Defense for two years, between April 07, 1956 and May 08, 1958, in order to advance his knowledge and experience.

Blood supply at the Gülhane Military Medical Academy School of Medicine Blood Bank has been conducted in accordance with the “Continual Instructions for Emergency and Collective Blood Supply” issued by the Garrison Command and the Gülhane Military Medical Academy Command’s “Continual Instructions to Meet Blood Demands”. Blood has been collected routinely, within a certain order, by the Blood Bank blood collection team considering the “TT 8-255 Instructions for the Operation Methods of Military Blood Centers” issued on December 24, 1966, and the principles of the World Health Organization in this respect.

The Gülhane Blood Center has been last restructured in 1967, by the resolution of the board of professors dated August 17, 1967 and numbered 33-67, and continues its activities as the Gülhane Periodical Regional Blood Center as per the Blood and Blood Products Law, published in the Official Journal dated 02.05.2007 and numbered 26510, within the periods defined by the Ministry of Health.

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RELATIONSHIP BETWEEN TURKISH ARMED FORCES AND TURKISH RED CRESCENT IN TURKISH BLOOD BANKING

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It is known that the contribution of Soldiers serving in the Turkish Armed Forces (TAF) holds an important place during the historical process in the supply of blood that is of vital significance for human life.

In the Commission Report on Blood Transfusion of the Red Crescent society dated 1948, it has been stated that the best donors would be strong and sturdy individuals of 20-40 years of age and individuals of such characteristics could be found as many as needed among soldiers, with regards to donor supply. It is also expressed in the same report that it is also possible to give such individuals a leave for 15-20 days in order to take 250-500 gr of blood.

It is quite apparent that the TAF has received great support from the Turkish Red Crescent during the efforts of the TAF to establish the first blood bank. Any regulations had not been issued regarding the establishment and maintenance of an organization that will arrange for the blood transfusion activities during that period. At the same time, it is also advised that it was not quite possible to find blood that would be adequate for the poor patients because there was no general heal insurance. Transfusion could only be applied to wealthy individuals in return for a large amounts as 20 TL on the average (according to the monetary value in 1940). Therefore, a donation of 5000 TL has been made, so as to be under the control of the floating capital of the Military Medical Academy, in order to pay for the cost of blood to be collected from paid donors so that blood could also be given to poor patients. In addition, in the report that the Turkish Red Crescent Society General Central Board has presented at the 1949 congress, it has been stated that 5000 TL has been donated during 1948 to the Blood Bank and Blood Transfusion Center established at the Military Medical Academy in Ankara, in order to be spent when needed. Then, in the report presented during the 1950 congress, it has been stated that 2500 TL more has been allocated to the Blood Bank and Blood Collection Center, and in the 1951 congress, it has been stated that 5000 TL more has been allocated, in addition to the earlier aids.

When the statistical data obtained regarding blood donation and donor supply are examined, it is observed that the major supporters of the Red Crescent during the initial years have been the rank and file (Table-1). Meanwhile, it is stated that almost all of the donors in 1957 were soldiers. Although soldiers constitute the majority of the donors during the initial years, it is stated that 95% of the collected blood was used by civilians and 5% by soldiers.

Table-1 Blood Donation Figures

Year*	Civilian	Soldier	Total	Ratio of Soldier Donors
1957			**3.997**	
1958			**21.324**	
1959			**24.733**	
1960			**30.167**	
1961			**41.746**	
1962			**47.082**	
1963			**60.116**	
1964			**68.271**	
1965			**73.500**	
1966			**83.375**	
1967			**87.802**	
1968			**105.774**	
1969			**107.913**	
1970			**125.029**	
1971			**103.170**	
1972			**113.889**	
1973			**136.547**	
1974			**117.951**	
1975			**127.647**	
1976			**125.646**	
1977			**135.437**	
1978			**150.780**	
1979			**157.104**	
1980			**190.207**	
1981	38.039	124.901	**162.940**	76,65%
1982	42.754	161.787	**204.541**	79,10%
1983	73.593	183.066	**256.659**	71,33%
1984	75.665	211.796	**287.461**	73,68%
1985	75.514	223.139	**298.653**	74,72%
1986	72.777	224.801	**297.578**	75,54%
1987	102.750	212.381	**315.131**	67,39%
1988	158.192	183.767	**341.959**	53,74%
1989	135.774	203.650	**339.424**	60,00%
1990	173.442	217.074	**390.516**	55,59%
1991	195.489	205.059	**400.548**	51,19%
1992	221.376	191.517	**412.893**	46,38%
1993	229.238	178.653	**407.891**	43,80%
1994	243.845	216.172	**460.017**	46,99%
1995	245.265	194.954	**440.219**	44,29%
1996	261.872	200.043	**461.915**	43,31%
1997	253.501	203.739	**457.240**	44,56%
1998	247.910	192.120	**440.030**	43,66%
1999	258.097	170.185	**428.282**	39,74%
2000	194.720	152.271	**346.991**	43,88%
2001	216.630	144.676	**361.306**	40,04%
2002	185.503	140.834	**326.337**	43,16%
2003	183.613	129.123	**312.736**	41,29%
2004	197.815	107.509	**305.324**	35,21%
2005	263.085	79.061	**342.146**	23,11%
2006	394.363	107.739	**502.102**	21,46%
2007	473.646	119.319	**592.965**	20,12%
2008	539.147	114.934	**654.081**	17,57%
2009	713.847	134.739	**848.586**	15,88%
2010	920.023	94.493	**1.014.516**	9,31%
2011	1.175.080	101.132	**1.276.212**	7,92%
2012	1.385.043	84.764	**1.469.807**	5,77%
2013	1.565.258	75.620	**1.640.878**	4,61%
2014	1.795.084	65.174	**1.860.258**	3,50%
2015	1.885.357	52.575	**1.937.932**	2,71%

* In the blood donation figures of 1980 and before, civilian and soldier distinction statistics are not available.

In the TAF, which was one of the major supporters of the Red Crescent with respect to blood donation and donor supply during the initial years, it is observed that the Esteemed Chief of General Staff General Cemal TURAL, Commander of Naval Forces Admiral Necdet URAN, National Security Board General Secretary General Kemalettin GÖKAKIN, Commander of the 1st Army General Memduh TAĞMAÇ, Commander of the 2nd Army Lieutenant General Nazmi KARAKOÇ, Commander of the 3rd Army Fikret ESEN and the other commanders have supported these initiatives by making written statements within the scope of the "Red Crescent Blood Program Activities" in 1967, as well as getting involved in activities aimed to increase the motivations of the soldiers under their command.

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TRANSFUSION PRACTICES AND DEVELOPMENT IN TURKEY

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Blood has been mystical and fascinating for mankind since the antique ages. In 1615, Libavius has described a transfusion method that is similar to the present method. Meanwhile, positive developments have started after William Harvey has discovered blood circulation in 1916 and incorporated it into medicine.

There is no other treatment that is able to treat the symptoms caused by acute blood loss, which leads among transfusion indications, better than blood transfusion. Therefore, transfusion of blood or blood products holds a significant place in our day. Mehmet Yardımcı, Fethi Tezok and Halit Kamgözen, who have presented the "Report on the Fifth International Transfusion Congress" in 1955, have stated that blood transfusion is a matter that concerns all world countries, and it has been expressed in the papers of all countries who participated in the congress that blood has lifesaving and curative effects in peace and especially during war.

Nihat Artunkal expresses that while blood transfusion in the war field in works written prior to World War I is merely a delusion and was impossible to apply in practice, it is understood from the written works that transfusion has been accomplished with success by the French Army during the aforementioned war. Meanwhile, during World War II, the British and the American armies have sent the bloods they had previously prepared in their countries to the war surgeons at the farthest point of the front during the war and ensured transfusion.

Meanwhile, transfusion activities in Turkey have been started by Ord. Prof. Dr. Burhanettin Toker in 1921 in Cerrahpaşa, and by Operator Dr. Ömer Vasfi Aybar in 1923 at the Ankara Numune Hospital. Toker states that he has made transfusion with the "Oehlecker" instrument in 1927, and subsequently the American-made "Persi" instrument.

Blood transfusion, which was used for treatment purposes during World War I, has been applied on many cases for preventive porpoises (treatment preventing the development of diseases) and numerous times as preoperative in cases that were not suitable for surgery during World War II. It is expressed by Burhaneddin Osman Tugan that blood transfusion has started to be applied at Gülhane as of 1935, with the transfusion instrument (Blood Transfusion Instrument of Dr. Jouvelet and Henyr) donated by the Turkish Ambassador Mr. Fethi in London.

In the 1947 Instructions of the Gülhane Military Medical Academy, under the sub-heading "Military Coursed to be

taught at the Military Medical Academy" of heading XXIV, it has been stated that blood and plasma transfusions will be taught within the "War Surgery" course, in various health troops as revival measures and practices.

In the "Commission Report on Blood Transfusion" of the Red Crescent Society dated 1948, it has been stated that the number of donors would be increased over time by announcements and propagandas to be made to the public, it will be possible to collect blood by recording the data of the donors and store it at (+)5-6 degrees at transfusion centers, and use it when needed or ensure direct transfusion by sending to the bed of the patient when needed.

Today, the transfusion practices are conducted in line with the "Blood and Blood Products Law", published in the Official Journal dated 02.05.2007 and numbered 26510, the "Blood and Blood Products Regulation" that has been prepared as based on this law and published in the Official Journal dated b04.12.2008 and numbered 27074, and the techniques set forth in the National Blood Guide.

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