


HEART TEAM EDUCATION ASSOCIATION

Patient Blood Management Cardiac Surgery Perspective

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Disclosures

Project Consultant

- Terumo Cardiovascular, Ann Arbor, MI, USA
- Essential Pharmaceuticals, NC, USA
- Advancis Surgical, Nottinghamshire, UK
- Spectrum Medical, Fort Mill, SC, USA
- Gish Biomedical, Buena Vista, CA, USA
- Livanova International

Honorarium/Travel

- Dr. Franz Köhler Chemie
- CSL Behring
- Liva Nova, International
- Pfizer Turkey
- Abdilbrahim Pharma, Turkey

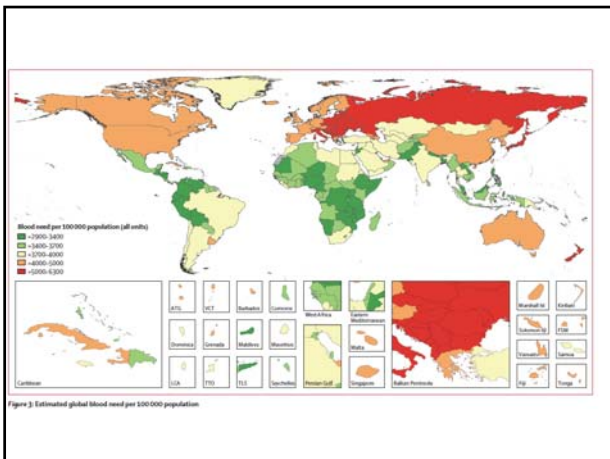
International Society

- International Society for Minimally Invasive ECC, Executive Member
- CREF- Cardiothoracic Research & Education Foundation, USA, Board Member
- Heart Team Education Foundation, President- Senior Scientific Advisory Board

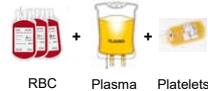
NO CONFLICTS OF INTEREST

All studies presented here are performed in an independent setting

Visiting Lecturer/Cooperation

Availability - Existing Gap in Blood Product Units



RBC + Plasma + Platelets


Need > Supply

119

Of 195 countries (61%)

Need-to-supply ratio 1.12

Global Need: 305M units
Global Supply: 272M units



Data available by country
World Wide

"The global need and availability of blood products: a modelling study" (Roberts et al., 2019)

META-ANALYSIS

OPEN

Multimodal Patient Blood Management Program Based on a Three-pillar Strategy
A Systematic Review and Meta-analysis

- Meta-Analysis of 17 studies with **235779** patients
 - ✓ Pre-PBM: 100886 patients
 - ✓ PBM: 134893 patients
- Outcome:
 - ✓ RBC transfusion rate
 - ✓ RBC units transfused
 - ✓ Hospital LOS
 - ✓ Adverse outcomes
 - ✓ Mortality

Althoff F. C. et al. Ann Surg (2019) 269: 794

TABLE 1. Benefits of Patient Blood Management

	Change	P	Number of Patients
Transfusion rate	-39%	<0.00001	207,006
RBC unit per patient	-0.43 unit	<0.00001	216,657
Hospital LOS	-0.45 day	<0.00001	219,850
Major complications	-20%	<0.00001	214,298
Acute renal failure	-26%	<0.00001	166,955
Infection rate	-9%	<0.03	192,987
Thromboembolic events	-25%	<0.00001	170,189
Mortality	-11%	<0.02	221,528

LOS indicates length of stay.

Original Article

The Effect of the Perioperative Blood Transfusion and Blood Conservation in Cardiac Surgery Clinical Practice Guidelines of the Society of Thoracic Surgeons and the Society of Cardiovascular Anesthesiologists upon Clinical Practices

- **1,061 institutions returned with a 32% response rate**
 - 78% of anesthesiologists and 67% of perfusionists reporting having read all, part, or a summary of the Guidelines
 - 20% of reported that an institutional discussion had taken place as a result of the Guidelines
 - 14% reported that an institutional monitoring group had been formed
- **26% reported one or more practice changes in response to the Guidelines**
 - The changes made were reported to be highly (9%) or somewhat effective (31%) in reducing overall transfusion rates
 - Only 4 of 38 Guideline recommendations were reported by more than 5% of respondents to have been changed in response to the Guidelines

- a perceived lack of evidence
- a lack of awareness of the guidelines
- logistic issues related to the blood supply
- institutional dogma/policies that are based on economic considerations

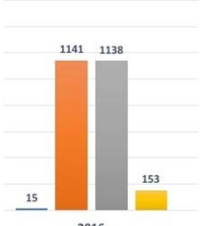


FOUNDATION	1881
BEDS	1140
DISCIPLINES	38
STAFF	4215
OUTPATIENT/YEAR	1.768.649
OPERATION/YEAR	55.469
TOTAL RBC UNIT /YEAR	34.881

CARDIOVASCULAR SURGERY


	A-C GROUP OP (n)	D-E GROUP OP (n)	OUTPATIENTS (n)	TOTAL
2015	857	461	34.445	1318

14 BEDS
5 ICU
1 OR



**BUILDING A PBM PROGRAM
NUMUNE TRAINING & RESEARCH
HOSPITAL- ANKARA
TEAM**

- CEO/Chief Physician
- Cardiovascular Surgeon
- Anesthesiologist
- Intensivist
- Perfusionist
- Nurse (ICU/Ward)
- Hematologist
- Cardiologist
- Blood Bank
- Hemovigilance Team
- Pharmacy
- Hospital Technologies Assessment Team



BUILDING A PBM PROGRAM NUMUNE TRAINING & RESEARCH HOSPITAL- ANKARA PREOPERATIVE

- 2016-October
- Education
- Transfusion Log
- IV Limitation
- Revision & Adaptation of Current Guidelines
- Cooperation with Cardiology
- Treatment of Anemia
 - ✓ Iron carboxymaltose

BUILDING A PBM PROGRAM NUMUNE TRAINING & RESEARCH HOSPITAL- ANKARA PEROPERATIVE

- Goal-directed coagulation
- Goal-directed perfusion
- Minimally Invasive Surgery
- Tranexamic Acid
- DDAVP
- Cerebral/Somatic Oximetry
- Design of ECC Circuitry (Integrated Filter)
- Customized Minimally Invasive ECC
- RAP
- VAVD
- Ultrafiltration
- Cell saver



Routine TXA:

- Slow IV Bolus- 20 mg/kg following induction of anesthesia
- Maintenance: 2 mg/kg/h infusion (until discharge from OR)

DDVAP:

- 0.4 mcg/kg- Off-pump

Fibrinogen Concentrate

- <1.5g/l (bleeding off-pump)



Novel Ultrafiltration Technique for Blood Conservation in Cardiac Operations
Serdar Guzelcilar, MSc, and Terence Gosselin, PhD

Original Paper

Comparative evaluation of blood salvage techniques in patients undergoing cardiac surgery with cardiopulmonary bypass

Serdar Guzelcilar,¹ Craig Robertson,² Ali Baran Budak¹ and Terence Gosselin¹

Abstract
Background: The primary objective of this study was to test and compare the efficacy of currently available intraoperative blood salvage systems in a demonstration of the level of return percentage conservation of red blood cells (RBC), when blood cells (RBC) are available (RA) to the patient.

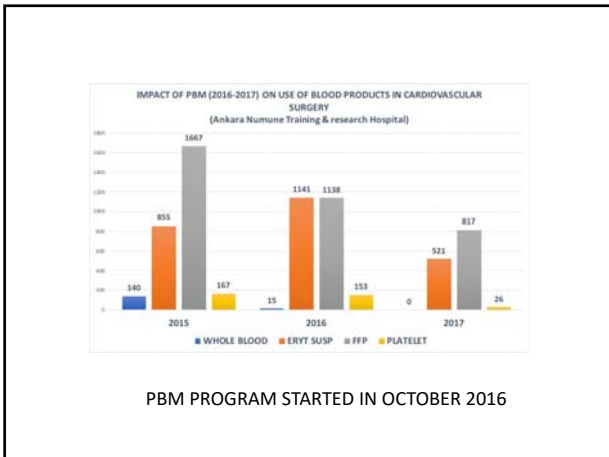


BUILDING A PBM PROGRAM NUMUNE TRAINING & RESEARCH HOSPITAL- ANKARA POSTOPERATIVE

- Goal-directed coagulation
- Transfusion Log
- IV Limitation
- Fibrinogen Concentrate

CARDIOVASCULAR SURGERY CASELOAD

	A-C GROUP (n)	D-E GROUP (n)	OUTPATIENTS	MORTALITY	TOTAL
2015	857	461	18623	4.3%	1318
2016	1404	1386	18658	3.1%	2790
2017	1827	3840	23537	2.8%	5667
2018	401+295+600 (1296)	2204	25396	2.9%	3500



CARDIOVASCULAR SURGERY

Decrease in Tx (vs 2015)

	2016	2017
GENERAL (%)	2,80	55
/A-C GROUP OP (%)	31	65

COST-EFFICIENCY (TL)

	2015	2016	2017
ENDORSEMENT (TL)	8,168,714	8,576,899	11,245,248
INVOICE (TL)	9,002,283	9,570,328	13,588,902
DISPOSABLES	5,202,018	4,697,240	4,355,299

-219,734 TL
5.06%

42 CABGX3

Table 3. Perioperative Outcome

	Blood Conservation Group 1	Control Group 2	P
Duration of CPB, min	90.4 ± 46	92 ± 42	.98
Duration of x-clamp, min	54.4 ± 16	62.2 ± 17	.94
t-intub, h	12.4 ± 7*	16.8 ± 8	.044
Postop hemorrhage, mL	545 ± 50*	775 ± 55	.046
Blood transfusion, unit	1.7 ± 1*	3.05 ± 1	.015
Inotropic support, n	75(37.8%)*	115 (56%)	.017
ICU stay, day	2.2 ± 1.1*	3.5 ± 1.2	.045
Hospital stay, day	6.4 ± 3	7.5 ± 4	.065
Mortality, n	-	2	.24

The Heart Surgery Journal 2017;17(2)
10 (5), 2017 204-October 2017
doi:10.1155/152796.2017.17(2)

Online address: <http://www.hsjournal.com>

A Cardiopulmonary Bypass Based Blood Management Strategy in Adult Cardiac Surgery

Ali Baran Budak, MD,¹ Kevin McCusker, MD,² Serdar Gunaydin, MD³

¹Numune Training & Research Hospital, Ankara, Turkey; ²New York Medical College, Valhalla, NY, USA

ABSTRACT

Background: Despite the recent introduction of a number of mechanical and pharmacologic blood conservation measures, bleeding and allogeneic transfusion remains persistent problems in open-heart surgical procedures. Efforts should be made to decrease or completely avoid transfusions to avoid these negative reactions.

Methods: Our coronary artery bypass grafting database was reviewed retrospectively and a total of 341 patients who underwent cardiac surgery with cardiopulmonary bypass (CPB) were enrolled in a 12-month period (January-December

there is evidence on the activation of inflammatory genes and cytokines in circulating leukocytes with transfusion of red blood cells [Ezrahar 2007]. Efforts should be made to decrease or completely avoid transfusions to avoid these negative reactions.

In an effort to reduce the negative impact of CPB on the adult population outcome, the minimized systems were developed to significantly reduce the hemolysis of the patient and reduce the foreign surface area that causes in contact with the patient circulating blood volume. Reducing the size of the perfusion apparatus has two obvious and immediate effects: first, a reduction in the contact surface

European Review for Medical and Pharmacological Sciences 2017; 21: 1074-1079

A structured blood conservation program in pediatric cardiac surgery

A.B. BUDAK¹, K. MCCUSKER², S. GUNAYDIN³

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²Numune Training & Research Hospital of Ankara, Ankara, Turkey

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 http://dx.doi.org/10.5606/tjtc.dergisi.2020.19701

Review / Derleme

Building a patient blood management program in a large-volume tertiary hospital setting: Problems and solutions

Büyük ölçekli hastane düzeyinde hasta kan yönetimi programının oluşturulması: Sorunlar ve çözümleri

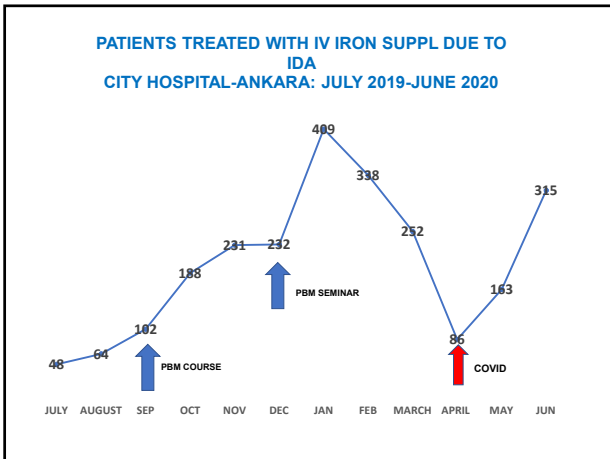
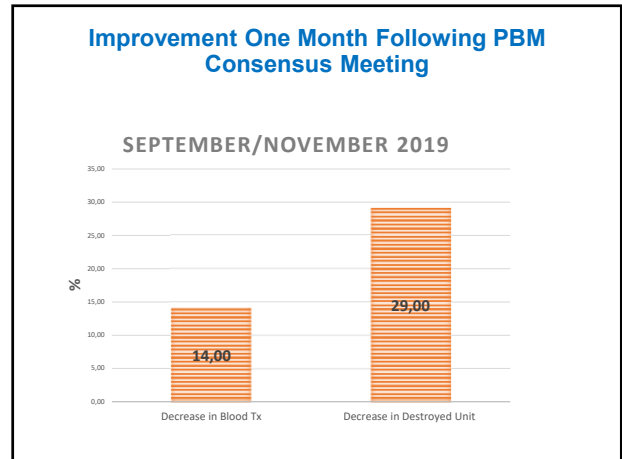
Serdar Güneşaydın¹, Şahin Donat^{2*}, Karan Özgök³, Ash Demir⁴, Gökkan Aştan⁵, Doğan Ersoy Serit⁶, Hale Bozbatı⁷, Ali Şampiyon⁸, Dilek Kazancı⁹, Arnel Boko Kleçli¹⁰, Şerif Alp Kuçuker¹¹, Ümit Kervan¹², Mehmet Ali Özaltın¹³

Institution where the research was done:
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⁷Department of Health Care Services, Nursing Unit, Ankara City Hospital, Ankara, Turkey

ABSTRACT
 Successful implementation of a patient blood management program necessitates the collaboration of a strong organization and a multidisciplinary approach. We organized a meeting with broad participation in our center to establish a consensus for implementation of a specific patient blood management

ÖZ
 Hasta kan yönetimi programının başarılı bir şekilde uygulanması, güçlü bir organizasyon iş birliği ve multidisipliner bir yaklaşım gerektirir. Merkezimizde spesifik bir hasta kan yönetimi programının uygulanmasına yönelik bir konsensus oluşturmak amacıyla geniş katılımli bir toplantı



Türkiye'de Kan Transfüzyon Yönetim Sisteminin Geliştirilmesi İçin Teknik Yardım Projesi

Technical Assistance for Improving the Blood Transfusion Management

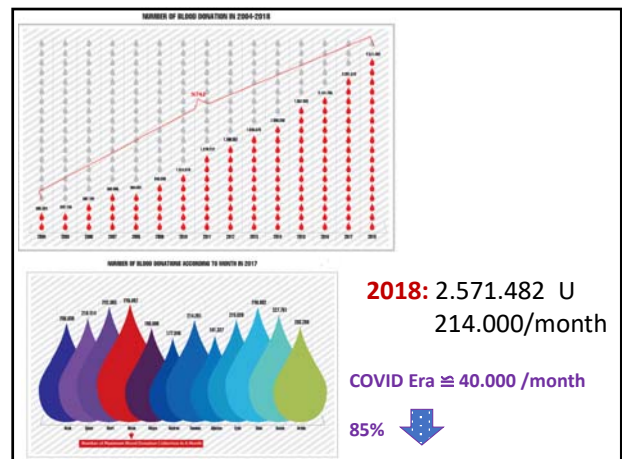
- 22 National Societies
- 6 Guidelines
- Perioperative-ICU-Ob&Gyn-Pediatrics-Massive Tx-Internal Medicine

Blood Demand/Supply Balance in Turkey

- Turkish Red Crescent Directorate General of Blood Services continues its activities in the field of blood services with 18 Regional Blood Centers, 67 Blood Donation Centers, 54 Blood Collection Units and mobile teams located all around Turkey
- For 2018, the blood donation target was determined to be 2,501,000 units in total
- The realization of the targets
 - ✓ 103% for blood donation target by collecting 2,571,482 U of blood
 - ✓ 82% --- 1,209,048 U FFP
 - ✓ 110% --- 244,436 U Pooled Platelet
 - ✓ 107% --- 39,762 U Apheresis Platelet

In 2018, the country's blood need was 3,005,641 units and Turkish Red Crescent responded 88% of this need.

Turkish Red Crescent	2,571,482
Transfusion Centers	129,246
Temporary RBC	304,913
Blood Need for 2018	3,005,641



QUANTITIES OF PRODUCTS PROVIDED FOR SERVICE IN 2018						
	APHERESIS	ERYTHROCYTE SUSPENSION	FRESH FROZEN PLASMA	POOLED PLATELET	FULL BLOOD	TOTAL
MIDDLE ANATOLIA RBC (ANKARA)	5.188	269.317	144.070	34.053	421	453.948
WESTERN ANATOLIA RBC (SAGHMER)	118	76.702	34.374	8.219	0	139.213
CENTRAL ANATOLIA RBC (KAYSERI)	93	77.816	15.895	3.375	0	130.009
EASTERN MEDITERRANEAN RBC (GAZIANTEP)	86	155.958	87.112	13.276	0	256.032
SOUTHWESTERN ANATOLIAN RBC (MALATYA)	0	56.673	43.349	2.189	0	102.210
CENTRAL MEDITERRANEAN RBC (ADANA)	5.946	277.942	120.247	13.547	0	317.322
EASTERN ANATOLIA RBC (DYARBAKIR)	0	49.396	27.735	5.899	0	102.850
EUROPE RBC	9.962	265.717	195.188	52.115	0	620.989
NORTH MARMARA RBC	3.340	187.851	11.403	28.419	0	251.419
WESTERN BLACK SEA RBC (SIVRICE)	85	138.778	12.913	12.247	0	203.871
SOUTHERN MARMARA RBC (BURSA)	49	150.545	16.287	14.854	0	221.155
AGSIAN RBC (IZMIR)	10.179	200.777	95.798	14.763	1	305.511
SOUTHERN AGSIAN RBC (DENIZLI) *	2.709	87.022	27.435	4.738	0	121.896
WESTERN MEDITERRANEAN RBC (ANTALYA)	152	129.891	64.444	4.097	0	302.104
EASTERN ANATOLIA RBC (ERZURUM)	1	41.418	19.381	3.263	7	64.900
SOUTHEASTERN RBC (VAN)	0	32.841	13.146	2.726	0	48.813
EASTERN BLACK SEA RBC (TRABZON)	848	64.078	28.449	5.148	0	96.517
CENTRAL BLACK SEA RBC (DAMLAZI)	487	86.404	21.293	5.508	0	140.648
GRAND TOTAL	86.463	2.446.135	1.151.776	235.483	429	6.876.288

	UNIT	TL	CABGX3 (N)
ES	2.446.135	794.993.875	100.000
FFP	1.151.776	120.256.877	15.032
POOLED PLT	235.483	113.031.840	14.128
TOTAL		1.028.282.592	129.160

REASONS OF ERYTHROCYTE SUSPENSION DISPOSALS												
Disposal (U)	2016				2017				2018			
	Not Potable	Expiration	Mixing	Other	Not Potable	Expiration	Mixing	Other	Not Potable	Expiration	Mixing	Other
ES	49.453											
FFP	45.856											
POOLED PLT	9.400											
TOTAL												

Disposal (U)	Main Reason: (Hemolysis, Clot, Lipid, Quality, Bag, Suspicious verification)	CABGX3 (N)
	ES	
FFP		600
POOLED PLT		564
TOTAL		3174

PBM PROGRAMS	EFFICIENCY (DECREASE)
ANKARA NUMUNE TRAINING & RESEARCH HOSPITAL (SURGICAL CLINICS)	2.87% (2017-2018)
ANKARA CITY HOSPITAL	14% (2019 SEP-2020 JAN)

In 2018, the country's blood need was 3,005,641 units and Turkish Red Crescent responded to 86% of this need.

Source	Units
Turkish Red Crescent	2,571,482
Transfusion Centers	129,246
Temporary RBC	304,913
Blood Need for 2018	3,005,641

TURKEY	PROJECTED DECREASE
BLOOD NEED	86.261 (2.87%)
	420.798 (14%)

	UNIT	TL	CABGX3 (N)
ES	2.446.135	794.993.875	100.000
FFP	1.151.776	120.256.877	15.032
POOLED PLT	235.483	113.031.840	14.128
TOTAL		1.028.282.592	129.160

TURKEY	PROJECTION	CABGX3(N)
COST DECREASE	29.561.000 (2.87%)	3695
	144.200.000 (14%)	18025

➔ **1/4 OF ALL OPEN HEART SURGERY IN TURKEY**

PBM IN COVID ERA

Preoperative Specific Features of COVID-19 Patients Undergoing CPB

- High-risk cases
- Deranged laboratory levels in a COVID-19 patient
- Hypercoagulability
- Hyperinflammation
- Associated Disorders

Tweet

Andreas Steinmayr @a_steinmayr

"By one estimate, the COVID-19 literature published since January has reached more than 23,000 papers and is doubling every 20 days"

If we don't flatten the curve, there will be about 50 million COVID papers by the end of the year.

Scientists are drowning in COVID-19 papers. Can new tools keep them afloat? sciencemag.org

1057 Studies found for COVID

- ClinicalTrials.gov: Federally-funded clinical studies related to COVID-19
- WHO Trial Registry Network: COVID-19 studies from the ICTRP database
- CDC: Information for Clinicians on Therapeutic Options for COVID-19 Patients

Also searched for SARS-CoV-2. See Search Details

Showing 1-10 of 1,057 studies

ChemRxiv | Preprint | COVID-19: Attacks the 1-Beta Chain of Hemoglobin and Captures the Porphyrin to Inhibit Human Heme Metabolism

Estimation of the number of blood donors during the COVID-19 incubation period across China and analysis of prevention and control measures for blood transfusion transmission

Journal of Infection and Public Health

COVID-19 transmission and blood transfusion: A case report

Hee Joong Cho^{1,2}, Ji Wan Koo¹, Soong Ki Roh¹, Yu Kyung Kim¹, Jang Soo Suh¹, Joon Ho Moon^{1,3}, Sang Kyun Sohn^{1,3}, Dong Won Baek^{1,3,4}

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 http://tds.elsevier.com.tr/doi/10.5653/tjcs.2020.09076

Editorial Comment / Editorial Forum

Perioperative planning in the COVID-19 pandemic: Cardiovascular perfusion and device-related issues

COVID-19 pandemisinde peroperatif planlama: Kardiyovasküler perfüzyon ve cihazla bağlı sorunlar

Serdar Günaydin

Department of Cardiovascular Surgery, Ankara City Hospital, Ankara, Turkey

The COVID-19 pandemic puts health services, including cardiac surgery units, under escalating pressure. The Heart Team is confronted with a novel virus and disease which leads to a great uncertainty. However, the decision of the operation is inevitable which is deemed time-sensitive, as delaying the

LDH (2.1-fold), alanine aminotransferase (1.5-fold), aspartate aminotransferase (1.8-fold), total bilirubin (1.2-fold), creatinine (1.1-fold), cardiac troponin I (2.2-fold), D-dimer (2.5-fold), and procalcitonin (1.2-fold). Compared to healthy controls, prothrombin time activity was lower and thrombin time shorter.⁽²⁾

ECMO/ECLS IN COVID ERA

COVID-19 Cases on ECMO in the ELSO Registry

COVID-19 Suspected or Confirmed	COVID-19 Confirmed Cases	COVID-19 Mortality Rate
209	206	7/28 (25%)

Total counts of COVID-19 confirmed patients and count of COVID-19 suspected but not confirmed patients

COVID-19 ECMO counts by ELSO Chapter

North America	566
Europe	204
Asia Pacific	23
Latin America	20
SWAFC	15
Thailand/Indo	

COVID-19 Cases on ECMO in the ELSO Registry

COVID-19 Suspected or Confirmed	COVID-19 Confirmed Cases	COVID-19 Mortality Rate
838	825	132/276 (47%)

Total counts of COVID-19 confirmed patients and count of COVID-19 suspected but not confirmed patients

CPR - Resuscitating Delivery of Cardiac Surgery During the COVID-19 Pandemic

- Shared decision-making surrounding the risk of surgery
- Healthcare providers should be aware that their safety also remains a priority
- Comprehensive screening procedures
- Non-urgent patients waiting for prolonged periods prior to surgery are at risk for clinical deterioration or adverse events
- A phased approach is recommended to resuming elective surgery based upon each hospital's reexpansion capacity: Phase 1 reflects up to a 25%, Phase 2 a 25%-50% and Phase 3 a 50%-100% increase, or a return to normal institutional activity
- Efforts to escalate cardiac surgical volumes require regular communication between members of the cardiac surgical team, intensive care units, hospital administration, and public health officials
- Real-time quality assurance teams should be focused on monitoring COVID-19 transmission within cardiac surgery units, postoperative complications in the pandemic time period related or unrelated to COVID, deficiencies in hospital workflow, or other related quality issues

How To Organize A Patient Blood Management Program in COVID Era

Institutional Aspects

- Education: One voice one message
- Commission for the responsible use of blood products (NOT traditional hemovigilance) mandated by the Board of Directors via Medical Director
- Intelligent Blood Ordering System
- Monitoring and feedback system and acting data based
- Early testing of focus patients (RBC transfusion rate $\geq 10\%$ or expected blood loss ≥ 500 ml) for anemia and iron deficiency IT program for early detection of focus patients
- Early treatment aiming at a Hb ≥ 130 g/L and no iron deficiency (Ferritin ≥ 100 ng/ml and TSAT $\geq 20\%$) Algorithm
- Nomination of a Patient Blood Manager

Epilogue

- PBM needs to be implemented to avoid the individual and combined adverse effects of anemia, iron deficiency, blood loss and RBC transfusions
- PBM is highly efficacious
- Key elements of PBM are:
 - Pre- and postoperative anemia / iron deficiency treatment with iv iron and epoetin alpha (sc)
 - Meticulous surgical technique
 - Individualized POC and coagulation factor based goal-directed coagulation management
- Successful PBM implementation requires structural changes, logistic reorganizations and leadership with psychological skills and persistency

Thanks!!

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