Optimizing Blood Management in Cardiothoracic Surgery

Lucille Mazzetta, BAN, RN, CCRN, SRNA-DNP student
University of Iowa Hospitals and Clinics

Introduction

- Cardiac surgical procedures have become less invasive, leading to lower likelihood of blood transfusion but preoperative blood ordering practices have not changed[1].
- Over ordering of blood products increases costs of patient care and wastes scarce blood resources[1-3].
- Creating an evidence-based maximum surgical blood ordering schedule (MSBOS) improves appropriate ordering of blood products[1,2].

Purpose

Purpose: To optimize the blood ordering process for cardiothoracic surgeries at the University of Iowa Hospitals and Clinics (UIHC)

- Objective 1: To develop a maximum surgical ordering schedule (MSBOS) for cardiothoracic surgical procedures.
- Objective 2: To implement the cardiac MSBOS at UIHC
- Objective 3: To decrease the crossmatch to transfusion ratio (C:T) for cardiothoracic surgical services at UIHC by 50% six months after implementation of the MSBOS.

Methods

Project was deemed not human subjects research

Initial data obtained for cardiothoracic procedures ('19-'20)*:
- Procedure type
- Surgeon
- Estimated blood loss (EBL)
- Disposition (transfused, returned, wasted, released)
- Date of procedure
- Medical record number (MRN)

→ Data then categorized by surgical procedure and analyzed for:
- % transfused
- Median EBL
- Transfusion index
- Risk for major bleeding
- ≥ 4 units in > 10% of patients

→ MBSOS with procedure specific blood ordering recommendations based on Frank's algorithm using this institution specific data[1]

- *Excluded data: surgeons no longer at UIHC, pediatric cases, and vascular procedures

Outcomes

Cardiac: Recommendations for Preoperative Blood Orders and Erythrocyte Transfusion Data

Case Category	Recommendation	n	% Transfused	Median EBL	Transfusion Index	Risk of Major Bleeding	C:T ratio	≥4U in >10%
Transplant-Heart	4U	13	76.92%	500	8.23	Yes	1.43	Yes
Transplant-Lung	2U	31	51.61%	500	1.23	Yes	4.00	No
Minimally invasive valve	2U	144	3.47%	0	0.06	Yes	40.25	No
CABG and Valve	2U*	429	31.47%	0	1.02	Yes	3.38	Yes
Assist Device VAD	2U	34	35.29%	0	2.59	Yes	1.83	No
Assist Device impella/IABP/ECMO	4U	54	42.59%	50	1.43	Yes	3.83	Yes
Cardiac Major Vascular	4U	78	51.28%	0	2.44	Yes	2.62	Yes
ASD or VSD	4U	7	28.57%	0	0.43	Yes	9.33	Yes
Pericardium	2U	16	6.25%	0	0.06	Yes	40.00	No
Pacemaker/ICD	T&S	52	5.77%	25	1.04	No	3.56	No

Thoracic: Recommendations for Preoperative Blood Orders and Erythrocyte Transfusion Data

Case Category	Recommendation	n	% Transfused	Median EBL	Transfusion Index	Risk of Major Bleeding	C:T ratio	≥4U in >10%
Esophageal	2U	106	7.55%	10	0.15	Yes	14.13	No
Sternal	2U	40	22.50%	0	0.40	Yes	7.88	No
Chest Wall	2U	36	8.33%	13.75	0.19	Yes	12.00	No
Thoracotomy-pneumonectomy	4U	8	12.50%	150	0.50	Yes	5.00	Yes
Thoracotomy all other procedures	2U	145	12.41%	25	0.32	Yes	8.15	No
Thorascopy	2U	322	4.35%	0	0.07	Yes	29.57	No
Mediastinoscopy	T&S	19	0.00%	0	0.00	Yes		No
Mediastinal exploration/washout	4U	53	58.49%	0	2.72	Yes	2.68	Yes
Scope procedures	T&S	17	5.88%	5	0.06	No	40.00	No

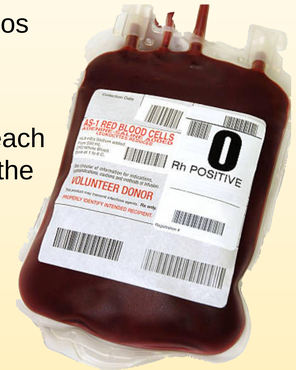
Tranfusion index = total number of RBC units transfused divided by total number of patients
EBL = estimated blood loss; T&C = type and cross; C:T = crossmatch to transfusion
≥ 4 U in > 10% = 4 or more units were transfused for more than 10% of patients for that procedure
Grey box represents areas where C:T was unable to be calculated because 0 units were transfused

Evaluation

- 15 major categories with 40 subcategories of cardiothoracic surgical procedures are being performed at UIHC
- The categorization process was tedious and required surgical experts
- Almost all cardiothoracic procedures had a C:T above 2 indicating inefficient blood utilization
  - Transplants, assist devices, and cardiac/major vascular procedures had C:T ratios all only slightly above 2
  - Minimally invasive valve, pericardial, and scope procedures had C:T ratios of 40 or greater
- Opportunities exist to collaborate with postoperative inpatient blood management efforts
- Lack of EBL charted for most patients making calculations difficult
- Recommendations do not consider patient specific co-morbidities

Conclusions

- Data analysis revealed areas for improvement and areas of appropriate preoperative T&C ordering
- This MSBOS offers practitioners a reference when ordering preoperative lab work and blood products.
- Data and recommendations presented to cardiothoracic surgical team so order sets can be adapted to recommendations
- Implementation will improve C:T ratios and decrease RBC waste and unnecessary laboratory testing
- C:T ratios should be monitored for each procedures after implementation of the MSBOS and adjustments made
- Future projects can create MSBOS recommendations for other surgical specialties at UIHC



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