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PEARLS OF LABORATORY MEDICINE

Patient Blood Management

Ryan A. Metcalf, MD, CQA(ASQ)

University of Utah and ARUP Laboratories

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CCTC Clinical Chemistry Trainee Council

Patient Blood Management (PBM)

- What is it?
  - Rationally optimizing anemia and hemostasis
  - Goal of restricting (optimizing) blood component use
- Why do we care?
  - Blood transfusion = most common procedure[1]
  - Top five most overused[2]
  - Standard of care[3]

Value = Quality / Cost

Decline in transfusions in US[4]

- 2008: ~15 million RBC units transfused
- 2015: 11.3 million RBC units transfused

- Likely due to implementation of PBM programs including evidence-based transfusion guidelines
  - Several large trials support a “restrictive” transfusion strategy

What might a PBM program encompass?

- Education program
- Optimize blood component use
- Diagnose and treat perioperative anemia
- Reduce/optimize blood loss in surgery and from lab draws

Project Management

- Challenge: blood transfusion ordered by a variety of specialties and administered by a variety of health care staff

Red Blood Cell (RBC) Transfusion Trials Comparing Hemoglobin Thresholds[5]

Trial	Population	Participants (n)	Thresholds (hemoglobin)	Primary outcome
TRICC	Critical care	838	7 g/dL vs 10 g/dL	30d mortality 18.7% vs 23.3%, P=0.11
FOCUS	Hip fracture	2016	8 g/dL vs 10 g/dL	Death or inability to walk across room at 60d, 35.2% vs 34.7%, P=0.9
Villanueva et al.	Upper GI Hemorrhage	921	7 g/dL vs 9 g/dL	Mortality at 45d, 5% vs 9% P=0.02
TRISS	Septic Shock	998	7 g/dL vs 9 g/dL	90d mortality, 43% vs 45% P=0.44
TITRE2	Post-cardiac surgery	2003	7.5 g/dL vs 9 g/dL	Infection or ischemic event in 3mo, 35.1% vs 33.0% P=0.3
TRICS-III	Cardiac surgery	4860	7.5 g/dL vs 8.5 or 9.5 g/dL	Composite, 11.4% vs 12.5% P<0.001 for noninferiority

Treat the patient, not the laboratory value

- Indications for RBC transfusion
  - Significant acute hemorrhage
  - Significant signs/symptoms of anemia

- However, lab values (e.g. hemoglobin) do provide very useful information to help decide whether to transfuse or not

PBM strategies to reduce unnecessary transfusions

- Clinical decision support improves RBC usage[6]
  - Best practice alert ("pop-ups") at computerized provider order entry
- RBC transfusion interventions reduce the proportion of patients transfused[7]
- Initiatives that successfully reduce RBC transfusion also reduce health care costs
  - RBC acquisition cost ~$200
  - RBC total activity based cost ~$800+

Indications for transfusion of other blood components

- **Platelets**
  - Bleeding prophylaxis (general): platelet count <5-10k/ul
  - Procedures/hemorrhage: paucity of evidence
- **Plasma**
  - Massive hemorrhage
  - Disseminated intravascular coagulation
  - Thrombotic thrombocytopenic purpura
  - Replacement of plasma constituent for which a more targeted therapy is not available
- **Cryoprecipitate** (contains fibrinogen, FVIII, vWF, FXIII)
  - Control bleeding associated with fibrinogen deficiency

Education program

- Materials: e.g. learning modules
- In-person: e.g. grand rounds

- Indications for transfusion, risks, evidence

- Develop hospital guidelines, protocols for specific clinical situations

Anemia Management[8]

- Preoperative
  - Screening: 3-4 weeks prior to elective surgery with expected major blood loss
  - Diagnose and treat iron/B12/folate deficiency anemia
- Optimize cardiac and pulmonary function
  - Acute normovolemic hemodilution
- Postoperative
  - Avoid unnecessary RBC transfusion

Optimizing Coagulopathy[8]

- Preoperative
  - Algorithm for patients on anticoagulation or anti-platelet medication
- Management of bleeding patients
  - Body temp > 36C
  - pH > 7.2
  - Hemorrhage monitoring (e.g. viscoelastic tests and/or hemoglobin, platelet count, coags including fibrinogen levels)
- Protocols for administration of blood components, factor concentrates, and antifibrinolytic agents
- Antifibrinolytics for cardiac, ortho, obstetric hemorrhage, massive hemorrhage surgeries
- Uremic platelet dysfunction (e.g. di-deoxy arginine vasopressin, DDAVP)

Blood Conservation Strategies[8]

- Minimize diagnostic blood loss
  - Reduced tube size
  - Fewer draws
- Surgical blood loss
  - “Close attention”
  - Minimally invasive techniques
  - Cell salvage

Optimal Blood Use with Patient-Centered Decision Making

- Informed consent
- Transfusion plan with thresholds based on risk
- Single unit transfusion policy
- Intelligent electronic ordering
- Ability to identify ordering provider
- Indication list (e.g. pocket card, posters)
- Documentation of the indication for each component

PBM-Related Metrics & Benchmarks[9,10]

- Track anemia: preop, hospital-acquired, treated patients
- Use of antifibrinolytics, cell salvage
- Blood usage by dept or procedure or physician: # units/patient
  - Benchmarking
- Blood supply chain efficiency
  - Crossmatch : transfusion ratio (<1.7:1)
  - Issue : transfusion ratio
  - Wasted products

Physician	RBCs Transfused / Procedure
Smith	0.5
Jones	8
Doe	1
Adams	1.2

PBM-Related Metrics & Reporting

- Patient outcomes!
  - In-hospital mortality
  - Morbidity (infections, myocardial infarction, stroke, etc.)
  - Length-of-stay (LOS)
  - Hemoglobin (presurgical and postoperative)
  - Hemovigilance (e.g. transfusion reactions)
- Report to clinicians and hospital administration
  - Include cost savings, return on investment

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