PATIENT BLOOD MANAGEMENT: THE IMPACT OF POINT-OF-CARE TESTING HEMOGLOBIN

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Accumen

TRANSFUSION SAFETY IN THE 21ST CENTURY

Transfusion Safety and Efficacy is Being Reevaluated

- Blood transfusion remains a precious resource that has saved countless lives
- Emerging evidence is redefining transfusion's narrow therapeutic window
- The benefits of transfusion have generally been overestimated and the risks have been underestimated
- Less is More with Transfusion

FOCUS ON OVERUTILIZATION

Two Leading Health Care Quality Organizations Hold National Summit to Build Consensus Around Ways to Minimize Overuse of Five Treatments

Appropriate Use Will Improve Quality and Safety of Patient Care

(OAKBROOK TERRACE, Ill. – September 28, 2012) – To help reach a consensus on ways to reduce the occurrence of medical treatments that are commonly used but not always necessary, the American Medical Association (AMA) -convened Physician Consortium for Performance Improvement (PCPI) and The Joint Commission co-sponsored the National Summit on Overuse, September 24, 2012, to discuss strategies to improve the quality and safety of patient care.

A variety of key stakeholders, including representatives from physician organizations, medical specialties, government agencies, research institutions and patient groups, came together at the National Summit on Overuse to discuss the appropriate use of the following treatments and procedures:

- Heart vessel stents (percutaneous coronary intervention or PCI)
- Blood transfusions (blood management)
- Ear tubes (tympanostomy tubes) for brief periods of fluid behind the ear drum
- Antibiotics for the common cold (viral upper respiratory infections)
- Early scheduled births (early induction) without medical need

The Joint Commission

AMA AMERICAN MEDICAL ASSOCIATION

FOR IMMEDIATE RELEASE

PODCAST

Listen to summit participants as they highlight the day's events.

INTERVIEW OUR EXPERTS

Click below to view or download images or bios.

Mark R. Chassin, M.D., FACP, M.P.P., M.P.H.
President
The Joint Commission

ARE TRANSFUSIONS OPTIMAL?

Group Questions Appropriateness of Most Blood Transfusions

"Allogeneic blood transfusion improves outcomes in only 11% of clinical scenarios for patients without trauma or active hemorrhage"

"an estimated 40% to 60% of transfusions are still done without a good indication"

Table 3. Appropriateness Rating of Scenarios by Type of Clinical Setting

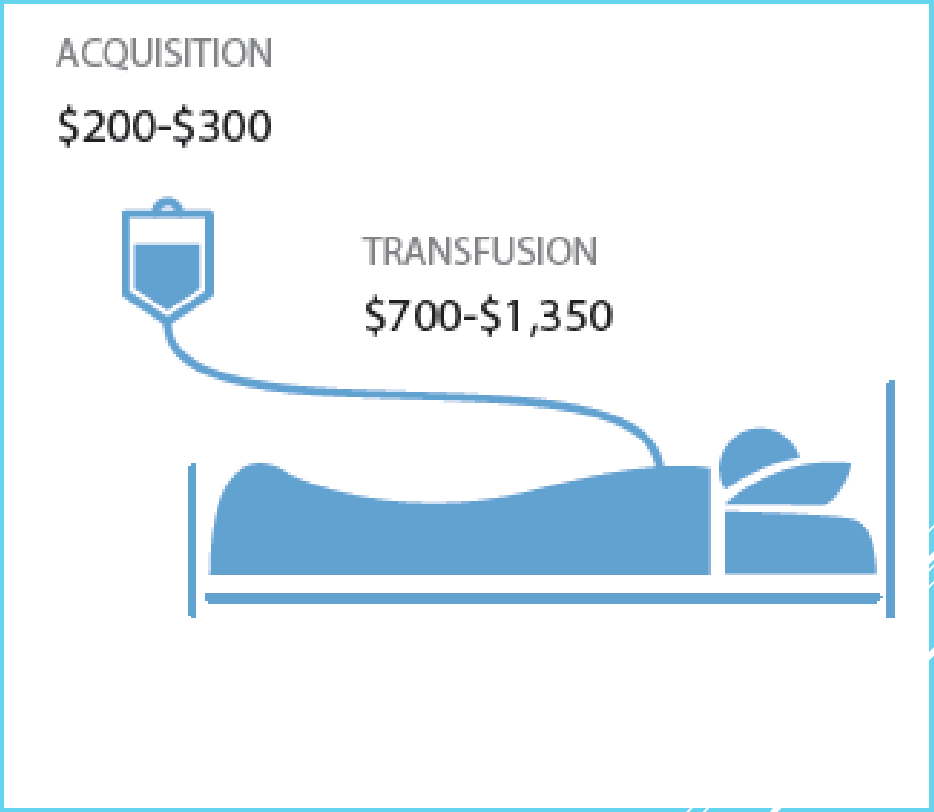
Scenarios	Medical (n = 180)	Surgical (n = 234)	Trauma (n = 36)
Rating			
Appropriate, n (%)	23 (12.8)	27 (11.5)	3 (8.3)
Inappropriate, n (%)	94 (52.2)	148 (63.3)	25 (69.5)
Uncertain, n (%)	63 (35.0)	59 (25.2)	8 (22.2)

Expert panel came to this conclusion based on review of 494 studies published over the last 13 years.

TransMedRev.2011;25(3):232-246.

The True Cost of Blood

Per RBC-unit costs using activity-based cost analysis was **between $522 and $1183** (mean $761) and were **3.2-4.8 times the acquisition cost**



Shander et al, Transfusion 2010

TRANSFUSION = TRANSPLANT?

Liquid Transplant

=

Organ Transplant

KEY ISSUES IN BLOOD MANAGEMENT

Adverse Effects of Allogeneic Transplantation

- Infectious Complications
  - Viral (e.g. HIV, Hepatitis, West Nile, Zika)
  - Bacterial contamination of platelets*
- Anaphylactic reactions* - 1:250,000
- Hemolytic transfusion reactions* (clerical error) - 1:16,000

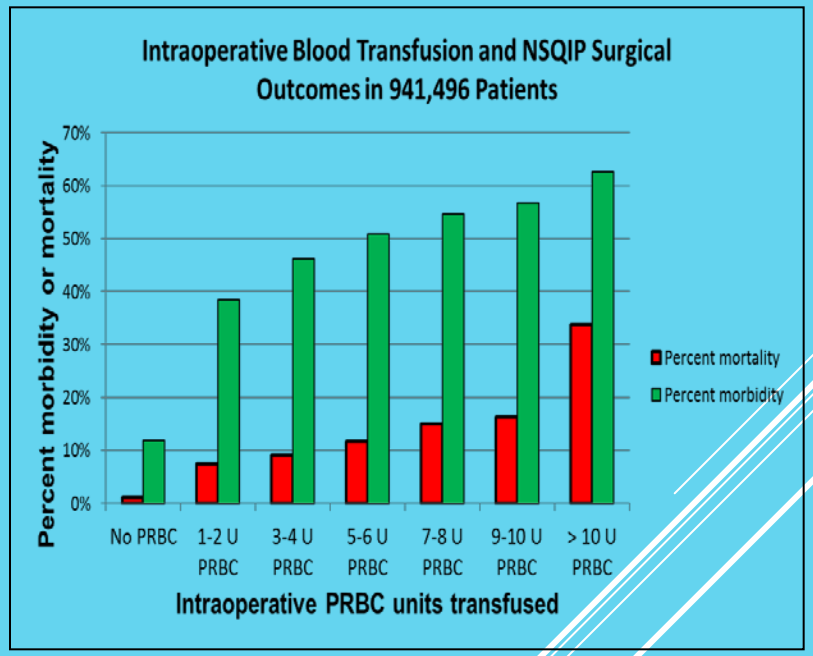
- Emerging Concerns
  - Pulmonary complications - circulatory overload (TACO*- 1:350)[2], acute lung injury (TRALI*) [2]
  - Transfusion related immunomodulation (TRIM) [3]
  - Storage lesion – systemic inflammatory response (SIRS), organ injury/failure, clotting, mortality [4]

[1] Goodnough, CritCareMed 2003;31
[2] Rana, Transfusion 2006;46
[3] Bernard, J Am Coll Surg 2009;208
[4] Koch, N Engl J Med 2008; 358

TRANSFUSION RELATED IMMUNOMODULATION

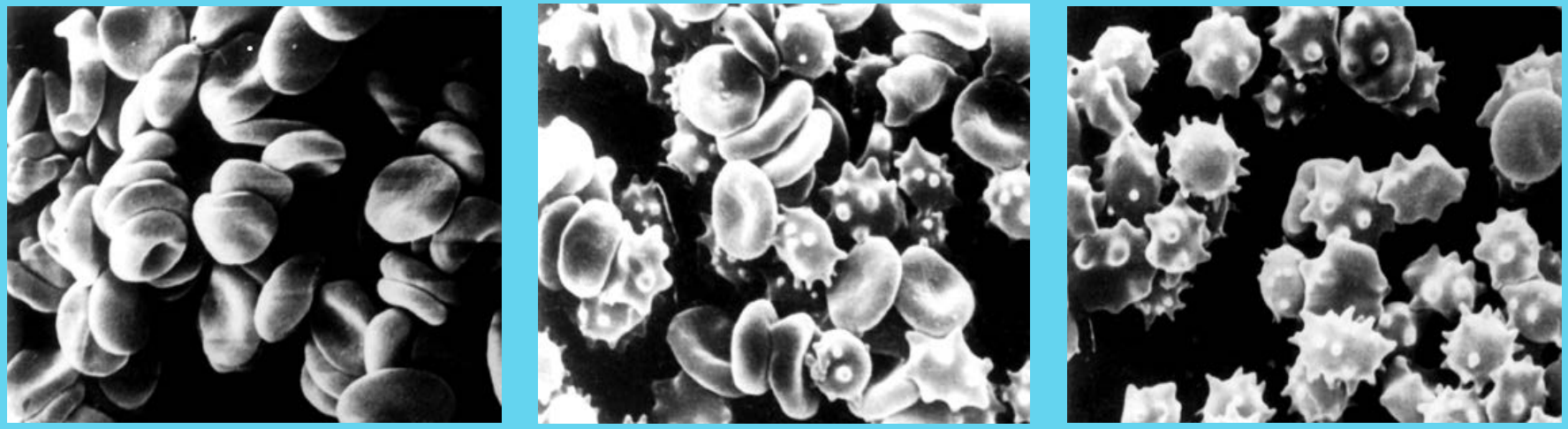
Transfusions cause dose-dependent alterations in immune system function[1]

- Surgery (CV, Ortho, Trauma – Increased postoperative infections, sepsis and mortality[2,3]
- Critical Care[4] – Increased pneumonia CLABSI, and sepsis
- Oncology – Increased cancer recurrence in some surgical oncology studies[5]



[1]Blumberg, Transfusion 2005;45(S)
[2] Ferraris, Arch Surg. 2012;147
[3] Bernard, JAmCollSurg 2009;208
[4] Napolitano, CritCareMed 2009;37(12)
[5] Al-Refaie, Surgery 2012;15

TRANSFUSION STORAGE LESION



RBCs Change Shape During Storage[1]

Day 1 Day 21 Day 35

Stored blood is an imperfect substitute[2]

- Sticky and inflexible (poor capillary flow)
- Nitric oxide scavenger (vasoconstriction)
- Pro-inflammatory and pro-thrombotic effects due to breakdown products that accumulate (Biological Response Mediators- BRMs)

Transfusions are associated with[3]

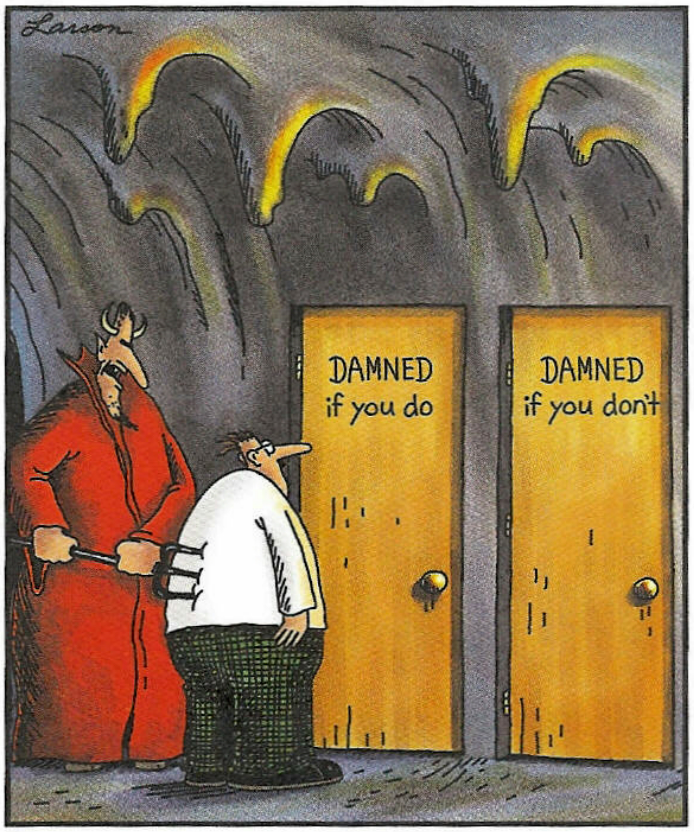
- Systemic inflammation
- Lung injury and pulmonary complications
- Renal injury and acute renal failure
- Myocardial infarction and DVTs
- Immunosuppression

[1]Reproduced with permission from Hovav, Transfusion.1999:39:277-281
[2] Edelstein, Seminars in Cardiothoracic and Vascular Anesthesia 2012;5
[3] Koch, N Engl J Med.2008;358:1229-1239.

WHAT IS THE SOLUTION?

Patient Blood Management programs:

- Improve blood utilization
- Establish proactive strategies designed to treat anemia, minimize blood loss and avoid blood transfusion
- Reduce complications
- **Save patient lives!**



"C'mon, c'mon—it's either one or the other."

PATIENT BLOOD MANAGEMENT PROGRAMS: ROLE OF POINT OF CARE TESTING

How POCT Supports Comprehensive PBM Programs

Providing

- The right patient getting
- The right blood product
- At the right time
- In the right dose
- For the right reason

Proactive strategies designed to prevent anemia and optimize red cell mass & minimize blood loss and bleeding

Patient Blood Management: The Three Pillars

1st Pillar

- Pre-op anemia management
- Erythropoiesis stimulating agents
- Oral Iron/ Intravenous Iron
- Nutritional support (Vitamin B12, Folate, Vitamin C)
- Anemia is a contraindication for elective surgery

2nd Pillar

- Tranexamic acid/ Antifibrinolytics
- Meticulous surgical hemostasis
- Manage bleeding risk and anticoagulants
- Cell Salvage
- Topical hemostatics
- Avoid secondary hemorrhage
- Minimize phlebotomy
- Lab guided coag management

3rd Pillar

- Low Hgb Transfusion threshold
- Optimize transfusion dosing
- Enhance hemodynamics
- Optimize ventilation and oxygenation
- Minimize oxygen consumption
- Avoid/treat infections promptly

Point-of-Care Testing in Hospitals

POCT is an important diagnostic tool within the hospital, especially high acuity clinical care settings where quick access to results are needed

- POCT Hemoglobin/ Hematocrit
- POCT INR
- POCT Platelet Function
- Whole Blood Coagulation Monitoring

Point-of-Care Testing Advantages

- Reduction of pre & post analytical errors by eliminating sample transportation/degradation, and sample mix-up
- Ease of use for non-laboratory staff
- **Small sample volume (frequent lab draws leads to hospital-acquired anemia)**
- **Quick results enable instant interventions in critical situations – goal directed care**

Point of Care and PBM

- How POCT supports comprehensive PBM
  - **ANEMIA PREVENTION**
    - Less Blood Loss trough Phlebotomy
  - **ANEMIA MANAGEMENT**
    - Preoperative Anemia Management/ Out-patient Anemia Management
  - **TRANSFUSION MANAGEMENT**
    - Quick Access to Hb. Results to Optimize Transfusion Decision Making
    - Assessing Results of Transfusion Therapy

Less Blood Loss through Phlebotomy

- Studies in multidisciplinary ICU show that an average of 40-70 mL/day of blood is drawn solely for diagnostic purposes.
- For each 100 mL of blood collected for lab testing, a patient´s Hb. level may decrease an average of 0.7 g/dL.
- Phlebotomy blood loss may account for as much as 30% of blood transfused in the ICU

Crit Care Med 2009 Vol. 37, No. 12:Journal of Trauma-Injury Infection & Critical Care. 67(6): 1439-1442; Dec 2009
Corwin HL, et al. Chest 1995; 108:767-71

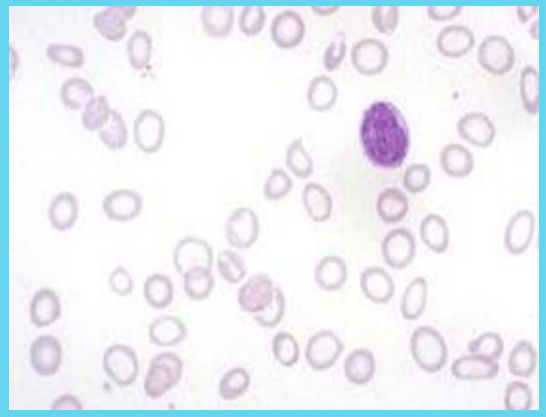
POCT Allows for Smaller Blood Volumes

While not the only factor for development of hospital-acquired anemia, phlebotomy for diagnostic testing can be an actionable target for intervention.

Microliters vs. Milliliters

Have you assessed nosocomial anemia in your organization?

Preoperative Anemia Management



Preoperative anemia is:

- Common in elective surgical patients (20-30%+)
- Associated with increased risk of transfusion and associated complications of allogeneic blood
- Independantly associated with perioperative morbidity and mortality

- Having an accurate hemoglobin or hematocrit when first planning for surgery is ideal to provide adequate time for treatment intervention
- Ordering lab values at preadmission testing may not provide sufficient time to work up anemia or provide adequate treatment (often days in advance of surgery)
- POCT lab testing can be an effective strategy in the surgeon's office to screen for anemia several weeks in advance of surgery

Practical Application – POCT Opportunities in Anemia Management

- Pre-surgical screening - Hb screen upon determination of surgical need for high blood loss non-urgent surgeries
  - Orthopedic Surgeon's office
  - General /Colorectal Surgeon's office
  - OB/GYN office
  - Hospital Lab/Transfusion Service
- POCT Hb. value can be used to trigger additional tests necessary to work up anemia (e.g. If Hb. <13 g/dl)
  - This can assist with challenges related to delays in getting patients in for pre-admission testing

Practical Application – POCT Opportunities in Anemia Management

- Out-patient Anemia Management – Hb check prior to each therapy (iron/EPO)
  - Less invasive and laborious than other blood tests; may provide advantages in terms of time, cost and patient comfort.
  - Physician office (Hem/Onc, Nephrology) - Prior to administration of ESA to verify Hb value and ensure compliance with CMS guidelines
  - Hospital out-patient infusion center - Monitor impact of anemia management strategies (IV iron, ESA)

Transfusion Decision Based on Data

During significant hemorrhage, most anesthesiologists and surgeons will not tolerate turn-around-times typically associated with lab-based tests and will transfuse blood based on clinical observations only.

- Hemoglobin levels play a large role in the decision to transfuse.
- Data from almost 3,000 surgical patients showed that **31%** of transfusions did not have a documented hemoglobin value.
- POCT with rapid turn-around-times may allow decision based on data rather than estimating the patient´s need.

**Savage et al, Variability in blood and blood component utilization as assessed by an anesthesia information management system. Anestesiologi 2012;117:99-106.*

Practical Application - POCT Advantages in Transfusion Decision Making

While transfusion triggers are getting lower and lower, access to quick and accurate lab results are essential in order to optimize use of blood products and make appropriate transfusion decisions.

- In-patient RBC Transfusion Ordering and Dosing
  - Ideal to have availability of POCT Hgb testing in high acuity areas within the hospital (OR, ER and ICU) where decisions to transfuse RBC are rapid
  - Supports the practice change recommendations to utilize a SINGLE unit, followed by a re-assessment prior to administering additional units
    - Prevent dose dependent harm from transfusion
    - Prevent transfusion associated circulatory overload

Assessing Results of Transfusion

- Why Give Two, One Will Do!
- Every ONE Matters
- No Buy One Get One Free with Transfusion

- For stable nonbleeding patients with symptomatic anemia, transfusion of a single unit of RBC, followed by clinical reassessment is appropriate
- If one unit of blood adequately improved the symptoms, then no further transfusion should occur
- Bedside Hb results at the point-of-care enables quick reassessment to determine the need for further transfusion.

**Leahy et al, A pragmatic approach to embedded patient blood management in a tertiary hospital. Transfusion, August 2013*

Practical Application - POCT Advantages in Transfusion Decision Making

- Out-patient Transfusion Ordering (Out-pt infusion Center)
  - Verify the Hgb. value prior to the actual transfusion
    - Hospitals and clinicians have reported inaccuracies with the documented pre-transfusion value provided by the physician's office
  - Check the Hb. value after transfusion of ONE unit of RBCs, prior to determination of the need for the SECOND unit
    - For Physicians (e.g. Oncologists) that are adopting a SINGLE unit RBC strategy for out-patients, one of the biggest obstacles identified is the time required to re-assess the patient after the 1st RBC unit

Summary

As part of a comprehensive PBM Program, POCT

- Will prevent anemia and blood loss by requiring less blood for diagnostic testing
- Can support preoperative anemia management programs by making it easy to obtain lab values well in advance of surgery
- Will provide actionable intelligence in high acuity situations that can guide goal directed transfusion therapy
- Provides the ability to rapidly assess the impact of a SINGLE unit RBC transfusion prior to deciding on additional blood products

QUESTIONS?

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