Timothy Hannon, MD, MBA, is a board certified anesthesiologist who serves as medical director of the St. Vincent Indianapolis Blood Management Program, a forward thinking program which he designed and implemented with great success. Since its establishment in 2001, the blood management program has reduced hospital transfusions by over 30%, resulting in annual savings of over 7000 units of blood products and cost savings that exceed $4,000,000 per year. The program has also substantially improved quality of care and increased patient safety, becoming a model for innovative quality improvement. Dr. Hannon is also the Founder and CMO of Strategic Healthcare Group LLC, a health care consulting group that is the national leader in safe, efficient and effective blood management solutions.
Agenda

- Brief Overview of Blood Management & Transfusion Safety
- A High Reliability Approach to Transfusion Safety
- General Approach to Program Implementation
- Advocate Health Care Transfusion Safety Program Case Study- Dr. Sikka
- Q & A
- Session I wrap up

Why is Blood Use an Issue?

- Blood is a precious and scarce community resource
- According to the 2010 HCUP survey, blood transfusions are the most commonly employed procedure for hospital inpatients
- Scientific evidence over the last decade has consistently shown transfusions to be less beneficial and more harmful
  - Clinical trials in high risk patients (critical care, cardiac surgery, orthopedics, gi bleed) show no benefit of liberal transfusion therapy and a tendency towards harm
  - A growing list of non-infectious risks of transfusion have been identified, including lung injury, volume overload, renal injury, multisystem organ failure and immunosuppression

Evidence Based Transfusion Practice

A Multicenter, Randomized Controlled Clinical Trial of Transfusion Requirements in Critical Care (TRICC)¹

“A restrictive strategy of red cell transfusions is at least as effective as and possibly superior to a liberal strategy in critically ill patients, with the possible exception of patients with acute myocardial infarction or unstable angina.”¹

Ranked as the #1 landmark study that has changed the practice of transfusion medicine² but how many physicians are familiar with it?

¹ Hébert et al, NEJM 1999;340(6)
² Blachman, Transfusion 2005;45

Physical Properties of Stored Blood

¹Kim-Shapiro- Transfusion 2011;51(4) ²Grimshaw- Transfusion 2011;51(4) ³Hovav- Transfusion 1999; 39
**Transfusion-Related Adverse Effects**

**Infectious and Noninfectious Risks of Transfusion**

- **Infectious Complications**
  - Viral transmission
  - Bacterial contamination of platelets* (1:3000)
  - nvCJD, West Nile, Chagas, Babesiosis, Chikungunya

- **Noninfectious Hazards of Transfusion**
  - Febrile and allergic reactions 1-2%
  - Hemolytic transfusion reactions
    - Mistransfusion* (clerical error) incidence 1:14,000-16,000
  - TA- Microchimerism (50% of trauma pts @ discharge/ 30% @ 1 year)*, TA- graft vs. host disease
  - SIRS, TRIO, TRAKI, TRAGI
  - TRALI* (1:10,000), TACO*(1:16-1:350)*

- **TRIM***

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2. Uter. Transfusion 2006;46
3. Rana. Transfusion 2006:46
4. Li. Transfusion 2011;51(2)

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**Transfusion-Related Adverse Effects**

**Transfusion Associated Circulatory Overload (TACO)**

Evidence of circulatory overload within 6 hours of a transfusion

- Increase in CVP and PCWP
- BNP may help distinguish from TRALI

Incidence 1%-8% (FFP and RBC)*

Mortality 1-3%*

- Increased mortality rate (OR=3.2)
- Increased LOS by 4 days (ICU)

Risk Factors

- Extremes of age
- Positive fluid balance (OR=9.4/L)
- Renal dysfunction (CRF OR=27)
- History of CHF (OR=6.6)
- Amount of blood given (OR=1.11/unit)
- Higher rates of transfusion (> 170 mL/hr)

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2. Murphy, AmJMed 2013
3. Li, Trans 2011;51(2)

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Transfusion Related Immunomodulation (TRIM)

- Immune system response to foreign tissue\(^1\):
  - Upregulation of humoral immunity-antibody production/alloimmunization
  - Downregulation of cellular immunity
    - Decreases in NK cell and macrophage activity
    - Activation of T-suppressor cells (anergy)
- Immune system “overload” leads to adverse effects\(^2\):
  - 3-10 fold increase in postoperative infections and VAP\(^3\) in transfused patients leading to increased LOS and costs
  - Increased 5 year mortality in CABG\(^4\), increased cancer recurrence in some studies
- Effect has been known and well-documented for years

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Transfusion Dose Response for Adverse Effects

Surgical Outcomes and Transfusion of Minimal Amounts of Blood in the Operating Room\(^3\)

Each unit of RBC transfused results in:
- 4% increase in wound complications
- 1.5 day LOS
- 0.9% increase in mortality
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, IL – September 26, 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 ventral shunts (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

“Since physicians want to practice evidence-based medicine and do what’s right during their interactions with individual patients, the work group emphasized the importance of having the infrastructure and support tools that help physicians make the best decisions and to document why they were made.”

“The work group pointed out that more guidelines are not the answer, since there are many excellent trials and guidelines available that are not being followed. To make sustainable progress in the use of blood and blood components, changing behaviors when supporting data are available is the best solution.”
Focus on Overutilization

Appropriate Use of Medical Resources

As your national association, the AHA is primarily focused on advising. Among our efforts, we have developed a “tip sheet” list of hospital-based procedures or interventions that should be reviewed and discussed by a patient and physician prior to proceeding. These are:

- Appropriate blood management in inpatient services;
- Appropriate antimicrobial stewardship;
- Reducing inpatient admissions for ambulatory-sensitive conditions (i.e., the back pain, asthma, uncomplicated pneumonia);
- Appropriate use of effective percutaneous coronary intervention; and
- Appropriate use of the intensive care unit for nonemergent terminal illness (including encouraging early intervention and discussion about priorities for medical care in the context of progressive disease).

To begin to discuss in your hospital and community, share this paper with your board, medical staff, and community leaders and use the discussion questions at the end to explore the issues together. In the coming months, the AHA will set our resources stopping much of the fine procedures or interventions listed above. We also will share best practices from hospitals and health systems that are already on this path. Equally important, the AHA will continue to work to reduce the barriers that initial hospitals face to provide the appropriate care at the appropriate time in the appropriate setting.

Focus on Overutilization

Choosing Wisely

Five Things Physicians and Patients Should Question

1. Don't prescribe vaccinations for healthy adults. Few, if any, adults need routine vaccinations. The risk of vaccine-related disease is lower than the risk of the disease the vaccine is intended to prevent.

2. Don't perform radiologic imaging (CT scans, MRIs, etc.) in patients who have no symptoms or an abnormality that could be caused by something other than the condition being imaged. For example, if a cancer patient has a lung nodule, don't order a CT scan if the nodule is the result of radiation injury and not cancer.

3. Don't transfuse red blood cells for arbitrary hemoglobin thresholds. The decision to transfuse should be made on clinical criteria (e.g., anemia, heart failure, or stroke), not on laboratory values alone.

4. Don't order continuous telemetry monitoring outside of the ICU without using a protocol that governs continuation.

5. Don't perform repetitive CBC and chemistry testing in the face of clinical and lab stability.

Five Things Physicians and Patients Should Question

1. Don't obtain baseline laboratory studies in patients without significant symptoms: CBC, electrolytes, glucose, liver function tests, renal function tests.

2. Don't recommend cardiovascular testing in asymptomatic patients with no risk factors for cardiovascular disease.

3. Don't use pulsed wave Doppler ultrasound to assess carotid artery disease.

4. Don't perform pulmonary artery catheters (PACs) routinely for cardiovascular surgery in patients with a low risk of complications. Theroller motors and catheter sheaths are associated with increased risk of infection and catheter dislodgement. The use of PACs for patients undergoing major cardiovascular surgery is controversial, and evidence supporting their use is limited.

5. Don't administer packed red blood cells (PCCs) in a young healthy patient without ongoing bleeding or anemia of 10 g/dL.
Focus on Overutilization

1. Don’t transfuse more than the minimum number of red blood cell (RBC) units necessary to relieve symptoms of anemia or to return a patient to a safe hemoglobin range (13 to 9 g/dL) in stable, non-surgical patients.

2. Don’t test for thrombocytopenia in adult patients with venous thromboembolism (VTE) occurring in the setting of major transient risk factors (surgery, trauma or immobilization).

3. Don’t use intravenous iron (IV) filters routinely in patients with acute VTE.

4. Don’t administer plasma or prothrombin complex concentrates for non-emergent reversal of vitamin K antagonists to patients outside of the setting of major bleeding, intracranial hemorrhage or anticipated emergent surgery.

5. Limit surveillance computed tomography (CT) scans in asymptomatic patients following invasive intent treatment for aggressive lymphoma.

Transfusion and Risk Management

Transfusions are associated with increased costs, risk of adverse events, and donor burden. The selection of blood products should be guided by clinical judgment, taking into account the patient’s medical condition, transfusion needs, and risk factors. Risk management strategies include:

1. Don’t transfuse red blood cells in hemodynamically stable, non-bleeding ICU patients with a hemoglobin concentration greater than 7 g/dL.

2. Don’t use parenteral nutrition in adequately nourished critically ill patients within the first seven days of an ICU stay.

3. Don’t deeply sedate mechanically ventilated patients without a specific indication and without daily attempts to lighten sedation.

4. Don’t continue life support for patients at High risk for death or severely impaired functional recovery without offering patients and their families the alternative of care focused entirely on comfort.

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Transfusion Economics


Transfusion Costs

Blood Costs

$ 220

Labor Overhead

$ 660

Adverse Effects

$ 1220

Adverse Effects

$ 2100*

*2010$ costs

Healthcare Quality and Costs

Quality → Outcomes → Resources → Costs

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Transfusion Appropriateness

- In spite of the growing evidence for more thoughtful & conservative blood use, blood utilization is far from optimal\(^1\)
  - There is wide variation in transfusion practice between hospitals and among physicians at the same hospital\(^2\)
  - Published studies and Strategic Healthcare Group audits demonstrate that 30-70% of transfusions are inappropriate or unnecessary\(^3\)
  - Transfusion appropriateness in many hospitals is essentially a “coin toss” decision
- Physicians typically lack formal training in transfusion medicine and are often unfamiliar with the current indications and dosing for blood component therapy\(^4\)

\(^1\)Boucher, Hannon- Pharmacotherapy 2007;27(10)  \(^2\)Bennett-Guerrero- JAMA 2010;304  \(^3\)Friedman et al- ArchPatholLabMed 2006;130  \(^4\)Deik- Transfusion 2003;43

Appropriate Blood Use and Patient Safety

- Blood transfusions are one of the most common treatments within our hospitals
- Evidence-based transfusion guidance has become more conservative because of a significant shift in transfusion benefits and risks
- In spite of this evidence, transfusion practice remains less than optimal
- Unnecessary transfusions waste precious resources and cause avoidable harm
- As such, the medical decision to transfuse is a critical component of patient safety
From Blood Safety to Transfusion Safety

Shifting the Focus From Blood Center to Hospital: A Vein-to-Vein Transfusion Safety Chain

Safe transfusion therapy depends upon an interconnected series of processes that begin with the donor and ends with the patient.¹

¹ Dzik, Transfusion 2003;43
Transfusion Safety is a multidisciplinary, multimodality patient safety initiative designed to improve blood utilization and reduce avoidable harm.

Using a High Reliability Approach to Reduce TACO

- Avoiding unnecessary transfusions!
  - “Meaningful use” of evidence-based transfusion guidelines
- Single unit transfusions (RBC)
  - Should be the standard of care for non-bleeding patients
- Reducing transfusion rates
  - Specify transfusion rates as mL/hr, not “transfuse over X hours”
  - <120mL/h on an infusion pump for patients at high risk (positive fluid balance, history of CHF, history of CRI)
- Splitting units and/or preemptive diuretics (high risk patients)
  - Lasix should not be used to “squeeze in” questionable transfusions
- “Critical Nurse Supervision”\(^1\):
  - Vigilant monitoring by nursing is key
  - Encouraging/enforcing transfusion guidelines (“stop the line”)
  - Careful monitoring for first 15 minutes
  - Intermittent monitoring every 30-60 minutes for duration of infusion
  - Use of continuous pulse oximetry

\(^1\) Alam, TransMedRev 2013
General Approach to Healthcare Quality Improvement

Philosophy
- Physicians and nurses want to do the right thing, but they “don’t know what they don’t know”
  - Initial and ongoing education, training and awareness are essential program elements
  - Competency and credentialing should be a requirement for both physicians and nurses
- Physicians and nurses don’t willingly harm patients!
  - Program must continually be framed as a patient safety initiative
  - Emphasis on patient safety drives a sense of urgency and helps to prioritize the program efforts

Methodology
- Evidence based, patient centered, data driven & systems oriented
- E4 Process Improvement Methodology
  - Evaluate, Educate, Engage, Empower
# Transfusion Safety Program Implementation

## Transfusion Safety Committee
- Review of Structure and Function
- Expansion of Membership
- Transfusion Guideline Development
- Development of Key Performance Metrics

## Clinician Education
- Physician, Nursing, Mid-Levels
  - Education, Training and Awareness in Support of Evidence-Based Transfusion Guidelines and Program Goals

## Phase I: Leading Change, Mobilizing Commitment, Developing Capabilities
- **Transfusion Safety Committee**
- **Clinician Education**

## Phase II: Changing Systems & Structures, Monitoring, Hardwiring
- **Phase I**
  - Review of Structure and Function
  - Expansion of Membership
  - Transfusion Guideline Development
  - Development of Key Performance Metrics
- **Ongoing Selection, Prioritization and Implementation of Projects**
  - Process Improvement in High Blood Use Specialties
  - Ongoing Education, Training & Awareness

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**IHI Appropriate Blood Use**

## Case Study: Advocate Health Care Transfusion Safety Program
- Introduction to Transfusion Safety