BLOOD UTILIZATION AND TRANSFUSION REACTIONS UPDATE AND SOME OTHER STUFF AS TIME PERMITS (WB, SCD MGMT, AND MTP)

ERIC FILLMAN, MD

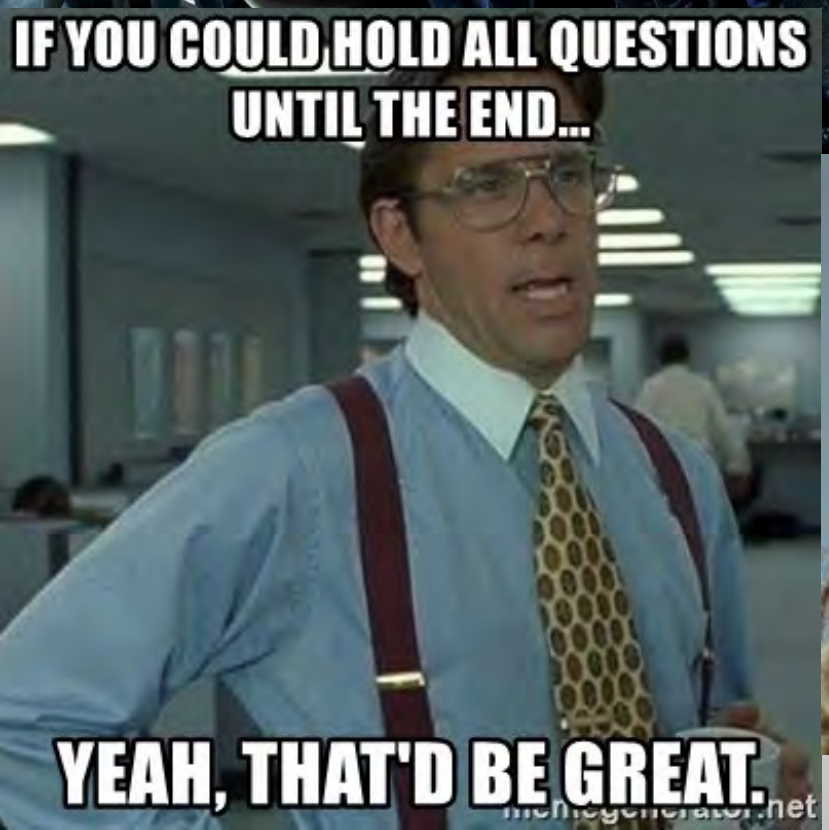
THURSDAY, FEBRUARY 17, 2022-12-1PM

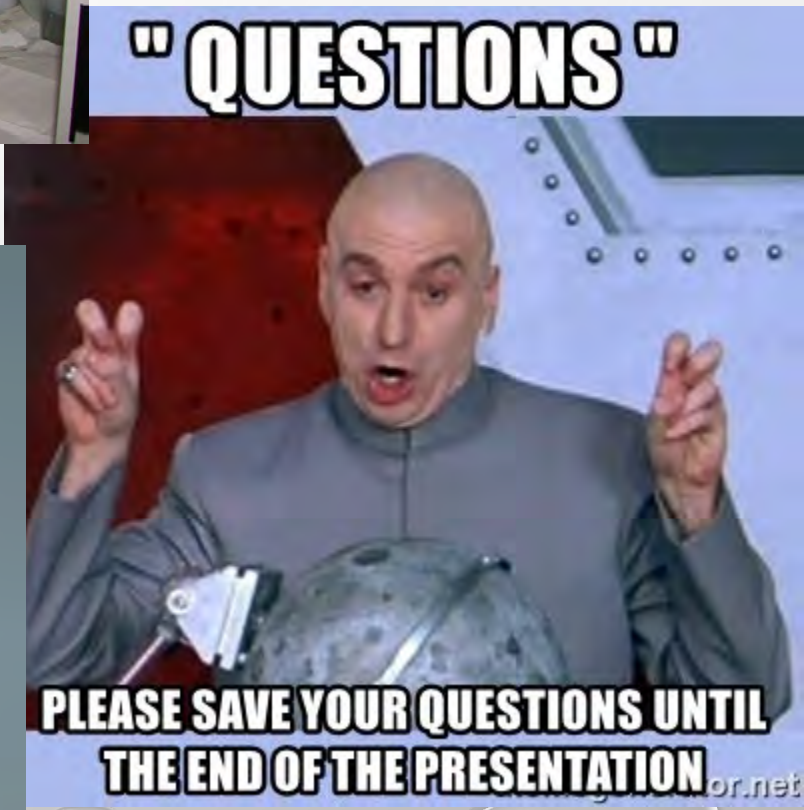
PRIMARY LEARNING OBJECTIVES

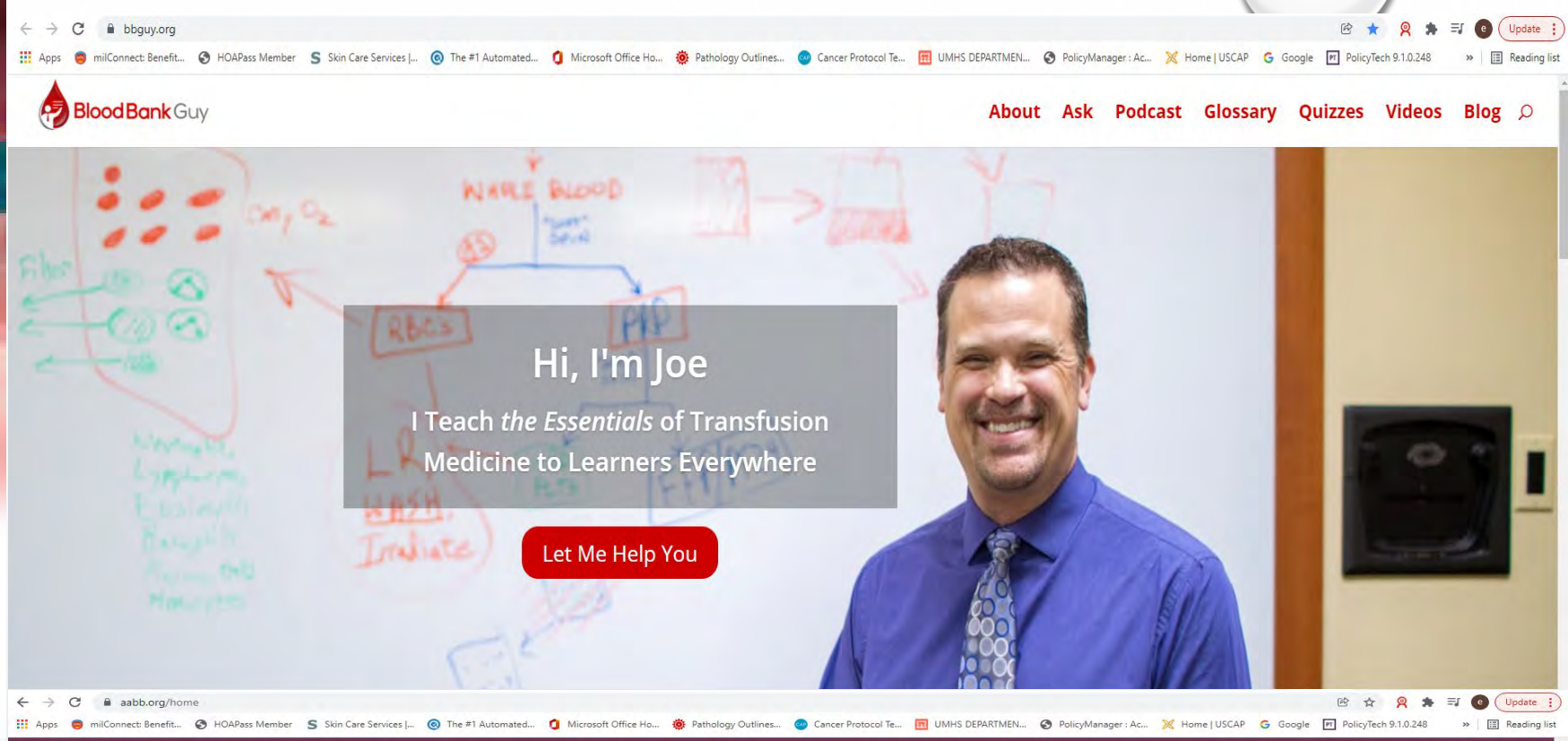
- TO GIVE A BACKGROUND ON BLOOD BANK SERVICES AND BEST PRACTICES IN BLOOD UTILIZATION.
- TO PROVIDE CURRENT RECOGNIZED AABB TRANSFUSION REACTIONS AND WAYS TO RECOGNIZE THEM.
- TO PROVIDE A BASIC BACKGROUND ON THE BLOOD SUPPORT OF SICKLE CELL PATIENTS.
- IF TIME PERMITS, BRIEF REVIEW OF OUR NEW MASSIVE TRANSFUSION PROTOCOL (MTP) AND USE OF WHOLE BLOOD IN BLEEDING PATIENTS OUTSIDE OF THE HOSPITAL SETTING.

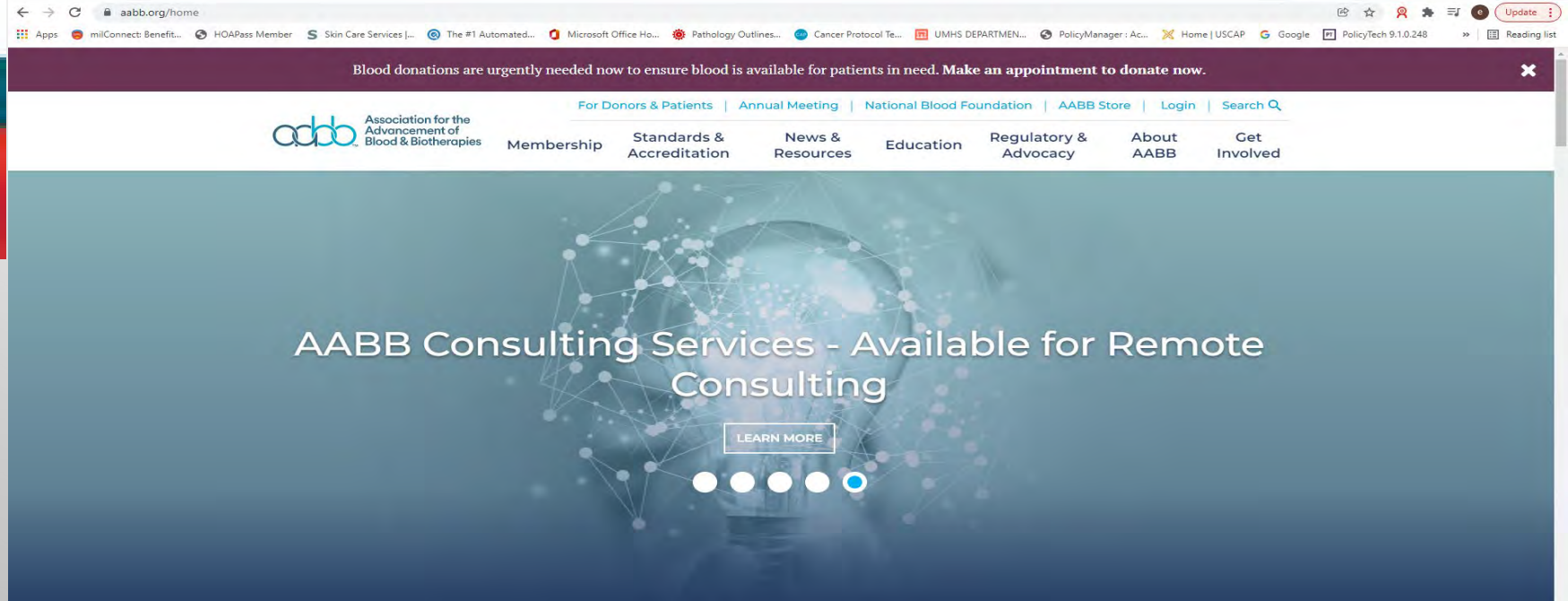
FINANCIAL DISCLOSURES

- NO RELEVANT FINANCIAL DISCLOSURES
- THE VIEWS PRESENTED ARE NOT A REFLECTION OF CPA, GRMC, OR THE US ARMY


IF YOU COULD HOLD ALL QUESTIONS
UNTIL THE END...
YEAH, THAT'D BE GREAT.


" QUESTIONS "
PLEASE SAVE YOUR QUESTIONS UNTIL
THE END OF THE PRESENTATION





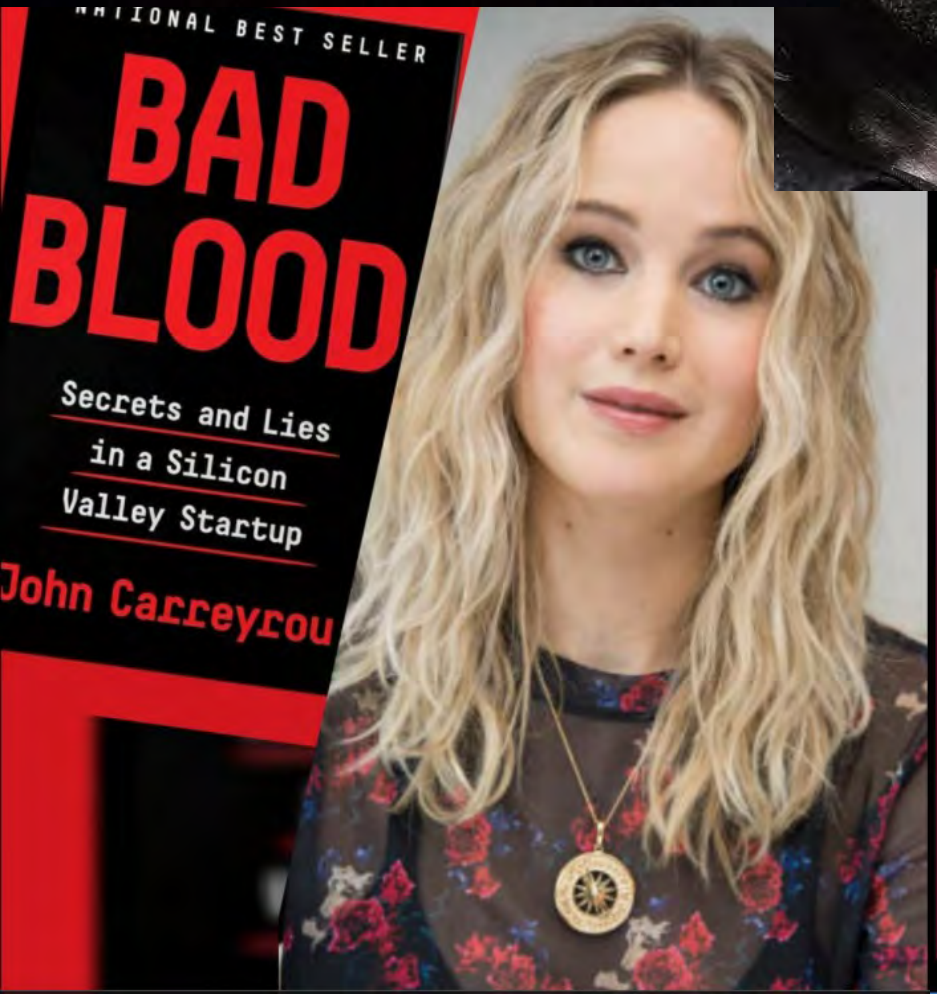
https://www.youtube.com/watch?v=RaA6BeepiJM Dr. Steven Frank, Med Dir at the JH Center for Bloodless Medicine and Surgery, Professor of Anesthesiology and Critical Care Medicine

My consiglieres, Ms Edna Pasadilla, MT and Ms Maria Courriveau, MT (aka Tom Hagen)


Blood simple.


SYLVESTER STALLONE
RAMBO
LAST BLOOD


STALLONE
This time he's fighting for his life.
FIRST BLOOD
15 (AA)
SYLVESTER STALLONE FIRST BLOOD RICHARD CRENNA
EMI


INTERNATIONAL BEST SELLER
BAD BLOOD
Secrets and Lies in a Silicon Valley Startup
John Carreyrou


DANIEL DAY-LEWIS
There Will Be Blood
Written for the Screen and Directed by PAUL THOMAS ANDERSON


Bloodsport


COLD BLOOD

Blood Management –

One of the few areas in medicine where all three of these can be achieved at the same time:

- Reduce Risk
- Save Cost
- Improve Outcomes

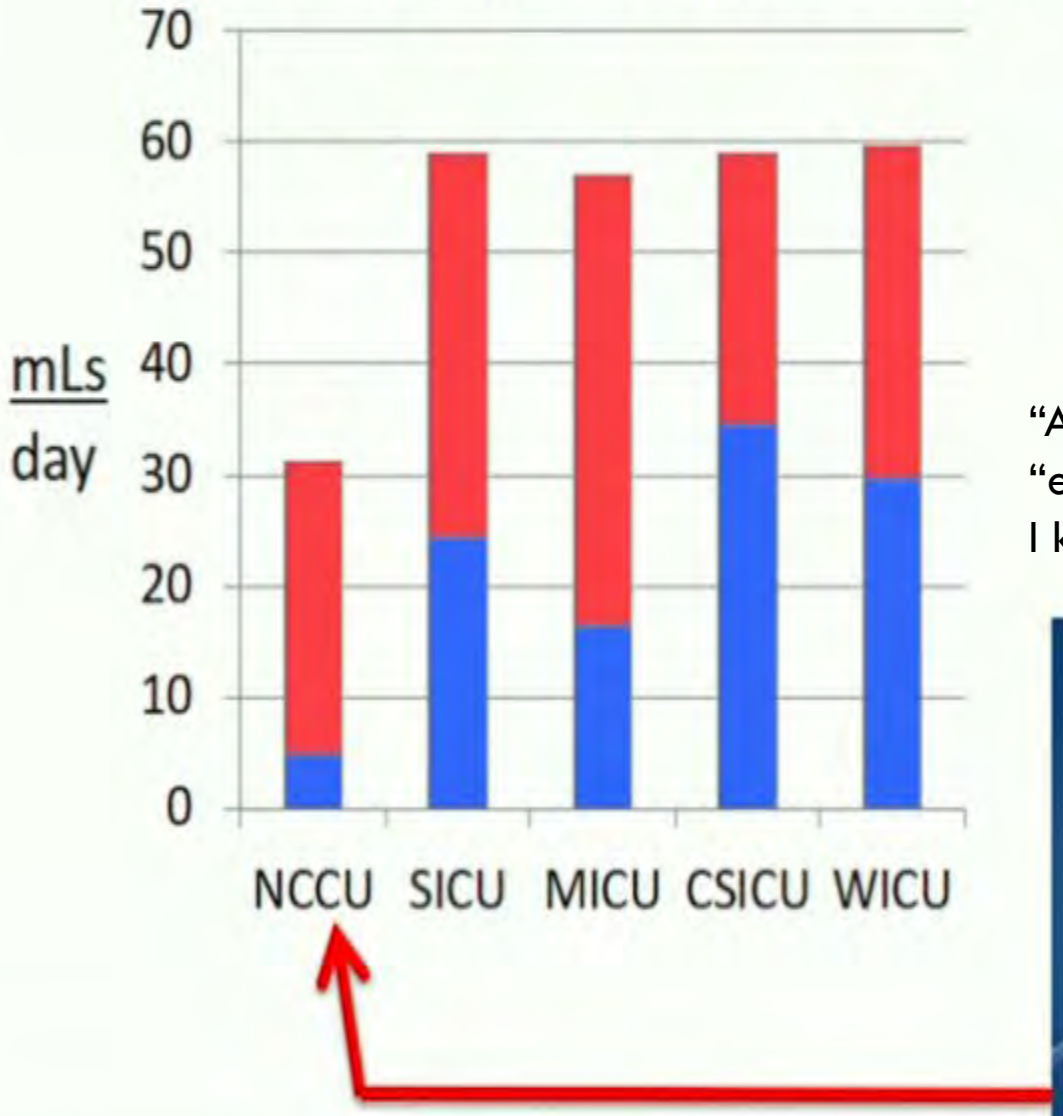
SO WHAT IS A REASONABLE HGB LEVEL TO TREAT?

- OBVIOUSLY WE DON'T TREAT A NUMBER (IE HGB); WE TREAT THE PATIENT, HOWEVER, THERE IS A REASONABLE TRANSFUSION (HGB) TRIGGER.
- RATIONALLY OPTIMIZING ANEMIA AND HEMOSTASIS.
- GOAL OF "RESTRICTING" BLOOD UTILIZATION (IE INFECTIOUS AND TRANSFUSION ASSOCIATED REACTIONS)…MORE TO FOLLOW.
- IMPROVE PATIENT OUTCOMES, EFFICIENCY, AND VALUE.
- HOWEVER, THERE ARE RELATIVELY WELL ESTABLISHED GUIDELINES FOR A "TARGET" HGB.
- REMEMBER ANEMIA IS NOT A DIAGNOSIS IT IS A SIGN OF AN UNDERLYING DISEASE/DIAGNOSIS.
- ULTIMATELY GOING BACK TO PATIENT CENTRIC MEDICINE AND TREATING THE DISEASE PROCESS.

ICU phlebotomy at Johns Hopkins

Over 1% of blood volume/day (cancels out erythropoiesis)

Cut in half using Safeset blood draw system ($9.45 cost)



"Anemia of chronic phlebotomy"—Avoid "euboxia" and terms like "lets tank 'em up." I know easy for a Pathologist to say…

SO WHAT IS AN ESTABLISHED REASONABLE HGB TRANSFUSION TRIGGER?

A. 9 G/DL

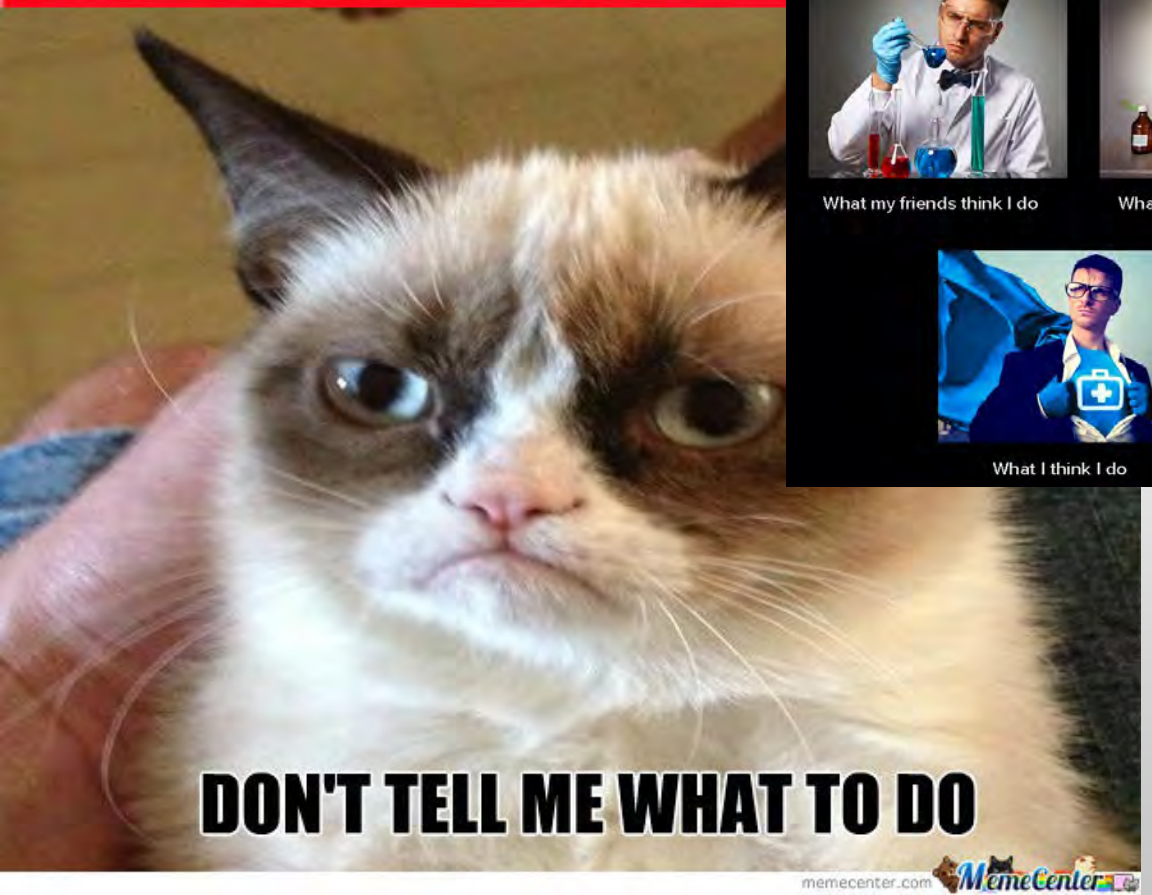
B. 10 G/DL

C. 7 G/DL

D. 8 G/DL

E. 6 G/DL

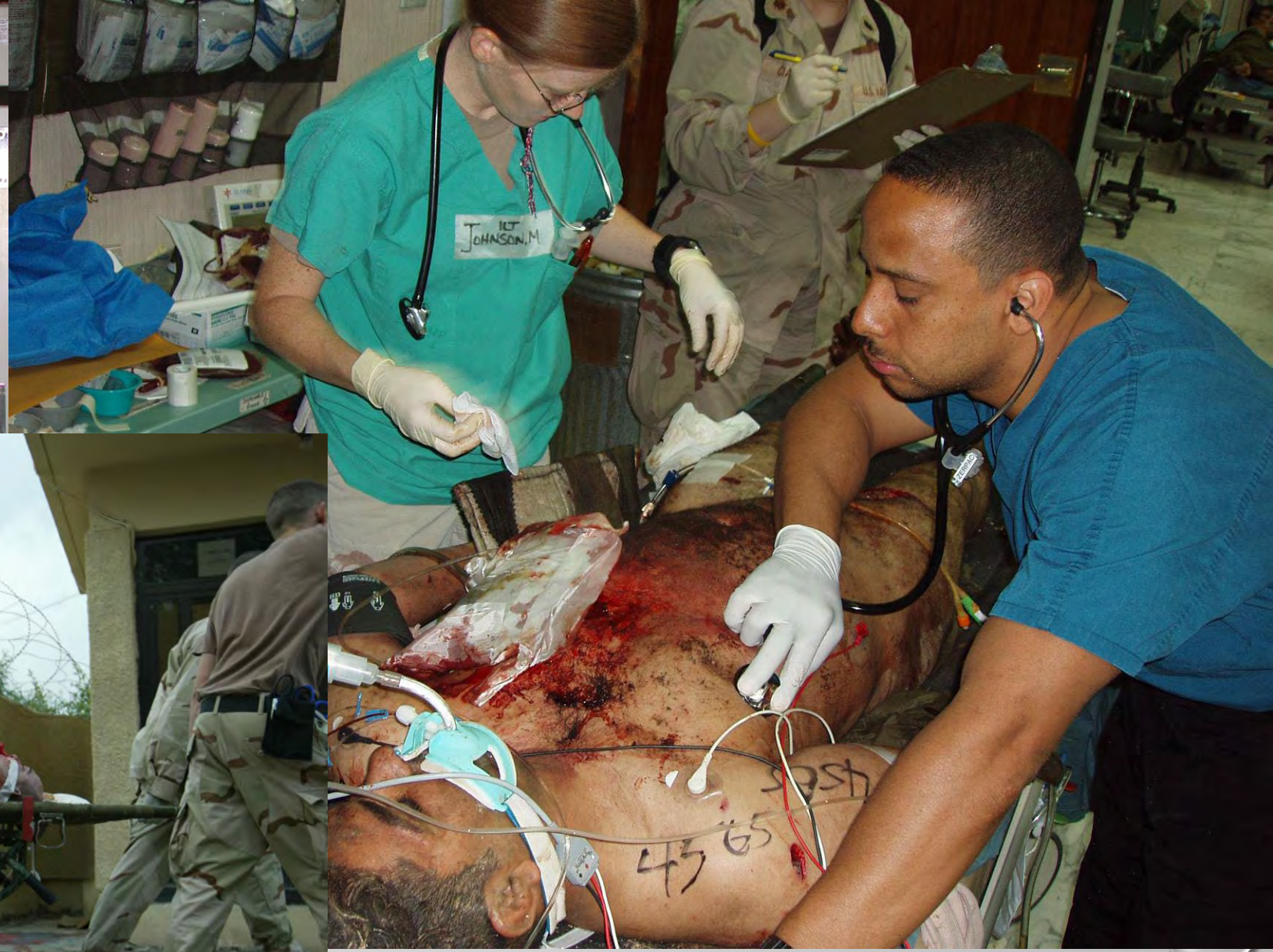

KEEP
CALM
AND


DON'T TELL ME WHAT TO DO
memecenter.com
MemeCenter


Laboratory Scientist
What my friends think I do
What my parents think I do
What society thinks I do
What I think I do
What I really do


DANIEL DAY-LEWIS
There Will Be Blood
Written for the Screen and Directed by PAUL THOMAS ANDERSON

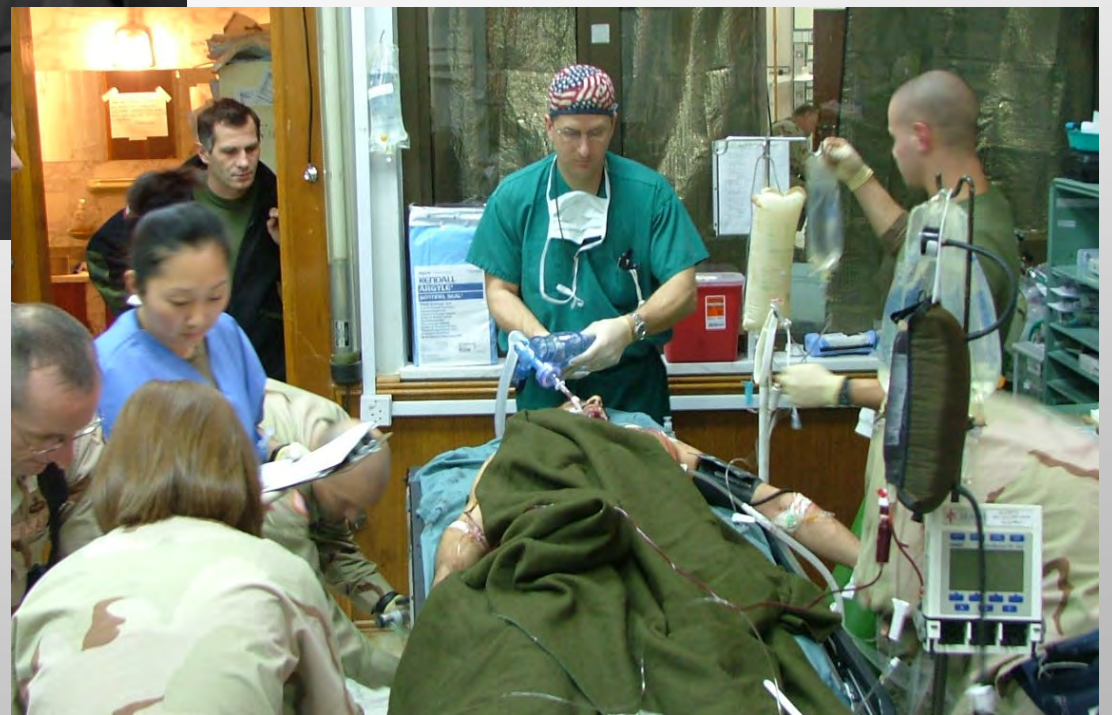

CARPENTER
U.S.ARMY
FILLMAN
U.S.ARMY


1LT
JOHNSON,M

EMT TRAUMAS

- Blood bank has 4 units of O Pos prepared to deliver to the ER for "Emergency Release"

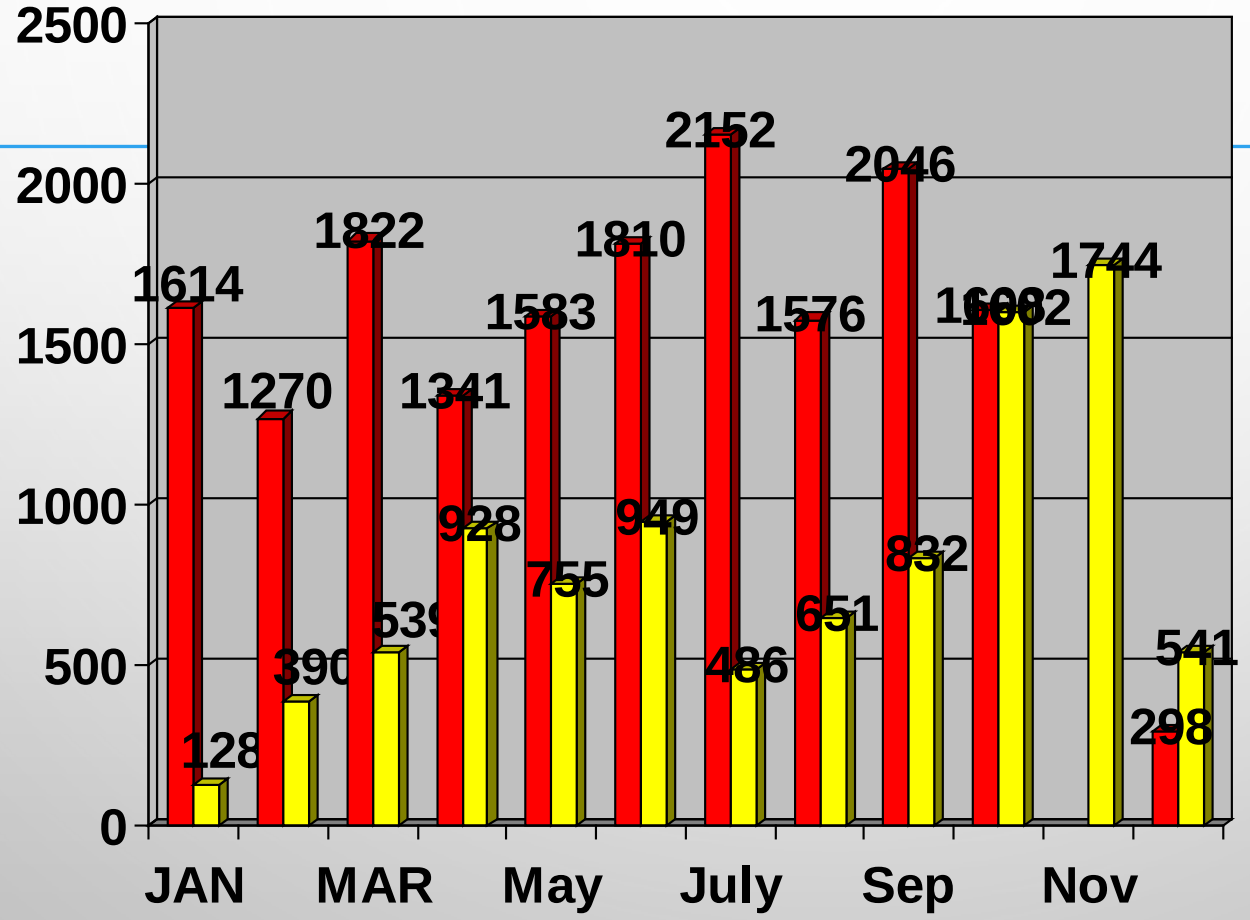
- "Trauma Panel" for lab specimens



Medical Task Force 86

Units Transfused

As of 11 SEP 05



Total Transfused

86th CSH : 17,187

31st CSH : 9,711

The 86th CSH assumed blood operations on 24 Dec 04

CRITICAL TRAUMA PATIENTS

- 19 JUN 2005 (FATHER'S DAY)
  - RIGHT LEG TRAUMATIC AMPUTATION FOLLOWING AN IED.
  - 203 BLOOD PRODUCTS.

CRITICAL TRAUMA PATIENTS

- 7 SEP 05: IED, SHRAPNEL LEFT BUTTOCK, BACK, AND LEFT LOWER EXTREMITY
  - CRYO: 20 UNITS
  - FFP: 64 UNITS
  - PLT: 6 UNITS
  - RBC: 82 UNITS
  - WB: 35 UNITS
  - TOTAL: 207 UNITS OF BLOOD PRODUCTS
- SOLDIER IS FROM THE SAME MP UNIT WHO LOST A SOLDIER AT WRAMC AFTER RECEIVING 203 UNITS ON 19 JUN 05

EVIDENCE BASED MEDICINE

- TRICC TRIAL ("TRANSFUSION REQUIREMENTS IN CRITICAL CARE") WAY BACK IN 1999.

The New England Journal of Medicine

VOLUME 340 FEBRUARY 11, 1999

A MULTICENTER, RANDOMIZED, CONTROLLED CLINICAL TRIAL OF TRANSFUSION REQUIREMENTS IN CRITICAL CARE

PAUL C. HÉBERT, M.D., GEORGE WELLS, PH.D., MORRIS A. BLAJCHMAN, M.D., JOHN MARSHALL, M.D., CLAUDIO MARTIN, M.D., GIUSEPPE PAGLIARELLO, M.D., MARTIN TWEEDDALE, M.D., PH.D., IRWIN SCHWEITZER, M.SC., ELIZABETH YETISIR, M.SC., AND THE TRANSFUSION REQUIREMENTS IN CRITICAL CARE INVESTIGATORS FOR THE CANADIAN CRITICAL CARE TRIALS GROUP*

ABSTRACT

Background To determine whether a restrictive strategy of red-cell transfusion and a liberal strategy produced equivalent results in critically ill patients, we compared the rates of death from all causes at 30 days and the severity of organ dysfunction.

Methods We enrolled 838 critically ill patients with euvolemia after initial treatment who had hemoglobin concentrations of less than 9.0 g per deciliter within 72 hours after admission to the intensive care unit and randomly assigned 418 patients to a restrictive strategy of transfusion, in which red cells were transfused if the hemoglobin concentration dropped below 7.0 g per deciliter and hemoglobin concentrations were maintained at 7.0 to 9.0 g per deciliter, and 420 patients to a liberal strategy, in which transfusions were given when the hemoglobin concentration fell below 10.0 g per deciliter and hemoglobin concentrations were maintained at 10.0 to 12.0 g per deciliter.

Results Overall, 30-day mortality was similar in the two groups (18.7 percent vs. 23.3 percent, P=0.11). However, the rates were significantly lower with the restrictive transfusion strategy among patients who were less acutely ill — those with an Acute Physiology and Chronic Health Evaluation II score of ≤20 (8.7 percent in the restrictive-strategy group and 16.1 percent in the liberal-strategy group, P=0.03) — and among patients who were less than 55 years of age (5.7 percent and 13.0 percent, respectively; P=0.02), but not among patients with clinically significant cardiac disease (20.5 percent and 22.9 percent, respectively; P=0.69). The mortality rate during hospitalization was significantly lower in the restrictive-strategy group (22.2 percent vs. 28.1 percent, P=0.05).

Conclusions A restrictive strategy of red-cell transfusion is at least as effective as and possibly superior to a liberal transfusion strategy in critically ill patients, with the possible exception of patients with acute myocardial infarction and unstable angina. (N Engl J Med 1999;340:409-17.)

RED-cell transfusions are a cornerstone of critical care practice,[1] but there are divergent views on the risks of anemia and the benefits of transfusion in this setting. One important concern is that anemia may not be well tolerated by critically ill patients.[2,3] Indeed, two recent studies suggested that anemia increases the risk of death after surgery in patients with cardiac disease[2] and in critically ill patients.[3] Red-cell transfusions are used to augment the delivery of oxygen in the hope of avoiding the deleterious effects of oxygen debt.[4] This view prompted the routine use of transfusion in patients with hemoglobin concentrations that were often more than 10.0 g per deciliter in studies evaluating resuscitation protocols.[5,6]

Critically ill patients may, however, be at increased risk for the immunosuppressive[7,8] and microcirculatory[9,10] complications of red-cell transfusions. In addition, concern about the supply and safety of blood has also encouraged a conservative approach to transfusions. For these reasons, the optimal transfusion practice for various types of critically ill patients with anemia has not been established.

To elucidate the potential risks of anemia and possible benefits of transfusions in critically ill patients, we conducted a randomized, controlled, clinical trial to determine whether a restrictive approach to red-cell transfusion that maintains hemoglobin concentrations between 7.0 and 9.0 g per deciliter is equiv-

From the Critical Care Program (P.C.H., G.P.) and the Clinical Epidemiology Unit (P.C.H., G.W., I.S., E.Y.), University of Ottawa, Ottawa; the Department of Pathology, McMaster University, Hamilton, Ont. (M.A.B.); the Critical Care Program, University of Toronto, Toronto (J.M.); the Critical Care Program, University of Western Ontario, London (C.M.); and the Critical Care Program, University of British Columbia, Vancouver (M.T.) — all in Canada. Address reprint requests to Dr. Hébert at the Department of Medicine, Ottawa General Hospital, 501 Smyth Rd., Box 205, Ottawa, ON K1H 8L6, Canada.

*Study investigators are listed in the Appendix.

CONCLUSIONS

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

TRICC Study

The "Transfusion Requirements in Critical Care" study, published by Hebert et al in the New England Journal of Medicine in 1999 (*NEJM* 1999;340:409-17), is one of the most important studies in transfusion medicine in the last 50 years. The authors performed a randomized, prospective study dividing patients in the intensive care unit into those who received transfusions "liberally" (only with hemoglobin below 10.0 g/dL) and on a "restricted" basis (only with hemoglobin levels below 7.0 g/dL). The study showed that the restrictive transfusion strategy was at least as effective as the liberal, with significantly less in-house mortality in the restrictive group (with the exception of those with serious cardiac disease). This is one of the landmark studies in this field, and it is quoted often to help justify the use of lower thresholds for transfusion of red cells.

AABB

Annals of Internal Medicine | CLINICAL GUIDELINE

Red Blood Cell Transfusion: A Clinical Practice Guideline From the AABB*

Jeffrey L. Carson, MD; Brenda J. Grossman, MD, MPH; Steven Kleinman, MD; Alan T. Tinmouth, MD; Marisa B. Marques, MD; Mark K. Fung, MD, PhD; John B. Holcomb, MD; Orieji Illoh, MD; Lewis J. Kaplan, MD; Louis M. Katz, MD; Sunil V. Rao, MD; John D. Roback, MD, PhD; Aryeh Shander, MD; Aaron A.R. Tobian, MD, PhD; Robert Weinstein, MD; Lisa Grace Swinton McLaughlin, MD; and Benjamin Djulbegovic, MD, PhD, for the Clinical Transfusion Medicine Committee of the AABB

Description: Although approximately 85 million units of red blood cells (RBCs) are transfused annually worldwide, transfusion practices vary widely. The AABB (formerly, the American Association of Blood Banks) developed this guideline to provide clinical recommendations about hemoglobin concentration thresholds and other clinical variables that trigger RBC transfusions in hemodynamically stable adults and children.

Methods: These guidelines are based on a systematic review of randomized clinical trials evaluating transfusion thresholds. We performed a literature search from 1950 to February 2011 with no language restrictions. We examined the proportion of patients who received any RBC transfusion and the number of RBC units transfused to describe the effect of restrictive transfusion strategies on RBC use. To determine the clinical consequences of restrictive transfusion strategies, we examined overall mortality, nonfatal myocardial infarction, cardiac events, pulmonary edema, stroke, thromboembolism, renal failure, infection, hemorrhage, mental confusion, functional recovery, and length of hospital stay.

Recommendation 1: The AABB recommends adhering to a restrictive transfusion strategy (7 to 8 g/dL) in hospitalized, stable patients (Grade: strong recommendation; high-quality evidence).

Recommendation 2: The AABB suggests adhering to a restrictive strategy in hospitalized patients with preexisting cardiovascular disease and considering transfusion for patients with symptoms or a hemoglobin level of 8 g/dL or less (Grade: weak recommendation; moderate-quality evidence).

Recommendation 3: The AABB cannot recommend for or against a liberal or restrictive transfusion threshold for hospitalized, hemodynamically stable patients with the acute coronary syndrome (Grade: uncertain recommendation; very low-quality evidence).

Recommendation 4: The AABB suggests that transfusion decisions be influenced by symptoms as well as hemoglobin concentration (Grade: weak recommendation; low-quality evidence).

Ann Intern Med. 2012;157:49-58. www.annals.org
For author affiliations, see end of text.
This article was published at www.annals.org on 27 March 2012.

Nine Landmark Randomized Clinical Trials Supporting Hb Triggers of 7-8 g/dL (Less is More)

Randomized Trials:

– all supporting Hb triggers of 7 or 8 g/dL

		Higher Triggers (9-10 g/dL)
7	•Hebert PC, et al: NEJM 1999 – Critically ill MICU pts.	- Same/Worse
7	•Lacroix J, et al: NEJM 2007 – Critically ill PICU pts.	- Same
7	•Villanueva C, et al: NEJM 2013 – Severe GI Bleeding	- Worse
7	•Holst LB, et al: NEJM 2014 – Septic Shock	- Same
7	•Robertson CS. et al: JAMA 2014 – Traumatic Brain Injury	- Same/Worse
8	•Carson JL, et al: NEJM 2011 – Elderly orthopedic Surg.	- Same
8	•Hajjar LA, et al: JAMA 2010 – Cardiac surgery pts.	- Same
7.5	•Murphy GJ, et al: NEJM 2015 – Cardiac surgery pts.	- Same
7.5	•Mazer CD, et al: NEJM 2017 – Cardiac surgery pts.	- Same/Worse (age>75)

Three Categories of Risks / Adverse Effects from Blood Transfusion

Clinical Event		Risk / Unit	
Allergic/Urticaria		1 in 100	Common
RBC Alloimmunization		1 in 100	
TACO		1 in 100	
TRALI		1 in 5,000	Not so Rare
Hemolytic Rxn		1 in 6,000	
Wrong Unit Given		1 in 15,000	
Hepatitis B		1 in 400,000	Rare
Hepatitis C		1 in 2,000,000	
HIV 1 and HIV 2		1 in 2,000,000	

Three Categories of Risks / Adverse Effects from Blood Transfusion

Clinical Event		Risk / Unit
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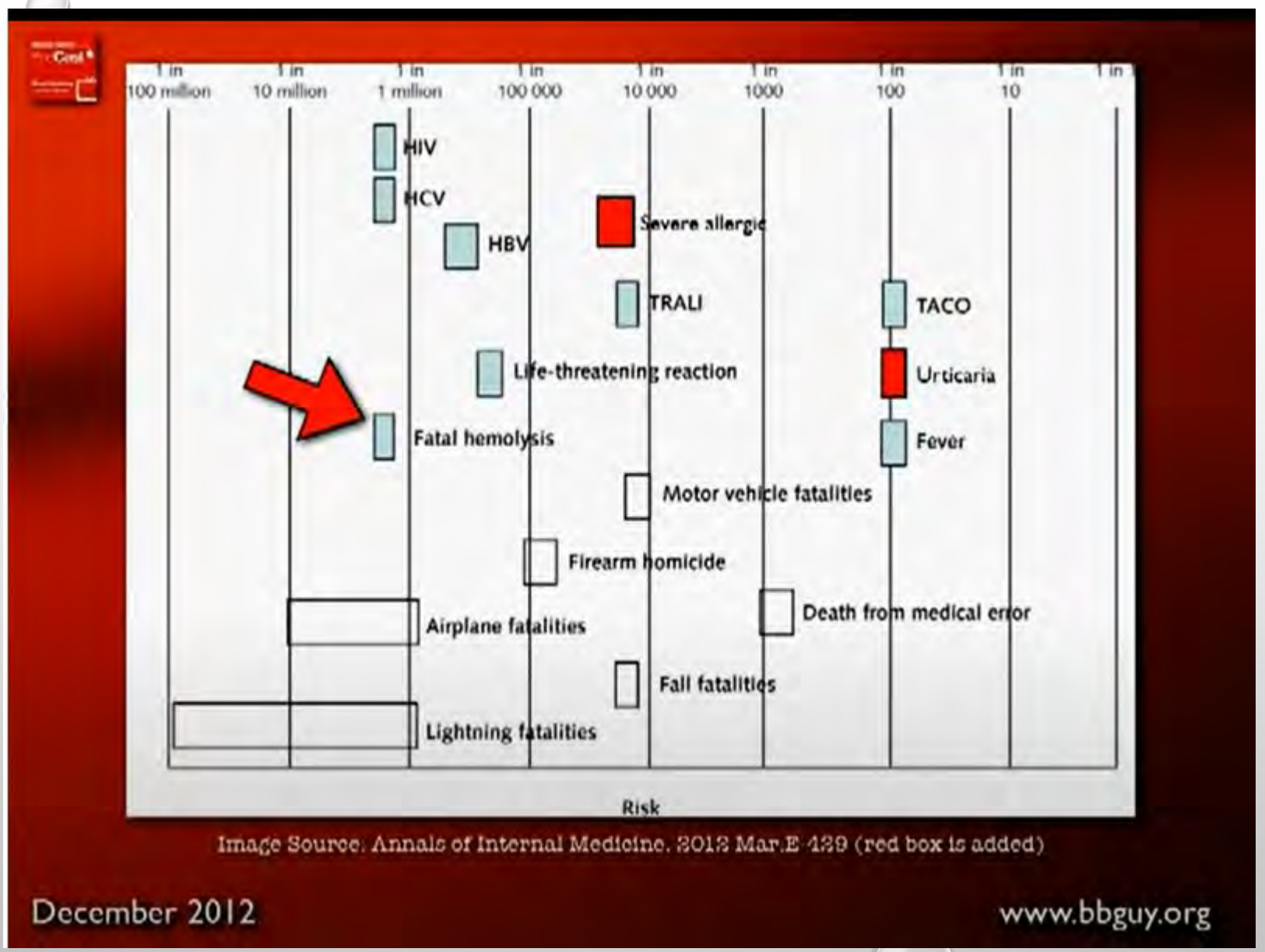
Wrong Unit Given		1 in 15,000
Hepatitis B		1 in 400,000
Hepatitis C		1 in 2,000,000
HIV 1 and HIV 2		1 in 2,000,000

Hep C and HIV = Death by Lightning Strike


1 in 100 million
1 in 10 million
1 in 1 million
1 in 100 000
1 in 10 000
1 in 1000
1 in 100
1 in 10
1 in
HIV
HCV
HBV
Severe allergic
TRALI
TACO
Life-threatening reaction
Urticaria
Fatal hemolysis
Fever
Motor vehicle fatalities
Firearm homicide
Airplane fatalities
Death from medical error
Fall fatalities
Lightning fatalities
Risk
Image Source: Annals of Internal Medicine. 2012 Mar;E 429 (red box is added)
December 2012
www.bbguy.org

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

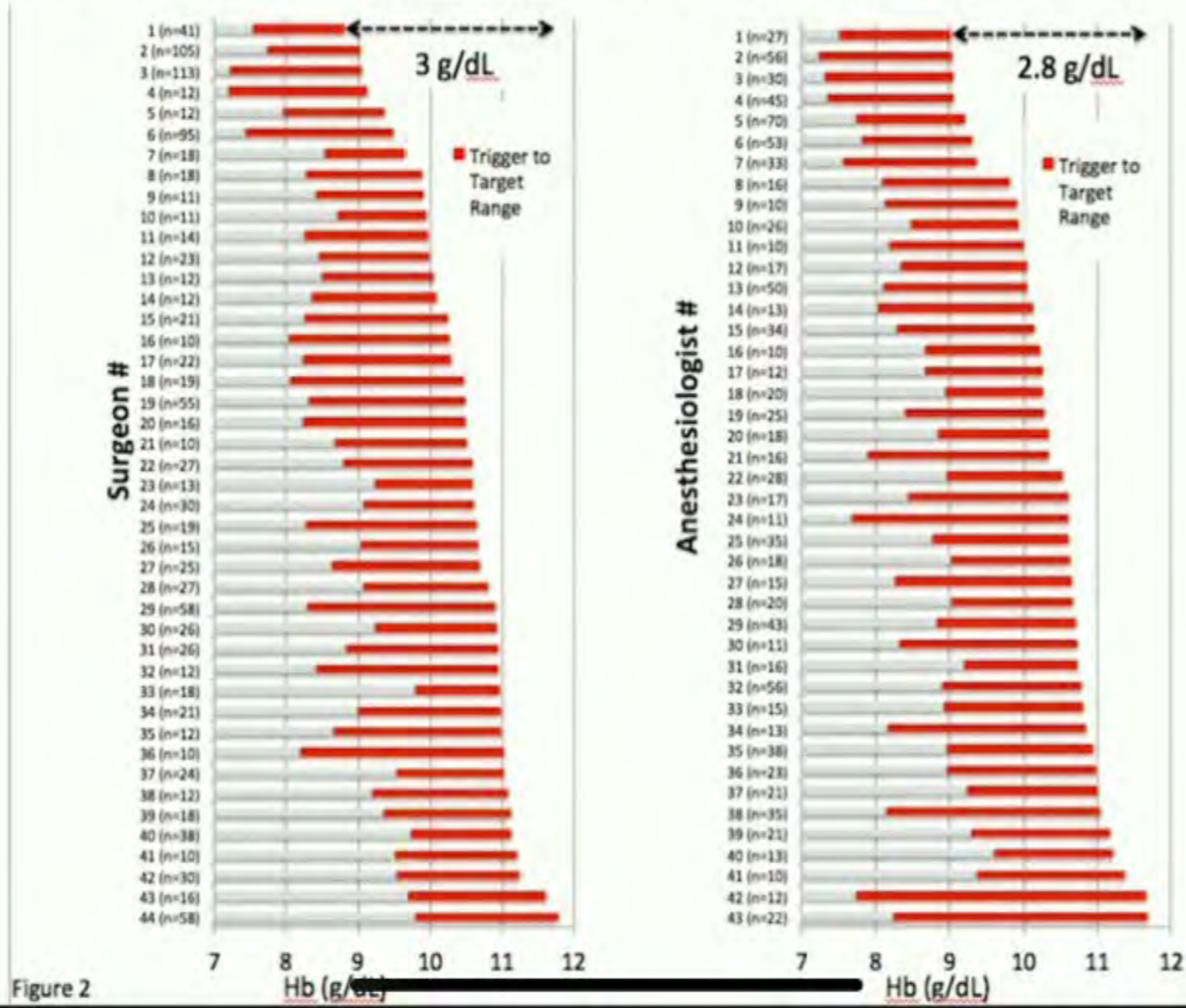
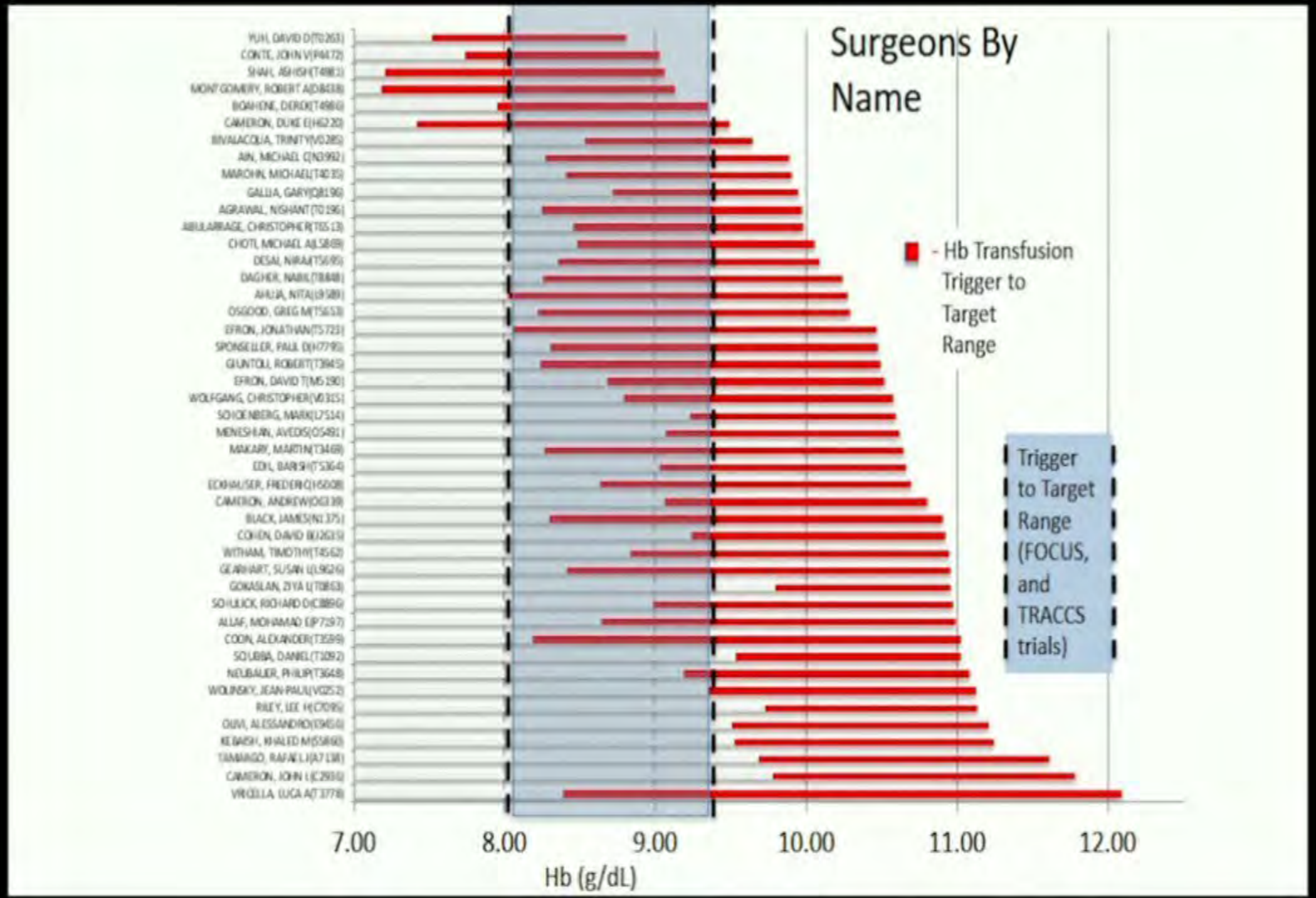
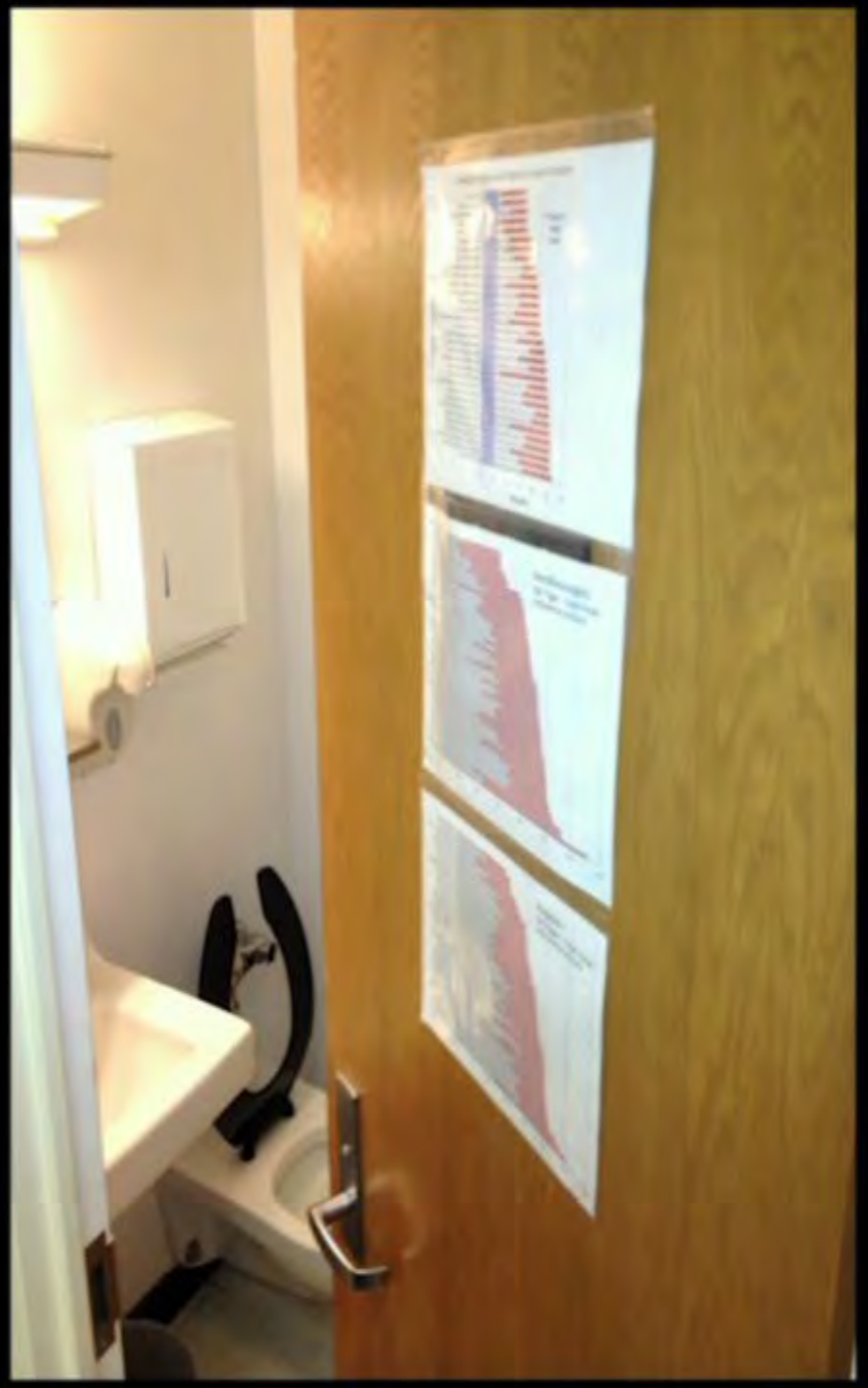


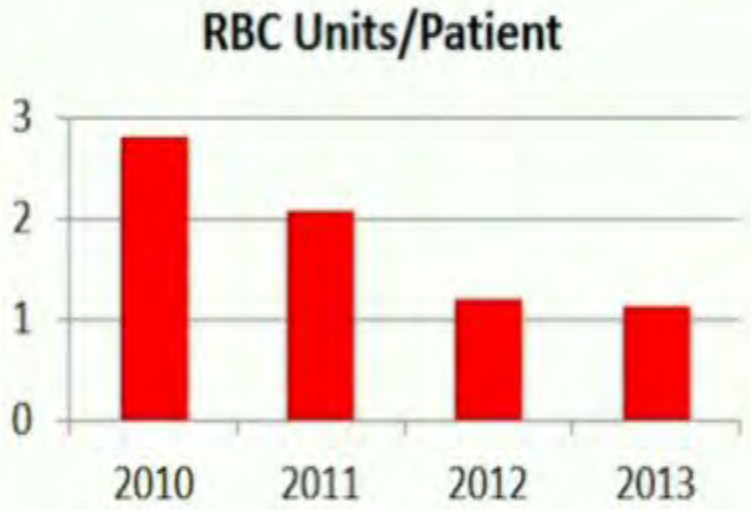
Figure 2

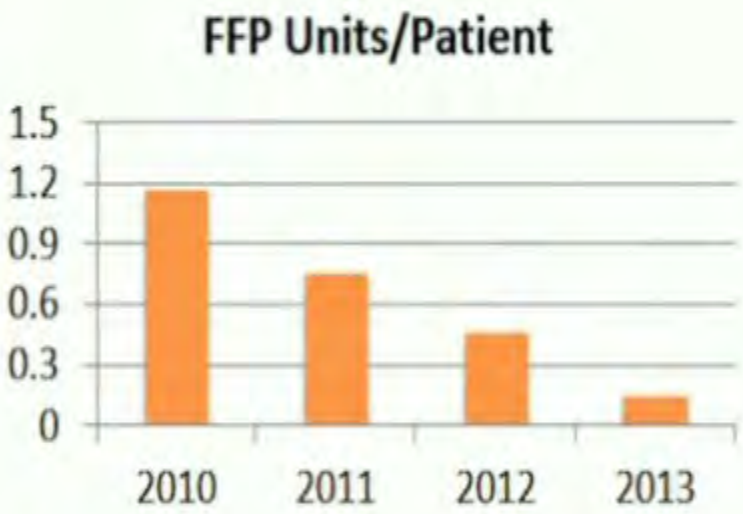

Surgeons By Name
- Hb Transfusion Trigger to Target Range
Trigger to Target Range (FOCUS, and TRACCS trials)
7.00
8.00
9.00
10.00
11.00
12.00
Hb (g/dL)

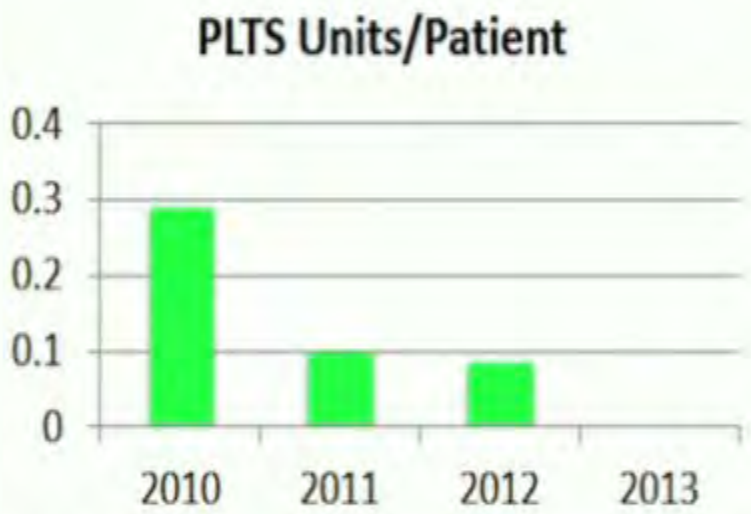


Public Display

Surgeon #44 (with permission)







Choosing Wisely®

An initiative of the ABIM Foundation

6 Societies have aims to Reduce unnecessary transfusion

Society of Critical Care Medicine

American Society of Anesthesiologists

American Society of Hospital Medicine

American Society of Hematology

American College of Obstetricians and Gynecologists

American. Assn. of Blood Banks (AABB)

https://www.choosingwisely.org/

Clinician Lists

Complete lists of recommendations by society can be found by clicking the society name or via individual recommendation pages.

Your search returned 5 results

Society	Recommendation
American Association of Blood Banks	Don't transfuse more units of red blood cells or other components than absolutely necessary.
American Association of Blood Banks	Don't transfuse red blood cells for iron deficiency without hemodynamic instability.
American Association of Blood Banks	Don't routinely use blood products to reverse warfarin.
American Association of Blood Banks	Don't perform serial blood counts on clinically stable patients.
American Association of Blood Banks	Don't transfuse O negative blood except to O negative patients and in emergencies for women of child bearing potential with unknown blood group.

Search Recommendations

American Association of Blood

- filter by -

- filter by -

- filter by -

- filter by -

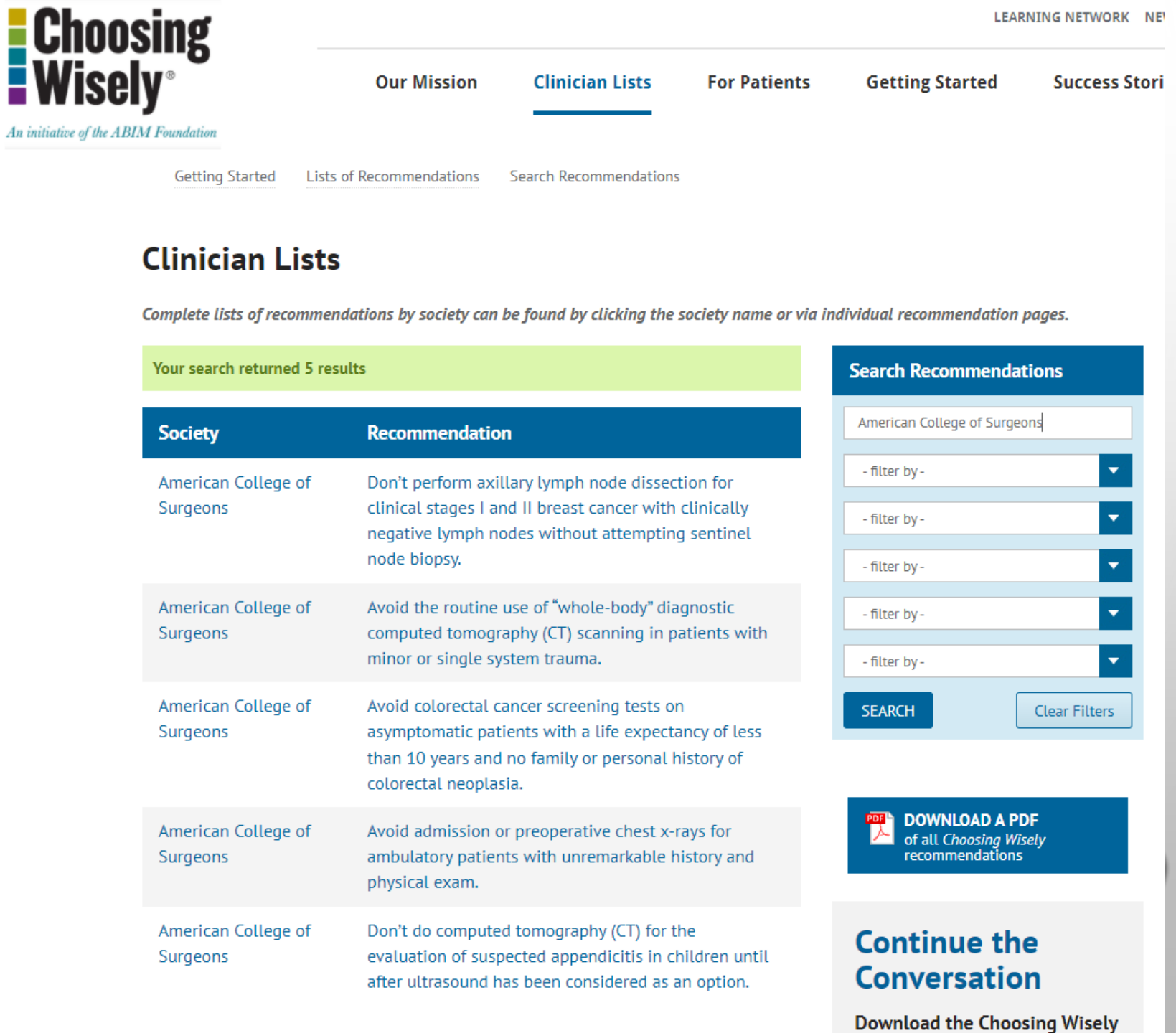
- filter by -

SEARCH Clear Filters

DOWNLOAD A PDF of all *Choosing Wisely* recommendations

Continue the Conversation

https://www.choosingwisely.org/



Clinician Lists

Complete lists of recommendations by society can be found by clicking the society name or via individual recommendation pages.

Your search returned 5 results

Society	Recommendation
American Society of Anesthesiologists	Don't obtain baseline laboratory studies in patients without significant systemic disease (ASA I or II) undergoing low-risk surgery – specifically complete blood count, basic or comprehensive metabolic panel, coagulation studies when blood loss (or fluid shifts) is/are expected to be minimal.
American Society of Anesthesiologists	Don't routinely administer colloid (dextrans, hydroxylethyl starches, albumin) for volume resuscitation without appropriate indications.
American Society of Anesthesiologists	Don't administer packed red blood cells (PRBCs) in a young healthy patient without ongoing blood loss and hemoglobin of ≥6 g/dL unless symptomatic or hemodynamically unstable.
American Society of Anesthesiologists	Don't use pulmonary artery catheters (PACs) routinely for cardiac surgery in patients with a low risk of hemodynamic complications (especially with the concomitant use of alternative diagnostic tools (e.g., TEE).
American Society of Anesthesiologists	Don't obtain baseline diagnostic cardiac testing (trans-thoracic/esophageal echocardiography – TTE/TEE) or cardiac stress testing in asymptomatic stable patients with known cardiac disease (e.g., CAD, valvular disease) undergoing low or moderate risk non-cardiac surgery.

Search Recommendations

American Society of Anesthesiologists

- filter by -

- filter by -

- filter by -

- filter by -

SEARCH

Clear Filters

DOWNLOAD A PDF of all *Choosing Wisely* recommendations

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https://www.sabm.org/wp-content/uploads/2018/08/SABM-Choosing-Wisely-List.pdf

Choosing Wisely®

An initiative of the ABIM Foundation

Society for the Advancement of Blood Management

SABM®

SOCIETY FOR THE ADVANCEMENT OF BLOOD MANAGEMENT

Five Things Physicians and Patients Should Question

1 Don't proceed with elective surgery in patients with properly diagnosed and correctable anemia until the anemia has been appropriately treated.

Anemia is common, presenting in approximately one-third of patients undergoing elective surgery. There is often the misconception that anemia is harmless, when, in fact, it is independently associated with significant morbidity and mortality that can be as high as 30-40% in certain patient populations. Treatment of anemia improves patient readiness for surgery, aids in management of comorbid conditions, decreases length of stay and readmission rates, and reduces transfusion risks. Treatment modalities may include nutritional supplementations, such as iron, B12 and folate, changes in medication, management of chronic inflammatory conditions or previously undiagnosed malignancy, or other interventions based on the etiology.

2 Don't perform laboratory blood testing unless clinically indicated or necessary for diagnosis or management in order to avoid iatrogenic anemia.

Up to 90% of patients become anemic by day 3 in the intensive care unit. Although laboratory testing can aid in diagnosis, prognosis and treatment of disease, a significant number of tests are inappropriate or unnecessary. Anemia secondary to iatrogenic blood loss causes an increased length of stay and mortality. Increased phlebotomy for laboratory testing also increases the odds for transfusion and its associated risks. Unnecessary laboratory testing adds to the cost of care through laboratory test charges and also by increasing downstream costs due to unnecessary interventions, prescriptions, etc. Thus judicious use of laboratory testing is recommended, and testing should not be performed in the absence of clinical indications.

3 Don't transfuse plasma in the absence of active bleeding or significant laboratory evidence of coagulopathy.

Recent studies demonstrate that plasma is often transfused inappropriately. In the absence of active bleeding or clear evidence of coagulopathy, current literature shows no reduction in blood loss or transfusion requirements with the use of plasma, but shows increased risk of transfusion-associated adverse events such as transfusion-related acute lung injury, transfusion-associated circulatory overload and allergic reactions. These transfusion-associated adverse events lead to poorer outcomes and increased cost of care.

4

Avoid transfusion when antifibrinolytic drugs are available to minimize surgical bleeding.

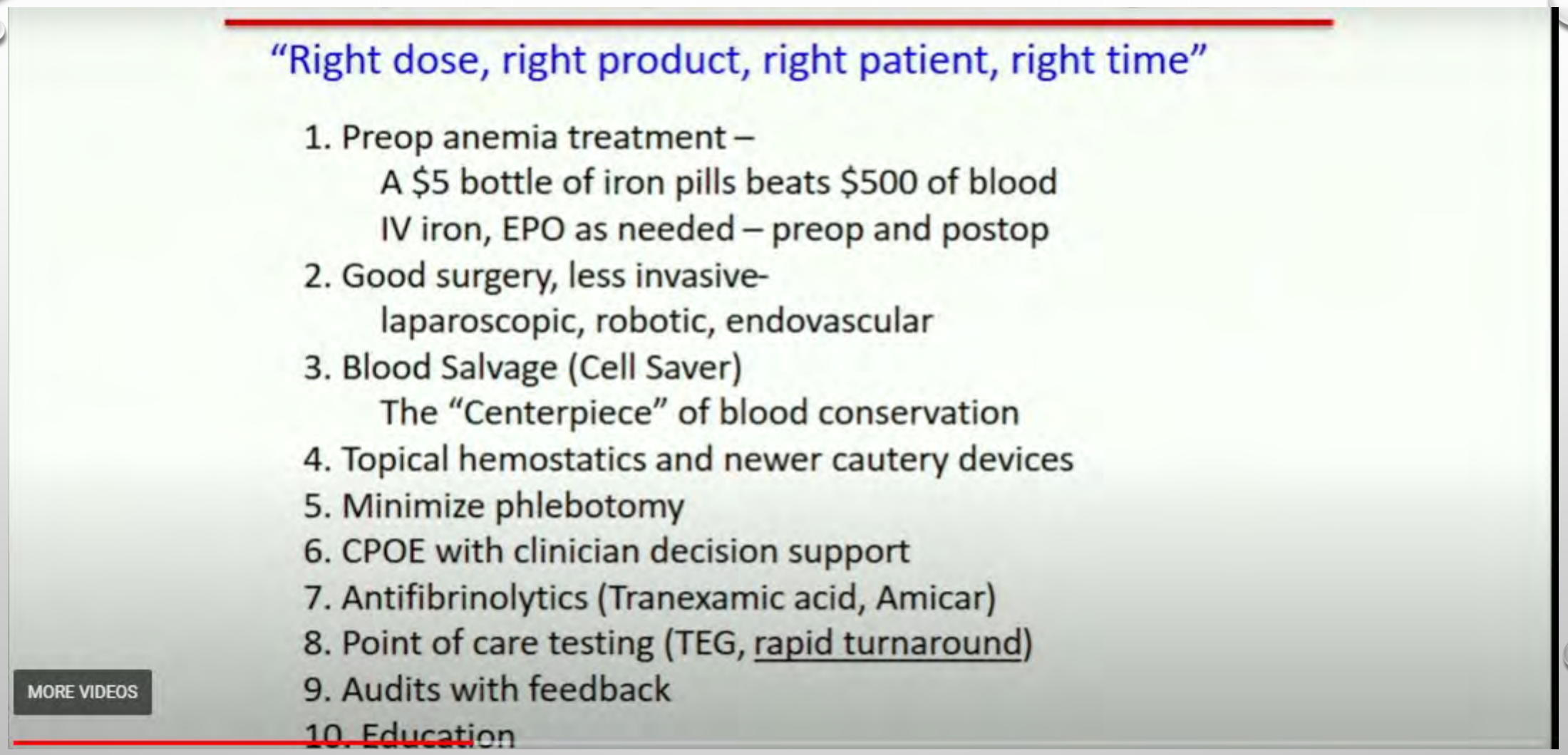
Antifibrinolytic pharmacologic therapy has been shown to reduce blood loss and transfusion requirements in orthopedic and cardiovascular surgeries. Early administration of tranexamic acid, specifically within three hours, in trauma and obstetric hemorrhage significantly reduces mortality and bleeding.

5

Avoid transfusion, outside of emergencies, when alternative strategies are available as part of informed consent; make discussion of alternatives part of the informed consent process.

Informed choice/consent regarding transfusion and other effective methods should be standardized and consistently delivered. Throughout the world, there is wide variation among medical practitioners and hospitals with regard to medical knowledge about the true risks of transfusion, alternatives to transfusion, and the delivery of this information to patients. Outside of the truly emergent clinical situation, transfusion should be avoided or limited when other interventions are available. Alternative strategies include, but are not limited to pharmacologic agents, cell salvage, normovolemic hemodilution and minimally-invasive surgical techniques.

https://www.sabm.org/wp-content/uploads/2018/08/SABM-Choosing-Wisely-List.pdf


"Right dose, right product, right patient, right time"
1. Preop anemia treatment –
A $5 bottle of iron pills beats $500 of blood
IV iron, EPO as needed – preop and postop
2. Good surgery, less invasive-
laparoscopic, robotic, endovascular
3. Blood Salvage (Cell Saver)
The "Centerpiece" of blood conservation
4. Topical hemostatics and newer cautery devices
5. Minimize phlebotomy
6. CPOE with clinician decision support
7. Antifibrinolytics (Tranexamic acid, Amicar)
8. Point of care testing (TEG, rapid turnaround)
9. Audits with feedback
10. Education
MORE VIDEOS

PRE-OPERATIVE ANEMIA

- PRE-OPERATIVE ANEMIA-PT. CENTRIC: A 62 YO GOING FOR A THA VERSUS A 28 YO FEMALE GOING FOR AN "X" PROCEDURE (FE DEFICIENCY ANEMIA).
- CONSIDER 28-30 D PRE-OP WORK-UP.
- IT IS WELL KNOWN THAT PTS. WITH PRE-OPERATIVE ANEMIA ARE ASSOCIATED WITH INCREASED LENGTH OF STAY, ADVERSE OUTCOMES, AND WOUND INFECTIONS.
- DON'T "TANK-UP" THE PATIENT PRIOR TO SURGERY. REMEMBER ANEMIA IS A SIGN OF AN UNDERLYING DISEASE NOT A SPECIFIC DIAGNOSIS.

American Association of Blood Banks

View all recommendations from this society

Released April 24, 2014; Updated January 28, 2022

Don't transfuse more units of red blood cells or other components than absolutely necessary.

- For red blood cells, a restrictive threshold (7.0-8.0g/dL) should be used for the vast majority of hospitalized, stable patients without evidence of inadequate tissue oxygenation (evidence supports a threshold of 8.0g/dL in patients with pre-existing cardiovascular disease). Transfusion decisions should be influenced by symptoms and hemoglobin concentration. Single unit red cell transfusions should be the standard for non-bleeding, hospitalized patients. Additional units should only be prescribed after re-assessment of the patient and their hemoglobin value.
- For plasma, do not transfuse plasma to correct coagulopathy in non-bleeding patients or patients.
- Do not transfuse platelets without laboratory guidance outside of fixed-ratio massive transfusions.

These items are provided solely for informational purposes and are not intended as a substitute for consultation with a medical professional. Patients with any specific questions about the items on this list or their individual situation should consult their physician.

How The List Was Created +

Sources -

Carson JL, Grossman BJ, Kleinman S, Tinmouth AT, Marques MB, Fung MK, Holcomb JB, Illoh O, Kaplan LJ, Katz LM, Rao SV, Roback JD, Shander A, Tobian AA, Weinstein R, Swinton McLaughlin LG, Djulbegovic B; Clinical Transfusion Medicine Committee of the AABB. Red blood cell transfusion: a clinical practice guideline from the AABB. Ann Intern Med. 2012 Jul 3;157(1):49–58.

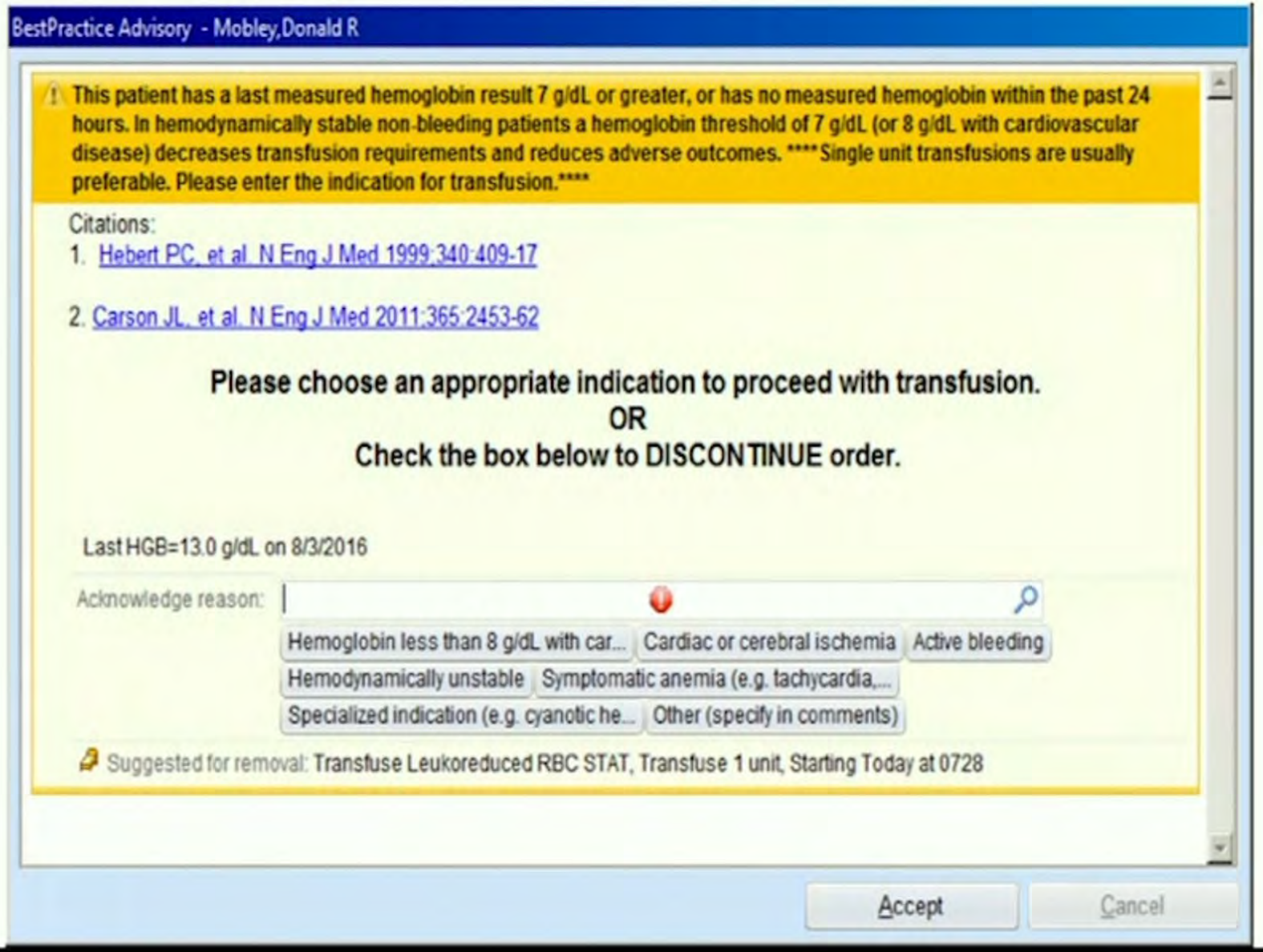
> BLOOD SAVES LIVES WHEN YOU NEED IT,
> BUT ONLY INCREASES RISKS AND COSTS WHEN YOU DON'T!
>
> STEVEN FRANK, MD

"Why give 2 when 1 will do?"

I'm long on record as stating that in "the old days," when people used to use a trigger of 10 g/dL of hemoglobin to transfuse people, that was silly. But now, I fear that the pendulum has swung the other way, and I hear people saying very strongly, "Any transfusion with a hemoglobin over 7 is obviously automatically inappropriate," and I think that's just as silly. So again, I know this is a sidebar, Aryeh, but I wonder if I could get your take on this? My position is, those are numbers and we're not treating numbers, we are treating patients, and I don't want to influence your answer (obviously I couldn't), but how do you feel about that argument?

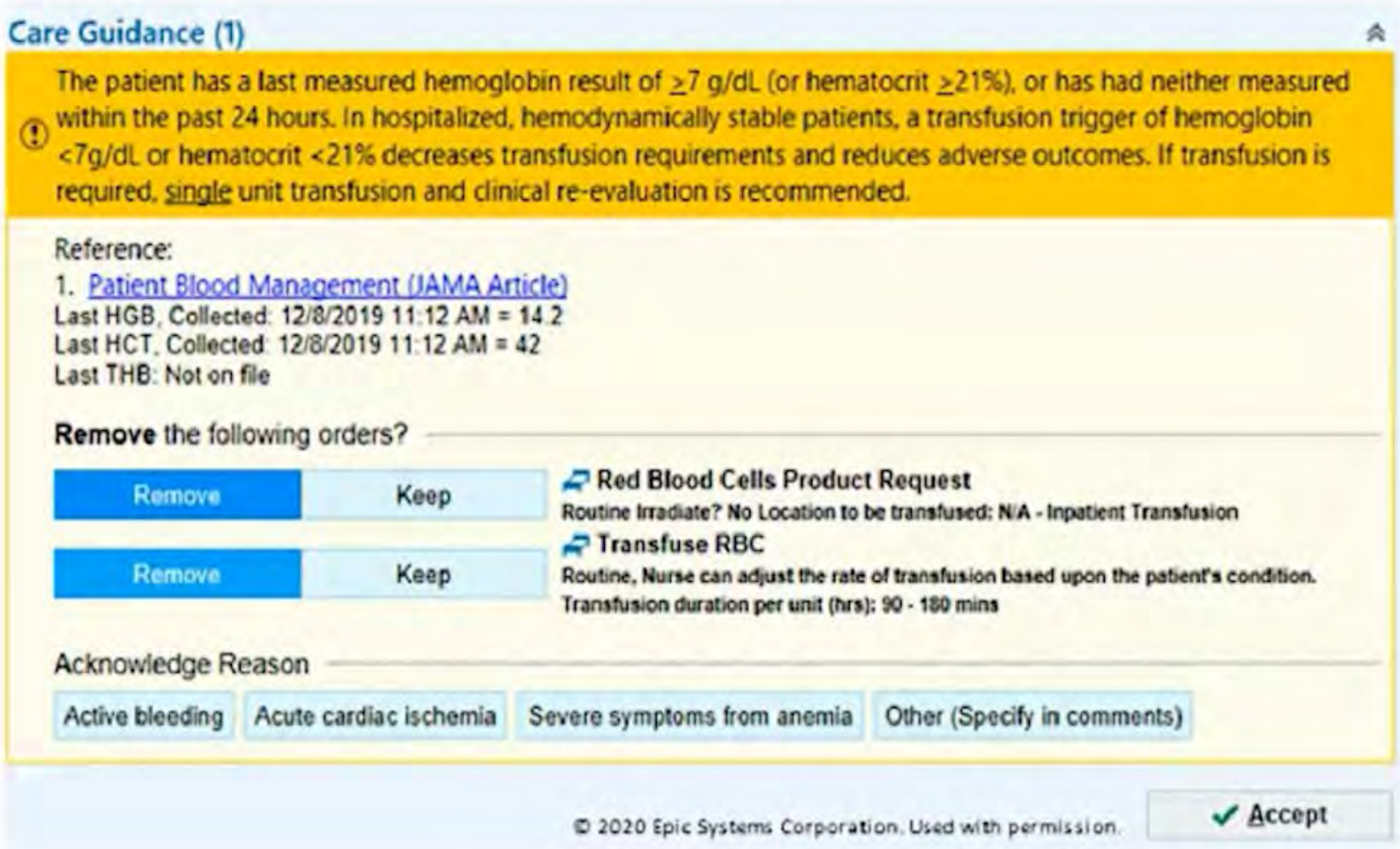
> THE REAL QUESTION IS NOT WHETHER A TRANSFUSION WAS "APPROPRIATE."
> THE REAL QUESTION IS WHETHER A TRANSFUSION WAS "AVOIDABLE."
>
> ARYEH SHANDER, MD

Best Practice Advisory triggered on Hb ≥ 7 g/dL



Hemoglobin/hematocrit BPA:

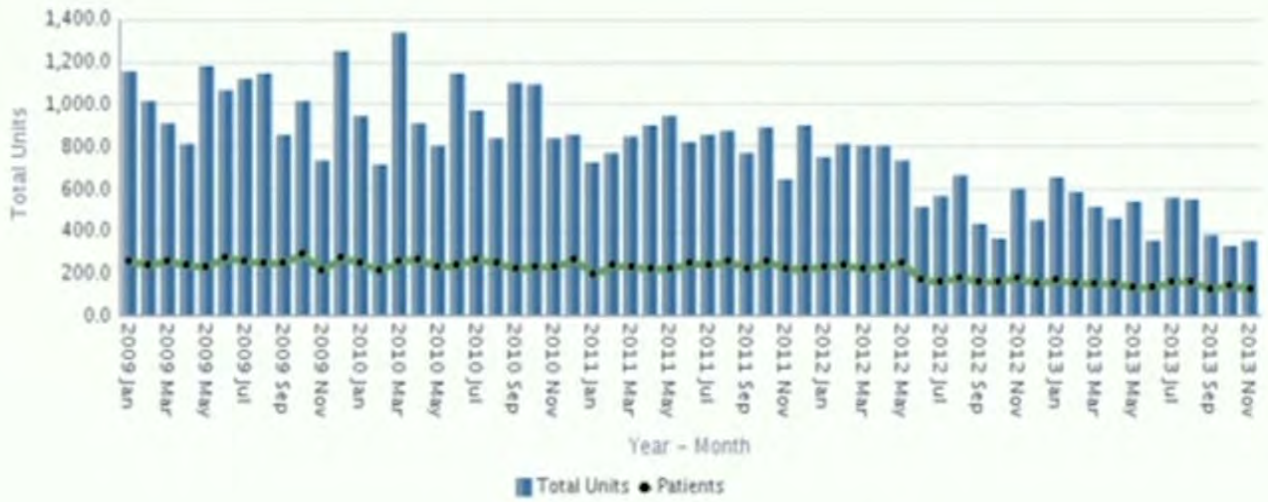
End user action to remove order 30% (very successful)



Zuckerberg GS, et al. *TRANSFUSION*, 2015

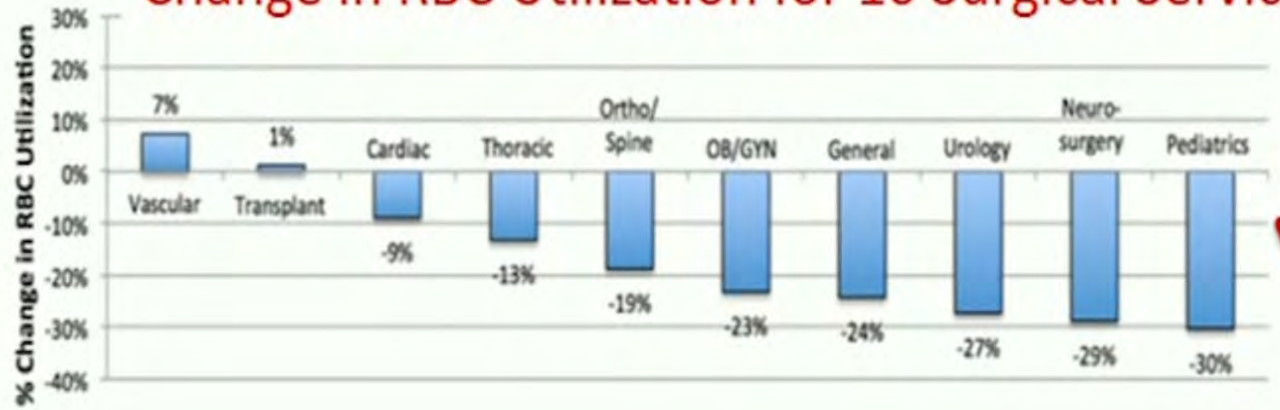
"Efficacy of Education Followed by Computerized Provider Order Entry with Clinician Decision Support to Reduce Red Blood Cell Utilization"

Monthly number of RBC units w/ preceding Hb > 8



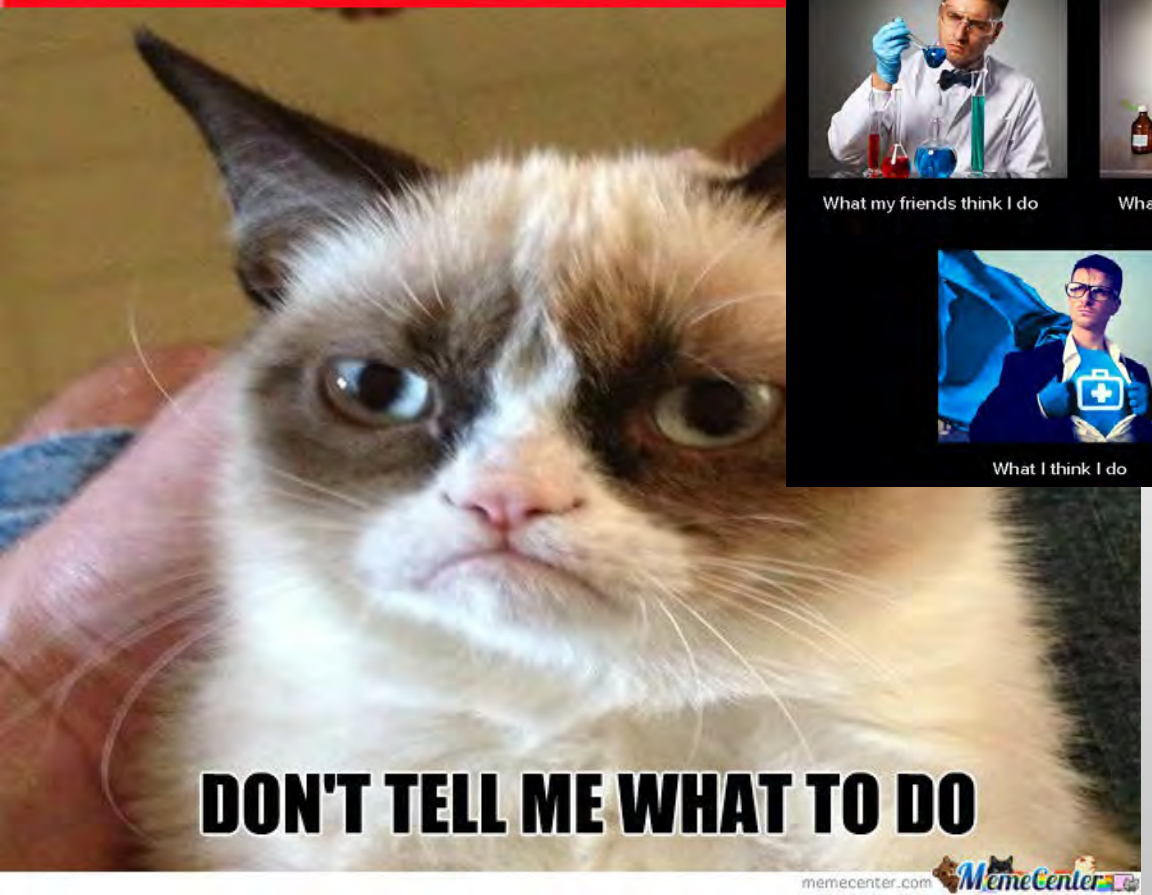
54%

Change in RBC Utilization for 10 Surgical Services



14.3%


KEEP
CALM
AND


DON'T TELL ME WHAT TO DO
memecenter.com
MemeCenter


Laboratory Scientist
What my friends think I do
What my parents think I do
What society thinks I do
What I think I do
What I really do

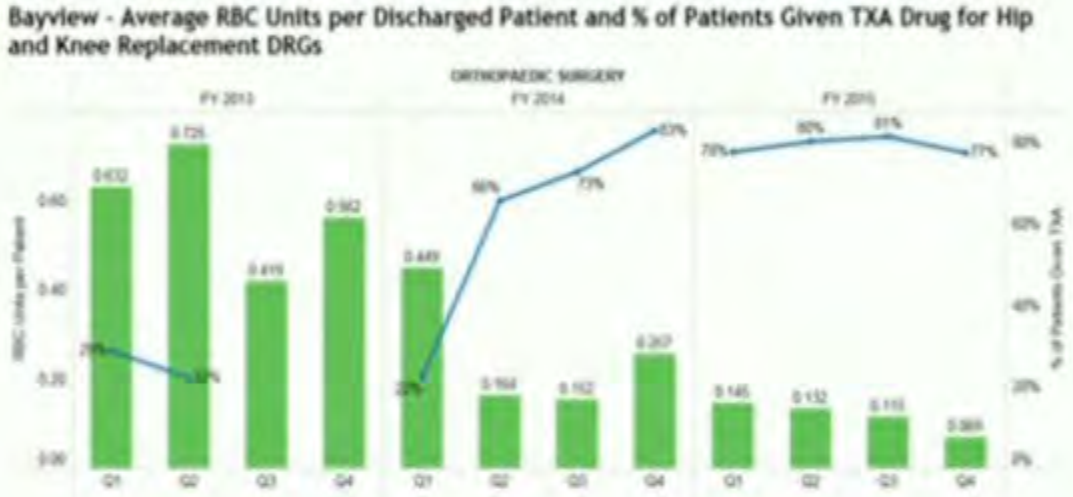

DANIEL DAY-LEWIS
There Will Be Blood
Written for the Screen and Directed by PAUL THOMAS ANDERSON

Bayview Hip and Knee Replacement FY13 – FY15

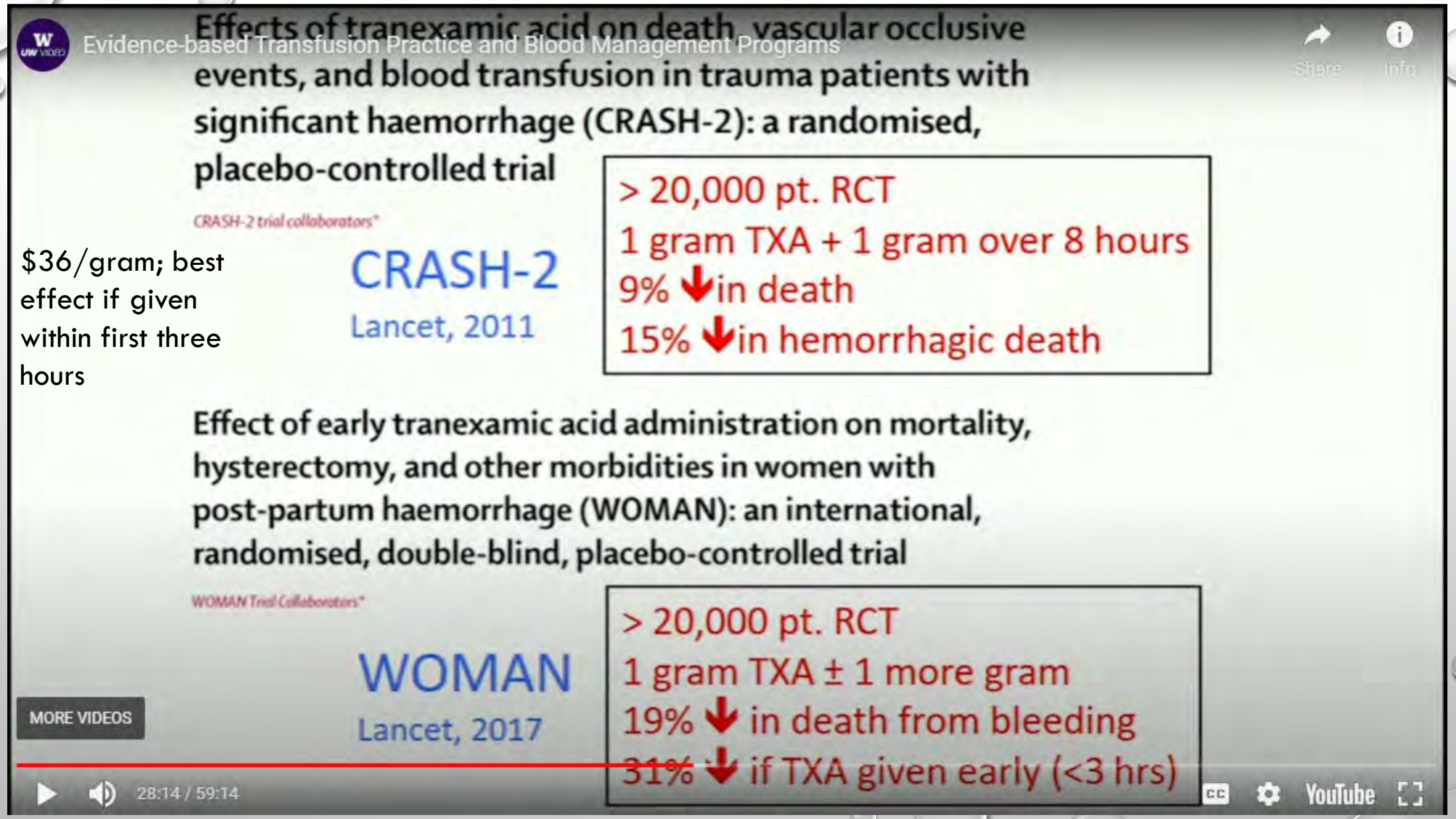
Tranexamic acid - a "game-changer"

Orthopedic, Cardiac, Trauma, and PPH cases "game changer". No evidence to date that it increases the risk for development of clots. Caveat is in those pts with SAH!!

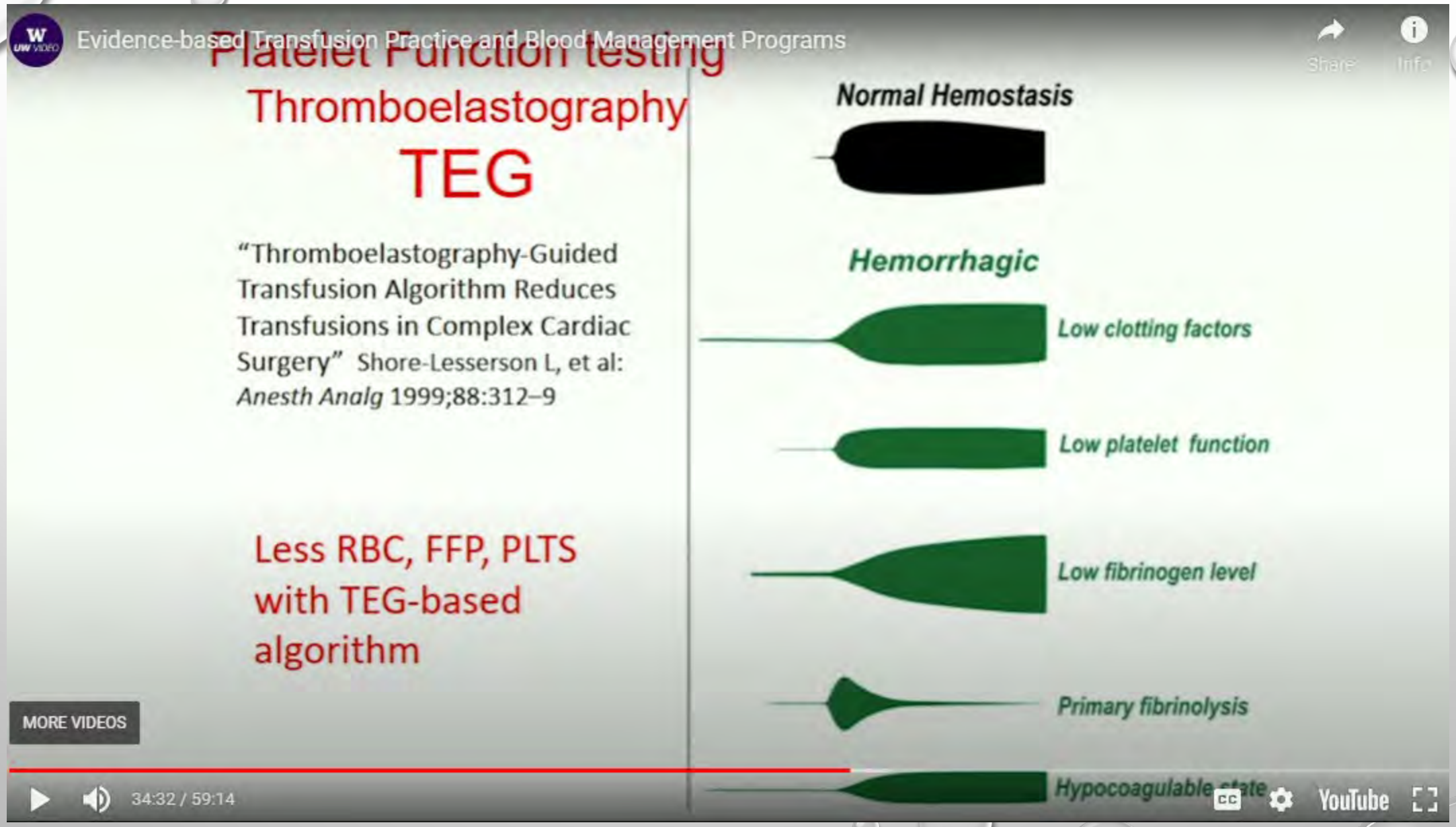
TXA began



73% ↓ In RBC U/Pt.



$36/gram; best effect if given within first three hours


Evidence-based Transfusion Practice and Blood Management Programs
Share
Info
Platelet Function testing
Thromboelastography
TEG
"Thromboelastography-Guided Transfusion Algorithm Reduces Transfusions in Complex Cardiac Surgery" Shore-Lesserson L, et al: Anesth Analg 1999;88:312–9
Less RBC, FFP, PLTS with TEG-based algorithm
Normal Hemostasis
Hemorrhagic
Low clotting factors
Low platelet function
Low fibrinogen level
Primary fibrinolysis
Hypocoagulable state
MORE VIDEOS
34:32 / 59:14
CC
YouTube


Monkey Wrench
"The Ultimate Foo Fighters Experience"


Oh, look at that cute little bastard.


ACADEMY AWARD® WINNER BEST ACTRESS JENNIFER LAWRENCE
BRADLEY COOPER
JENNIFER LAWRENCE
ROBERT DE NIRO
JACKI WEAVER
AND CHRIS TUCKER
SILVER LININGS PLAYBOOK
"THE BEST PICTURE OF THE YEAR!"

Ways to Decrease Blood Utilization

Provided as guidance by South Texas Blood & Tissue Center

Red Blood Cells/Platelets:

- When possible, split platelet units into smaller doses, which is an evidence-based, practice-based method for adult oncology inpatients based on the PLADO study (Slichter et al. N Engl J Med 2010;362:600-613).
- Avoid prophylactic transfusion of thrombocytopenic patients not actively bleeding, so platelets are available for actively bleeding patients needing therapeutic platelet transfusion.
- Consider using platelet counts of 5 x 10^3 as the trigger for prophylactic platelet transfusions rather than 10 x 10^3.

Plasma/Cryoprecipitate:

- Evaluate a more permissive policy for Prothrombin Complex Concentrates (e.g., Kcentra).
- Consider using tranexamic acid when appropriate.
- Implement off-label use of fibrinogen concentrate (RiaSTAP or other FDA approved similar products) to reduce the use of cryoprecipitate.

"The average decrease in blood donations was found to be 38%, with some regions showing up to 67% decrease."

The Impact of COVID-19 on Blood Transfusion Services: A Systematic Review and Meta-Analysis

Cindy Chiem Khader Alghamdi Thao Nguyen Joon Hee Han
Hongzhao Huo Denise Jackson

Laboratory Medicine, School of Health and Biomedical Sciences, RMIT University, Bundoora, VIC, Australia

Keywords
COVID-19 · Blood transfusion · Donations · RNAaemia

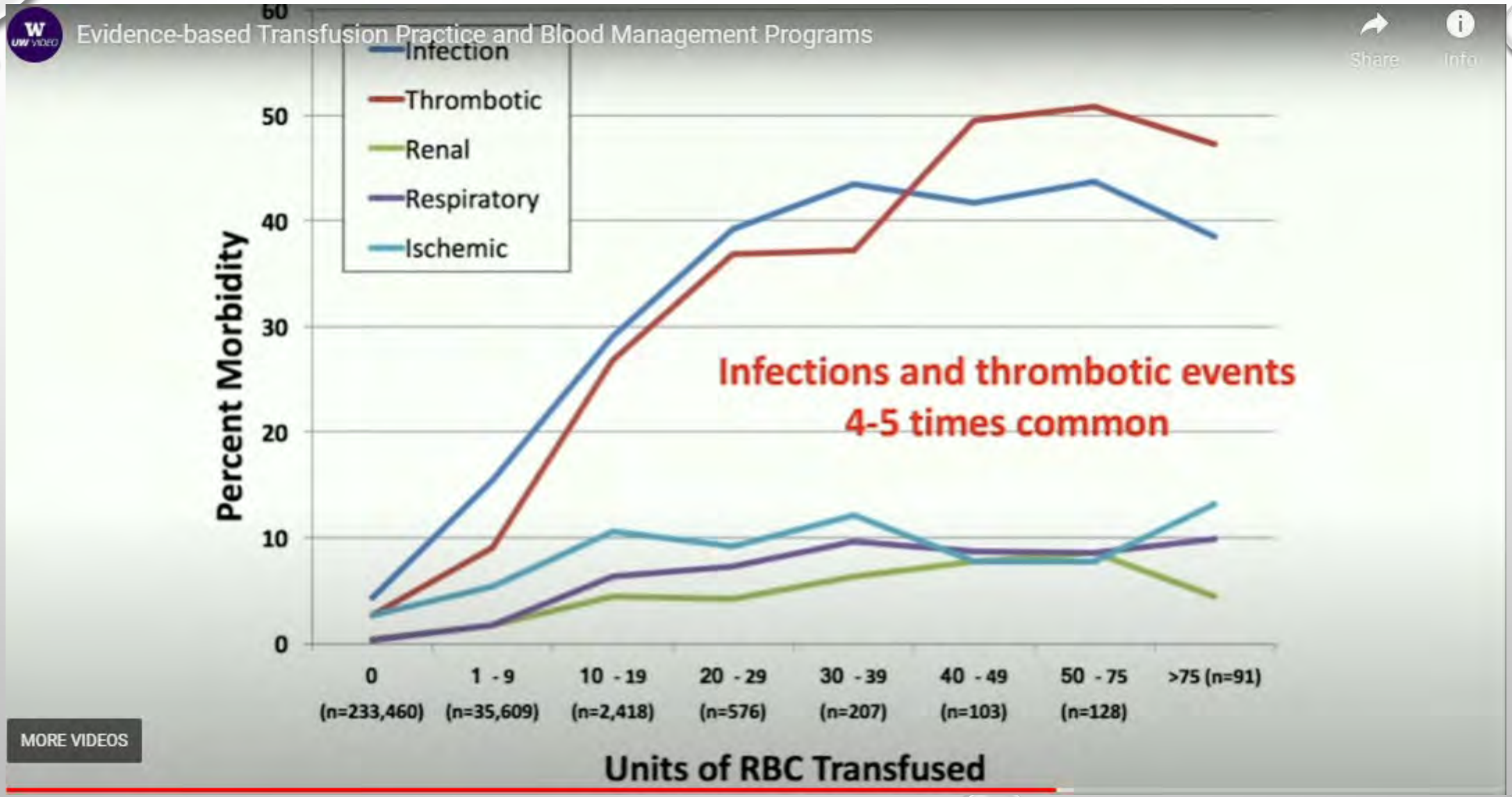
Abstract

Introduction: While SARS-CoV-2's main transmission route is through respiratory droplets, research has found that viral RNA could be detected in blood samples, causing concerns over the safety of blood donations and blood products. This paper therefore aims to systematically search for studies that have addressed their country's lack of donations and analyse the risk of blood transfusion-transmission. As such, it will answer the question "should blood services focus more on donation vigilance or worry more about the risks of transmission through blood products?" ***Methods:*** 38 articles were identified through a systematic review adopting the PRISMA and STROBE guidelines. Meta-analysis was conducted using OpenMeta software. ***Results:*** The average decrease in blood donations was found to be 38%, with some regions showing up to 67% decrease. To assess the risk of actual blood transfusion-transmission, three datasets were analysed. Firstly, the viral load in COVID-19 patients was studied and found to have less than 1% detection rate (ARD = −0.831, 95% −0.963, −0.699). Secondly, the prevalence of finding viral RNA in a pool of donations was nearly −1.503 (ARD = −1.538, −1.468). Lastly, recipients who were given blood products of positive donors were found to be −0.911 (ARD 95% = −1.247, −0.575). ***Discussion/Conclusion:*** Blood centres should focus more on launching initiatives and policies that would increase their countries' blood supply as the virus has no direct threat to blood safety.

Introduction

Blood transfusion is considered an integral part of medicine that treats thousands of patients every year, making blood products' management, safety, and storage fundamental in every country's national healthcare policy [1, 2]. Maintaining an adequate supply of blood products is no easy feat considering blood components have a short shelf life ranging from 5 to 42 days, and the fact that blood collection relies entirely on generous donations from the public [3]. However, not everyone can or is willing to donate; hence, constant encouragement from blood centres is therefore a necessary prosocial behaviour so that blood can be collected from all ethnicities and blood types. Due to its reliance on donations, the supplies can easily be diminished when disaster strikes especially in the cases of pandemics [4, 5].

Since late 2019, the world was plagued by a new disease that originated from Wuhan, China, infecting over 28 million people and causing at least 900,000 deaths across 188 countries [4]. Healthcares were suddenly hit with critical shortages of PPEs, ventilators, and hospital beds, causing governments around the world to act in an unprecedented manner to mitigate the exponential rise of infected cases [6–8]. Social distancing was implemented, as well as closing down public venues, schools, universities, and any non-essential work [7, 8]. This lockdown and the fear of virus transmission has not only affected the public's health and a decline in economy, it also caused a significant drop in the number of blood donations across the world, creating shortages at various blood banks and diminishing nationwide blood supply.


Evidence-based Transfusion Practice and Blood Management Programs
Share
Info
Infection
Thrombotic
Renal
Respiratory
Ischemic
Percent Morbidity
60
50
40
30
20
10
0
Infections and thrombotic events
4-5 times common
0 (n=233,460)
1 - 9 (n=35,609)
10 - 19 (n=2,418)
20 - 29 (n=576)
30 - 39 (n=207)
40 - 49 (n=103)
50 - 75 (n=128)
>75 (n=91)
Units of RBC Transfused
MORE VIDEOS

- Blood saves lives when you need it

- Only increases risks and costs when you don't

TRANSFUSION REACTIONS

"Put Neidermeyer (Fillman) on it, he's a sneaky little shit!"

https://www.aabb.org/docs/default-source/default-document-library/resources/aabb-quick-reference-guide-nhsn-hemovigilance-module.pdf?sfvrsn=30f1600b_0

Advancing Transfusion and Cellular Therapies Worldwide

QUICK REFERENCE GUIDE
NHSN Hemovigilance Module: Adverse Reaction Definitions

TRANSFUSION-ASSOCIATED GRAFT VS. HOST DISEASE (TAGVHD)
The introduction of immunocompetent lymphocytes into susceptible hosts. The allogeneic lymphocytes engraft, proliferate, and destroy host cells. If performed, marrow study shows hypoplasia, aplastic anemia, or marked hypocellularity with a lymphohistiocytic infiltrate.

Definitive: A clinical syndrome occurring from 2 days to 6 weeks after cessation of transfusion characterized by:

- Characteristic rash: erythematous, maculopapular eruption centrally that spreads to extremities and may, in severe cases, progress to generalized erythroderma and hemorrhagic bullous formation.
- Diarrhea
- Fever
- Hepatomegaly
- Liver dysfunction (i.e., elevated ALT, AST, Alkaline phosphatase, and bilirubin)
- Marrow aplasia
- Pancytopenia

AND
Characteristic histological appearance of skin or liver biopsy.

Probable: Meets definitive criteria
EXCEPT
Biopsy negative or not done.

Possible: N/A

POST TRANSFUSION PURPURA
Thrombocytopenia usually arising 5-12 days following transfusion of cellular blood components with findings of antibodies in the patient directed against the Human Platelet Antigen (HPA) system.

Definitive: Alloantibodies in the patient directed against HPA or other platelet specific antigen detected at or after development of thrombocytopenia
AND
Thrombocytopenia (i.e., decrease in platelets to less than 20% of pre-transfusion count).

Probable: Alloantibodies in the patient directed against HPA or other platelet specific antigen detected at or after development of thrombocytopenia.
AND
Decrease in platelets to levels between 20% and 80% of pre-transfusion count.

Possible: PTP is suspected, but laboratory findings and/or information are not sufficient to meet defined criteria above. For example, the patient has a drop in platelet count to less than 80% of pre-transfusion count but HPA antibodies were not tested or were negative. Other, more specific adverse reaction definitions do not apply.

UNKNOWN
Use this category if the patient experienced transfusion-related symptoms, but the medical event that caused those symptoms could not be classified.

TRANSFUSION-RELATED ACUTE LUNG INJURY (TRALI)
Acute hypoxemia with PaO2/fraction of inspired oxygen [FIO2] ratio of 300 mmHg or less combined with chest x-ray showing bilateral infiltrates in the absence of left atrial hypertension (i.e., circulatory overload). Onset of TRALI is abrupt in association with transfusion.

Definitive: NO evidence of acute lung injury (ALI) prior to transfusion
AND
ALI onset during or within 6 hours of cessation of transfusion
AND
Hypoxemia defined by any of these methods:

- PaO2/FiO2 less than or equal to 300 mmHg
- Oxygen saturation less than 90% on room air
- Other clinical evidence

AND
Radiographic evidence of bilateral infiltrates
AND
No evidence of left atrial hypertension (i.e., circulatory overload)

Probable: N/A
Possible: N/A

TRANSFUSION-ASSOCIATED CIRCULATORY OVERLOAD (TACO)
Infusion volume that cannot be effectively processed by the recipient either due to high rate and/or volume of infusion or an underlying cardiac or pulmonary pathology.

Definitive: New onset or exacerbation of 3 or more of the following within **12 hours** of cessation of transfusion:
(At least 1 of the following from A & B:)
A. Evidence of acute or worsening respiratory distress (dyspnea, tachypnoea, cyanosis and decreased oxygen saturation values in the absence of other specific causes) **and/or**
B. Radiographic or clinical evidence of acute or worsening pulmonary edema (crackles on lung auscultation, orthopnea, cough, a third heart sound and pinkish frothy sputum in severe cases); **or both**
AND

- Elevated brain natriuretic peptide (BNP) or NT-pro BNP relevant biomarker
- Evidence of cardiovascular system changes not explained by underlying medical condition (Elevated central venous pressure, evidence of left heart failure including development of tachycardia, hypertension, widened pulse pressure, jugular venous distension, enlarged cardiac silhouette and/or peripheral edema)
- Evidence of fluid overload

Probable: N/A
Possible: N/A

TRANSFUSION-TRANSMITTED INFECTION (TTI)
A bacteria, parasite, virus, or other potential pathogen transmitted in donated blood to transfusion recipient.

Definitive: Laboratory evidence of a pathogen in the transfusion recipient.
Probable: N/A
Possible: Temporarily associated unexplained clinical illness consistent with infection, but no pathogen is detected in the recipient. Other, more specific adverse reactions are ruled out.
Note: Possible cases cannot meet the definite or probable imputability criteria.

ALLERGIC REACTION
The result of an interaction of an allergen with preformed antibodies. In some instances, infusion of antibodies from an atopic donor may also be involved. It may present with only muccocutaneous signs and symptoms.

Note: Minor allergic reactions (non-severe) do not have to be reported to NHSN.

Definitive: 2 or more of the following occurring during or within 4 hours of cessation of transfusion:

- Conjunctival edema
- Edema of lips, tongue and uvula
- Erythema and edema of the periorbital area
- Generalized flushing
- Hypotension
- Localized angioedema
- Maculopapular rash
- Pruritus (itching)
- Respiratory distress; bronchospasm
- Urticaria (hives)

Probable: ANY 1 of the following occurring during or within 4 hours of cessation of transfusion:

- Conjunctival edema
- Edema of lips, tongue and uvula
- Erythema and edema of the periorbital area
- Localized angioedema
- Maculopapular rash
- Pruritus (itching)
- Urticaria (hives)

Possible: N/A

TRANSFUSION ASSOCIATED DYSPNEA (TAD)
Respiratory distress within 24 hours of cessation of transfusion that does not meet the criteria for TRALI, TACO, or allergic reaction. Respiratory distress should not otherwise be explained by a patient's underlying or pre-existing medical condition.

Definitive: Acute respiratory distress occurring within 24 hours of cessation of transfusion
AND
Allergic reaction, TACO, and TRALI definitions are not applicable.

Probable: N/A
Possible: N/A

OTHER
Use this option if the recipient experienced an adverse reaction that is not defined in the Hemovigilance Module Surveillance Protocol (e.g., transfusion-associated acute gut injury (TRAGI), transfusion-associated immunomodulation (TRIM), iron overload, microchimerism, hyperkalemia, thrombosis).

FEBRILE NON-HEMOLYTIC TRANSFUSION REACTION (FNHTR)
Fever and/or chills without hemolysis occurring in the patient during or within 4 hours of cessation of transfusion. If transfusion-related, the most common cause is a reaction to passively transfused cytokines or a reaction of recipient antibodies and leukocytes in the blood product. If blood culture of patient or residual component is performed, the results should be negative. Laboratory findings should show no evidence of acute hemolysis.

Note: Reactions may be classified as FNHTRs in the absence of fever if chills or rigors occur.

Definitive: Occurs during or within 4 hours of cessation of transfusion
AND EITHER

- Fever (greater than or equal to 38°C/100.4°F oral and a change of at least 1°C/1.8°F from pre-transfusion value)

OR

- Chills/rigors are present.

Probable: N/A

Possible: FNHTR is suspected, but reported symptoms and/or available information are not sufficient to meet the criteria defined above. Other, more specific adverse reaction definitions do not apply.

HYPOTENSIVE TRANSFUSION REACTION
A drop in blood pressure occurring during or within 1 hour of cessation of transfusion. Other symptoms, such as facial flushing, dyspnea, or abdominal cramps may occur, but usually hypotension is the sole manifestation.

Definitive: All other adverse reactions presenting with hypotension are excluded
AND
Hypotension occurs during or within 1 hour after cessation of transfusion.

- Adults (≥18 years): Drop in systolic BP of greater than or equal to 30 mmHg and systolic BP less

DELAYED HEMOLYTIC TRANSFUSION REACTION (DHTR)
The recipient develops antibodies to RBC antigen(s) between 24 hours and 28 days after cessation of transfusion. Clinical signs of hemolysis are usually present. If performed, post-transfusion LDH and bilirubin levels increase and subsequently fall back to baseline in the following days.

Note: Report all hemolytic reactions, including when the recipient is intentionally transfused with incompatible blood components.

Definitive: Positive direct antiglobulin test (DAT) for antibodies developed between 24 hours and 28 days after cessation of transfusion
AND EITHER

- Positive elution test with alloantibody present on the transfused red blood cells

OR

- Newly-identified red blood cell alloantibody in recipient serum

AND EITHER

- Inadequate rise of post-transfusion hemoglobin level or rapid fall in hemoglobin back to pre-transfusion levels

OR

- Otherwise unexplained appearance of spherocytes.

Probable: Newly-identified red blood cell alloantibody demonstrated between 24 hours and 28 days after cessation of transfusion
BUT
Incomplete laboratory evidence to meet definitive case definition criteria.

Note: Patient may be asymptomatic or have symptoms that are similar to but milder than AHTR; symptoms are not required to meet case definition criteria.

Possible: DHTR is suspected, but reported symptoms, test results, and/or available information are not sufficient to meet the criteria defined above. Other, more specific adverse

Advancing Transfusion and Cellular Therapies Worldwide

ACUTE HEMOLYTIC TRANSFUSION REACTION (AHTR)
Rapid destruction of red blood cells during, immediately after, or within 24 hours of cessation of transfusion. Clinical and laboratory signs of hemolysis are present.

Note: Report hemolytic reactions resulting from immune or non-immune causes, including when the recipient is intentionally transfused with incompatible blood components.

Definitive: Occurs during, or within 24 hours of cessation of transfusion with new onset of **ANY** of the following signs/symptoms:

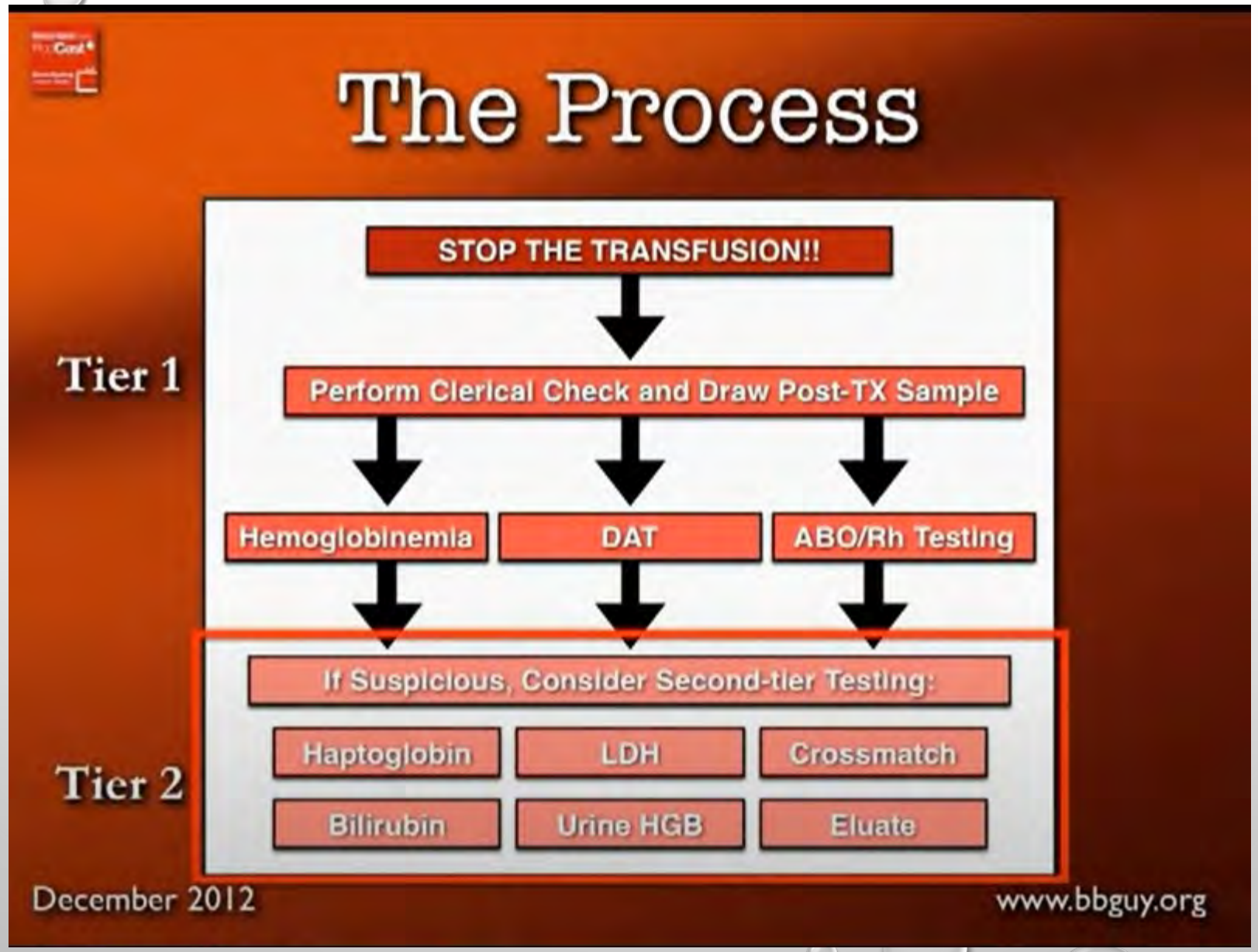
- Back/flank pain
- Chills/rigors
- Disseminated intravascular coagulation (DIC)
- Epistaxis
- Fever
- Hematuria (gross visual hemolysis)
- Hypotension
- Oliguria/anuria
- Pain and/or oozing at IV site
- Renal failure

AND
2 or more of the following:

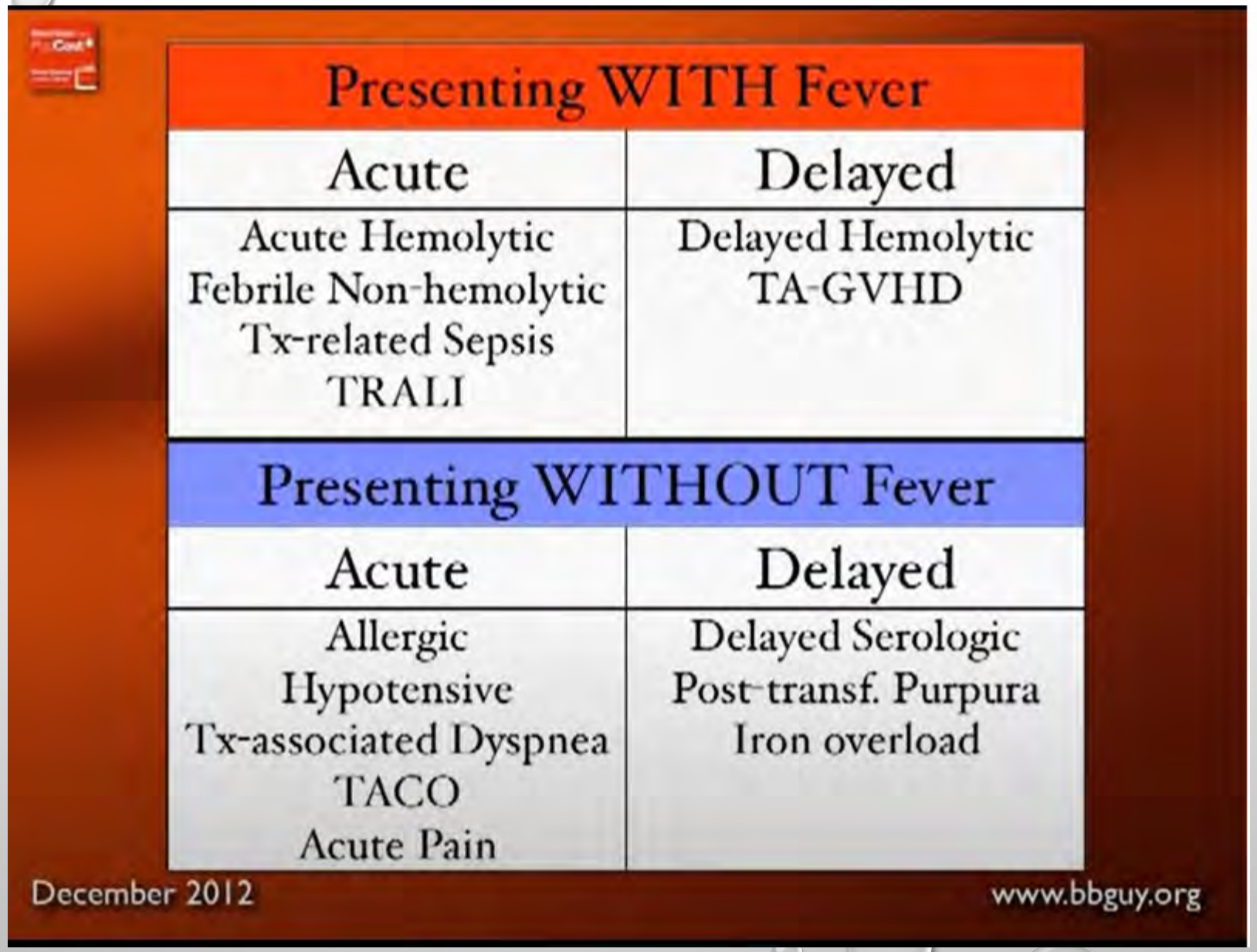
- Decreased fibrinogen
- Decreased haptoglobin
- Elevated bilirubin
- Elevated LDH
- Hemoglobinemia
- Hemoglobinuria
- Plasma discoloration c/w hemolysis
- Spherocytes on blood film

AND EITHER
IMMUNE MEDIATED

- Positive direct antiglobulin test (DAT) for anti-IgG or anti-C3


The Process
STOP THE TRANSFUSION!!
Tier 1
Perform Clerical Check and Draw Post-TX Sample
Hemoglobinemia
DAT
ABO/Rh Testing
If Suspicious, Consider Second-tier Testing:
Tier 2
Haptoglobin
LDH
Crossmatch
Bilirubin
Urine HGB
Eluate
December 2012
www.bbguy.org

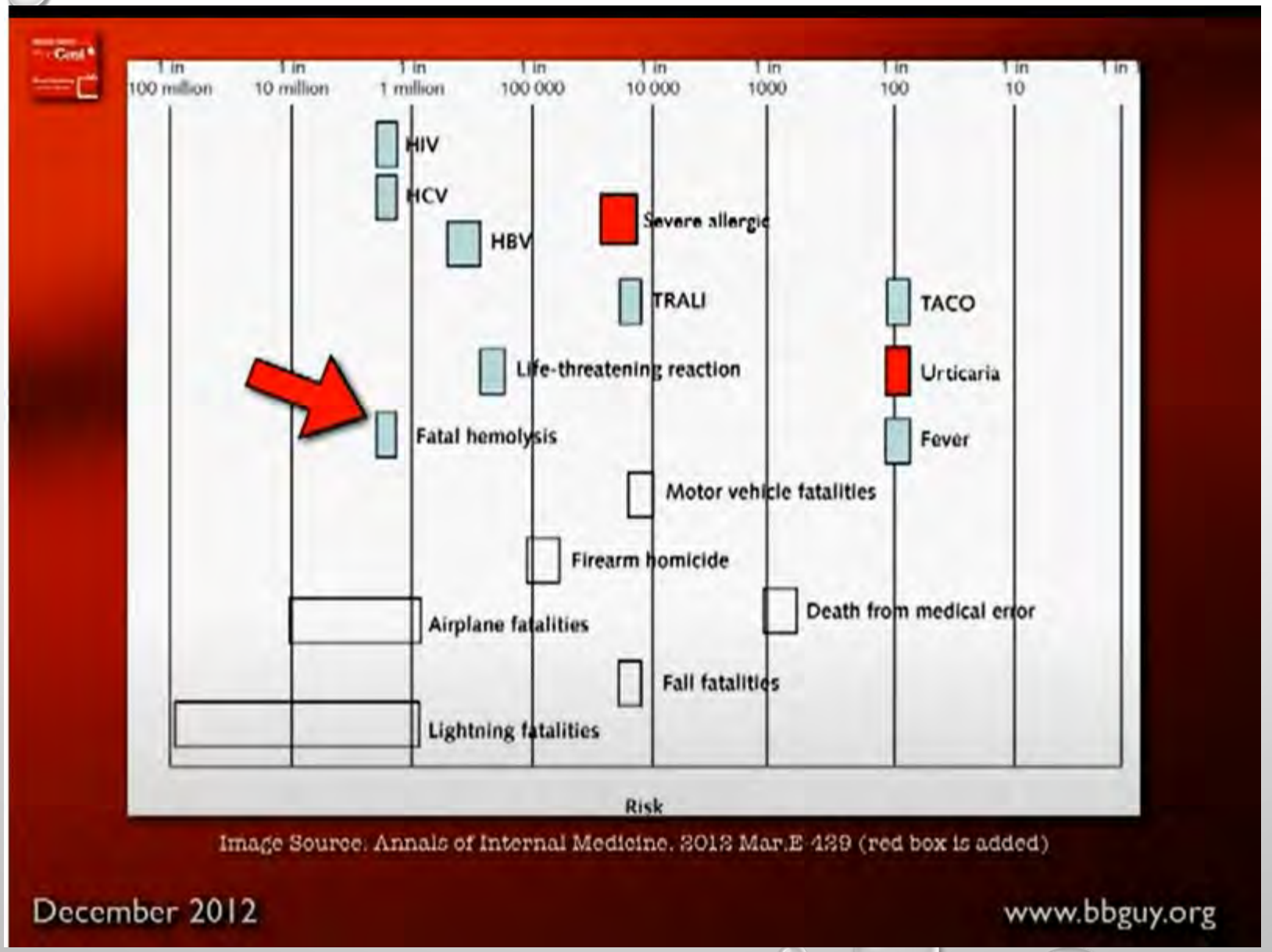
Less than 24 hours versus Greater than 24 hours is the cut point for acute and delayed.



TRANSFUSION REACTIONS

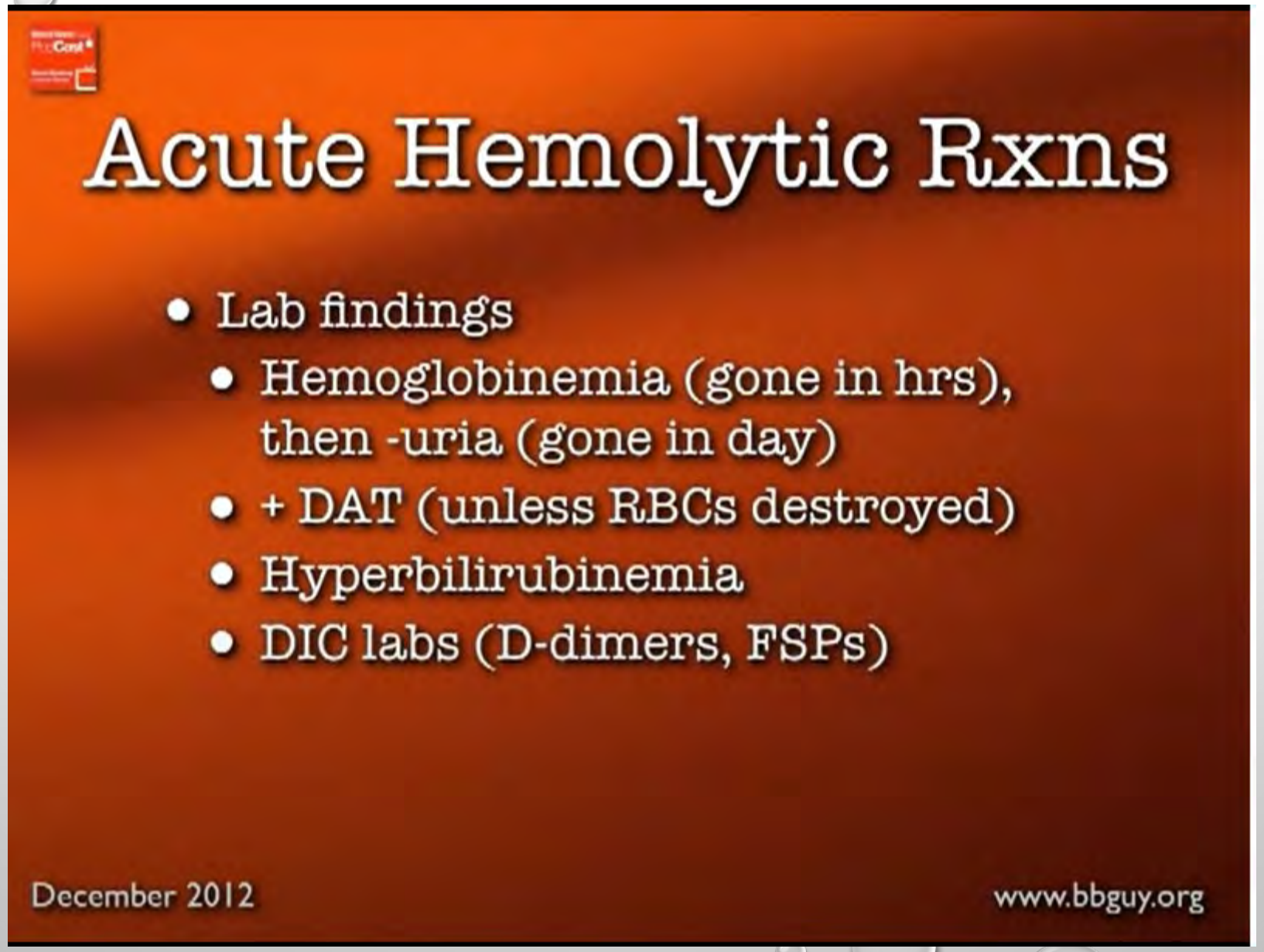
- WHEN IN DOUBT STOP THE TRANSFUSION!!!!!

- ACUTE HEMOLYTIC TRANSFUSION REACTION (AHTR).***
- DELAYED HEMOLYTIC TRANSFUSION REACTIONS (DHTR).
- FEBRILE NON-HEMOLYTIC TRANSFUSION REACTION (FNHTR). MOST COMMON.
- ALLERGIC REACTION.
- TRANSFUSION-ASSOCIATED CIRCULATORY OVERLOAD (TACO).
- TRANSFUSION-ASSOCIATED LUNG INJURY (TRALI).
- HTTPS://WWW.AABB.ORG/DOCS/DEFAULT-SOURCE/DEFAULT-DOCUMENT-LIBRARY/RESOURCES/AABB-QUICK-REFERENCE-GUIDE-NHSN-HEMOVIGILANCE-MODULE.PDF?SFVRSN=30F1600B_4


1 in 100 million
1 in 10 million
1 in 1 million
1 in 100 000
1 in 10 000
1 in 1000
1 in 100
1 in 10
HIV
HCV
HBV
Severe allergic
TRALI
TACO
Life-threatening reaction
Urticaria
Fatal hemolysis
Fever
Motor vehicle fatalities
Firearm homicide
Airplane fatalities
Death from medical error
Fall fatalities
Lightning fatalities
Risk
Image Source: Annals of Internal Medicine. 2012 Mar.E-129 (red box is added)
December 2012
www.bbguy.org

ACUTE HEMOLYTIC TRANSFUSION REACTION (AHTR).***

- DON'T MISS THIS ONE.
- MOST COMMON REASON: CLERICAL ERROR/HUMAN ERROR; WE ARE OUR OWN WORST ENEMY.
- DEFINITION IS ITS NAME: RAPID DESTRUCTION OF RED BLOOD CELLS DURING, IMMEDIATELY AFTER, OR WITHIN 24 HOURS OF CESSATION OF TRANSFUSION. CLINICAL AND LABORATORY SIGNS OF HEMOLYSIS ARE PRESENT.
- ACCOMPANIED BY: BACK/FLANK PAIN, CHILLS/RIGORS, DIC, EPISTAXIS, FEVER, HEMATURIA, HYPOTENSION, OLIGURIA/ANURIA, PAIN AND/OR OOZING AT IV SITE.
- 1:76000 (1/1.8 M FATAL).
- 80% ALONE PRESENT WITH SIMPLY FEVER AND CHILLS; EARLY, EARLY EARLY (WITHIN THE FIRST 15 MINUTES—NURSING STAFF START THE TRANSFUSION SLOWLY AND BE COGNIZANT OF TEMP.


Acute Hemolytic Rxns
Lab findings
Hemoglobinemia (gone in hrs), then -uria (gone in day)
+ DAT (unless RBCs destroyed)
Hyperbilirubinemia
DIC labs (D-dimers, FSPs)
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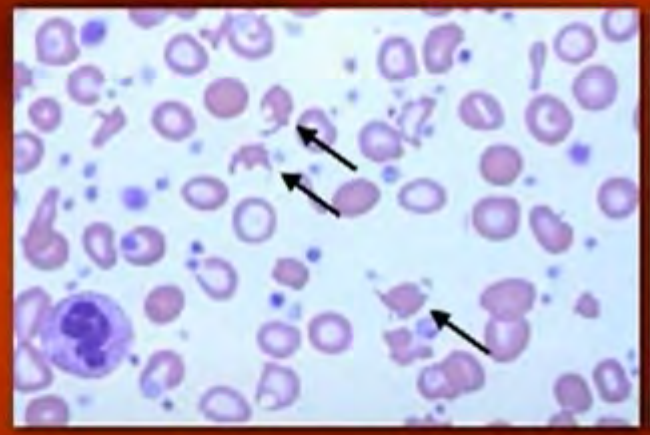
Peripheral Smear

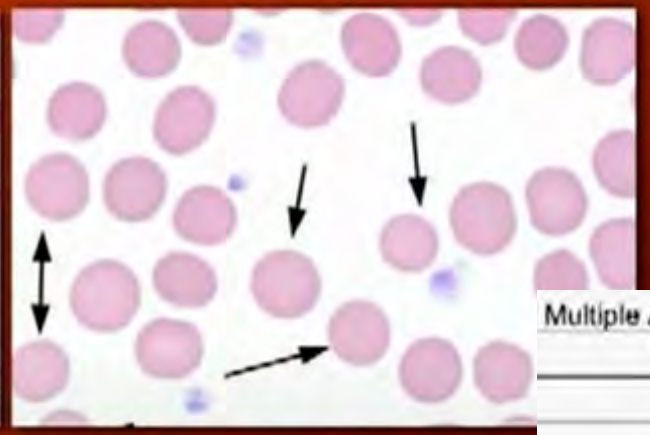
ABO INCOMPATIBILITY (60%)

OTHERS (40%)

Intravascular

Extravascular





Schistocytes

Spherocytes

Multiple Antibodies*
Other**
Fy^a
Jk^b
Kell
Jk^a
c
Js^b
Co^a

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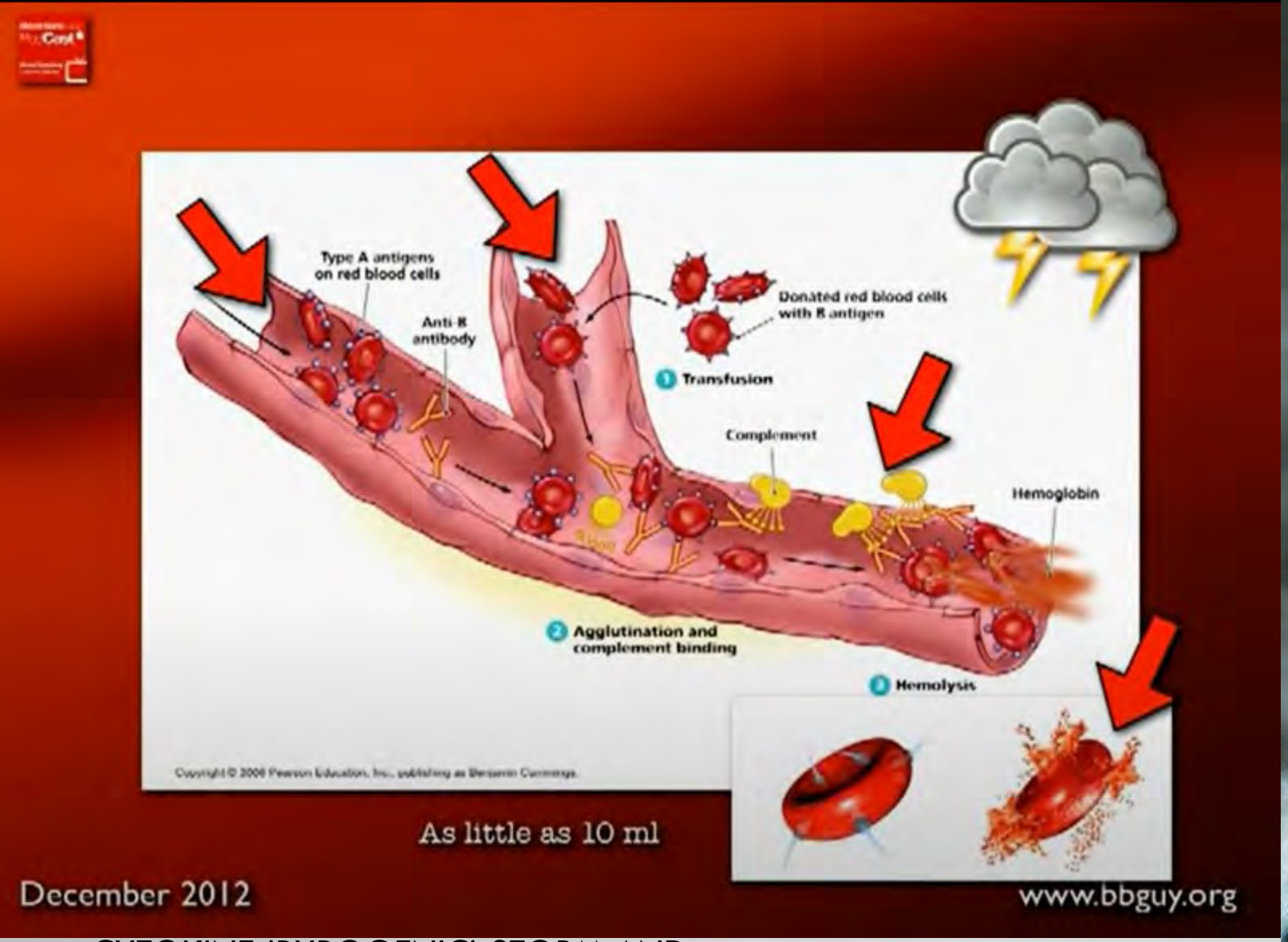

CYTOKINE (PYROGENIC) STORM AND COAGULATION ACTIVATION AS WELL AS FIBRINOLYTIC CASCADES….CYTOKINES, CYTOKINES. "C'MON GUYS, IT'S ALL CYTOKINES (BALLBEARINGS) THESE DAYS!"

Acute Hemolytic Rxns

- Treatment
  - Hydration and diuresis
  - Maintain urine output
    - At least 1 mL/Kg/hr (furosemide)
    - Low-dose Dopamine (+/–)
  - Heparin for early DIC?
  - RBC exchange?

WHAT'S THE PHYSIOLOGIC ISSUE HERE? FLUID OVERLOAD ESPECIALLY IF PATIENTS BECOME ANURIC.

DO THE RIGHT THING. DON'T EVER ASK THAT A MISLABELED SPECIMEN, EVEN ON A HARD STICK EVER BE USED…REDRAW! "CHIP, I WILL COME AT YOU LIKE A SPIDER MONKEY"

Acute Hemolytic Rxns

- Prevention
  - Phlebotomy, labeling, processing, issue, and administration
  - Two separate types done by some
  - Technology (RFID, bar codes, etc)

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TRALI

- Standard Definition
  - NHLBI, Canadian Consensus Conf.
  - New ALI <6 hrs after transfusion
    - ALI: Hypoxemia (PaO_2/FiO_2 ≤300 or O_2 sat <90%), bilateral CXR infiltrates
  - No other known risk factors for pulmonary edema

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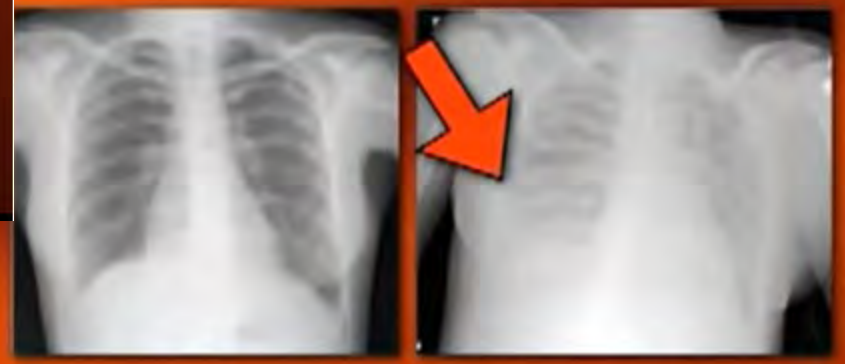
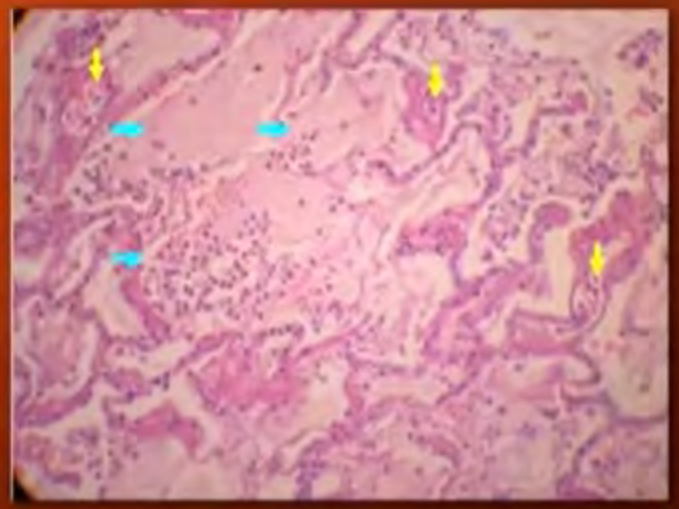
Pathophysiology is simply priming of neutrophils in the lung by usually anti-HLA and/or anti-neutrophil antibodies in the donor units. 30% of our body's neutrophils live in the lungs. Donor females pregnant and/or prior blood transfusion recipient donors.

TRALI



Pretransfusion Post-transfusion



Images courtesy of Dr. Chris Silliman

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This is a transfusion reaction! Consider a pt with CHF or an old frail patient who comes in with chronic symptomatic anemia and you give he or she two or three units of pRBCs for an H/H of 6/18. What's gonna happen? Young and old; Renal failure.

TACO

- Acute CHF due to transfusion
  - Typical CHF physical exam
    - Dyspnea, orthopnea, rales, hypoxia
    - Systolic HTN (widened pulse pressure), JVD, headache
  - Afebrile usually

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Care Guidance (1)

The patient has a last measured hemoglobin result of ≥7 g/dL (or hematocrit ≥21%), or has had neither measured within the past 24 hours. In hospitalized, hemodynamically stable patients, a transfusion trigger of hemoglobin <7g/dL or hematocrit <21% decreases transfusion requirements and reduces adverse outcomes. If transfusion is required, single unit transfusion and clinical re-evaluation is recommended.

TACO VS. TRAIL (DIFFICULT)

TRANSFUSION ASSOCIATED CIRCULATORY OVERLOAD (TACO)

- AT RISK: CHF, VERY YOUNG/VERY OLD, RF, CHRONIC COMPENSATED ANEMIAS. "WHY DO 2 WHEN 1 WILL DO?" TRANSFUSE SLOW.
- NO FEVER; USUALLY.
- HYPERTENSION.
- ELEVATED BNP.
- DYSPNEA OFTEN OVER THE LENGTH OF THE TRANSFUSIONS.
- DIURETIC RESPONSIVE.
- TX: LIKE CHF; SLOW OR SPLIT TRANSFUSION.

TRANSFUSION-RELATED ACUTE LUNG INJURY (TRALI)

- FEVER.
- HYPOTENSION.
- ACUTE DYSPNEA.**
- DIURETIC UNRESPONSIVE.

TRALI

- Proving diagnosis usually difficult and time-consuming
  - Antibodies, ruling out other stuff
- Wet CXR, low O2 sat, no failure signs
  - BNP levels may help
- Respiratory support
- Mortality 5-25%; 80% rapid recovery

TRALI

- Prevention
  - Strategies:
    - All/predom. male plasma/PLTs
    - Male/nullip female plasma/PLTs
    - Screening female PLT donors
  - AABB mandates
  - Defer implicated donors if Abs found

Mild Allergic Reactions

- 1-3% incidence
- Urticaria (hives); local typical
  - Angioedema
- Type I hypersensitivity
- Benadryl prevents (+/-) and treats
- May restart transfusion
- Upper or lower resp sx = "moderate"

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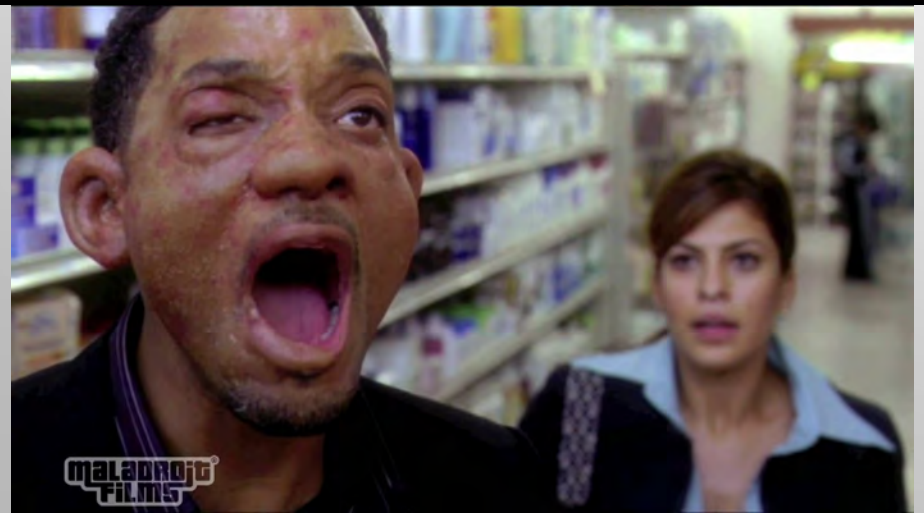

Severe Allergic RXNs

- Definitions:
  - Anaphylactic: Shock, hypotension
  - Anaphylactoid:
    - Some use for milder anaphylactic
    - Respiratory symptoms with hypotension and GI complaints
    - ACEi-related reactions
  - Really loose distinction

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Severe Allergic RXNs

- Classic: IgA deficiency
  - Generally in those with severely decreased/absent IgA (<0.05 mg/dl)
- IgE-type anti-IgA is difficult to detect (anti-IgA in labs is IgG version)
- VERY few with RXN have anti-IgA

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Consider testing for IgA and/or haptoglobin deficiency and if severely low than do anti-IgA testing. VERY RARE. Treat like any other severe (anaphylactic) reaction—Epinephrine, yada yada yada. PREVENTION: IgA deficient products or washed RBCs; autologous donations.

DDX

- Acute HTR
- Septic transfusion reaction
- Acute hypotensive reaction (handout)
- Coincidental anaphylactic RXN
- Pulmonary embolus, acute MI, others

- NOTE: Lack of fever and skin findings may be VERY helpful

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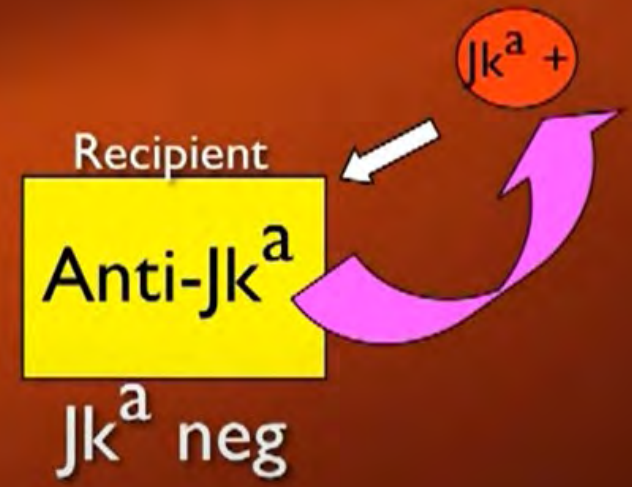
DELAYED HEMOLYTIC REACTIONS

Delayed Hemolytic Rxns

- Hemolysis occurring >24 hrs to <28 days after transfusion (per CDC)
- Anamnestic response is typical
  - Previously formed but currently undetectable antibody
  - Kidd, Duffy, Kell most common
- Primary rarely

Anamnestic Response



Delayed Hemolytic Rxns

- Extravascular (except with Kidd)
- Signs/symptoms
  - Often none
  - Fever/anemia of unknown origin
  - Unexplained jaundice and/or scleral icterus

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Delayed Hemolytic Rxns

- Lab
  - Icteric serum
  - + DAT ("mf")
  - Anemia
  - Newly positive antibody screen
  - Spherocytes
  - LDL, bili, hapto

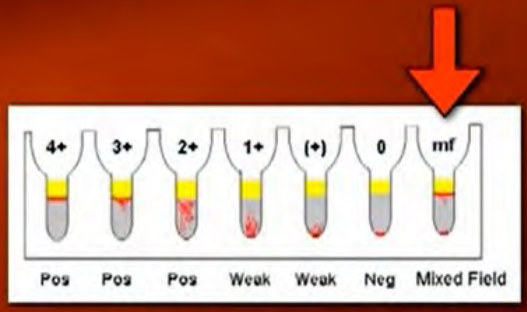

Image source: www.mirrscitech.co.kr

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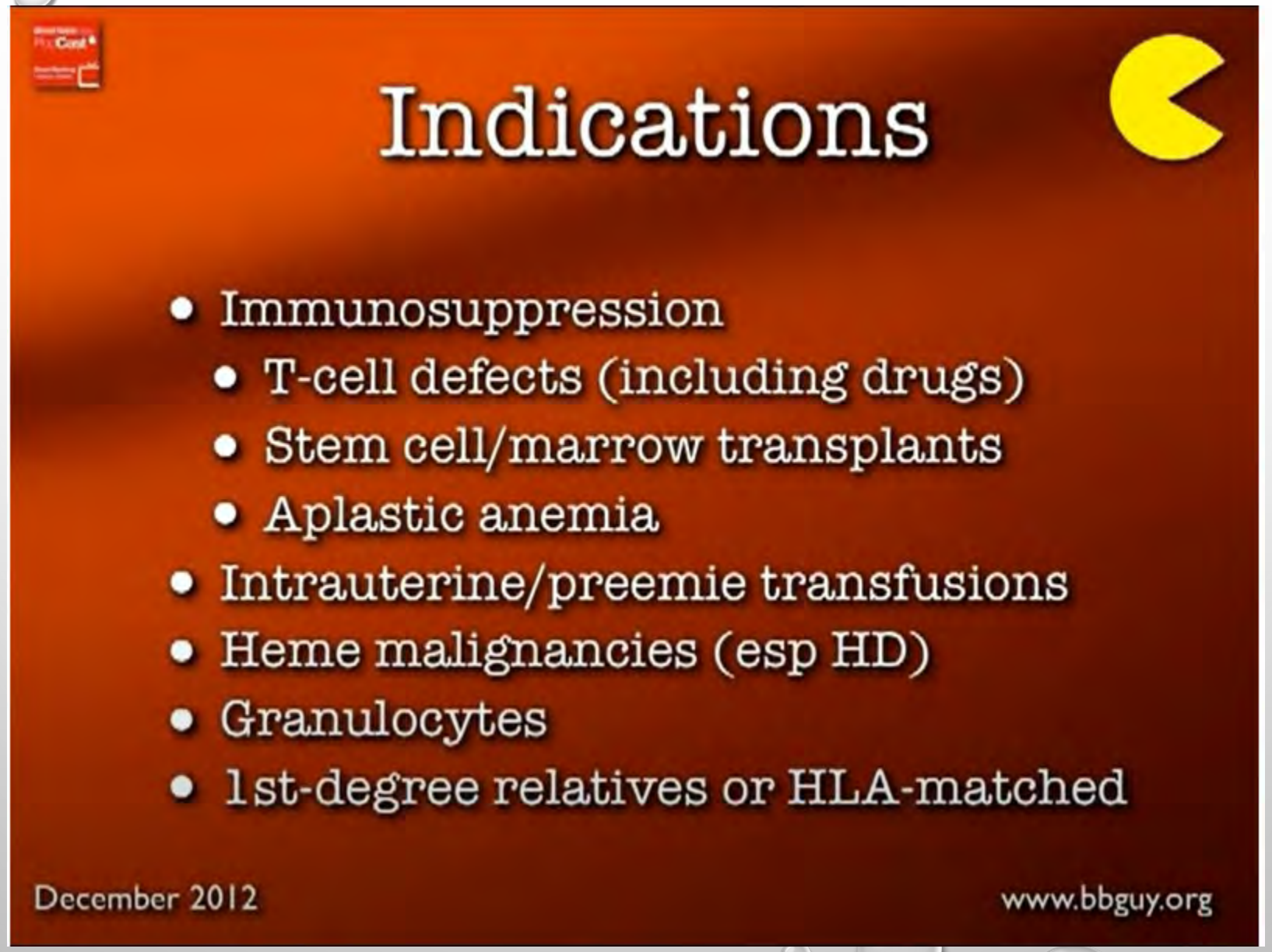
TA-GVHD; NOTE THE ABSENCE OF SS DZ.



WHOLE BLOOD (O+ LOW TITER)

- I THINK WHOLE BLOOD IS GREAT IN PRE-HOSPITAL TRAUMA SITUATIONS.
- HOWEVER, THE VERDICT IS STILL NOT OUT ON ITS RISK/BENEFIT, HOWEVER, I BELIEVE THAT IT WILL BE THE FUTURE OF PRE-HOSPITAL TRANSFUSION PRACTICE.
- PHYSIOLOGICALLY, IT HAS BEEN ESTABLISHED THAT THESE WB UNITS HAVE A DEFINITE COAGULATIVE BENEFIT (STICKY PLATELETS).
- FROM A COST/BENEFIT PERSPECTIVE A LEVEL III-IV TRAUMA CENTER WOULD BURN THRU AN INORDINATE AMOUNT OF WB (COST CAN BE ANYWHERE FROM $200-300 OR HIGHER DEPENDING ON GEOGRAPHIC REGION)
- LASTLY, WHOLE BLOOD (O+LOW TITER)…CAN ANYONE THINK OF WHY WHEN COMPONENT THEREAPY IS AVAILABLE WHY THIS WOULD BE A BAD IDEA IN A FEMALE OF CHILD BEARING AGE?

QUOTE FROM OCTOBER 2005

"THEY ONLY DO WHOLE BLOOD DRIVES WHEN ABSOLUTELY NECESSARY-THEY CAN TEST USING IMMUNOASSAY-HCV, HIV, HBV, RPR. THESE ARE QUICK SCREENING TESTS. THEY HAVE LIMITED CAPABILITY TO DETERMINE THE SPECIFICITY OF A POSITIVE DAT, BUT WE DO HAVE SOME ANTIBODY SCREENING CAPABILITY.
THE LAST PATHOLOGIST GAVE THEM THE OK TO KEEP PLATELETS 7 DAYS, AS LONG AS THE CULTURES ARE NEGATIVE-THEY ARE ALL CULTURED. THERE ARE NUMEROUS THINGS/ISSUES FROM A BLOOD BANK PERSPECTIVE THAT YOU WILL SEE HERE THAT WAS ALIEN TO ME AT FIRST: WHOLE BLOOD DRIVES, USE OF THE TEG, ETC."

Whole blood transfusion versus component therapy in adult trauma patients with acute major haemorrhage

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ABSTRACT

Objective In the era of damage control resuscitation of trauma patients with acute major haemorrhage, transfusion practice has evolved to blood component (component therapy) administered in a ratio that closely approximates whole blood (WB). However, there is a paucity of evidence supporting the optimal transfusion strategy in these patients. The primary objective was therefore to establish if there is an improvement in survival at 30 days with the use of WB transfusion compared with blood component therapy in adult trauma patients with acute major haemorrhage.

Methodology A systematic literature search was performed on 15 December 2019 to identify studies comparing WB transfusion with component therapy in adult trauma patients and mortality at 30 days. Studies which did not report mortality were excluded. Methodological quality of included studies was interpreted using the Cochrane risk of bias tool, and rated using the Grading of Recommendations Assessment, Development and Evaluation approach.

Results Search of the databases identified 1885 records, and six studies met the inclusion criteria involving 3255 patients. Of the three studies reporting 30-day mortality (one randomised controlled trial (moderate evidence) and two retrospective (low and very low evidence, respectively)), only one study demonstrated a statistically significant difference between WB and component therapy, and two found no statistical difference. Two retrospective studies reporting in-hospital

Conclusion Recognising the limitations of this systematic review relating to the poor-quality evidence and limited number of included trials, it does not provide evidence to support or reject use of WB transfusion compared with component therapy for adult trauma patients with acute major haemorrhage.

PROSPERO registration number CRD42019131406.

Key messages

What is already known on this subject

- Transfusion practice in trauma has evolved to administration of blood component therapy (red cells, plasma and platelets) in a ratio that closely approximates whole blood (WB).
- However, it has not been determined if WB versus component therapy is superior.

What this study adds

- In this systematic review, we found six studies directly addressing WB versus component therapy.
- Overall level of evidence was very low to moderate with only one randomised controlled trial.
- No studies reported worse survival with WB, however, there is insufficient evidence to support or reject the use of WB transfusion compared with component therapy for adult trauma patients with acute major haemorrhage.
- Larger prospective, randomised or adaptive trials are required to better understand if WB improves survival in adult trauma patients with acute major haemorrhage compared with component therapy.

erse events between groups, one study (n=354) incidence of AKI in the WB group compared therapy.[30] Another study (n=369) found a of ARDS in the FWB group compared with leither study was designed to address these primary outcome, and therefore may not be onstrate an accurate difference. Both studies duced fresh WB. Both AKI and ARDS may be plex immunological mechanisms. A simplified des inflammation caused by the transfusion of d cells.[30] White blood cells cause inflammation crovascular damage to the endothelium. In the ause vascular leakage into the alveolar space, onary oedema and ARDS. Of note, most WB in nd middle-income world is leucoreduced due ous diseases such as variant Creutzfeldt-Jakob

TOWAR Study Aims to Improve Mortality Rates for Trauma Patients

University of Pittsburgh | Health Sciences

6/22/2021

PITTSBURGH - Researchers at the University of Pittsburgh School of Medicine are leading the Type O Whole blood and assessment of AGE during prehospital Resuscitation (TOWAR) Trial in an effort to better understand the intricacies of giving whole blood—blood that is not separated into its components— to trauma patients while they are in an ambulance on the way to the hospital.

"When someone donates blood, typically it gets separated it into parts—red cells, plasma, platelets—for storage and the parts can be used individually. But when someone is bleeding, they're losing all of these parts. Trauma research has shown that if you put all of these parts back together again it can be beneficial to trauma patients or patients at risk of bleeding," explained Dr. Jason Sperry, a professor of surgery at Pitt and UPMC trauma surgeon.

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Regional Whole Blood Program Low Titer O Positive Whole Blood (LTOWB)

STRAC is the recipient of a $150,000 grant from the San Antonio Medical Foundation. This inter-institutional collaboration with the South Texas Blood and Tissue Center, UT Health San Antonio, University Health Systems (UHS), and the US Army Institute of Surgical Research / San Antonio Military Medical Center was formed to study and address the optimizing care of seriously injured or ill patients in STRAC region. This care need is met through the development of a cold stored whole blood product and implement transfusion of cold stored whole blood in the prehospital setting for helicopters emergency medical services. Funding from the Remote Trauma Outcomes Research Network (through the Department of Defense) allowed for an expansion to ground emergency medical services.

TRANSFUSION OF THE SICKLE CELL PATIENT

EVIDENCE REPORT

Evidence-Based Management of Sickle Cell Disease

Expert Panel Report, 2014

Summary of the Evidence

An adequate systematic review of the literature with fair sensitivity and specificity for all studies indexed by SCD terms and the symptom of acute anemia was not feasible. A large and nonspecific return of studies with significant heterogeneity, high miss rate, and low-quality evidence (lack of comparative studies) was anticipated. No systematic evidence review was conducted, and the panel used a consensus process to develop a proposed strategy for triaging and promptly managing acute anemia.

Recommendations

1. During all acute illnesses in people with SCD, obtain a CBC and reticulocyte count, repeat daily in all hospitalized patients, and compare the results with the patient's prior measurements. **(*Consensus–Panel Expertise*)**
2. Assess people with SCD whose hemoglobin concentration is 2 g/dL or more below their baseline (or less than 6 g/dL when the baseline is unknown) for acute splenic sequestration, an aplastic episode, a delayed hemolytic transfusion reaction, ACS, and infection. **(*Consensus–Panel Expertise*)**
3. Use simple transfusion in people with SCD and acute anemia whose symptoms are due to anemia. **(*Consensus–Panel Expertise*)**
4. Perform a CBC and reticulocyte count promptly and again 7 to 10 days later in siblings and others with SCD who are exposed to a person with an aplastic episode. **(*Consensus–Panel Expertise*)**
5. Manage aplastic events with immediate red blood cell transfusion aimed at restoring the hemoglobin to a safe (not necessarily baseline) value. Isolation of hospitalized patients (droplet precautions) is required to prevent spread of the parvovirus B19 to pregnant women and others with SCD or compromised immunity. **(*Consensus–Panel Expertise*)**

American Society of Hematology 2020 guidelines for sickle cell disease: transfusion support

Stella T. Chou,[1] Mouaz Alsawas,[2] Ross M. Fasano,[3] Joshua J. Field,[4] Jeanne E. Hendrickson,[5,6] Jo Howard,[7,8] Michelle Kameka,[9] Janet L. Kwiatkowski,[1] France Pirenne,[10] Patricia A. Shi,[11] Sean R. Stowell,[3] Swee Lay Thein,[12] Connie M. Westhoff,[13] Trisha E. Wong,[14] and Elie A. Akl[15]

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Background: Red cell transfusions remain a mainstay of therapy for patients with sickle cell disease (SCD), but pose significant clinical challenges. Guidance for specific indications and administration of transfusion, as well as screening, prevention, and management of alloimmunization, delayed hemolytic transfusion reactions (DHTRs), and iron overload may improve outcomes.

Objective: Our objective was to develop evidence-based guidelines to support patients, clinicians, and other healthcare professionals in their decisions about transfusion support for SCD and the management of transfusion-related complications.

Methods: The American Society of Hematology formed a multidisciplinary panel that was balanced to minimize bias from conflicts of interest and that included a patient representative. The panel prioritized clinical questions and outcomes. The Mayo Clinic Evidence-Based Practice Research Program supported the guideline development process. The Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach was used to form recommendations, which were subject to public comment.

Results: The panel developed 10 recommendations focused on red cell antigen typing and matching, indications, and mode of administration (simple vs red cell exchange), as well as screening, prevention, and management of alloimmunization, DHTRs, and iron overload.

Conclusions: The majority of panel recommendations were conditional due to the paucity of direct, high-certainty evidence for outcomes of interest. Research priorities were identified, including prospective studies to understand the role of serologic vs genotypic red cell matching, the mechanism of HTRs resulting from specific alloantigens to inform therapy, the role and timing of regular transfusions during pregnancy for women, and the optimal treatment of transfusional iron overload in SCD.

Sickle cell disease: when and how to transfuse

Jo Howard

Guy's and St Thomas' NHS Foundation Trust, London, United Kingdom; and King's College London, United Kingdom

Blood transfusion remains an important therapeutic intervention in patients with sickle cell disease (SCD), aiming to both increase the oxygen carrying capacity of blood and to reduce the complications of vaso-occlusion. Simple, manual exchange and automated exchange can be effective in reducing the acute and chronic complications of SCD, and the advantages and disadvantages of each methodology mean they all have a role in different situations. Evidence for the role of emergency transfusion in the management of the acute complications of SCD, including acute pain and acute chest syndrome, comes from observational data. Several important randomized controlled trials have shown the efficacy of transfusion in primary and secondary stroke prevention in patients with SCD but, outside these areas, clinical practice lacks a clear evidence base. Evidence for the role of long-term transfusion in the prevention of the non-neurologic chronic complications of SCD comes from analysis of secondary outcomes of these randomized trials and from observational data. In view of the paucity of data, the risks and benefits of transfusion should be fully discussed with patients/families before a long-term transfusion program is commenced. Evidence is only available for the role of preoperative transfusion or for prophylactic transfusion through pregnancy in certain situations, and the role of transfusions outside these situations is discussed. Questions about when and how to transfuse in SCD remain and will need further randomized trials to provide answers.

Steps for Massive Transfusion Protocol (MTP)

1. Identify patients who require MTP

ADULT
Administration of ≥10 FRBCS units within 24 hours
Acute administration of 4-5 FRBC units within 1 hours, or
Replacement of >50% of the total patient blood volume by blood products within 3 hours

PEDIATRIC
Transfusion of one blood volume of RBC units in 24 hours

OBSTETRIC
At stage 3 of obstetrical blood loss for continued bleeding with QBL ≥1500 mL;
Any patient with abnormal vital signs/labs or oliguria, or Sign/symptoms of hypovolemic shock

OR

OTHER
Systolic blood pressure of ≤ 90 mmHg;
Heart rate >120 beats per minute;
Evidence of penetrating torso trauma;
Patient who are expected to require the replacement of a patient's TBV in less than 24 hours;
Acute administration of 4-5 units within 1 hour, or;
Replacement of >50% of the total patient blood volume by blood products within 3 hours

2. Activate MTP Protocol

After Emergency Release Activation, MTP activated by the surgeon, physician, anesthesiologist and/or ED physician if MTP criteria met.

Activate MTP using RED phone that directly connects to Blood Bank

AND

Clearly state to Blood Bank:
MTP is being initiated,
Patient Name,
D.O.B, and
Patient Location

AND

Notify RBX of MTP Activation and location

PBX
Overhead pages-"Attention, Attention, Massive Transfusion Protocol Activation to (location)" three times.

Calls Vocera (7888), asks for group "Massive Transfusion", announcing the activation information, three times.

Call House Supervisor cell phone to notify of Massive Transfusion Protocol activation and location.

If Birthing Center MTP, call Anesthesiologist cell phone to notify of Massive Transfusion Protocol activation and location.

MTP Team Responds
Charge Nurse,
House Supervisor,
Code Blue Team,
Attending Physician (if in hospital),
Pastoral Care,
Anesthesiologist (if BC location),
Lab

3. Optimize intrinsic coagulation

Avoid hypothermia, use Blood warmer

Follow GRMC Hemorrhage policies found in PowerDMS.
For OB Hemorrhage, follow OB Hemorrhage Management Plan Flow Chart (e.g., Uterotonics (Pitocin, Methergine, Hemabate, Cytotec) and Anti-Fibrinolytic (TXA)).

4. Arrival of cross matched blood

Blood Bank calls RED phone that 1st small cooler from 1st MTP Pack is ready for pick-up

AND

Runner brings patient sticker and picks-up (1) cooler

Initial 1st MTP Pack Cooler (1)
-4 units FRBCs

Blood Bank Calls RED phone that 2nd MaxPlus cooler from 1st MTP Pack is ready for pick-up

AND

Runner brings patient sticker and picks-up (1) cooler:

Second 1st MTP Pack Cooler (1)
-6 FFP & 1 Platelet

Continue the process with 2nd-4th MTP pack, set-up as follows:

2nd MTP Pack (1) Cooler
6 FRBC, 6 FFP, 0 Platelet
3rd MTP Pack (1) Cooler
6 FRBC, 6 FFP, 1 Platelet
4th MTP Pack (1) Cooler
6 FRBC, 6 FFP, 0 Platelet

For Cryoprecipitate: Provider must indicate when to thaw. Come comes in a pool of 5

5. Recheck & Monitor

-After every MTP Pack completion, re-draw labs: BNP, CBC, PT/INR, PTT, LDH, Blood Gases, and Fibrinogen
-Monitor while the transfusion is going: Temperature >35°C, pH: 7.35-7.45, Base Excess: <-6, Lactate, Hemoglobin 7-9g/dL, INR <1.5, PTT <42s, and Fibrinogen >100mg/dL

I AM BEING CALLED ABOUT A MASSIVE TRANSFUSION, WHAT TO I DO?

- POSSIBLE MASSIVE
- MASSIVE TRANSFUSION REQUESTED.

POSSIBLE MASSIVE

- POSSIBLE MASSIVE COMES AS A RESULT OF CRITERIA GIVEN TO THE TECH TO CALL THE PATHOLOGIST.
- I.E. THE PATIENT HAS RECEIVED X AMOUNT OF RED BLOOD CELLS, PLASMA, PLATELETS CRYO.

POSSIBLE MASSIVE

- ASK FOR ALL THE BLOOD PRODUCTS THAT HAVE BEEN GIVEN.
- MAKE SURE THEY ARE “ON TRACK” WITH A RATIO OF 6 RBC, 6 FFP, 1 DOSE OF CRYO AND 1 PLATELET.
    - EX. IF THEY HAVE RECEIVED ALL RED BLOOD CELLS AND NO FFP, CRYO OR PLATELET, YOU MAY CALL TO SUGGEST THESE PRODUCTS.
- CALL TO THE ORDERING CLINICIAN, IF ORDERING LOOKS APPROPRIATE IS NOT REQUIRED.

MASSIVE TRANSFUSION REQUESTED

- IF THE TECH CALLS TO NOTIFY THAT A MASSIVE TRANSFUSION HAS BEEN REQUESTED, INVOLVEMENT OF THE PATHOLOGIST IS REQUIRED.
- OBTAIN THE FOLLOWING INFORMATION FROM THE TECH:
  - NAME, DOB, AGE AND GENDER OF PATIENT.
  - INVENTORY OF O PRODUCTS (NEGATIVE AND POSITIVE) AND AB PLASMA.
  - WHETHER TESTING HAS BEEN PERFORMED ON NOT/BLOOD TYPE IF AVAILABLE.
  - LOCATION OF PATIENT, ORDERING PERSON IF KNOWN AND PHONE NUMBER.

MASSIVE TRANSFUSION REQUESTED

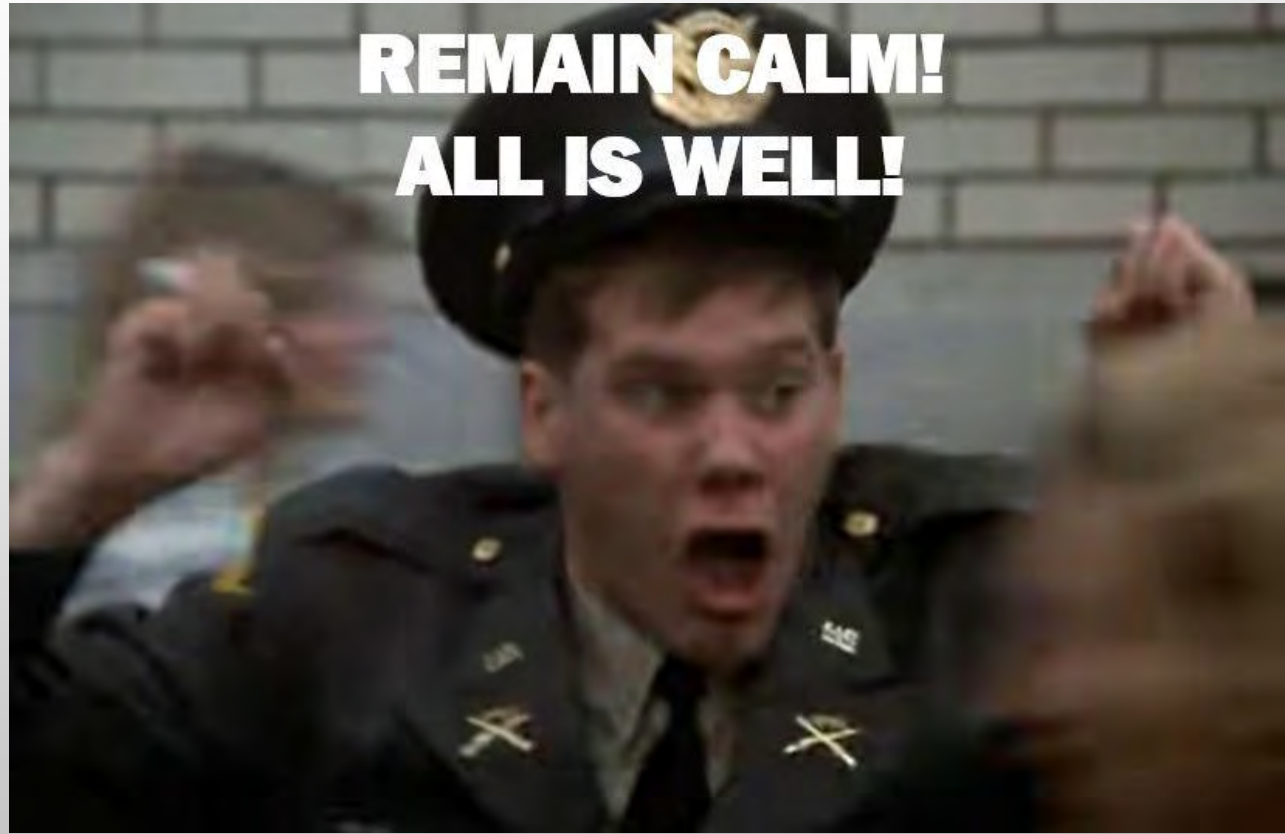
- CALL THE ORDERING CLINICIAN OR MEMBER OF THE TEAM AND OFFER TO AID WITH COMMUNICATION TO THE BLOOD BANK.
- LET THEM KNOW THAT THE PRODUCTS WILL BE UNCROSSMATCHED O NEGATIVE (OR POSITIVE) RED BLOOD CELLS AND AB NEGATIVE PLASMA.
  - IF THEY CHOOSE NOT TO RECEIVE UNCROSSMATCHED PRODUCTS, LET THEM KNOW THAT THEY WILL NEED TO PUT IN AN ORDER FOR QUANTITY OF TYPES OF PRODUCTS DESIRED AND THAT A READ-BACK WILL BE REQUIRED.
  - IF THEY ASK HOW LONG IT WILL TAKE TO RECEIVE CROSSMATCHED PRODUCTS, THIS WILL DEPEND ON WHETHER A TYPE AND RE-TYPE IS COMPLETED.
    - IF COMPLETE, APPROXIMATELY 20 MINUTES.
    - IF INCOMPLETE, AT LEAST 1 HOUR FOR TESTING AND ISSUING BLOOD.

MASSIVE TRANSFUSION REQUESTED

- REMIND THEM THAT THEY WILL CONTINUE TO RECEIVE BLOOD PRODUCTS IN THE FOLLOWING RATIO UNTIL THEY TELL UP TO STOP: 6 UNITS RBC, 6 UNITS FFP, 1 DOSE CRYO, 1 APHERESIS PLATELET.
- REMIND THEM TO LET THE BLOOD BANK KNOW WHEN THEY WOULD LIKE TO DISCONTINUE THE MASSIVE TRANSFUSION PROTOCOL.
- CALL THE BLOOD BANK TECH BACK REGARDLESS TO LET THEM KNOW OF THE RESULT OF THE CONVERSATION.
- ASSESS INVENTORY AND DETERMINE WHETHER ADDITIONAL PRODUCTS NEED TO BE ORDERED OR REQUESTED FROM ANOTHER HOSPITAL.

MASSIVE TRANSFUSION REQUESTED

- **REMEMBER TO STAY CALM AND THAT YOU ARE NOT ALONE.**



ERIC FILLMAN, MD

- EFILER@GRMEDCENTER.COM
- E.FILLMAN@CLINPATHASSOC.COM
- GRMC BLOOD BANK: 830-401-7541
- OFFICE: 830-401-7899
- CELL: 210-823-4500
- HOME: 210-368-2011 (WE IGNORE THIS PHONE SINCE ONLY TELEMARKETERS CALL ANYMORE)

CRITICAL TRAUMA PATIENTS

- 19 JUN 2005 (FATHER'S DAY)
  - RIGHT LEG TRAUMATIC AMPUTATION FOLLOWING AN IED.
  - 203 BLOOD PRODUCTS.

https://thefallen.militarytimes.com/army-pfc-timothy-j-hines-jr/980492

MilitaryTimes

HONOR THE FALLEN

Honoring those who fought and died in Operation Enduring Freedom, Operation Iraqi Freedom and Operation New Dawn

HOME

NATO KOSOVO FORCE

OPERATION ALLIES REFUGE

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OPERATION FREEDOM'S SENTINEL

OPERATION INHERENT RESOLVE

OPERATION IRAQI FREEDOM

OPERATION NEW DAWN

OPERATION OCTAVE SHIELD

OPERATION ODYSSEY LIGHTNING

OPERATION SPARTAN SHIELD

TASK FORCE SINAI

U.S. AFRICA COMMAND OPERATIONS

Army Pfc. Timothy J. Hines Jr.

Died July 14, 2005 Serving During Operation Iraqi Freedom

21, of Fairfield, Ohio; assigned to the 64th Military Police Company, 720th Military Police Battalion, 89th Military Police Brigade, Fort Hood, Texas; died July 14 at the Walter Reed Army Medical Center, Washington, D.C., of wounds sustained on June 19 when an improvised explosive device detonated near his Humvee in Baghdad.

Fort Hood soldier dies of Iraq wounds

Associated Press

A Fort Hood soldier has died of injuries from a bomb explosion last month in Baghdad, the Pentagon confirmed Sunday.

Pfc. Tim Hines, 21, of Fairfield, Ohio, died Thursday night at Walter Reed Army Medical Center in Washington. His grandmother, Florence Thomas, said Friday that his wife, mother and other family members were with him.

An anonymous donor has given $130,000 to pay private school tuition for Hines' two-year-old daughter and unborn son, The Cincinnati Enquirer reported in Monday's editions.

Family members said Hines was the gunner on a Humvee in a convoy when a bomb detonated on a Baghdad highway on Father's Day. He suffered kidney and tissue damage and internal bleeding, and his right leg was amputated in a Baghdad hospital. He was having emergency surgery Thursday when he died.

Hines enlisted in December 2003 and was stationed at Fort Hood, Texas, with the 720th Battalion, 89th Military Police Brigade, 64th Military Police Unit, before shipping out to Iraq in February.

Hundreds mourn soldier who died of Iraq injuries

SPRINGDALE, Ohio — If Pfc. Tim Hines Jr. could have held on for another few weeks, he would have been able see his second child.

The 21-year-old from Fairfield died last week at Walter Reed Army Medical Center in Washington, D.C., after battling injuries he received in a bomb explosion in Baghdad for almost a month.

More than 400 family members and friends gathered for his funeral Friday in this Cincinnati