A NEW APPROACH TO INTRAOPERATIVE BLOOD TRANSFUSION PREPARATION:
Using data as our guide

Anne Que, CRNA, MS
MGH- Department of Anesthesia, Critical Care and Pain Medicine
Division of General Surgery- CRNA Team Leader
OUTLINE

I. Background
   A. Decrease unnecessary Transfusion
   B. Optimize the preparation

II. Data- MGH and National

III. Strategy

IV. Case report

V. Impact

VI. Further Studies
Evidence-based medicine: Save blood, save lives

Transfusions are one of the most overused treatments in modern medicine, at a cost of billions of dollars. Researchers are working out how to cut back.

• Joint Commission
• Choosing Wisely
• #1 ranked journal in the world
Blood transfusion targeted at the Overuse Summit.

- Blood transfusion is the most commonly performed procedure in US hospitals

Five most overused procedures:

1. *Blood transfusions*
2. Heart vessel stents
3. Ear tubes
4. Antibiotics for the common cold
5. Early induction of labor without indication
Eight 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

• Hebert PC, et al: NEJM 1999 – Critically ill MICU patients
• Hajjar LA, et al: JAMA 2010 – Cardiac surgery patients
• Lacroix J, et al: NEJM 2007 – Critically ill PICU patients
• Villanueva C, et al: NEJM 2013 – Severe GI Bleeding
• Robertson CS. et al: JAMA 2014 – Traumatic Brain Injury
• Murphy GJ, et al: NEJM 2015 – Cardiac surgery patients

Courtesy of Steve Frank, MD
# Three Categories of Risks / Adverse Effects from Blood Transfusion

<table>
<thead>
<tr>
<th>Clinical Event</th>
<th>Risk / Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Common</strong></td>
<td></td>
</tr>
<tr>
<td>Allergic/Urticaria</td>
<td>1 in 100</td>
</tr>
<tr>
<td>RBC</td>
<td>1 in 100</td>
</tr>
<tr>
<td>Alloimmunization</td>
<td>1 in 100</td>
</tr>
<tr>
<td>TACO</td>
<td>1 in 100</td>
</tr>
</tbody>
</table>

| **Not so Rare**            |             |
| TRALI                      | 1 in 5,000  |
| Hemolytic Rxn              | 1 in 6,000  |
| Wrong Unit Given           | 1 in 15,000 |

| **Rare**                   |             |
| Hepatitis B                | 1 in 200,000|
| Hepatitis C                | 1 in 2,000,000|
| HIV 1 and HIV 2            | 1 in 2,000,000|
Red Blood Cells Stored $\geq 35$ Days are Associated with Adverse Outcomes in High-risk Patients (Goel R, et al, Transfusion 2016)

$\geq 28$ days

- All patients
  - Morbidity: $1.06$ (0.97, 1.15) $p=0.2$
  - Mortality: $0.96$ (0.81, 1.15) $p=0.66$

- ICU patients
  - Morbidity: $1.06$ (0.94, 1.19) $p=0.36$
  - Mortality: $0.98$ (0.8, 1.21) $p=0.88$

- Elderly patients
  - Morbidity: $1.05$ (0.94, 1.19) $p=0.39$
  - Mortality: $0.92$ (0.73, 1.17) $p=0.49$

$\geq 35$ days

- All patients
  - Morbidity: $1.19$ (1.07, 1.32) $p=0.002$
  - Mortality: $1.18$ (0.95, 1.47) $p=0.13$

- ICU patients
  - Morbidity: $1.25$ (1.08, 1.44) $p=0.002$
  - Mortality: $1.38$ (1.08, 1.74) $p=0.009$

- Elderly patients
  - Morbidity: $1.22$ (1.04, 1.42) $p=0.01$
  - Mortality: $1.28$ (0.96, 1.71) $p=0.1$

Courtesy of Steve Frank, MD
Risk-adjusted Clinical Outcomes in Patients Enrolled in a Bloodless Program
Frank SM, et al Transfusion, 2014
294 Jehovah’s Witness Patients vs. Propensity Matched Controls

- Death: P=0.046
- Infection: P=0.08
- Thrombotic: P=0.39
- Renal: P=0.86
- Respiratory: P=0.21
- MI: P=0.93
Risk-adjusted Clinical Outcomes in Patients Enrolled in a Bloodless Program
Frank SM, et al Transfusion, 2014

![Bar chart showing total charges, total costs, and direct costs for bloodless patients and control patients.]

- Total Charges: $P=0.09$
- Total Costs: $P=0.02$
- Direct Costs: $P=0.02$
Morbidity and Mortality after High-dose Transfusion

Daniel J. Johnson, B.S., Andrew V. Scott, B.S., Viachaslau M. Barodka, M.D., Sunhee Park, M.D., Jack O. Wasey, B.M., B.Ch., Paul M. Ness, M.D., Tom Gniadek, M.D., Ph.D., Steven M. Frank, M.D.

The 50/50 rule

Dose of Blood and Mortality after Massive Transfusion

50% mortality after 50 RBC units

y = 9.4664x - 10.563
R² = 0.98885

Units of RBC Transfused

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)
5 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 Association of Blood Banks

S. Frank, MD (Johns Hopkins)
PROCESSES AROUND BLOOD PREPARATION

1. Explaining transfusion risk and obtaining informed consent
2. Pre-transfusion examination & clerical routine
3. Phlebotomizing & delivering patient’s blood specimen to blood bank & central lab
4. Patient blood testing in central lab & analyzing results - routine & emergency
5. Controlling & storing components in hospital blood bank
6. ABO/Rh-typing new patients
7. ABO/Rh-typing control
8. Antibody screening
9. Cross matching manual distribution of components and controlling delivery received at transfusion site
10. Return deliveries of unused components
11. Cleaning transfusion site & disposing waste
12. Administering and monitoring transfusion
DIAGNOSTIC DATA

Survey: Department Of Anesthesia, RNs, Surgery
N=41
**PROCESS MAP**

In Surgeon’s Office:
- **Send To PATA**: Yes
  - **NO**: Phone Screen Evaluation
  - **YES**: NEED T&S?

In PATA:
- **NEED T&S?**: Yes
  - **NO**: No blood draw
  - **YES**: Draw BBS
- **T&C**: Yes
  - **NO**: No plans to transfuse in OR
  - **YES**: Send to OR

Intra-Op:
- **Transfuse?**: Yes
  - **NO**: Blood Check
  - **YES**: Transfuse

T&C:
- **NO**: No plans to transfuse in OR
- **YES**: Send to OR
Baseline Variability

- Lack of guidelines
- Evolution of surgical techniques
  - Laparoscopy
  - Robotic
  - Hemostatic techniques (surgical or agents)
- Over-ordering becomes commonplace
**Preliminary Data**

- Laparoscopic Hysterectomy
- Open Hysterectomy
- Laparoscopic Appendectomy
- Laparoscopic Cholecystectomy
- Hernia Repair
- Cystoscopy
- Liver resection
DATA: HYSTERECTOMY CASES

Laparoscopic Hysterectomy Cases over 14 months

- Total: 616
- T&S: 529
- T&C: 133
- Transfused: 6

Vaginal and Total Abdominal Hysterectomy Cases 2013 to 2015

- Total: 562
- T&S: 539
- T&C: 208
- Issued: 157
- Transfused: 68

T&S ordered | T&C ordered | Transfused
---|---|---
86% | 21% | 1%

T&S ordered | T&C ordered | Issued | Transfused
---|---|---|---
96% | 37% | 28% | 12%
### Data: High Volume Procedures

**High Volume Procedures at MGH**

**Jan 2013 to June 2015**

<table>
<thead>
<tr>
<th>Booked Procedure</th>
<th># of Patients</th>
</tr>
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<tbody>
<tr>
<td>Laparoscopic Cholecystectomy</td>
<td>1487</td>
</tr>
<tr>
<td>Laparoscopic Appendectomy</td>
<td>876</td>
</tr>
<tr>
<td>Inguinal Hernia</td>
<td>1531</td>
</tr>
<tr>
<td>Laser Lithotripsy and Cystoscopy</td>
<td>665</td>
</tr>
</tbody>
</table>

| Type and Screen                      | 625           |
| Type and Cross                       | 6             |
| Transfusion                           | 6             |

| Total                                 | 1487          |
| Type and Screen                       | 625           |
| Type and Cross                        | 6             |
| Transfusion                           | 6             |

| Total                                 | 1531          |
| Type and Screen                       | 530           |
| Type and Cross                        | 12            |
| Transfusion                           | 0             |

| Total                                 | 665           |
| Type and Screen                       | 132           |
| Type and Cross                        | 10            |
| Transfusion                           | 1             |
DATA: HIGH VOLUME PROCEDURES

Laparoscopic Cholecystectomy
- No BBS: 55%
- Type and Screen: 42%
- Type and Cross: 3%
- Transfused: 0%

Inguinal Hernia
- No BBS: 91%
- Type and Screen: 8%
- Type and Cross: 1%
- Transfused: 0.15%

Laparoscopic Appendectomy
- No BBS: 61%
- Type and Screen: 38%
- Type and Cross: 1%
- Transfused: 0%

Laser Lithotripsy and Cystoscopy
- No BBS: 84%
- Type and Screen: 14%
- Type and Cross: 2%
- Transfused: 0.15%
DATA: LIVER RESECTION COUNTS (2013-15)

Liver Resection Cases 1-2013 to 6-2015

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>T&amp;S</th>
<th>T&amp;C</th>
<th>Issued</th>
<th>Transfused</th>
<th>Returned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases</td>
<td>192</td>
<td>187</td>
<td>174</td>
<td>163</td>
<td>31</td>
<td>158</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>T&amp;S ordered</th>
<th>T&amp;C ordered</th>
<th>Issued</th>
<th>Transfused</th>
</tr>
</thead>
<tbody>
<tr>
<td>97%</td>
<td>91%</td>
<td>84%</td>
<td>16%</td>
</tr>
</tbody>
</table>
RBC USAGE: TRANSFUSED VS. RETURNED

### Open Hysterectomy

- **Units Transfused**: 166
- **Units Issued**: 457
- **Units Returned**: 291
- **Return Rate**: 64%

### Liver Resection

- **Units Transfused**: 112
- **Units Issued**: 576
- **Units Returned**: 459
- **Return Rate**: 80%
Decreasing Variability in Blood Transfusion Preparation for Laparoscopic Hysterectomy Procedures

CONCLUSIONS:
- Routine preoperative type and screen and cross-matching for certain procedures may be a misuse of resources
- Decreasing the routine ordering of T&S through PATA provided minimal change
- Development of this methodology for other procedures is a slow process
- Adoption of a new electronic health record provided an opportunity to implement a preparation for transfusion guideline

NEXT STEPS:
- Examine transfusion rates for high volume, low risk procedure at MGH
- Teach the use of the SSBOS within EPIC to various work flows: Surgery, Peri-operative nursing, Anesthesia and Blood Bank
- Audit the use of SSBOS for optimization
- Capture data for the development of large-scale transfusion measures
- Explore possibility of an algorithmic approach to determine transfusion risk

Results:
- PATA decreased Pre-op orders of T&S
- Anesthesia providers decreased drawing of pre-op T&S
- GYN surgeons agreeable to holding off routine drawing
Optimizing Preoperative Blood Ordering with Data Acquired from an Anesthesia Information Management System

Steven M. Frank, M.D.,* James A. Rothschild, M.D.,† Courtney G. Masear, M.D.,‡ Richard J. Rivers, M.D.,* William T. Merritt, M.D.,* Will J. Savage, M.D.,§ Paul M. Ness, M.D.||

Algorithm to create guidelines- SSBOS

*Hopkins Study
First updated blood order schedule in 30 years, and first ever based on actual blood utilization data.
**SSBOS Suggested Blood Products**

<table>
<thead>
<tr>
<th>Product</th>
<th>Est. Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type And Screen</td>
<td>0</td>
</tr>
<tr>
<td>Type And Cross</td>
<td></td>
</tr>
</tbody>
</table>

**Type and Screen Results (Click on the result to see expiration date) (Last 2 results in the past 30 days)**

<table>
<thead>
<tr>
<th>EXPIRATION DATE OF SAMPLE</th>
<th>ABO/Rh</th>
<th>ABO</th>
<th>Rh</th>
<th>Antibody screen</th>
<th>Direct Antoglobulin Test</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05/26/16</td>
<td>0911</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05/03/16</td>
<td>1519</td>
<td>B</td>
<td>Positive</td>
<td>Negative</td>
<td></td>
</tr>
</tbody>
</table>

**RBCs (1 Week)**

There is no flowsheet data to display.

**Platelets (1 Week)**

There is no flowsheet data to display.

**Plasma (1 Week)**

There is no flowsheet data to display.

**Cryoprecipitate (1 Week)**

There is no flowsheet data to display.
STANDARD SURGICAL BLOOD ORDER SCHEDULE (SSBOS)

- Institute-specific updated schedule done at Johns Hopkins to guide pre-operative blood ordering
- Primary blood ordering categories:
  - “no T/S or T/C”
  - “T/S”
  - “T/C”
- Important caveats:
  - Data from one institution
  - Intra-operative transfusion data included but does not take into account postoperative transfusion

The "What if" scenario...
The “What if” scenario...

% Transfused < 5 and Median EBL ≤ 50 mL and Transfusion Index < 0.3 and Risk of major bleeding = “no”

No Type/Screen No Crossmatch

% Transfused ≥ 5 and Median EBL > 50 mL and Transfusion Index ≥ 0.3

Risk of major bleeding = “yes”

Type/Screen

≥ 4 U Erythrocytes in > 10% of patients

Type/Cross 2U

Type/Cross 4U

Major vascular/transplant

Type/Cross 6-15U

<5% transfused

Uncrossmatched blood
CASE (EMILY NAOUM, MD, RESIDENT CASE CONFERENCE)

- 20 year old woman presents for an I&D of a LLE wound with vac placement
CASE CONTINUED

- **PMH:** pedestrian struck 3 months ago, otherwise healthy
  - Multiple fractures
- **PSH:** tibia/fibula fracture fixation, skin graft, muscle flap
- **Medications:** Oxycodone PRN
- **NKDA**
CASE CONTINUED

- Physical Exam:
  - Height 5’1” Weight 50 kg
  - Reassuring airway exam
  - Unremarkable CV, respiratory, abdominal, and neurological exam

- Laboratory Studies
Case continued

- **Outside Imaging per Orthopedic Surgery Note:**
  - Recent CT scan shows the back of the tibial fracture with large anterior defect; repair and the wound clearly go down into the tibial shaft.
WHO SHOULD GET A BLOOD BANK SAMPLE?

- Partners Surgical Blood Ordering Schedule

<table>
<thead>
<tr>
<th>Orthopedic Surgery Case Category</th>
<th>Rec</th>
<th>Orthopedic Surgery Case Category</th>
<th>Rec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thoracic/Lumbar/Sacral fusion</td>
<td>T/C 2U</td>
<td>Peripheral vascular</td>
<td>T/S</td>
</tr>
<tr>
<td>Pelvic orthopedic</td>
<td>T/C 4U</td>
<td>Vascular wound I and D</td>
<td>T/S</td>
</tr>
<tr>
<td>Open hip (including THR revision)</td>
<td>T/C 2U</td>
<td>carotid vascular</td>
<td>T/S</td>
</tr>
<tr>
<td>Femor open</td>
<td>T/C 2U</td>
<td>AV fistula</td>
<td>T/S</td>
</tr>
<tr>
<td>Above/Below knee amputation</td>
<td>T/C 2U</td>
<td>Peripheral endovascular</td>
<td>T/S</td>
</tr>
<tr>
<td>Humerus open</td>
<td>T/S</td>
<td>Angi/Angiogram</td>
<td>No Sample</td>
</tr>
<tr>
<td>Fasciotomy</td>
<td>T/S</td>
<td>Peripheral wound I&amp;D</td>
<td>No Sample</td>
</tr>
<tr>
<td>Shoulder Incision &amp; drainage</td>
<td>T/S</td>
<td>1st rib resection/thoracic outlet</td>
<td>No Sample</td>
</tr>
<tr>
<td>Tibial/fibular</td>
<td>T/S</td>
<td>Superficial or skin</td>
<td>No Sample</td>
</tr>
<tr>
<td>Total hip arthroplasty</td>
<td>T/S</td>
<td>Foot/toe amputation/debride</td>
<td>No Sample</td>
</tr>
<tr>
<td>Total Knee replacement</td>
<td>T/S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shoulder open</td>
<td>T/S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knee open</td>
<td>T/S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sports Shoulder</td>
<td>T/S</td>
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<tr>
<td>Thigh soft tissue</td>
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</tr>
<tr>
<td>Ortho external fixation</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Peripheral nerve/tendon</td>
<td>No sample</td>
<td></td>
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</tr>
</tbody>
</table>
HOW MIGHT I FIND RECOMMENDATIONS FOR MY PATIENT IN THE ALL-KNOWING EPIC?
**INTRAOPERATIVE COURSE**

- GA, LMA
- EBL 30 mL
- IVF 1000 mL LR
SURGICAL HAND-OFF TO PACU NURSE

- I&D of left leg wound
- Placement of wound vac
## PACU Course

<table>
<thead>
<tr>
<th>Vitals</th>
<th>1630</th>
<th>1645</th>
<th>1700</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temp</td>
<td>36.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temp Source</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Heart Rate</td>
<td>105</td>
<td>86</td>
<td></td>
</tr>
<tr>
<td>Pulse (SpO2)</td>
<td>103</td>
<td>84</td>
<td></td>
</tr>
<tr>
<td>Rhythm</td>
<td>Normal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BP (cuff)</td>
<td>127/77</td>
<td></td>
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</tr>
<tr>
<td>BP Location</td>
<td>Left</td>
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</tr>
<tr>
<td>BP Method</td>
<td>Autom</td>
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</tr>
<tr>
<td>Orthostatic Position</td>
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<tr>
<td>Respiratory Rate</td>
<td>18</td>
<td></td>
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</tr>
<tr>
<td>MAP (cuff)</td>
<td>95</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Infusions

## Oxygenation

## Pain/Delirium

<table>
<thead>
<tr>
<th>Intake</th>
<th>1630</th>
<th>1645</th>
<th>1700</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.V.</td>
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<tr>
<td>Blood</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Total In</td>
<td></td>
<td></td>
<td>500</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output</th>
<th>1630</th>
<th>1645</th>
<th>1700</th>
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<tbody>
<tr>
<td>Blood</td>
<td>30</td>
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<td></td>
</tr>
<tr>
<td>Total Out</td>
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<tr>
<td>I/O Net</td>
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**PACU Course**

<table>
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<tr>
<td>BP (cuff)</td>
<td>127/77</td>
<td>127/81</td>
<td>72/38</td>
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<td>BP Location</td>
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**Infusions**

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**Pain/Delirium**

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</tr>
<tr>
<td>Blood</td>
<td></td>
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</tr>
<tr>
<td>Total In</td>
<td>500</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Output**

| Blood                  | 30     | 1400   |        |        |        |
| Total Out              | 30     | 1400   |        |        |        |
| I/O Net                | 470    | -1400  |        |        |        |
PACU Course continued

- IV Access: 20g R AC, 18 g L wrist
- Surgical team notified
- Blood bank notified – sample sent from PACU
Return to OR

- EBL 600 mL
- IVF: 2250 mL LR
- 3 units pRBCs ~ 800 mL
- UOP 300 mL

- Surgical Procedure: vac removal, wound exploration, packing with surgicel, ligation of vessels x 3, “diffuse non-surgical bleeding”
- Transferred to ICU intubated and sedated post-operatively
What are the actual risks of giving uncrossmatched blood?

- Risk of having antibody: 2-11%
- Risk of antibody being clinically significant: 0.6 to 6.4%
- Risk of having clinical reaction
  - Delayed hemolytic transfusion reactions: 0.4%
  - Alloimmunization: 1.8 to 8.6%
- When emergency transfusion is needed to a patient who does not have a “current” pre-transfusion type:
  - O negative red cell units if the recipient is a female under the age of 50 years, or a male under the age of 18 years;
  - O positive red cell units for all other patients; and
  - Conversion to the patient’s ABO and Rh type and type as soon as that can be determined.

FUTURE DIRECTION

- Balance cost and safety
- Use of data
  - Retrospective
  - Institution-specific
  - Goal-directed
  - Use-specific
- Use of technology
NEXT STEPS:

- Stratify historical transfusion data per procedure
- Identify procedures where T&S is unnecessary
- Gather characteristics from procedures with likelihood of transfusion to identify correlations
- Build transfusion database and model
- In parallel, integrate SSBOS into EPIC
- Validate model
- Ensure reporting tools in EPIC captures data

IDEAL PROCESS DESIGN

- Booking of Surgery
  - Automatic
  - SSBOS
  - Surgery/Anesthesia/BB
- Clinical Decision Tool
  - Intra-op
  - Risk of transfusion
- Prediction Analytics
  - Validation
  - Learning
  - Quality Metrics
IMPACT

“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 Hgb > 8

Change in RBC Utilization for 10 Surgical Services

Zuckerberg GS, et al. TRANSFUSION, 2015
POST EPIC IMPLEMENTATION

Percentage of Laparascopy Hysterectomy (%) Procedures with Blood Type & Screen

<table>
<thead>
<tr>
<th>Percent of Laparoscopic Hysterectomy (%) Procedures with Blood Type &amp; Screen</th>
<th>Pre-eCare Go Live</th>
<th>Post-eCare Go Live</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of Laparascopy Hysterectomy (%) Procedures with Blood Type &amp; Screen</td>
<td>96%</td>
<td>27%</td>
</tr>
</tbody>
</table>

Pre- and Post-eCare Go Live April 2, 2016
IMPACT

PROCESSES AROUND BLOOD PREPARATION

1. Explaining transfusion risk and obtaining informed consent
2. Pre-transfusion examination & clerical routine
3. Phlebotomizing & delivering patient’s blood specimen to blood bank & central lab
4. Patient blood testing in central lab & analyzing results - routine & emergency
5. Controlling & storing components in hospital blood bank
6. ABO/Rh-typing new patients
7. ABO/Rh-typing control
8. Antibody screening
9. Cross matching manual distribution of components and controlling delivery received at transfusion site
10. Return deliveries of unused components
11. Cleaning transfusion site & disposing waste
12. Administering and monitoring transfusion
### Potential savings $211,448 / year
## IMPACT

**Approximate Costs of T&S**

<table>
<thead>
<tr>
<th>MGH</th>
<th>Partners-NSH</th>
<th>JSLS (2010)</th>
</tr>
</thead>
<tbody>
<tr>
<td>22.10</td>
<td>16.04</td>
<td>30.00</td>
</tr>
</tbody>
</table>

- Does not include Instrumentation
- Maimonides Hospital

### $9,921.79 Lap Hyst Procedures
### $13,812.50 Lap Cholecystectomies
### $55,000 (JSLS) - Hernias/Appendectomies/Cholecystectomies

Are Routine Blood Group and Save Samples Needed for Laparoscopic Day Case Surgery?

Peter M. Thomson¹ · Jack Ross¹ · Samrat Mukherjee¹ · Borzoueh Mohammadi¹

Fig. 1: Pre-operative G&S and peri-operative transfusion status

DURING THE STUDY PERIOD, 293 PATIENTS UNDERWENT LAPAROSCOPIC CHOLECYSTECTOMY, 123 LAPAROSCOPIC INGUINAL HERNIA REPAIR AND 116 DIAGNOSTIC LAPAROSCOPY (EXCLUDING GYNAECOLOGICAL LAPAROSCOPY)
**IMPACT**

*Patient Safety*
- Misdirection of blood bank resources
- Unnecessary transfusion
- JCAHO

*Efficiency*
- Improved efficiency- OR, Blood Bank
- Standardization of the process
- National standards

*Cost*
- Blood is not reimbursed well due to DRGs
- Decreased hospital costs
Based on these data, the total cost of RBC transfusion per patient transfused in the surgical setting of this hospital was **US$ 3433**. The total cost of a unit of RBC was **US$ 1,158** (2007 value), of which, indirect overhead, total transfusion process cost, weighted average acquisition cost and direct overhead cost per unit accounted for 40.6%, 34.0%, 21.5% and 3.9%, respectively.

April 2010 of *Transfusion* study findings confirm that annual expenditures on blood and transfusion-related activities for surgical patients are significant resource drains—costing between **$1.6 to $6.0 million per hospital** surveyed.
ACKNOWLEDGEMENTS

- Jeanine Wiener-Kronish, MD
- Steve Frank, MD
- Wilton Levine, MD
- Marcela del Carmen, MD
- Aalok Agarwala, MD, MBA
- Keith Lillemoe, MD
- Elizabeth Mort, MD
- Daniel Yeh, MD
- David Chang, PhD
- Mary Bourbonniere, RN, PhD
- Sara E. Dolan Looby, PhD
- Sunny Dzik, MD
- Rob Makar, MD, PhD
- Bill Driscoll
- Milcho Nikolov
- Kent Eliason
- Daniel Morash, MBA
- Ann Schwartz, CRNA, MS
- Gautam Goel, PhD
- Victoria Carballo
- Emily Naoum, MD
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