The Transfusion Decision: A Pillar of Medicine!

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There is always a storm lurking somewhere?
Some decisions are easy!
Transfusion is emotional!
Risk/ Benefit

- **Risks**
  - Immune
  - White Cells
  - TRALI
  - Adverse Outcomes
  - ABO-Rh
  - Emerging Viruses
  - Costs
  - Decreased O₂ delivery
  - Allergy
  - Etc.

- **Benefits**
  - Fresh Blood
  - Pediatric Heart
  - Historical-Fresh Blood
  - Trauma
  - Massive Transfusion
Most Transfusions

- 1-3 units (are they necessary?)

- The transfusion decision is prophylaxis!
The Transfusion Decision

- No maybe!
- No trial period!

Deal or No Deal
- Yes/No
**Transfusion Trigger: History**

- **1900-1925**: 3-5gm/dl - cardiac failure / critical DO$_2$
- **1925-1939**: 5-7gm/dl - focus on prophylaxis
- **1930**: Nobel Prize in Medicine: Landsteiner for histocompatibility

- **1937-1987**: 10gm/dl - John Lundy, MD

- **1987-2006**: 7-10gm Consensus Conference, ASA, ACS etc.
- **2006**: 6gm/dl. ASA revised guidelines.
The Religion of 10
Transfusion Paternalism

- Trust me, I’m a doctor!

- “Your doctor will decide if you need a transfusion.”

- “We will transfuse you if we think you really need it.”

- Sept. 2002-CDC warning. Tx. utilization, no change!

- What is true informed consent?
<table>
<thead>
<tr>
<th>Year</th>
<th>1971</th>
<th>1982</th>
<th>1986</th>
<th>1987</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tx $10^6$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red Cells</td>
<td>6.32</td>
<td>11.47</td>
<td>12.16</td>
<td>12.06</td>
</tr>
<tr>
<td>Platelets</td>
<td>0.41</td>
<td>4.18</td>
<td>6.30</td>
<td>7.26</td>
</tr>
<tr>
<td>Plasma</td>
<td>0.18</td>
<td>1.95</td>
<td>2.18</td>
<td>2.16</td>
</tr>
</tbody>
</table>
Study of 300,000 patients with post transfusion hepatitis.

15,000 annual hospitalizations.

Deaths-950/year.

Critical Question: Who needed to be transfused!
1970-1980’s 7-17% sero-conversion US, 2-3% in Australia and 45% in Japan

42.5%-70% with elevated ALT develop chronic active disease.

20% develop cirrhosis

Times: 13.6 years to chronic active hepatitis, 17.8 years to cirrhosis, 23.4 to hepatocellular carcinoma
Hepatitis

- How many have died?
- Most die before they develop cirrhosis
- When was the last time you cared for a patient with transfusion contracted cirrhosis?
- Perhaps the largest iatrogenic epidemic
A Few Words About Risks
Older Blood is Associated with Adverse Outcomes in Reop Cardiac Surgery!

- 432 Pts, Reop CABG or Valve

- After correction for confounders oldest blood was associated with in-hospital mortality (hazard ratio 1.151 $P<0.0001$) and out-of-hospital mortality (1.116 $P<0.0001$).

- Association between renal failure, length of stay and ICU stay.

Leading Causes of Transfusion-related Mortality

<table>
<thead>
<tr>
<th>Cause</th>
<th>Mortality (# deaths per million units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBC mediated</td>
<td>22,000-46,000</td>
</tr>
<tr>
<td>Hemolytic</td>
<td>1-500</td>
</tr>
<tr>
<td>Viral</td>
<td>2-100</td>
</tr>
<tr>
<td>Bacterial</td>
<td>1-500</td>
</tr>
<tr>
<td>TRALI</td>
<td>1-500</td>
</tr>
<tr>
<td>Misc: Allergic, TA-GVHD, Metabolic, Fe overload</td>
<td>0.5-10 *</td>
</tr>
<tr>
<td>Misc: MOSF, TRIM, end-organ injury</td>
<td>0.8-1.2 †</td>
</tr>
<tr>
<td>Misc</td>
<td>0.5-3 *</td>
</tr>
</tbody>
</table>

* Mathematical estimates
† Reported (literature or FDA)
‡ Prospective, randomized studies
EFFECT OF RED CELL TRANSFUSION ON MORTALITY

- van de Watering 1998 (n = 914)
- Wallis 2002 (n = 597)
- Bilgin 2004 (n = 496)
- Fung 2004 (n = 1146)

Mortality (%)

In Hospital 60 Day 90 Day In Hospital

* p<0.05, † p = 0.11 (need to enroll 1174 pts to detect an 80% decrease)

£ Non-randomized trial
Effect of Transfusion on Long-term Survival

Factors Associated with Increased Mortality

<table>
<thead>
<tr>
<th>Risk</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perioperative Transfusion</td>
<td>2.4</td>
</tr>
<tr>
<td>Peripheral Vascular Disease</td>
<td>1.9</td>
</tr>
<tr>
<td>COPD</td>
<td>2.2</td>
</tr>
<tr>
<td>NYHA FC IV</td>
<td>1.5</td>
</tr>
<tr>
<td>Age</td>
<td>1.05</td>
</tr>
</tbody>
</table>

Quality of Life

- 1995-1999 – 12,536 Pts. Cleveland Clinic
- Duke Activity Status Index, 6 and 12 months

- Quality of life was incrementally worse the more perioperative red cells transfused (\(P<0.0001\)), platelets (\(P<0.02\)).

Effect of Transfusion on Long-term Survival

Survival (%) vs. Time (years)

- No Tx
- 1 Unit
- 2 Units
- 3-5 Units
- > 6 Units

N=10,289

Blood Conservation

- Requires planning
- Must be patient individualized
- Consensus amongst service providers

- Every drop of blood is precious!
Techniques

- Anemia/ Transfusion Trigger
- Meticulous Surgical Hemostasis
- Cell Saver
- Post Op Salvage
- Erythropoeitin
- Anesthetic Techniques (Deliberate Hypotension, Regional)
- Euvolemic Hemodilution
- Autologous Pre-Donation
- RAP
- Enhanced Coag Testing (TEG, PT, aPTT, Plt, Fib)
- Utilize Coag Algorithm
- Aprotinin (Hearts, Ortho, Neuro, Trauma ???)
- DDAVP
- Amicar/Tranexamic Acid
- Critical Care (limit blood draws)
- Other New Agents (Bivalirudin, New Serine Protease Inhibitors)
Aprotinin and Plavix

- **Prospective:** van der Linden, Lindall, Sartipy. Aprotinin decreases postoperative bleeding and number of transfusions in patients on clopidogrel undergoing coronary artery bypass graft surgery: double-blind, placebo controlled randomized clinical trial, Circulation 2005;112:I276-0.

Personal Experience

- 3 JW patients to Hgb <3gm/dl.
- 1 JW to 1.2 gm/dl.
- All survived without organ damage!
- Coronary disease patients who have ischemia relieved!
Transfusion Decision:
It will change a life!

- What is the “best” transfusion trigger?
- 3, 5, 7, 10 Arbitrary!
- Should it be something other than Hgb/Hct?
- You have to decide!
Transfusion Changed These Lives?

- Arthur Ashe: Transfused for a Hgb. of 8.9gm/dl. **Died of HIV/AIDS!**
- Jackie Kennedy: Transfused when John was born. **Died of non-Hodgkins Lymphoma!**
- Therapy or Safety Net?
What to Do? - Research!

"Back to Square One!"
Lead or Follow/
Learn/Question: What is the Truth?
Lead or Follow/
Learn/Question: What is the Truth?

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