Medical Aspects of the Pittsburgh Centralized Transfusion Service

Mark Yazer, MD FRCPC
The Institute For Transfusion Medicine
Department of Pathology, University of Pittsburgh
ITXM is the parent company of CTS

The Institute for Transfusion Medicine (ITXM)

1 med director*

ITXM Clinical Services

Central Blood Bank (CBB)

Hemophilia Treatment Center of Western Pennsylvania

2.5 full time MDs

Blood Science Foundation

LifeSource Blood Bank (Chicago)

ITXM Diagnostics

4 MDs

1 med director*

Centralized Transfusion Service (CTS)

RBC serology reference laboratory

Cord Blood Bank

1 med director*

1 med director*

1 med director*

1 med director*

2 RN managers

Therapeutic Apheresis Service

Coagulation Reference Laboratory

1 tech director
## CBB vs. CTS

<table>
<thead>
<tr>
<th></th>
<th>CBB</th>
<th>CTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent Company</td>
<td>ITxM</td>
<td>ITxM</td>
</tr>
<tr>
<td>Role</td>
<td>Collect donations, prepare components</td>
<td>Provide medical and technical services to member hospitals</td>
</tr>
<tr>
<td># full time physicians</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td># hospitals serviced</td>
<td>~ 45</td>
<td>16</td>
</tr>
<tr>
<td>Patient/physician interactions</td>
<td>Minimal</td>
<td>Daily</td>
</tr>
<tr>
<td>Community visibility</td>
<td>High</td>
<td>Low</td>
</tr>
</tbody>
</table>
Centralized Transfusion Service...

A network of integrated hospital transfusion services that are supported by BOTH on-site and central laboratory facilities.
**Central laboratory**

- 80% PLT pooling
- 85% Irradiation
- > 85% Leukoreduction
- 95% Washing/deglycerolization
- 95% Pretransfusion testing
- 99% Immunohematology

**Hospital laboratory**

- >80% plasma thawing
- 90% Cryoprecipitate thawing & pooling
- 5% STAT ABO typing
Geographic distribution of hospitals in the CTS system

- Allegheny General (13%)
- CTS central facility
- Western Pennsylvania (7%)
- UPMC Shadyside (20%)
- UPMC Presby/Monte/Magee (27%)
- UPMC Mercy (7%)
- Children’s (6%)
- UPMC Southside

3 km
Geographic distribution of hospitals in the CTS system

- Cranberry (1%)
- Passavant (7%)
- UPMC St. Margaret (5%)
- Forbes
- UPMC McKeepseport (2%)
- Washington (5%)
- Washington (5%)
The Pittsburgh CTS by the numbers: FY 10

- RBC: 123,000 (42% leukoreduced)
- PLT: 112,000 WBP Eq (10% apheresis)
- Plasma: 71,000 (including thawed plasma)

About half of these products went to 3 hospitals
Transfusion reactions

% of total

RBCs transfused

UPMC Braddock
UPMC Magee Women's
UPMC Mackeesport
UPMC Shadyside
UPMC St. Margaret's
UPMC Passavant
UPMC Cranberry
UPMC Mercy
Allegheny General
West Penn
Washington
Essential Operational Features

- Information Systems
- Medical Expertise
- Automated testing
Essential Features Of The CTS: Information Systems

- Tracking and storing patient special needs information
  - Patients can visit different hospitals
  - Essential component modification details follow them
  - Eliminates the need to re-investigate special needs with every admission
  - Permits anticipation of daily blood needs
Essential Features Of The CTS: Information Systems

- Serological history follows recipients
  - Easy to view recipients’ entire in-network transfusion history
  - Transfusion reaction history is also readily available (guides component modifications)
  - Can reduce extent of repeat serological investigations

- Historical ABO type is maintained on file!
16 events: Complete information available

10 events: Erroneous and historical types obtained at same hospital

5 events: Potential mistransfusion
ABO compatible

5 events: Potential mistransfusion
ABO incompatible

6 events: Historical type previously obtained at different hospital

3 events: Potential mistransfusion
ABO compatible

3 events: Potential mistransfusion
ABO incompatible

MacIvor et al. Transfusion 2009
ABO check type sample quickly implemented in 2010
Central databank facilitates regional utilization review
  » Helps to identify sources of product wastage and “non-evidence based” transfusion practice
  » Can rapidly implement corrective measures; preserves the city’s blood inventory
  » Allows for benchmarking between similar hospitals
Benefits of a CTS: Medical expertise

- On average only 39 candidates/year write the TM board
- That’s barely enough for each hospital in Pittsburgh!
  - What about the rest of the country!? 
- All CTS hospitals have the benefit of 24/7 expert MD coverage, even the smaller-volume sites 
- In Pittsburgh, 4 physicians can manage 19 hospitals thanks to:
  - Centralization 
  - Thorough SOPs 
  - Competent and motivated technologists 
  - Knowledgeable managers
Benefits of a central laboratory: Antibody investigations

- Technologists skilled in blood group serology are hard to find
- It takes 20 years to become a 20 year veteran
- There are 16 hospitals in our CTS network
  » There aren’t that many serologists in Pittsburgh!
- It is logical to pool this expertise in one laboratory
Benefits of a central laboratory: Higher efficiency

- Comparison of efficiency of 3 CTS vs. 6 in-hospital transfusion service (HTS) non-supervisory staff

<table>
<thead>
<tr>
<th></th>
<th>HTS</th>
<th>CTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tech FTE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total FTE</td>
<td>20</td>
<td>60</td>
</tr>
<tr>
<td>RBC units transfused (000)</td>
<td>40</td>
<td>80</td>
</tr>
</tbody>
</table>

Simpson M et al., Transfusion 2002;42S:130S
Benefits of a central laboratory: Higher efficiency

Simpson M et al., Transfusion 2002;42S:130S
Benefits of a central laboratory: Smaller inventory

Triulzi et al., Transfusion 2002;42S;135S
Relationship with blood supplier

- We’re all on the same team! (and computer system)
- Permits close communication during times of shortages
- Focused donor recruitment campaigns can be conducted if a specific product is low
Possibility exists to share donor ABO information
Close relationship with both clinicians and blood supplier also allows for easier prediction of when rare donors will be needed
Greatly simplifies supplier’s logistics
Benefits of a central laboratory: Research


- Yazer MH, Triulzi DJ, Cortese Hassett A, Kiss JE. Cryoprecipitate prepared from plasma frozen within 24 hours after phlebotomy contains acceptable levels of fibrinogen and VIIIC. *Transfusion* 2010;50:1014-1018.


Grants: REDS I, II,III, RADAR, TMH network, NBF, NIH, DARPA
Cost savings associated with CTS

- Depends on where the hospital starts
  - Economies of scale
  - Automation
  - Smaller overall workforce
  - Reduced wastage

- Evidence based practice
  - Probably the biggest ongoing savings
    - Rational, evidence based component therapy
    - Implementation and enforcement of transfusion triggers
    - Stewardship of expensive recombinant factors
    - Involvement with peri-operative blood management
    - System-wide benchmarking
Benchmarking across an entire healthcare system
For patients with previous INR < 1.6

PLASMA TRANSFUSION ALERT

Your patient's most recent INR is 1.3.
The institutional guideline for plasma transfusion is INR => 1.6.
The published literature indicates that for an INR < 1.6 the risk of a plasma transfusion exceeds its minimal if any hemostatic benefits.
Please choose the appropriate action below to resolve this alert.

Alert Action
- [ ] Cancel Plasma Transfusion Order
- [ ] Proceed with Plasma Transfusion Order

[OK]
Triggers when Hemoglobin Level is $\geq 8.5$
Effectiveness of RBC alert

Facility

<table>
<thead>
<tr>
<th>Facility</th>
<th>Order Count</th>
<th>Alerts Heeded</th>
</tr>
</thead>
<tbody>
<tr>
<td>HZN</td>
<td>71</td>
<td>6</td>
</tr>
<tr>
<td>MCK</td>
<td>69</td>
<td>5</td>
</tr>
<tr>
<td>MER</td>
<td>172</td>
<td>23</td>
</tr>
<tr>
<td>MWH</td>
<td>69</td>
<td>4</td>
</tr>
<tr>
<td>PAS</td>
<td>454</td>
<td>52</td>
</tr>
<tr>
<td>PUH</td>
<td>590</td>
<td>90</td>
</tr>
<tr>
<td>SHY</td>
<td>870</td>
<td>114</td>
</tr>
<tr>
<td>SMH</td>
<td>242</td>
<td>36</td>
</tr>
</tbody>
</table>
Downsides of a CTS

- **Blood Supplier**
  - Virtually none

- **Hospital**
  - Needs to get used to “outsourcing”
  - Computer interfaces might need to be developed for patient and billing information sharing

- **Transfusion physicians**
  - Can require extensive traveling
  - “Bread and butter” transfusion issues multiplied by the number of hospitals served
  - Lots of credentialing, transfusion committees, meetings...