The Role of Pathology Informatics in Transfusion Service Optimization

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Informatics Grand Rounds
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Conflict of Interest and Disclosure

Dr. Calvino Cheng, MD, FRCP
• None to disclose

Stephanie Watson, MLT
• None to disclose

• Please note: any vendor-related references are not to be construed as endorsements or non-endorsements.
Objectives

• Outline the informatics initiatives which have been implemented at Blood Transfusion Service, Nova Scotia Health Authority, Central Zone in Halifax, Nova Scotia

• Discuss how initiatives arose, the interplay between Blood Transfusion Services and the Pathology Informatics Group and how these initiatives were implemented.

• Identify barriers and enablers for project success

• Examine the impact of these initiatives on the institution

• Examine how this can be applied to other institutions
What is Pathology Informatics?

Definition

• The science of processing data for storage and retrieval; information science

• Pathology informatics has to do with the "acquisition, organization, validation, storage, retrieval, integration, analysis, communication and presentation of information, using computers and information technology as tools" within the field of pathology.
Mission of the Pathology Informatics Group at NSHA

1. To create an efficient, intelligent and innovative information backbone for the diagnostic laboratory.

2. To improve the health of the patient and health care system through effective laboratory information management and research empowerment.
Who is the Pathology Informatics Group (PInG)?

- We are a mix of Medical Laboratory Technologists, Data Integrity Officers and Data and Business Analysts.
- Intimate understanding of business processes and data in laboratory and radiology.
- Deliver business intelligence, system data quality and integrity.
- Housed in Pathology and Laboratory Medicine.
We will present three case studies on how Informatics and Transfusion services collaborated to improve daily operations:

1. RBC Unit Inventory Ordering Algorithm
2. Millennium Blood Transfusion Service Dashboards
3. Notification of Transfusion Letters
RBC Unit Inventory Ordering Algorithm
Supply and demand of blood products is stochastic.

The blood supply is critical to manage in a hospital system, as it is necessary to ensure availability while minimizing wastage.

Red cell units (RBC) are the most commonly transfused blood component in the hospital system; however, managing the supply has been very difficult at our institution.

Red cell inventory wastage through expiry was increasing (50-200+ units discarded/year).
PROBLEM
Managing Red Blood Cell Unit Inventory

- Transfusion rates and red cell usage has been dropping year-over-year, but the red cell inventory was not falling, but instead increasing (10+ days inventory on hand, vs. the standard 5 day inventory).

- The 5-day line used in this graph is an ideal inventory according to the Canadian Blood Services inventory trend report.

NSHA Central Zone Inventory Levels
September 2014 to January 2015
Through an internal audit/observation, we discovered that technologists had no standardized methods to order inventory to meet maximum or ideal limits.

Liver transplants and other surgeries also resulted in significant inventory fluctuations and overages.

RBC inventory numbers were due for an update, as our previous estimate was calculated in 2007.

Re-calculation of a new base inventory level would require a significant amount of time and effort in manual data manipulation, and compliance to those set thresholds would likely be variable.
Issues with the RBC unit ordering process itself

- Significant amount of complexity and manual work required to calculate and account for inventories in different areas in the laboratory, hospital and system
- Perceived risk of shortages, especially on weekends or holidays, and no way to provide the technologists a degree of certainty and accountability for the units in the system
- Not all information required for an order is readily available to the techs, which adds to the stress
- High technologist turnover and there were many junior technologists involved
PROBLEM
Managing Red Blood Cell Unit Inventory

Original sheet used to determine what to order, based on the 2007 base inventory numbers:

- The sheet wasn’t user friendly
  - how would a new tech know where to start?

- The information was static, not reacting to current demand

- The only change in the final order numbers would be from a calculation that took between 5-30 minutes, twice per day

- High turnover rate means lots of repetitive tech training, and variation in ordering practices
An automated algorithm to simplify and standardize the blood ordering process, implemented end of May 2015

- Algorithm determines real-time demand
- Same mathematics as before, but automated
- Scheduled printout summarizes what to order per blood type, calculations already complete. If negative, don’t order.
- Inventory snapshot
Managing Red Blood Cell Unit Inventory

The Algorithm

- Current inventory on hand (Available + \( \frac{1}{2} \) Crossmatched)
- Looks back and ahead:
  - Historical usage data to predict current and future demand
- Institutional hematology variable scan, and how many RBC units the patients need based on past transfusion trends
- Failsafes in place to buffer against unpredictable shocks, algorithm self-corrects
- Allows for flexibility if techs know more is needed
RBC unit inventory levels have decreased post-implementation.

The inventory swell of recent Winter months is a reaction to a seasonal increase of demand at our sites, which is automatically determined by the algorithm.

Our unit outdate rates (on graph) remain consistently very low, indicating that the algorithm’s ordering suggestions are closely matching real-world demand.

RESULTS
Managing Red Blood Cell Unit Inventory

October 2014 to February 2016
RESULTS
Managing Red Blood Cell Unit Inventory

- Outdates, post-algorithm implementation period:
  - 0.8% discard rate due to expiry on average (previous year was 1.6% average during same period)
  - 12 months pre and post

  96 vs 227 discarded
  - @450/unit
  - $58950 saved
### RESULTS

Managing Red Blood Cell Unit Inventory

- Yearly outdate rates by month, NSHA Central Zone:

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<th>Month</th>
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RESULTS

Managing Red Blood Cell Unit Inventory

• Nearly eliminating the time a technologist spends doing non-value-added activity (i.e. calculations), especially pertaining to the inventory (inventory typically takes 5-45 minutes per time, twice a day, depending on technologist)

• Less pressure on techs, especially new hires

• Patient population and their anticipated use is taken into account when an order is made

• Significant cost savings from minimizing discards due to expiry
Blood Transfusion Service Dashboards
Expiring Red Blood Cell Units Dashboard

- Red cell recycling is an important way to combat expiry.
- RBC units have shelf-life of 42 days
  - Expire while unit sits on shelf costs $$$
  - Large geography and complex system makes tracking nearly all expiring units difficult
  - Recycling can happen when we identify those units
### Expiring Red Blood Cell Units Dashboard

**Related Dashboards:** Expiring RBC Units | Expiring Platelet Units | Thrombocytopenia | Yesterday and Today

**Report Run On:** MAY-11-2016 at 12:26:51 pm
**For:** EXPIRING RED BLOOD CELL UNITS

**Close This Window:** **Note this page will automatically refresh once new data is available**

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• Platelet (PLT) inventory is even more dynamic than RBC inventory (shelf-life 5 days)

• Management of PLT inventory has implications for both patient care and the cost of health care delivery.

• Difficult to keep track of platelets at different sites

• Technologists spend hours a day reconciling platelet inventory

• Institutional discard rates are high in Canada (19.0% – buffy coat; 22.8% PRP; 2.4% APH) – ours were also this high.

INFORMATICS SOLUTION
Patient Platelet Requirements & Unit Inventory

• Thrombocytopenia and Expiring Platelet dashboards to enable:
  • Reduction of our inventory & matching actual demand
  • Matching the compatible blood group of platelet to patient
  • Reducing incompatible transfusions; improving platelet survival
  • Improving patient safety (pre-order/system scan)
  • Reducing discards from expiry
Thrombocytopenia Dashboard system monitors and displays both inventory and real-time institution-wide patient PLT counts.

The dashboard provides the ability to order PLTs from our distributor based on current institutional demands, rather than historical data.

This system is unique as it provides individual patient information, allowing for more informed ordering and assignment of PLTs.

Cited as a Leading Practice by AABB Accreditors (December 2011)
## Thrombocytopenia Dashboard

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INFORMATICS SOLUTION
Patient Platelet Requirements & Unit Inventory

Expiring Platelet Units Dashboard

- Allows monitoring for PLTs near expiry across our Central Zone sites to improve management.

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RESULTS
Patient Platelet Requirements & Unit Inventory

• A significant reduction in average monthly PLT outdate rate was observed following the implementation of the PLT Dashboard Suite from 24.5% to 15.1%

• PLT age at time of transfusion was also reduced from 3.60 days to 3.46

• ABORh patient donor match rates were not decreased, suggesting that the institutional policy of matching PLTs and maximizing plasma compatibility was maintained

• The dashboard system is an inexpensive and novel blood inventory management system which is associated with a significant reduction in platelet unit wastage rates at our institution
Notification of Transfusion Letters
PROBLEM
Notification of Transfusion

Background

• The Canadian Standards Association (CSA) [Z902-10] 11.2.2 indicates that “A procedure shall be in place to ensure that recipients of blood, blood components, and blood products receive notification of the transfusion in writing.”

• We analyzed the information flow in our laboratory information system to assess for gaps in doing this electronically.
Options and Limitations:

• Family physician responsible to give the "Notification of Transfusion" letter to the patient

• Nurse responsible to give the "Notification of Transfusion" letter to the patient

• Emailing the "Notification of Transfusion" letter

• Sending the "Notification of Transfusion" letter to the nurse unit with first unit/product

• Mail "Notification of Transfusion" letter
  • Funding for stamps and staff to stuff envelopes for mailing
  • Deceased patients
  • Patient address
  • Returned mail
• Report automatically listing all patients in the previous quarter who have received a blood product or derivative

• The patient is to be listed only once regardless of the number or type of product they received
  • Report gives patient name, HCN, DOB, address

• A letter will go out to each patient once/year, even if they received a new product or derivative in a later quarter.
  • The database query checks for this before generating the printout, eliminating the process of a person having to manually look back into paper or electronic records.

• Part two - have the patient info print out on the "Notification of Transfusion" letter
RESULTS
Notification of Transfusion

- To date, Blood Transfusion Service has mailed out 13,324 Notification of Transfusion letters.

- There have been very few issues/phone calls to BTS. Most patients want to know what product they received and/or why.

- There was one call to request a change in their mailing address and one call complaint about the cost of a stamp.
Enablers and barriers

WHAT HAVE WE LEARNED?
Enablers

• Responsive and involved Pathology Informatics Group (inclusion in QA meetings, on-site accessibility)

• Cooperative relationship with end users and managers, along with valuable feedback

• Great input from external resources to NSHA – (ex: Canadian Blood Services, Nova Scotia Provincial Blood Coordination Program)

• Close collaboration with Information Management/Information Technology at Nova Scotia Health Authority
Barriers

• In preservation of patient safety and system security, there’s often a slow adoption of new technology and workflows

• Limited number of analysts, leading to a backlog of various projects

• Often, the diagnostic laboratory doesn’t know what they want and propose a technological solution without thinking of their real need.
  • Informatics can assist in identifying the need, rather than jump to the solution.
Conclusion

• Through a close collaboration between Pathology Informatics and the diagnostic laboratory, solutions can be developed which improve workflow and resource utilization.

• This is something that should be cultivated and harnessed in other institutions.
Acknowledgements

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    • Automated RBC Ordering Algorithm
    • Patient Notification of Transfusion Letters

• **Don Doiron** - Data and Business Analyst, Pathology Informatics
  • Developer of:
    • Expiring RBC Units Dashboard
    • Expiring Platelet Units Dashboard
    • Thrombocytopenia Dashboard

• **Dr. Irene Sadek**, Blood Transfusion Service Director/Hematopathology Division Chief

• Pathology Informatics Group (NSHA, Central Zone)
• Blood Transfusion Services (NSHA, Central Zone)
• Joan Macleod, Natalie Chisholm, Our Tech IIs, Our MLTs

[Logo: Nova Scotia Health Authority]
QUESTIONS

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