Data Hidden in Plain Sight - Using Unexpected Analytics for Quality and Process Improvement in the Clinical Laboratory

Presented by:

Jordan Olson, MD FACP
Director of Laboratory Preanalytics and Medical Director of Clinical Pathology informatics at Geisinger Health System

November 16, 2017
Learning objectives

• Understand where unexpected data sources exist in the laboratory and how they can be used for improvement efforts.

• Identify the need for data to support improvement efforts or implementing change.

• Describe a process where current data sources can be tweaked to be used in specific improvement activities.

• Define financial and operational benefits associated with utilizing unexpected sources of lab data.
Original 1915 Laboratory
Geisinger Medical Laboratory Core Lab
Geisinger Medical Laboratory

- 88 CLIA certified sites
- 11 patient service centers
- 42 couriers on the road daily
  - 1.8 million miles per year
  - 20,000 site visits per month
- 1300 employees
- 9.5 million billable tests performed annually
Pneumatic Tube Delivery of Specimens

**PNEUMATIC TUBE SYSTEMS**

- Nearly ubiquitous in large hospitals
- Often under-utilized, misunderstood
- Great opportunity to demonstrate value ‘outside’ the laboratory
Pneumatic Tube Systems for Specimen Transport

SAFE FOR MOST ANALYTES

SOME EXCEPTIONS EXIST
• Platelet function studies, ABGs

IRRETRIEVABLE SPECIMENS
• Surgical pathology, cytology, and other “irretrievable’ specimens may require special handling

BLOOD TRANSPORT
• AABB has special guidance for the validation of pneumatic tube systems
• Logistics important
Demonstrating value with the pneumatic tube system

**TRANSPORT TIMES**
- Transport aid dispatch system data
  - tracked amount of time transport aid spent on job
- Pneumatic Tube data
  - taken from pneumatic tube system controller software

**AVERAGE TRANSIT TIME**

95% complete time

The 95th percentile of how long the transit takes (i.e., 95% all transport trips will be shorter than this time)
Transport Time by Method

Average time: tube
Time to 95% complete: tube
Average time: transport
Time to 95% complete: transport
Transit Times

21:35 Average transit time for transport

2:23 Average transit time for tube
Shift in Workload

Using the pneumatic tube system put more tasks onto the laboratory staff

74.8 sec
Average amount of additional time blood bank staff spends issuing product by tube compared to transport

6 sec
Average amount of additional time receiving staff spends receiving a specimen through the tube system vs. the drop-off window

21 min 35 sec
Average amount of time transport does not spend supporting the blood bank when a product is tubed
Products Issued by Transport Type

Number of Products

Nurse
OR
Other
Transport
Tube

© Copyright 2017, Cardinal Health. All rights reserved. CARDINAL HEALTH, the Cardinal Health LOGO and ESSENTIAL TO CARE are trademarks or registered trademarks of Cardinal Health.
# Shift in Workload

## TRANSPORT TRIPS

<table>
<thead>
<tr>
<th></th>
<th>Nov</th>
<th>Dec</th>
<th>Jan</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012-2013</td>
<td>1681</td>
<td>1671</td>
<td>1816</td>
<td>1723</td>
</tr>
<tr>
<td>2013-2014</td>
<td>732</td>
<td>699</td>
<td>701</td>
<td>711</td>
</tr>
<tr>
<td>Change</td>
<td>-949</td>
<td>-972</td>
<td>-1115</td>
<td>-1012</td>
</tr>
</tbody>
</table>

## TUBE TRANSACTIONS

<table>
<thead>
<tr>
<th></th>
<th>Nov</th>
<th>Dec</th>
<th>Jan</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012-2013</td>
<td>732</td>
<td>699</td>
<td>701</td>
<td>711</td>
</tr>
<tr>
<td>2013-2014</td>
<td>2111</td>
<td>2032</td>
<td>2144</td>
<td>2096</td>
</tr>
<tr>
<td>Change</td>
<td>1379</td>
<td>1333</td>
<td>1443</td>
<td>1385</td>
</tr>
</tbody>
</table>

## Change in Number of Tasks (month) and Time per Task (minutes)

<table>
<thead>
<tr>
<th>Task Type</th>
<th>Change in Number of Tasks (month)</th>
<th>Time per Task (minutes)</th>
<th>Change in Task Time (minutes/month)</th>
<th>Change in Task Time (hours/month)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport</td>
<td>-1012</td>
<td>21.58</td>
<td>-21839</td>
<td>-364</td>
</tr>
<tr>
<td>Blood Bank</td>
<td>1385</td>
<td>1.08</td>
<td>1496</td>
<td>+25</td>
</tr>
</tbody>
</table>
## Shift in Workload for Clinical Samples

### Transaction in SPA

<table>
<thead>
<tr>
<th>Month</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 2013</td>
<td>11,267</td>
</tr>
<tr>
<td>Jan 2014</td>
<td>29,388</td>
</tr>
<tr>
<td>Change</td>
<td>+18,121</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TASKS</th>
<th>TRANSPORT (est)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>18,121</strong></td>
<td><strong>- 500</strong></td>
</tr>
<tr>
<td><strong>0.1</strong></td>
<td><strong>30</strong></td>
</tr>
<tr>
<td><strong>1812</strong></td>
<td><strong>15,000</strong></td>
</tr>
<tr>
<td><strong>+30</strong></td>
<td><strong>-250</strong></td>
</tr>
</tbody>
</table>
Pneumatic Tube System TAT: demonstrating value in upgrades

Percent of transactions received in a given transaction time.
**Pneumatic Tube System TAT**

### Average TATs

- **Request > Sent**
- **Sent > Arrived**
- **Arrived > Drop**
- **Request > Arrive**
- **Request > Drop**
Pneumatic Tube System Hourly Workload into Laboratory

TRANSACTION SENT TIME VOLUME BY HOUR OF DAY
Pneumatic Tube System Blood Delivery

Average TATs
- Request > Sent
- Sent > Arrived
- Arrived > Drop
- Request > Arrive
- Request > Drop
Pneumatic Tube Transport Systems

- Drives significant improvements for the hospital system as a whole
- Shifts workload

A LABORATORY NEEDS TO CLAIM THESE WINS even if the major benefactor is outside the laboratory
On-Instrument Data

- Modern automation generates hundreds of data points per hour
- Each sample gets multiple time stamps
- Middleware often contains this data
Transit Time: Lavender Tubes to XN9000

CR1
Median: 0:48
90th Per: 8:55

IPB TO XN9000

RFX
Median: 3:05
90th Per: 11:18

© Copyright 2017, Cardinal Health. All rights reserved. CARDINAL HEALTH, the Cardinal Health LOGO and ESSENTIAL TO CARE are trademarks or registered trademarks of Cardinal Health.
Transit Time: Input Buffer to cobas 8000 (7556)
Test Menu Analysis

• Reagent utilization and reagent cost analysis:
  – Data available from middleware, LIS

• Did not include:
  – Cost of QC materials
  – Cost of calibrators
  – Labor
Lewistown
Mt. Pocono

Number of Tests

<table>
<thead>
<tr>
<th>Test</th>
<th>QC/YR</th>
<th>PT/YR</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DBIL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LIPASE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAGNESIUM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>URIC ACID</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Cost

<table>
<thead>
<tr>
<th>Test</th>
<th>QC COST/YR</th>
<th>PT COST/YR</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMY</td>
<td>$320.00</td>
<td>$15.00</td>
</tr>
<tr>
<td>CK</td>
<td>$350.00</td>
<td>$20.00</td>
</tr>
<tr>
<td>DBIL</td>
<td>$300.00</td>
<td>$10.00</td>
</tr>
<tr>
<td>LIPASE</td>
<td>$250.00</td>
<td>$5.00</td>
</tr>
<tr>
<td>MAGNESIUM</td>
<td>$200.00</td>
<td>$3.00</td>
</tr>
<tr>
<td>URIC ACID</td>
<td>$150.00</td>
<td>$2.00</td>
</tr>
</tbody>
</table>
Scenery Park

Number of Tests

Cost

© Copyright 2017, Cardinal Health. All rights reserved. CARDINAL HEALTH, the Cardinal Health LOGO and ESSENTIAL TO CARE are trademarks or registered trademarks of Cardinal Health.
Recommendations

- **Lewistown:** Sending the tests listed to GMC could save $19,753.96 in reagent cost for Quality Control analysis per year.

- **Mt. Pocono:** Sending the tests listed to GMC could save $1,063.68 in reagent cost for Quality Control analysis per year.

- **Scenery Park:** Sending the tests listed to GMC could save $5,070.29 in reagent cost for Quality Control analysis per year.
Extra Tubes

• Tubes Drawn without specific orders

• Often as part of a ‘rainbow’ draw in ED

• Extra tubes are logged into LIS system at time of receipt with specific test code based on specimen type
Extra Tubes are Rarely Used

- On average 6.04% of extra tubes are used for Add-on testing
- Blue, Lavender, Green tubes are used 8.59%
- All other types are used 3.16% of the time
Policy Change based on data

- **Only in ED**, In addition to the specimens required for ordered tests, draw 1 citrated whole blood (Blue), 1 plasma separator tube (Lt Green), 1 EDTA whole blood (Lavender), if these specimens have not been obtained for the ordered tests.

- **Do not draw additional** lithium heparin (dark green), serum separator (gold), Fluoride (grey), Pink-EDTA whole blood (pink), Serum (Red).

- **All other locations; ONLY** draw specimens required by ordered testing.
Absolute number of extra tubes received
Savings

• Specimen Tubes approx. $16.56/100

• 5681 Tubes/Month

• $11289.28 / year in supply cost savings

• Specimens 3ml/blood per tube

• = 204 LITERS of Blood per year

• = 584 Units of blood

• = 40 ADULT BLOOD VOLUMES
Conclusions

• Laboratory has data everywhere

• Nearly unlimited opportunities for improvement

• Look for unexpected data sources when solving problems

• Laboratory drives hospital wide value – demonstrating that value is critical
Questions?

Presented by:
Jordan Olson, MD FCAP
jeolson@Geisinger.edu

The information in this presentation is provided for educational purposes only and is not legal advice. It is intended to highlight laws you are likely to encounter, but is not a comprehensive review. If you have questions or concerns about a particular instance or whether a law applies, you should consider contacting your attorney.
Thank you