Monitoring Electronic Report Flow

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Overview

- Electronic Pathology (E-Path) Reporting
- E-Path Reporting Dilemma
- Early Monitoring Solution
- Current Architecture
- E-Path Monitoring Application
- E-Path Notification System
- Conclusion
- Screencast Demo
Electronic Pathology (E-Path) Reporting

- E-Path Reporting began in 2004 through Artificial Intelligence in Medicine
- PHIN-MS followed in 2009
- 93 of 100 KY hospitals using E-Path reporting
  - 96% of large hospitals
  - 95% of small hospitals
- Most in-state and out-of-state freestanding labs use E-Path reporting
- Over 382,000 E-Path records received
# of E-Path records dramatically increase each year
# of E-Path Reports A Week Per Year

Flow of E-Path Reports are accelerating
E-Path Reporting Dilemma

- Facilities send reports through messaging systems (A.I.M and PHIN-MS)
- Report flow may drop between facilities and KCR.
  - Data connection may drop
  - Reporting facility server fails
  - Some labs manually send reports and forget
  - A Lab relocates
- KCR Operations Staff need to take immediate action to reestablish connection to the reporting facility
- It’s vital to have a way of analyzing facilities’ report flow
E-Path Monitoring Demand

• KCR needed a tool which monitored the flow of E-Path reports from each reporting facility

• Automated emailing system established.

• KCR operations staff received daily emails of the report volume of each facility
Sample Daily E-Mail Report

Number of Pathology Reports on Tuesday June 21, 2011
- Baptist East: 17
- Central Baptist: 5
- Ephraim McDowell RMC: 5
- Jewish Hospital: 14
- Jewish Hospital – Shelbyville: 1
- Kings Daughters MC: 19
- KOSAIR: 1
- LABCORP – Park Duvall Comm. Health Ctr.: 1
- MCBG: 3
- Murray Calloway: 8
- NORTON: 6
- OMHS: 15
- Pikeville Medical Center: 4
- ...

Not a great way to visualize report flow

Daily Emails are annoying

Kentucky Cancer Registry
Current Architecture

• KCR parses incoming E-Path reports into a replicated database.
• REST API in place to retrieve E-Path information from KCR database.
• A web application can use this data to analyze the report flow from facilities to the KCR.
1) Facilities submit reports through a messaging system.
2) Reports then sent to the KCR.
3) Reports are then parsed to replicated database.
4) E-Path Monitor grabs data through API to monitor report volumes.
Easy analysis of report flow

Easy to detect problems

Interactive Chart
Users can set thresholds.

Thresholds help determine when facilities are sending an irregular amount of reports.

When report volume breaks threshold, users receive email.
The following facilities had weekly E-Path counts that were outside their minimum or maximum thresholds for the week Jun 1, 2011 – Jun 7, 2011:

<table>
<thead>
<tr>
<th>Sending Facility</th>
<th>Weekly Count</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owensboro Medical Health System</td>
<td>5</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Clinical Path Associates</td>
<td>2</td>
<td>16</td>
<td>28</td>
</tr>
<tr>
<td>Ameripath</td>
<td>9</td>
<td>10</td>
<td>32</td>
</tr>
<tr>
<td>RMC Trover</td>
<td>56</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Saint Claire RMC</td>
<td>10</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Associated Path</td>
<td>0</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>Bostwick Laboratories</td>
<td>0</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Central Baptist</td>
<td>103</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Western Baptist</td>
<td>62</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
Conclusion

- E-Path Monitor App is an easy-to-use tool for E-Path report flow monitoring:
  - Chart allows to see dips and spikes in report volume
  - Automated weekly email informative and less cumbersome
  - Link in email to E-Path Monitor allows for less work to view important data
Future Enhancements

- Expanding past E-Path report flow
  - Electronic Medical Records (EMRs)

- Setting automatic/default thresholds:
  - Gaussian distribution
  - Machine Learning with Hidden Markov Models
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Questions & Demo