Eliminating lost and non-reported imaging exams in US Air Force teleradiology practice

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Disclosure

• The authors neither currently have (nor previously had) a financial interest or other relationship with any commercial organization in the past 12 months that may have an interest in the content of this presentation
• The views herein are those of the authors and not of the Department of Defense or US Air Force
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Background

• All diagnostic imaging exams must be interpreted by a radiologist and reported to the referring physician
  – In practice, exams may fail to transmit to PACS and/or be lost during transmission to PACS
  – Exams may go un-reviewed and un-reported on PACS
  – Reports may fail to transmit to the electronic health record for review by the ordering physician due to network inconsistencies

• Lost exams and reports pose a tremendous patient safety and quality problem in radiology
  – Radiology departments must have reliable processes in place to find these exams, which are often lost due to computer network failures as well as unavoidable human error
  – Lack of robust processes to identify these exams in a timely fashion pose an ethical and legal risk to the radiologist

Background

• USAF Teleradiology Workflow
  – Exams ordered in CHCS (Composite Health Care System) = RIS (radiology information system)
  – Stand-alone imaging equipment (eg. CR, CT, MRI) receive CHCS input and transmit images to PACS via secure local and teleradiology networks
  – Images on PACS (AGFA Impax 6.3) are reviewed and dictated/finalized with AGFA Talkstation
  – Reports are electronically routed to local/national CHCS’ and subsequently to the worldwide military electronic medical record (EMR - AHLTA/Essentris)
How bad is the problem?

- On a daily basis, an average of 1 out of 300 exams are “lost” in our radiology system (images not on PACS from local & national sites).
- Depending on network integrity, few or many radiology reports may also not be transmitted back to the CHCS RIS and subsequently to the EMR.
- Our process was not reliable in identifying lost and non-reported exams between January 2015 and August 2015, resulting in a “build-up” of 61 “problems”.

<table>
<thead>
<tr>
<th>CHCS Status</th>
<th>Not on PACS</th>
<th>New</th>
<th>Dictation Started</th>
<th>Dictated</th>
<th>Approved</th>
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<td>0</td>
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<td>75,623</td>
</tr>
</tbody>
</table>

Table 1: Number of exams in various CHCS status at Travis AFB radiology in Sept 2015

Why the problem matters

- The images find their way to PACS but are so old no one sees them.
- Patient’s images are acquired but fail to transmit to the PACS.
- A referring physician orders imaging and expects exam completion and reporting back to the EMR for review.
- The images are finally reviewed but the dictated report fails to transmit to the EMR due to a network failure.
- The referring physician does not see the delayed report and was not alerted by the radiology department.
- Delay in Diagnosis.
How do we look for lost exams?

- USAF Radiology RIS (CHCS) has search tools to find “incomplete” exams; daily searches are made by imaging technologists, PACS team members, and key QA radiologists
  - Any radiologist can use RIS/PACS search tools to assure daily work completion
- At our 15 teleradiology sites, the lead technologist assures that all exams are sent/seen on PACS, and they expect final reports on all exams daily (usually a 1-2 hour report turnaround time)

How do we look for lost exams?

- AGFA Impax has search capabilities to identify exams on PACS without final reports; routine searches for these types of exams is a quick and simple additional method to identify non-reported exams
- Exams that remain in “Dictated” status may have reports that are finalized in Talkstation but not posted into CHCS or the EMR due to a network failure
Initial Results and QI Plan

- By 31 December 2015, search tools and QA efforts led to all unreported exams for 2015 being reported.
- In January 2016, we began a year long effort to attempt to keep lost exams at ZERO; problems we knew we would encounter included:
  - Daily networks outages
  - Human error in getting exams onto PACS
  - Error in identifying unreported exams
  - Network errors during report transmission/posting back into the EMR
- Daily effort by multiple team members would maintain the ongoing ZERO lost/unreported exam standard.

PQI

Choose your team

Define your problem

List key drivers

Measure your problem

Test different interventions

Identify root causes

Sustain improvements
Problem Definition

• Not all radiologists, technologists, and referring physicians understand scope of the problem of lost exams
• People unknowingly make error in contributing to lost exams or in trying to find lost exams and reports in spite of honest efforts
• Network errors are surprisingly common, leading to reports not being posted in the EMR
  – Should a report posting to the EMR a month late get an addendum? The interpreting radiologist may never know of the delay… should they?
• Referring physicians and patients say “I never heard back, so I assumed everything was ok…”

More Challenges

• As a radiology technologist training program and a radiology residency program, there is lack of understanding of the pitfalls in exam reporting
  – New rotating technologists must be taught to cross-check that all their exams are on PACS
  – Residents must check for partially dictated exams and to assure their reports are moving from “dictation started” into “approved” status
  – Staff radiologists must be vigilant for lost exams

Underlying all of this is the problem of task saturation
### Root Cause Issues

**Human error**
- Skill-based performance ("Auto-pilot mode")
  - 1:1000 errors when we try our best to avoid error
- Rule-based performance ("If-Then response mode")
  - 1:100 errors when we practice the best we can
- Knowledge-based performance ("Figure out mode")
  - 1:3 errors on shaky ground out of our scope of practice

### Root Cause Issues

**Computer Network Error**
- Network servers may crash when needed security updates are made (complex problem with cybersecurity)
- Overseas hackers always attempting to "crack" military networks and denial of service issues arise

**Communication Error**
- Referring providers are not omniscient and cannot known when a radiology report did not reach them
- Radiologists assume 100% of their reports will be read by the ordering provider when the real number may be more like 20%
Key Improvement Drivers

- Choosing the improvement team
  - Section heads and lead technologists for each modality
  - Key QA/QI radiologists
  - Support of department leadership
- Key Improvement Drivers
  - Culture change in department that lost exams are everyone’s responsibility
  - Communications between technologists and radiologists
    - Daily technologist checks/identification of “EXAMINED” exams not on PACS as well as unread exams that seem delayed
    - Exams with reports stuck in dictation system are marked with IMPAX "_PACS_" keyword so that the PACS team can get reports posted in EMR
  - Actively performance tracking by leadership
  - Coaching the department to keep ZERO harm events

Key Interventions

- Mandatory DGMC facility-wide “High Reliability Organization” Training
  - Understanding of how we make human error…. and ways errors lead to harm
  - Steps we should take to try to minimize error leading to patient harm
- “Lost” exams now a standard agenda item at weekly section head /technologist / safety meetings
- Daily discussion at section huddles
- Our leadership challenges the department to have ZERO lost exams
Ongoing Results / Sustainment

• We rarely (if ever) get phone calls about lost reports; most calls are to discuss results
• While we maintain ZERO lost reports, we call the referring providers about ANY case where an unread, lost, or delayed report could result in significant patient harm
• We are now entering “delayed exam reporting” as a “near miss” in our medical center’s patient safety reporting system
• We are sustaining our results thru discussion and vigilance on this issue in all department venues

Take home thoughts...

• Error is inevitable, so having a reliable process to identify lost exams is important
  – As computer network stability is unreliable, it is not reasonable to assume error-free data exchange
• Departmental leaders should be engaged on oversight of their process to get to “zero” lost and unreported exams
  – Patient safety offices in medical centers should be briefed if this is an ongoing radiology issue in your department
• For the radiologist, direct communication with the referring physician is needed when encountering a “lost” exam or delayed report to prevent a delay in diagnosis
Abbreviated References