

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

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- 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
- This material has not been presented or submitted for presentation or publication elsewhere, no outside funding was provided, and the information is unclassified



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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



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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)



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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”

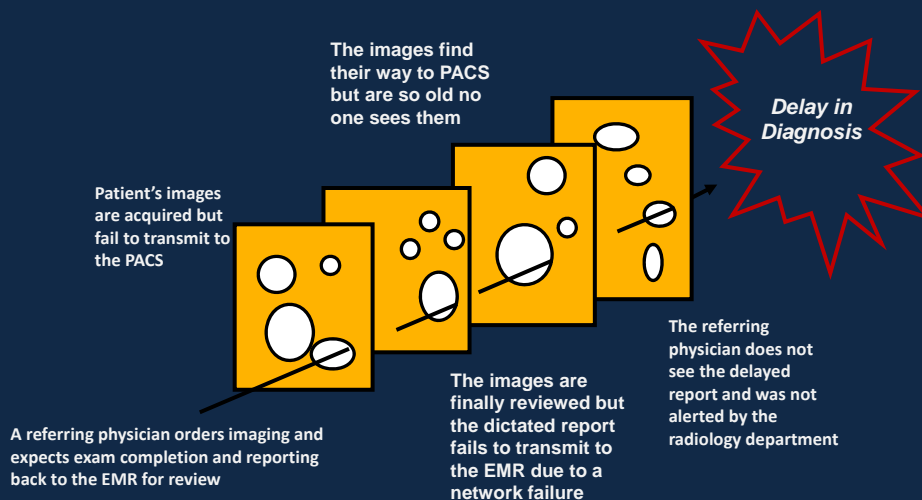
**PACS (AGFA IMPAX) Status
(September 2015)**

CHCS Status	Not on PACS	New	Dictation Started	Dictated	Approved
ARRIVED	11	0	0	0	0
EXAMINED	3	2	15	30	0
COMPLETED	0	0	0	0	75,623

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



Why the problem matters



How do we look for lost exams?

- USAF Radiology RIS (CHCS) has search tools to find “incomplete” exams; daily searches are made 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)

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**** RADIOLOGY MENU ****
OP Order Processing Menu
RS Radiology Scheduling Menu
EP Exam Processing Menu
ER Exam Reporting Menu
IT Image Tracking Menu
MR Workload/MEPRS Reports Menu
SM System Maintenance Menu

Select Radiology System Menu Option: ep Exam Processing Menu

AP Patient Arrival
DD Enter/Edit Departure/QA data
EI Exam Inquiry
LE List Exams by Status
NP Worksheet/Label Print
PO Pending Radiology Orders
PP Pending Portable Exam List
DL Radiology Daily Exam Log

Select Exam Processing Menu Option: dl

IT Image Tracking Menu
MR Workload/MEPRS Reports Menu
SM System Maintenance Menu

Select Radiology System Menu Option: ep Exam Processing Menu

AP Patient Arrival
DD Enter/Edit Departure/QA data
EI Exam Inquiry
LE List Exams by Status
NP Worksheet/Label Print
PO Pending Radiology Orders
PP Pending Portable Exam List
DL Radiology Daily Exam Log

Select Exam Processing Menu Option: dl Radiology Daily Exam Log
Select EARLIEST ARRIVAL DATE/TIME: T// 1-30 (17 Oct 2015)
Select LATEST ARRIVAL DATE/TIME: T// 1-15 (01 Nov 2015)

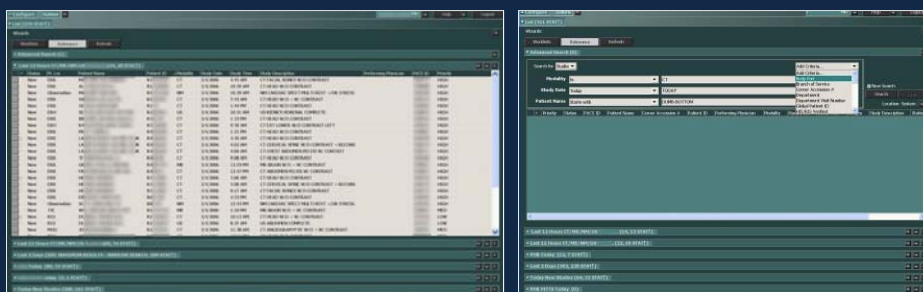
Select RADIOLOGY LOCATION: ALL/dgmc com DGMC COMPUTED TOMOGRAPHY OK? YES//
Select PATIENT CATEGORY: BOTH/ (BOTH)
Select EXAM STATUS: ALL/ 1
Select DEVICE:

=Incomplete
    
```



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**



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PQI

Choose your team

Define your problem

List key drivers

Measure your problem

Test different interventions

Identify root causes

Sustain improvements

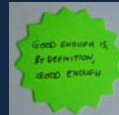


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Problem Definition



- 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...”**



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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



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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



*GEMS - Generic Error Modeling System; Jens Rasmussen and James Reason	DGMC	HPI COMPARE
Skill-Based: Familiar, routine acts that can be carried out smoothly in an automatic fashion	22%	15%
Rule-Based: Problem solving in a known situation according to set of stored “rules,” or learned principles	59%	70%
Knowledge-Based: Problem solving in new, unfamiliar situation for which the individual knows no rules – requires a plan of action to be formulated	19%	15%



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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 know 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%**



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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



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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

Booz | Allen | Hamilton & HPI

TRUSTED CARE

BEHAVIORS FOR ERROR PREVENTION

CLEAR COMMUNICATION

- Closed Loop Communication
- Clarifying Questions
- SBARS (Situation, Background, Assessment, Request/Recommendation) for notifications and structured handoffs

ATTENTION TO DETAIL

- Self-check using STAR (Stop, Think, Act, Review)

RESPECTFUL TEAMWORK

- Cross Check each other
- Give 5:1 Feedback
- Speak Up for Safety — CUS it up (I have a Concern, I am Uncomfortable, We need to Stop)

EXERCISE A QUESTIONING ATTITUDE

- Validate and Verify
- Stop the Line — "I need clarity"



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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



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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



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Abbreviated References

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