Radiological Missed Injuries: A Collaborative Approach for Loop Closure
Objective

• Gain understanding that a collaborative radiology review process provides a more accurate metric to identify the radiology missed injuries

• Gain further knowledge of a collaborative multi-directional structured PI approach to decrease radiological missed injuries and improve patient outcomes

• Foster an approach of non-punitive feedback in a collegial manner
Target Audience

• Trauma Program Manager/Trauma PI Coordinator
• Trauma Surgeons
• Orthopedics
• Neurosurgery
• Radiology Department
Successful management of poly-trauma patient depends on accurate radiologic assessment.

- Identify and follow-up on radiological misreads for the trauma patient
- Trauma surgeons and consulting physicians review images independent of the radiologist
- Newly identified injuries resulted in delayed management of time sensitive injuries
- RAD PI system is the current PI process in many trauma centers
Background: Literature Review

Issue invested at other institutions:

- 49% of patients transferred to level 1 trauma center with outside imaging were found to have missed injuries & Ninety percent of those injuries were clinically significant. ²

- Small percentage of missed injuries are thought to be clinical relevant, but those injuries have potential to impact a patient’s clinical course. ³

- Given the complexity of the interpretation of trauma imaging, some institutions support a dual reading process to minimize radiological errors. ¹

References at the end of the presentation
Case Scenario

Patient: Middle-aged obese male in MVC striking abdomen on steering wheel, + seatbelt sign

ED trauma bay

- CT chest/abd/pelvis, hypotensive in 80s, improved with 500mL bolus
  - Results: grade 1 spleen
  - Other injuries: left posterior hip dislocation
Case Scenario

ED Room:

Procedures: Patient sedated for reduction of left hip dislocation

Vitals: SBP 80-90s, NRB 15L

Dwell time: about 3 hours
Case Scenario

- Arrived to GMB floor
- SBP 90, HR 120s, still requiring NRB 15L
- Fluid bolus given 2.5L total (BP improved)
- Labs: lactic 5.1-6.8, CK 3,514, K+6.6, Blood sugar 334 (treated), hemoglobin 14.2 then down to 11.1
- Bedside u/s- negative

By the AM:
- Hgb 7.5, lactic 17.1, base deficit -21, transferred to ICU, MTP ordered
Case Scenario

- Emergent OR for ex-lap, splenectomy, lysis of adhesions with 3.5L blood in abdomen

- Swiss cheese effect
  - Grade III spleen
Case Scenario

- Patient admitted to GMB from ED
- RN on GMB floor called trauma team several times throughout night d/t BPs 90s, lactic acid elevated
Opportunities for Improvement

- Question if ED/Trauma hand off in ED room done
- No communication with trauma team about patient condition change done by either ER MD or RN (hypotensive episodes, critical values, increased NRB 15L)
- Documentation of communication between team members
- Radiologic missed injury resulted in delay of operative intervention
Development of Tracking Tool

- Identify standard method to track trauma cases with missed radiologic injuries
- Simple tool for trauma physicians and residents to utilize
# Tracking Tool

<table>
<thead>
<tr>
<th>Patient Name</th>
<th>MRN</th>
<th>RAD Exam Ordered</th>
<th>Date of Exam</th>
<th>FAST Results (circle one)</th>
<th>Discrepancy Change Pt Care? (circle one)</th>
<th>Description of Radiology Discrepancy Report/Change in patient Care</th>
<th>Primary Service Involved (circle one)</th>
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<tbody>
<tr>
<td>Positive</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td></td>
<td>TS</td>
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<tr>
<td>Negative</td>
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<td>NO</td>
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<td>SICU</td>
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<td>Inconclusive</td>
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<td>EGS</td>
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PI Process to Review Missed Injuries

- Select group of radiologists review all trauma imaging
- Significant imaging findings identified by the radiologist are communicated directly to the trauma surgeon
- Trauma surgeon reviews all images independently as soon as able
- The trauma surgeon reviews images with the radiologist (available 24 hours a day) if needed
- The trauma surgeon documents any missed injury not initially identified by the radiologist using the report tool
PI Process to Review Missed Injuries

- The trauma PI nurse reports all missed injuries to the Trauma Radiology Liaison.

- Reported missed injuries are reviewed by the Trauma Radiology Liaison, to confirm the presence of radiologic abnormality. An additional radiologist is used for review when needed.

- The trauma PI nurse documents any new confirmed findings in the trauma registry.

<table>
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<tr>
<th>Issues</th>
<th>Occurrence</th>
<th>Issue Description</th>
<th>Review Type</th>
<th>Review Date</th>
<th>Level of Review</th>
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<tbody>
<tr>
<td>RAD.MISS</td>
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<td>Case reviewed with Radiol.</td>
<td>TR.PI.NURS</td>
<td>05/20/2018</td>
<td>Level2</td>
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PI Process to Review Missed Injuries

• The Trauma Radiology Liaison provides feedback to the trauma team when false positive findings are reported.

• The Trauma Radiology Liaison provides feedback to radiology and trauma if additional findings are identified on second review.

• Missed injuries are documented in our electronic internal peer review system, enabling the original radiologist to review and rebut findings.
PI Process to Review Missed Injuries

- New findings are documented as a highlighted addendum at the bottom of the original radiology read.
- Notable cases are reviewed in the month Trauma Performance Committee meeting.
- Clinically significant cases are reviewed at the Radiology Morbidity and Mortality (M&M) conferences.
- The radiology team can view additional cases on the study share file.
Two-Way Feedback

- Collaboration and communication between the radiologist and trauma surgeons is important
  - Missed injuries reported to reading radiologist
  - Rebutted cases reported back to trauma surgeon
Study Design

- Structure multi-disciplinary process improvement initiative to identify and minimize missed radiologic injuries
- Collaborative approach between the trauma team and Department of Radiology
Sample

- 1567 trauma patients admitted
- Date range 8.26.15- 5.7.17
Findings/Results

- Seventy-seven imaging studies with missed radiological injuries
- 14 excluded due to voice recognition errors
- 12 additional cases excluded were pediatric or non-trauma service cases
- Final inclusion: 49 patients with 51 imaging studies with missed injuries over a 20 month period
Findings/Results

Demographics:

- 63.3% male
- 61.2% MVC
- Average age 42.8
- Average ISS 20.6
- Missed injuries most common on CT scans of thorax and abdomen and on Chest x-ray
Table 1: Number of Missed Injuries by Exam Type (n=51)
Continued Findings/Results

- In 60.8% of imaging cases (n=31) with identified missed injury resulted in a change in patient care.

- Trauma Surgeon was the most common clinician to identify the missed surgeon with orthopedic surgeon second.

- Through collaboration between radiology and trauma surgeons, the number of missed radiologic injuries decreased:

<table>
<thead>
<tr>
<th>Date</th>
<th>Number of Missed Injuries</th>
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<td>Jan-May 2017</td>
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Findings/Results

Figure 1: Number of Missed Injuries Identified by Clinician

- Neuro Surgeon
- O/S
- OMFS
- Ortho Surgeon
- PRS
- Radiologist
- Trauma Surgeon
Discussion and Conclusion

- Concurrent process solidified communication with our radiology team during the inpatient stay.
- Process is simple, not punitive and the reporting tool is easily accessible.
- The trauma surgeons are expected to review all images.
- The radiology liaison is committed to the trauma service and schedules radiology M&Ms to review radiologic missed cases.
- The radiologists are accountable to electronically review missed cases.
- Period reporting of metrics at Peer Review meeting.
Goal

- Maintain a consistent effort to minimize the number of missed radiologic injuries
- An audit filter is maintained in the trauma registry to track and trend all missed radiologic injuries to facilitate continuous process improvement
Learning Outcomes

- Utilize the information to assess current state in one’s own trauma center
- Utilize Trauma PI Coordinator to spearhead, navigate and push forward the initiative
- Investigate opportunities for a collaborative approach to clinical problems
- Identify an action plan that is comprehensive and multidirectional across multiple disciplines
- Recognize the importance of engaging liaisons into the PI process to achieve loop closure


Questions