

SPECTRUM HEALTH



**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

Background

- 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 investigated 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

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

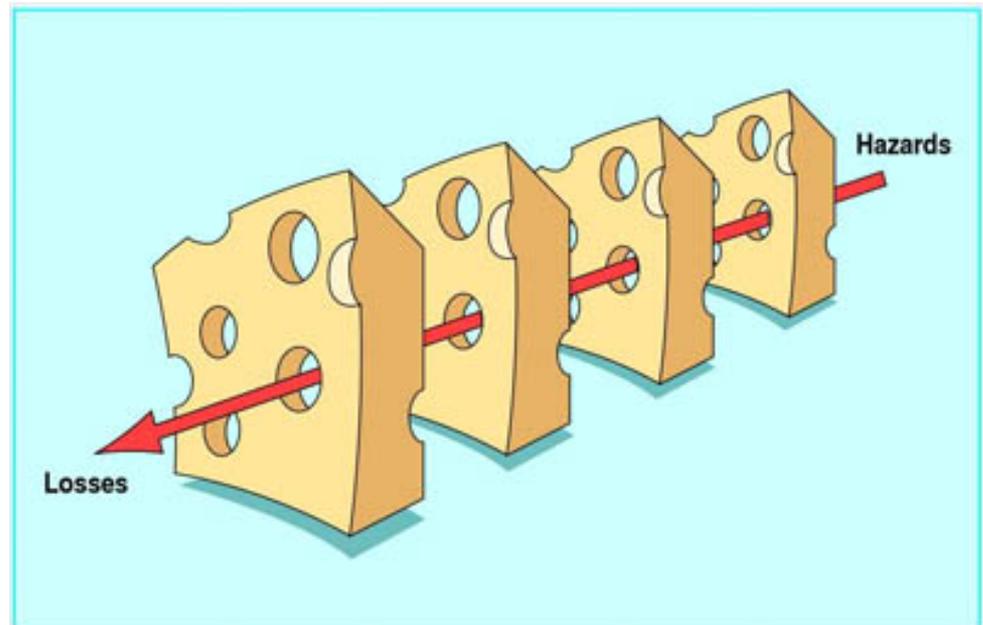
- Arrived to GMB floor
- SBP 90, HR 120s, still requiring NRB 15L
- Fluid bolus given 2.5L total (BP improved)
- Labs: lactic 5.1-6.8, CK 3,514, K+6.6, Blood sugar 334 (treated), hemoglobin 14.2 then down to 11.1
- Bedside u/s- negative

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

Patient Name	MRN	RAD Exam Ordered	Date of Exam	FAST Results (circle one)	Discrepancy Change Pt Care? (circle one)	Description of Radiology Discrepancy Report/Change in patient Care	Primary Service Involved (circle one)
				Positive Negative Inconclusive	YES NO		TS SICU EGS
				Positive Negative Inconclusive	YES NO		TS SICU EGS

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.

	Issues	Occurrence	Issue Description	Review Type	Review Date	Level of Review
1	RAD.MISS	1	Case reviewed with Radiolc	TR.PI.NURS	05/20/2018	Level2

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

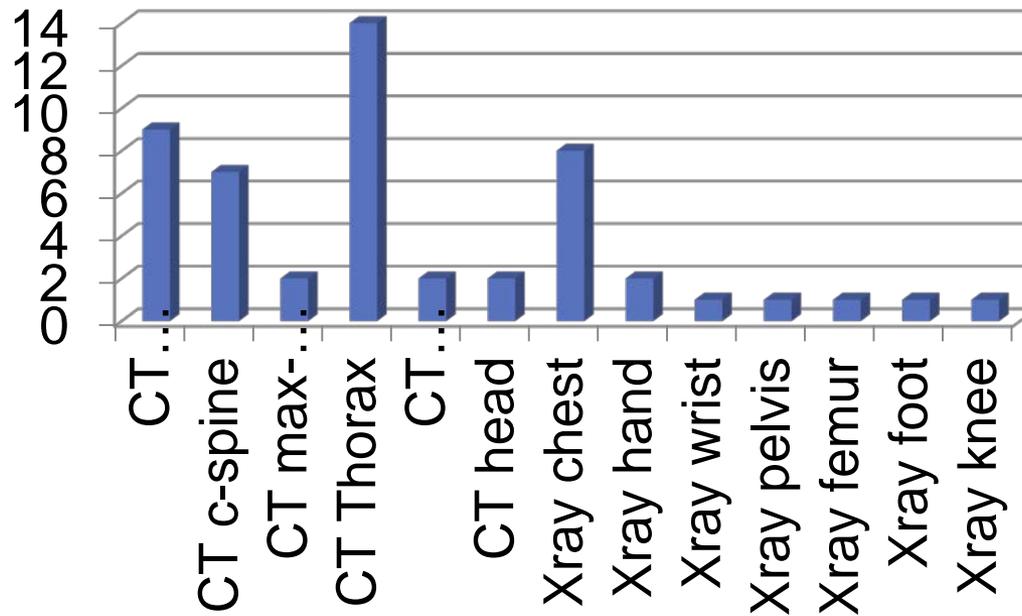
Findings/Results

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

Findings/Results

Table 1: Number of Missed Injuries by Exam Type (n=51)



■ Table 1:
Number of
Missed Injuries
by Exam Type
(n=51)

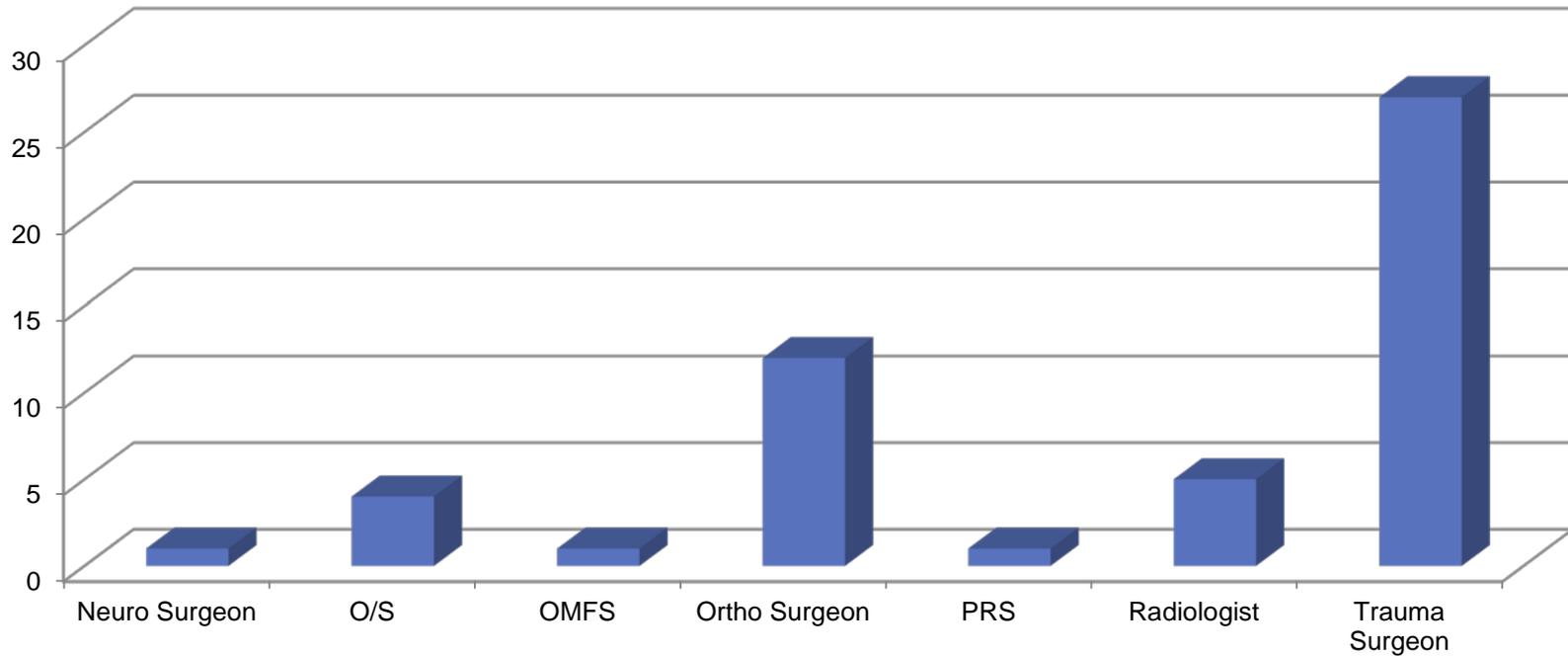
Continued Findings/Results

- 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:

Date	Number of Missed Injuries
Jan-May 2016	18
Jan-May 2017	7

Findings/Results

Figure 1: Number of Missed Injuries Identified by Clinician



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 multi-directional across multiple disciplines
- Recognize the importance of engaging liaisons into the PI process to achieve loop closure

References

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Bonds M, Hersperger S, Garwe T, Fails R, Johannesen S, Kim C, Adeseye AA, Lees J, Havron W. Adequacy and accuracy of non-trauma center computed tomography: What are we missing? *J Trauma Acute Care Surg.* 2017 Apr 18. doi: 10.1097/TA.0000000000001507. [Epub ahead of print]

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Questions