Improving educational quality through the assessment of radiology resident preliminary interpretations.

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Disclosure

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Purpose

- Identify discrepancies between on-call resident preliminary interpretations and final attending reads of emergent computed tomography (CT) studies.
- Assess discrepancy impact on patient care
- Improve resident education by identifying topics more frequently missed by residents thereby minimizing the likelihood of future discrepancies

Methods

- The following after hours CT studies from the adult and pediatric emergency departments were reviewed retrospectively from the 2011 calendar year
  - Pediatric neurologic CTs
  - Pediatric abdomen and pelvis CTs
  - Adult head CTs
  - Adult abdomen and pelvis CTs
  - Adult chest CTs, pulmonary embolus (PE) protocol

Discrepancy Identification

- Discrepancies were identified through two means
  - Review of prospectively acquired emergency department discrepant read forms
  - Review of the final attending report for indication of a discrepancy such as verbal notification communicated to the ordering physician

Clinical Impact

Clinical impact was determined following a thorough review of the medical record. Discrepancies were classified into one of four categories:

- Clinical Impact of 1:
  - No significant immediate clinical impact and/or additional findings that required nonemergent outpatient follow-up
  - Example: incidental pulmonary nodule
- Clinical impact of 2:
  - Potential clinical impact, however, patient received appropriate care based on other correctly interpreted findings or clinical symptomatology
  - Example: enlarged kidney with perinephric stranding, patient treated for pyelonephritis based on clinical symptoms

Clinical Impact cont.

- Clinical Impact of 3:
  - Discrepancy that altered patient management in the emergency department or during that admission
  - Example: Thickening of gastric antrum, endoscopy recommended. Follow-up endoscopy revealed gastritis and gastric ulcer
- Clinical Impact of 4:
  - Sentinel Event: Discrepancies for potential serious adverse outcome if not corrected
  - Example: Intracranial bleed, central pulmonary embolism, perforated appendicitis with abscess, perforated viscous

Results

- 6109 total emergency CTs reviewed from January 1, 2011 – December 31, 2011
  - 823 Pediatric Neurologic CTs
  - 169 Pediatric Abdomen/Pelvis CTs
  - 2767 Adult Head CTs
  - 1787 Adult Abdomen/Pelvis CTs
  - 563 Adult Chest CTs, PE protocol

Pediatric Neurologic CTs

Clinical Impact	# of Discrepant Studies	% of Total Studies
1 No significant clinical impact or outpatient follow-up	7	0.9%
2 Patient treated appropriately based on other findings despite discrepancy	5	0.6%
3 Altered patient management	7	0.9%
4 Sentinel event	0	0%
All Discrepancies	19/823	2.3%

Pediatric Abdomen/Pelvis CTs

Clinical Impact	# of Discrepant Studies	% of Total Studies
1 No significant clinical impact or outpatient follow-up	2	1.2%
2 Patient treated appropriately based on other findings despite discrepancy	1	0.6%
3 Altered patient management	2	1.2%
4 Sentinel event	0	0%
All Discrepancies	5/169	3.0%

Adult Head CTs

Clinical Impact	# of Discrepant Studies	% of Total Studies
1 No significant clinical impact or outpatient follow-up	13	0.5%
2 Patient treated appropriately based on other findings despite discrepancy	4	0.1%
3 Altered patient management	4	0.1%
4 Sentinel event	0	0%
All Discrepancies	21/2767	0.8%

Adult Abdomen/Pelvis CT

Clinical Impact	# of Discrepant Studies	% of Total Studies
1 No significant clinical impact or outpatient follow-up	34	1.9%
2 Patient treated appropriately based on other findings despite discrepancy	19	1.1%
3 Altered patient management	17	1.0%
4 Sentinel event	1	0.06%
All Discrepancies	71/1787	4.0%

- Sentinel event was a ruptured appendicitis with pelvic abscess

Adult Chest CT, PE protocol

Clinical Impact	# of Discrepant Studies	% of Total Studies
1 No significant clinical impact or outpatient follow-up	15	2.7%
2 Patient treated appropriately based on other findings despite discrepancy	1	0.2%
3 Altered patient management	7	1.2%
4 Sentinel event	0	0%
All Discrepancies	23/563	4.1%

Discussion

- Among published literature there is no standardization of “major” or “significant” discrepancies.
- To compare our data discrepancies of “3” and “4” are concordant with “major” discrepancies
- Discrepancies classified as “2” had the potential for clinical impact however the patient was treated appropriately based on other correctly identified and interpreted findings or the clinical presentation of the patient
  - Some of these may have been considered “significant” in some published studies

Summary of significant discrepancy rates

	"3" and "4"	"2", "3" and "4"
Peds Neuro CTs	0.9%	1.5%
Adult Head CTs	0.1%	0.3%
All Neuro CTs	0.3%	0.6%
Peds Abdomen/Pelvis CTs	1.2%	1.8%
Adult Abdomen/Pelvis CTs	1.0%	2.1%
All Abdomen/Pelvis	1.0%	2.0%
Adult Chest CTs	1.2%	1.4%

Discussion

- Study reviewing 11,908 emergency studies found an overall 2.6% major discrepancy rate
  - 92.8% no significant negative effect
  - 6.9% some negative effect
  - 0.3% significant negative effect
  - Comparable to RADPEER data of 2.1%
- Study concluded no detrimental effect on quality of patient care from resident preliminary interpretations
- Ruchman RB et al. *Preliminary radiology resident interpretations versus final attending radiologist interpretations and the impact on patient care in a community hospital*. AJR 2007; 189(3): 523.

Discussion

- Recent study found discrepancy rates of residents were less than of comparable to rates for practicing radiologists
  - 1.1% significant discrepancy rate for abdominal CTs
    - 1.0% at our institution
  - 0.6% significant discrepancy rate for neurologic CTs
    - 0.3% at our institution
- Ruma J et al. *Cross-sectional examination interpretation discrepancies between on-call diagnostic radiology residents and subspecialty faculty radiologists: analysis by imaging modality and subspecialty.* J Am Coll Radiol. (2011); 8(6): 409.

Discussion

- Study examining 4768 torso CTs (chest, abdominal and/or pelvic) found a discrepancy rate of 2.0%
  - Patient management was changed in 0.3% of total cases
- Study concluded that independent radiology resident coverage should continue.
- Chung JH et al. *Overnight resident interpretation of torso CT at a level 1 trauma center an analysis and review of the literature*. Acad Radiol (2009); 16(9): 1155.

Discussion

- Prior study examining 6852 neurologic CT cases found a discrepancy rate of 3.3%
  - Significant discrepancy rate of 2.5%
    - 61% of significant discrepancies resulted in no change in patient management (1.5% of total cases)
    - 32% of significant discrepancies resulted in some change in patient management (0.8% of total cases)
- Miyakoshi A et al. *Accuracy of preliminary interpretation of neurologic CT examinations by on-call radiology residents and assessment of patient outcomes at a level I trauma center.* J Am Coll Radiol. 2009; 6(12): 864.

Discussion

- A 6 month review of preliminary resident interpretations of 1756 CT examinations demonstrated an overall clinically significant discrepancy rate of 2.0%
  - Abdominal/pelvic CTs 4.1% discrepancy
    - 1-2% at our institution
  - Chest CTs 2.5% discrepancy
    - 1.2-1.4% at our institution
  - Head CTs 0.7% discrepancy
    - 0.3-0.6% at our institution
- Walls J et al. *The DePICTORS Study: discrepancies in preliminary interpretation of CT scans between on-call residents and staff.* Emerg Radiol. (2009); 16(4): 303.

Discussion

- Recent study examining 45,608 studies initially interpreted by residents determined benchmarks for major discrepancy rates
  - CT major discrepancy benchmark of 4.0%

- Ruutiainen A et al. *Identifying Benchmarks for Discrepancy Rates in Preliminary Interpretations Provided by Radiology Trainees at an Academic Institution*. JACR 2011; 8(9): 644.

Practicing Radiologist Discrepancies

- Recent peer review data of practicing radiologists collected over 1 year and 5278 studies demonstrated an overall discrepancy rate of 3.6% in all modalities
  - Swanson JO et al. *Optimizing peer review: A year of experience after instituting a real-time comment-enhanced program at a children's hospital*. AJR Am J Roentgenol. (2012); 198(5): 1121.
- Review of RADPEER data yields an overall discrepancy rate of 2.91%
  - Jackson VP et al. *RADPEER scoring white paper.* J Am Coll Radiol. (2009); 6(1): 21.

Practicing Radiologist Discrepancies

- Subspecialty trained neuroradiologists demonstrated 2.0% rate of clinically significant discrepancies
- Babiarz LS and Yousem DM. *Quality control in neuroradiology: discrepancies in image interpretation among academic neuroradiologists*. AJNR Am J Neuroradiol. (2012); 33(1): 37.

Improving Resident Education

- This study sought not only to calculate discrepancy rates for resident quality assessment but also to identify areas for educational quality improvement
- Most discrepancies were sporadic, however, certain “blind spots” were identified

Improvement Areas

- Neurologic CTs
  - Mastoiditis
  - Small subperiosteal abscess
- Abdominal CTs
  - Subtle pyelonephritis
  - Subtle bowel wall thickening
  - Pulmonary embolus on non-PE exams
- Chest CTs, PE protocol
  - Small nonocclusive thrombus

Improvement Efforts

- Areas identified for improvement efforts
- Topics taken to the residency program director and respective section chiefs in body, chest, pediatric and neuroradiology for education enhancement
  - Targeted didactic lectures
  - Targeted interactive case conferences

Improvement Efforts

- Creation of teaching files for continued reference by all residents
- Ongoing assessment
  - Inclusion of improvement areas in objective structured clinical examinations (OSCEs)

Conclusion

- Discrepancy rates of radiology residents at our institution are similar to or below published literature
- Majority of discrepant reads are not clinically significant in the emergency setting
- Educational benefit from call is difficult to quantify but undeniable
- Independent resident interpretations should continue

Conclusion

- Resident education can be improved by identification of on-call discrepancies
- Through focused lectures and interactive case-based learning we hypothesize that discrepancy rates will further decrease

Limitations

- Retrospective review that relied on prospectively acquired discrepancy forms and/or indication of a discrepancy in the final report
  - Discrepancies may have been missed if a form was not filled out and no notation was made in the final report, however, these are felt to be unlikely clinically significant

Limitations

- Our institutions discrepancy forms and discrepancy notations in the final report are at the discretion of the interpreting attending radiologist
  - Thresholds of what constitutes a discrepancy may vary slightly among attending radiologists.
- When comparing published literature, the definition of a “major” or “significant” discrepancy is not standardized.
  - Discrepancies that result in alterations of patient care are more easily comparable