Establishing Educational Quality Assurance Methods to Reduce Radiology Resident On-Call Misses and Misinterpretations: A Review of Our Experience

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Disclosures

- The authors have no financial conflicts of interest to disclose
- This presentation will not involve discussion of unapproved or off-label, experimental, or investigational therapies

"Cuiusvis hominis est errare, nullius nisi insipientis in errore perseverare." [1]

~ Marcus Tullius Cicero~

1. Cicero MT. Phillipicae xii, ii, v.

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Purpose

- “Anyone can make a mistake, but only the fool persists in error,” as Cicero wrote, remains especially true in Radiology residency training.
- Misinterpreted and missed findings by the on-call Radiology resident are inevitable.
- We highlight essential steps taken to develop our quality assurance program, placing an emphasis on teaching aspects.
- We sought to reduce the frequency of clinically significant adverse outcomes and to enhance resident learning in a non-punitive environment where staff are comfortable reporting errors.

Methods

- We reviewed the quality assurance program of our Radiology Department at a regional trauma center over the past four years to better understand how the reporting of resident errors, pertaining to conventional radiographs, can improve overall staff education and patient care.
- The following is an outline of the overall process at our institution.

Methods

Preliminary Report Error Identified

1. A Radiology Attending determines that there is a error in a preliminary on-call report.

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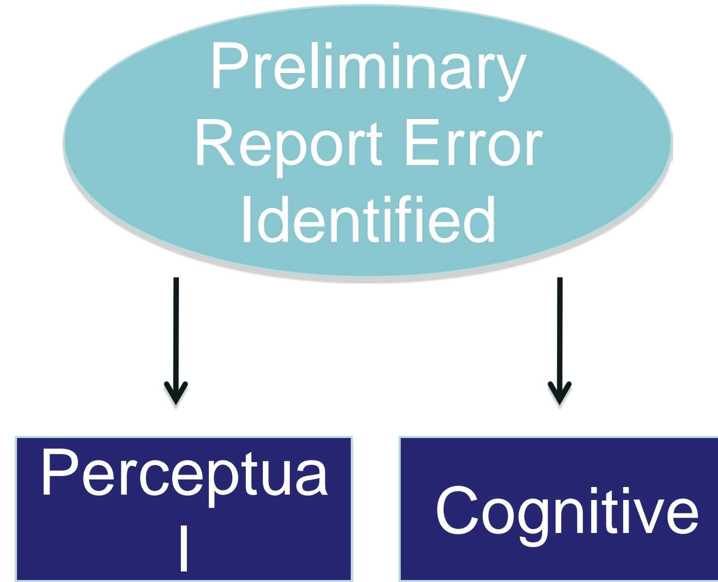
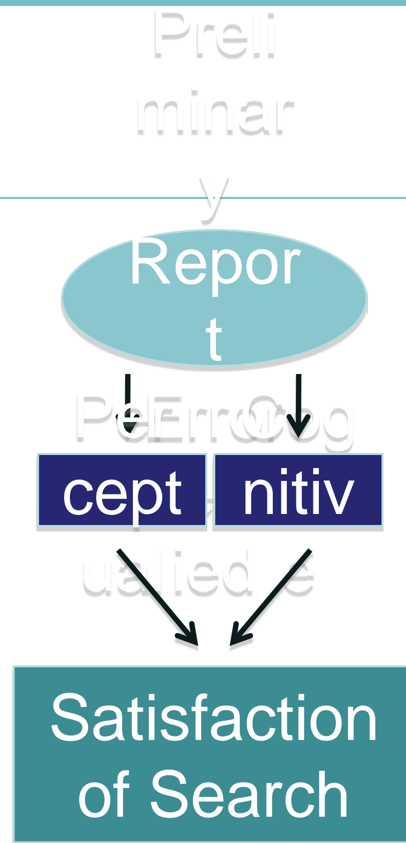
Methods



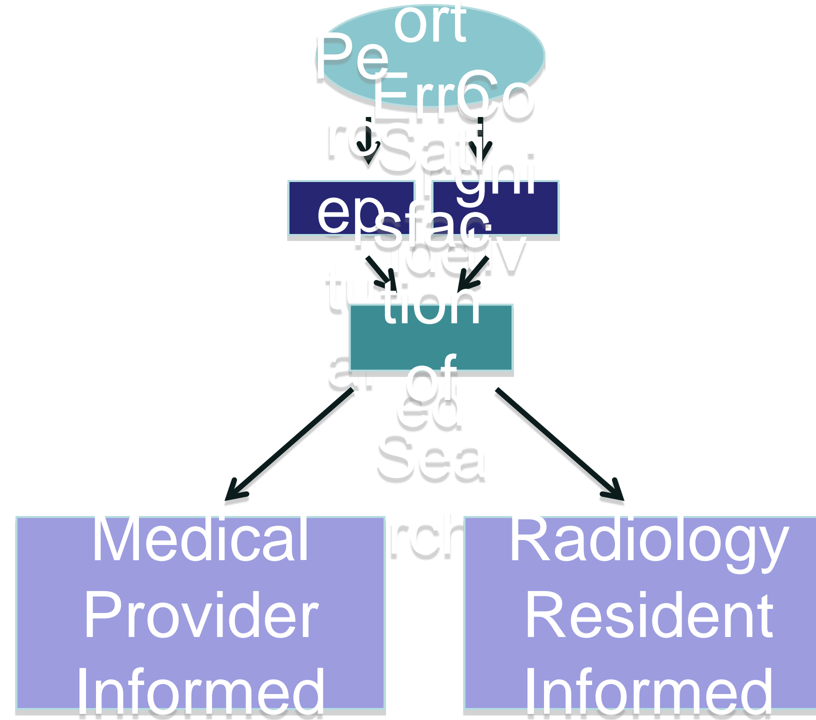
2. Errors are categorized as perceptual, when the abnormality was not seen, or cognitive, when seen but misconstrued.

Methods



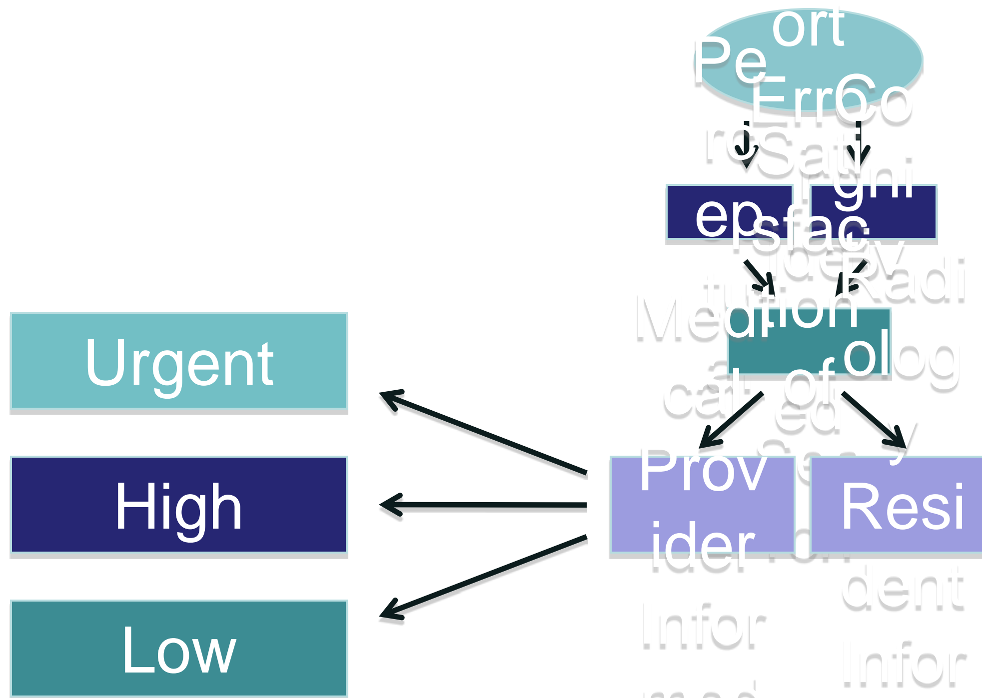
3. The error is considered as "satisfaction of search" when one finding was made at the expense of another.

Methods



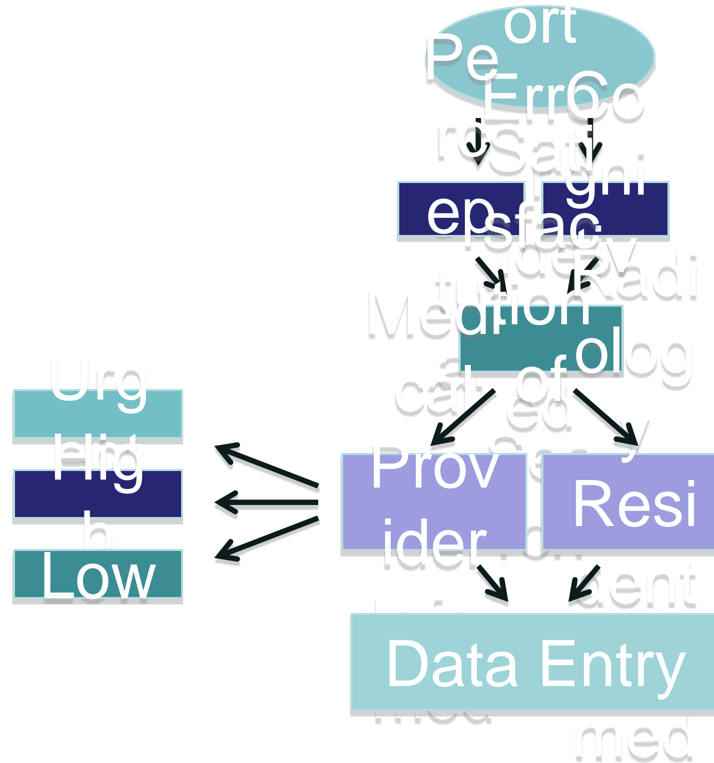
4. The responsible Radiology Resident is informed of the discrepancy and the Medical Care Provider is contacted, enabling further intervention, if necessary.

Methods



5. Clinical significance is designated as Urgent, High, or Low:
"Urgent" errors delayed treatment or misdirected management in a life-threatening manner.
"High" were not life-threatening.
"Low" significance errors did not directly affect treatment or management, or required additional views or studies.

Methods



6. The relevant case identifiers, study time, initial interpretation error and resident PGY level are then recorded in a secure shared on-line data file.

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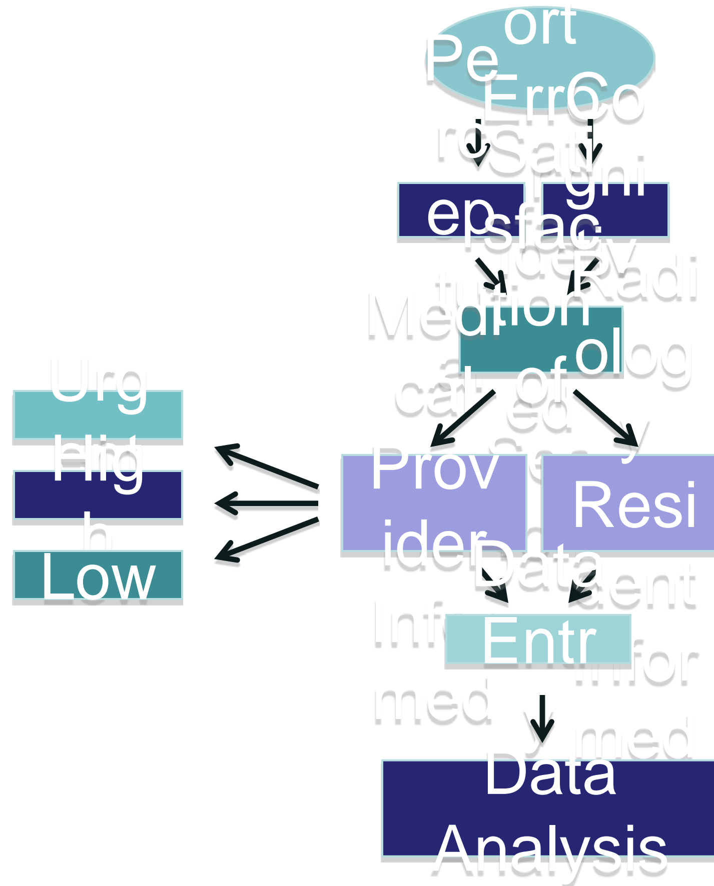
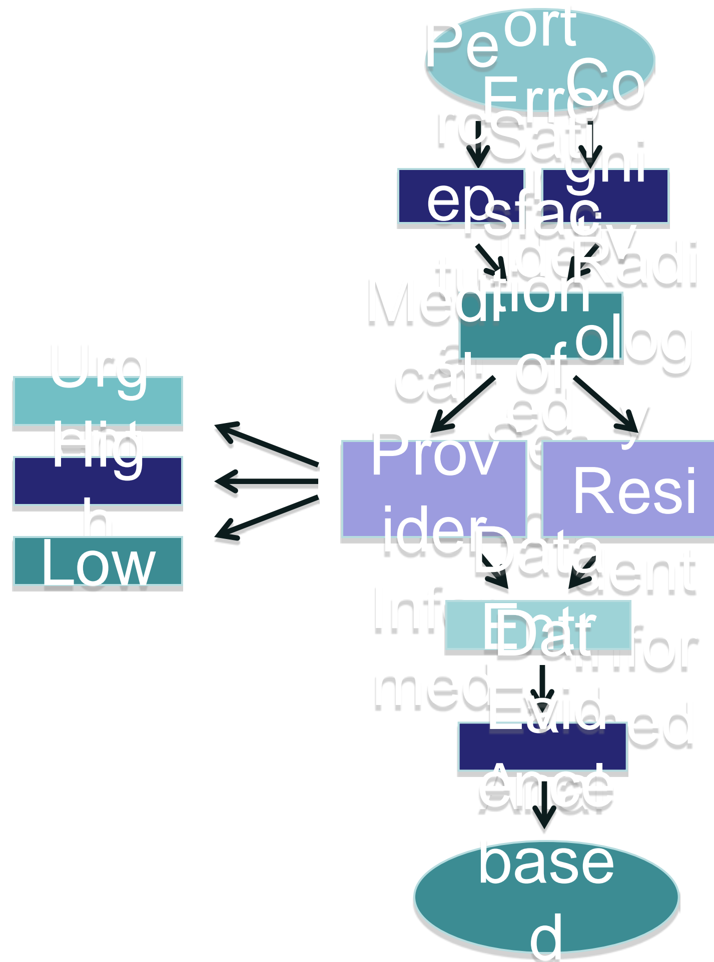
Methods



7. Our data analysis includes evaluation of each occurrence in relation to the level of training, the type of error committed and the degree of clinical significance.

Methods



8. We then focus teaching, based on the acquired data, towards specific PGY level residents depending on the types of errors frequently committed.

Results

- Most recorded errors involved extremity fractures, pneumothoraces and pneumoperitoneum, and pulmonary infiltrates.
- Over the past four years, 54.75% (s=11.15) of all errors (N=194) were made by first year residents.
- This average decreased with higher sequential class level [second year: 21.25% (s=7.18), third year: 16.25% (s= 7.37), fourth year: 6.50% (s= 8.44)].
- Overall, perceptual errors, 81.87% (s=26.78), were more common than cognitive ones, 11.87% (s=15.83), and both types of errors were more prevalent among first and second year as compared to more senior residents.
- "High" severity errors accounted for 80.25% (s= 26.3) of the total while "Urgent" and "Low" severity errors occurred less frequently at 5.31% (s=9.31) and 7.62% (s=9.32).

Results

2007-2010 Resident On Call Errors

YEAR	Residents				Type of Error*				Severity of Error†					
					Type of Error (%)				Severity (%)					
	Total Errors	Resident Year	# Errors	%	P=28	C=9	P(76%)	C(24%)	U=4	H=26	L=7	U(11%)	H(70%)	L(19%)
2007	N= 37	1	24	65%	17	7	71%	29%	3	17	4	13%	71%	17%
		2	9	24%	8	1	89%	11%	1	5	3	10%	50%	30%
		3	4	11%	3	1	75%	25%	0	4	0	0%	100%	0%
		4	0	0	0	0	0%	0%	0	0	0	0%	0%	0%
					Type of Error (%)				Severity (%)					
		Resident Year	# Errors	%	P=21	C=7	P (75%)	C (25%)	U=0	H=27	L=1	U(0%)	H(96%)	L (4%)
2008	N=28	1	11	39%	9	2	82%	18%	0	11	0	0%	100%	0%
		2	4	14%	3	1	75%	25%	0	4	0	0%	100%	0%
		3	6	21%	3	4	43%	57%	0	6	1	0%	86%	14%
		4	6	21%	6	0	100%	0%	0	6	0	0%	100%	0%
					Type of Error (%)				Severity (%)					
		Resident Year	# Errors	%	P=72	C=3	P(96%)	C(4%)	U=8	H=60	L=7	U(11%)	H(80%)	L(9%)
2009	N=75	1	42	56%	40	2	95%	5%	4	35	3	10%	83%	7%
		2	13	17%	12	1	92%	8%	4	8	1	30%	62%	8%
		3	18	24%	18	0	100%	0%	0	15	3	0%	83%	17%
		4	2	3%	2	0	100%	0%	0	2	0	0%	100%	0%
					Type of Error (%)				Severity (%)					
		Resident Year	# Errors	%	P=50	C=4	P(93%)	C(7%)	U=7	H=44	L=3	U(13%)	H(81%)	L(6%)
2010	N=54	1	32	59%	28	4	88%	12%	7	24	1	22%	75%	3%
		2	16	30%	16	0	100%	0%	0	15	1	0%	94%	6%
		3	5	9%	5	0	100%	0%	0	4	1	0%	80%	20%
		4	1	2%	1	0	100%	0%	0	1	0	0%	100%	0%
					Type of Error Avg.				Severity Avg.					
		Resident Year	Avg %		P=171	C=23	Avg P %	Avg C %	U=19	H= 157	L=18	Avg U %	Avg H %	Avg L %
Total	N=194	1	54.75 ± 11.15		23.5 ± 13.48	3.75 ± 2.36	84 ± 10.17%	16 ± 10.17%	3.5 ± 2.88	21.75 ± 10.31	2 ± 1.83	11.25 ± 9.07%	82.25 ± 12.84%	6.75 ± 7.41%
		2	21.25 ± 7.18		9.75 ± 5.56	0.75 ± 0.5	89 ± 10.42%	11 ± 10.42%	1.25 ± 1.89	8 ± 4.97	1.25 ± 1.26	10 ± 12.25%	76.5 ± 24.30%	11 ± 13.11%
		3	16.25 ± 7.37		7.23 ± 7.23	1.25 ± 1.89	79.5 ± 27.04%	20.5 ± 27.04%	0 ± 0	7.25 ± 5.25	1.25 ± 1.26	0%	87.25 ± 8.85%	12.75 ± 8.85%
		4	6.50 ± 8.44		2.25 ± 2.63	0 ± 0	100%	0%	0 ± 0	2.25 ± 2.63	0 ± 0	0%	100%	0%

*Type of Errors: Perceptual (P): Missed finding(s) Cognitive (C): Misinterpreted finding(s)

†Severity of Error: Urgent (U): Life threatening High(H): Non-life threatening Low(L): No Change/Additional studies

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Conclusion

- Constructing a system in which misses and call-backs can be easily recorded and reviewed enables a wide range of educational opportunities.
- Our review of data suggests that most on-call errors are perceptual in nature, committed by first and second year residents.
- Teaching at conferences should therefore be geared toward helping each resident develop an organized and systematic approach and search pattern when confronted with an unknown case.
- We hope that our experience will allow others to enhance their own educational curricula and improve patient care.

References

1. Cicero, Marcus Tullius. Philippicae xii, ii, v.