SciMedCentral

Journal of Radiology & Radiation therapy

Research Article

Toward Improved Radiology Reporting Practices in the Emergency Department: A Survey of Emergency Department Physicians

Andrew J. Gunn[1]*, Mark D. Mangano[1], Brian S. Pugmire[1], Dushyant V. Sahani[1,2], William D. Binder[3] and Garry Choy[1,4]

[1]Department of Radiology, Massachusetts General Hospital/Harvard Medical School, USA
[2]Division of Abdominal Imaging and Intervention, Department of Radiology, Massachusetts General Hospital/Harvard Medical School, USA
[3]Department of Emergency Medicine, Massachusetts General Hospital/Harvard Medical School, USA
[4]Division of Emergency Radiology and Teleradiology, Massachusetts General Hospital/Harvard Medical School, USA

Corresponding author
Andrew J. Gunn, Department of Radiology, Massachusetts General Hospital/Harvard Medical School, FND 21655 Fruit St, Boston, MA 02155, Tel: 617-724-4255; Fax: 617-726-3077; Email: agunn@partners.org

Submitted: 01 September 2013

Accepted: 21 October 2013

Published: 23 October 2013

Keywords
- Radiology reporting
- Quality improvement
- Emergency radiology

Abstract

Purpose: Improving reporting practices in the emergency department (ED) is important for optimized patient care. However, the preferences and opinions of ED physicians regarding many reporting practices are not well-known. Thus, we surveyed ED physicians to better understand their expectations and attitudes in regards to both traditional, non-routine, and non-traditional reporting practices.

Materials and Methods: An online survey was distributed to all 41 ED physicians at our institution and responses were collected confidentially.

Results: There was a 93% response rate (N=38). The majority of respondents were satisfied with radiology reporting, the language used in reports, their ability to contact a radiologist, and recommendations in the report. Turn-around times were cited as the most significant problem with radiology reporting. A turn-around time of within 60 minutes was found to be appropriate for all imaging modalities. 92% of respondents felt that the ordering physician, rather than the radiologist, should deliver the results of an examination. ED physicians were divided about whether the standard report or a phone call was necessary for a variety of potentially urgent diagnoses. 74% of respondents feel medico-legally obligated by radiologist recommendations; although, this appears to be influenced by both the wording and location of the recommendation in the report.

Conclusions: ED physicians were generally satisfied with most aspects of radiology reporting although room for improvement exists, particularly in turn-around times. ED physicians prefer to deliver the results of examinations themselves, feel medico-legally obligated by recommendations in the report, and have varied opinions regarding non-routine communication for potentially urgent diagnoses.

INTRODUCTION

The radiologist and the service that he or she provides are a vital part of the diagnosis and treatment of patients in the emergency department (ED) [1]. Both the American College of Emergency Physicians (ACEP) and the American College of Radiology (ACR) recognize the importance of comprehensive imaging services in the ED and that effective communication between radiologists and ED physicians via proper radiology reporting practices is a critical component of quality care [2,3]. However, there are several barriers to reporting exam results in the emergency setting, including: time constraints because of the increasing demand for imaging, incomplete information from the ordering provider, wait times for radiologist interpretation, and difficulties for the ED physician and radiologist to contact one another [1,2,4]. Ultimately, these obstacles can result in compromised patient care in addition to medico-legal ramifications [5-7].

An appropriate first step toward improving radiology reporting practices in the ED is to better understand the preferences and expectations of ED physicians [8]. There has been considerable recent interest in improving radiology reporting practices through both survey- and focus group-based methods [9-20]. With regards to reporting practices in the ED, there has been a particular focus on analyzing and improving report turn-around time [1,4,21-23] even though the definition of an appropriate turn-around time is subjective [23]. While it is clear that turn-around time is an important aspect of radiology reporting in the ED, there are additional facets of radiology

reporting, such as clear and appropriate language, the method by which results are delivered to ED physicians and patients, and the potential clinical impact of radiologist recommendations in the report, which warrant exploration as well. Therefore, we surveyed the ED physicians at our institution to better understand their preferences as a means toward improving the service provided to referring physicians and patients.

MATERIALS AND METHODS

A web-based survey (Appendix 1) was created and managed using REDCap electronic data capture tools [24]. REDCap (Research Electronic Data Capture) is a secure, web-based application designed to support data capture for research studies, providing: 1) an intuitive interface for validated data entry; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for importing data from external sources. The web-based survey was distributed via an internal listserv to all 41 ED physicians at our institution and results were collected anonymously. As a point of reference, we practice in a large academic Level 1 trauma center which provides high-level tertiary care. The ED is staffed with approximately 5 attending ED physicians at any time who supervise several physician assistants, nurse practitioners, ED fellows, and ED residents. Radiology services in the ED are provided by 8 radiologists who, with the exception of 2, work full-time in the ED. There are 1-2 attending radiologists in the ED at all times who supervise 1-2 residents and/or fellows. While the majority of the emergency radiologists work full-time in the ED, only one of these radiologists completed sub-specialty training in emergency radiology. The emergency radiologists have an average of approximately 10 years in practice.

RESULTS

There were 38 responses (93% response rate) from physicians with an average of 14.4 years in practice (range: 2-35 years). Collectively, this group is responsible for ordering approximately 100,000 examinations each year. Overall, a majority (79%) of respondents was either "very satisfied" or "somewhat satisfied" (mean: 4.3, 1-5 scale; 25% quartile: 4, 75% quartile: 5) with radiology reporting in the ED. Diagnostic accuracy (47%) was chosen as the most important component of a radiology report followed by turn-around time (29%). No other response was selected by more than 10% of respondents. Turn-around time (47%) was identified as the most significant problem with radiology reporting in the ED followed by 'too many recommendations for further testing or treatment' (18%). No other response was selected by more than 10% of respondents. Opinions regarding appropriate turn-around times for radiography, ultrasound (US), computed tomography (CT), and magnetic resonance imaging (MRI) were obtained and are summarized in Figure 1. The majority of respondents indicated that an appropriate turn-around time for radiographic (95%), US (79%), CT (79%), and MRI (50%) examinations was at some point within 60 minutes of exam completion. It should be noted that 45% of respondents thought radiographs should be reported within 30 minutes, 50% of respondents thought MRIs should be reported in between 60 and 120 minutes, and that no respondents thought that turn-around times greater than 120 minutes were appropriate for any examination.

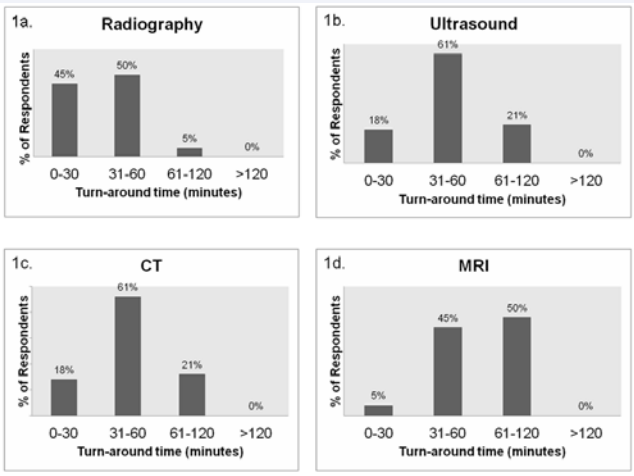

Figure 1 Bar graphs indicating appropriate turn-around times as suggested by responding ED physicians for radiography (Figure 1a), US (Figure 1b), CT (Figure 1c), and MRI (Figure 1d).

We were interested in assessing the ability of ED physicians and radiologists to communicate with one another. Therefore, we asked the ED physicians about their perceived ability to contact a radiologist, if needed, and about the language used in radiology reports. A majority (76%) of respondents felt it was either "very easy" or "somewhat easy" to contact the radiologist (mean: 4.3, 1-5 scale; 25% quartile: 4, 75% quartile: 5). 84% of respondents found the language used in radiology reports to be either "very clear" or "somewhat clear" (mean: 4.4, 1-5 scale; 25% quartile: 4, 75% quartile: 5). 42% of respondents believe radiologists should adjust the language used in reports in the emergency setting (compared to in-patient or out-patient exams) while 34% felt that no such adjustment should be made (24% were unsure). 32% of respondents felt that radiologists should adjust the language used in radiology reports given that patients at our institution have access to their results through an on-line portal system.

We wanted to gauge the opinion of ED physicians in regard to methods of radiology reporting outside the standard written report. For example, there has been some recent interest in the practice of radiologists delivering examination results directly to patients [19,25-29]. However, 92% of respondents thought that the most appropriate way for a patient to learn the results of an imaging examination was from the ordering provider. 8% of respondents thought that the most appropriate way was for the patient to access the results themselves through an on-line portal. No respondents thought that the results should be communicated to the patient directly by the radiologist. Additionally, the ACR recommends that radiologists contact the ordering physician directly for urgent findings [30], but the definition of urgent can be subjective. Thus, we asked the ED physicians if they preferred a telephone call, standard written report, or e-mail alert regarding frequently-encountered, potentially urgent diagnoses in the ED. The results are summarized in Table 1. We included several "potentially urgent" diagnoses in this survey because of a perceived heterogeneity in reporting practices

Table 1: Results from asking ED physicians if they would prefer a telephone call, standard written report (Std. Report), or e-mail alert for several frequently-encountered, potentially urgent ED diagnoses.

Diagnosis	Phone Call	Std. Report	E-mail Alert
Pneumonia	47% (18/38)	53% (20/38)	0% (0/38)
Cholecystitis	55% (21/38)	39% (15/38)	5% (2/38)
Displaced fracture	47% (18/38)	50% (19/38)	3% (1/38)
Non-displaced fracture	32% (12/38)	61% (23/38)	8% (3/38)
Joint dislocation	63% (24/38)	37% (14/38)	0% (0/38)
Diverticulitis/Colitis	37% (14/38)	55% (21/38)	8% (3/38)
Small bowel obstruction	63% (24/38)	37% (14/38)	0% (0/38)
Appendicitis	76% (29/38)	24% (9/38)	0% (0/38)

amongst radiologists regarding which of these diagnoses warrant physician-to-physician communication. Our survey did not include diagnoses that are clearly urgent to both radiologists and emergency physicians, such as new-onset subarachnoid hemorrhage, brain herniation, or tension pneumothorax, which would clearly warrant physician-to-physician communication.

The ACR has also suggested that radiologists should make recommendations within the report for further diagnosis and treatment, when appropriate [30]. In our survey, 76% of respondents were either "very satisfied" or "somewhat satisfied" with recommendations within the radiology report (mean: 3.9, 1-5 scale; 25% quartile: 3, 75% quartile: 4), with no statistically significant difference when compared to overall satisfaction with reporting (P=0.17). 74% of respondents feel medico-legally obligated by radiologist recommendations within the report. The sense of medico-legal obligation is increased for 37% of respondents when the recommendation is set apart from the clinical impression within its own section. Adding qualifying language to a recommendation, such as "if clinically indicated", decreases the sense of medico-legal obligation for 82% of respondents.

CONCLUSIONS

The radiology report is the primary method by which the radiologist communicates the results of an examination with the ordering physician and the patient. The proper communication of these results plays a key role in patient care, especially in the ED where patient histories are often unobtainable and physical examinations can be limited. Both the ACEP [2] and the ACR [3,30] have published guidelines that aim to direct radiologists toward providing the best possible care for patients in the ED through effective reporting. These documents provide detailed information regarding the qualifications of those who interpret studies in the ED, the need for reasonable turn-around times, components of a high-quality radiology report, and guidance regarding both routine and non-routine communication of results. Such initiatives that seek to enhance reporting practices are important for optimizing patient care [5,6]. Additionally, as radiologists contemplate their own reporting practices, it is advisable for them to understand the opinions, preferences, and feedback from their referring physicians, who may be able to identify problems in reporting practices that go unnoticed by the radiologist [31].

In our survey, ED physicians were generally satisfied with radiology reporting, the clarity of language used in reports, and their ability to contact a radiologist, when needed. Diagnostic accuracy was selected as the most important component of a radiology report while turn-around times were cited as the most significant problem. Despite technologic advancements such as voice recognition software and the wide-scale implementation of picture archiving and communication systems (PACS) which have significantly decreased turn-around times [21,32-34], our results indicate that there is still room for improvement in this regard. Thus, in order to define the target, we asked the ED physicians to identify what they felt were appropriate turn-around times for a variety of modalities. The results are summarized in Figure 1, but receiving examination results within sixty minutes appears to be appropriate for all modalities, which concurs with general expectations that have been quoted in the literature [21]. Of note, the general expectations for turn-around times for radiographs were somewhat shorter than other modalities while expectations for turn-around times on MRIs are somewhat longer than other modalities. At current, our emergency radiology division is collaborating with the ED regarding ways to reduce turn-around time such as educating radiologists about triaging of cases and adjusting shift assignments to better correspond with the patient volume in the ED.

The ACR's "Practice Guideline for Communication of Diagnostic Imaging Findings" discusses strategies for both routine and non-routine communication of results [30]. It suggests that non-routine communications (e.g. paging or calling the ordering provider) should be used when the findings suggest the need for immediate or urgent interventions, the findings may be seriously adverse to the patient's health, or if the findings are unexpected. In the authors' opinion, there are some clear instances when non-routine communication should be used; for example, tension pneumothorax, impending brain herniation, or unexpected pneumoperitoneum. However, there are many situations in the ED setting that are less clear, given the unique situation where the ordering physician is often expecting a positive finding and actively waiting on results for patient disposition. Hence, we solicited the opinion of the ED physicians about whether routine (the traditional written report) or non-routine (a phone call or e-mail alert) communication is preferred for a variety of commonly-encountered, potentially urgent diagnoses. The results are summarized in Table 1 but, in short, the only clear pattern that emerged from the respondents was that they did not prefer to receive e-mails alerting them to potentially urgent diagnoses but were fairly divided with regards to receiving the traditional written report in comparison to a phone call for nearly every provided diagnosis. Given the overall heterogeneity of results, it would be wise for the radiologist to discuss these practices with their ED physicians in order to determine a practice model that is both patient-centered and mutually agreeable.

There has been considerable recent interest in the radiology literature regarding another type of non-traditional reporting in which the radiologist would deliver the results of the examination directly to the patient [19,25-29]. This communication could potentially take the form of providing the patient with a copy of the written report, providing the patient a link to an on-line portal where they can check their own exam results, or via face-

to-face communication with the radiologist. 92% of ED physicians in our survey prefer to deliver the results themselves while no respondents thought that the radiologist should be delivering results to patients. These findings agree with a recent survey of primary care physicians, who also overwhelmingly (95%) prefer to deliver the examination results to patients [19]. Interestingly, the hesitancy on the part of ED physicians in allowing radiologists to deliver examination results runs against other reports that have shown that patients value the expertise and improved turn-around times provided by direct communication with the radiologist [25-27]. The reasons behind these findings are likely multi-factorial but may be secondary to worries that radiologist-led delivery of exam results could lead to patient confusion, a loss of the physician-patient relationship, and possible delays in patient discharge from the ED.

At our institution, we have attempted to follow ACR guidelines by including a separate "*recommendation*" section within the structured report in an attempt to make recommendations clearly recognizable to referring physicians [30]. However, it was unknown how ED physicians felt about this practice. The majority of respondents (76%) were either "very satisfied" or "somewhat satisfied" with recommendations within the radiology report even though "too many recommendations for further diagnosis and treatment" was the second-most commonly cited problem with radiology reports (18% of respondents). The apparent dichotomy with regard to radiologist recommendations in our survey agrees with prior reports that demonstrate a diversity of opinions on this matter amongst a wide variety of specialties, including both radiologists and non-radiologists [13,15,35-37]. The variability seen among ED physicians may be due to balancing patient care responsibilities against potential delays in discharge by further testing recommended by radiologists in addition to the medico-legal ramifications of ignoring such recommendations [37]. Indeed, 74% of respondents feel medico-legally obligated by recommendations in the radiology report. Our survey indicates that this sense of medico-legal obligation is affected by both the wording and location of the recommendation within the report. For example, the addition of qualifying language, such as "if clinically indicated" makes 82% of respondents feel less medico-legally obligated. Moreover, 37% of respondents felt more medico-legally obligated if the recommendation is set apart from the clinical impression in its own section. One reason for these findings may be that the addition of qualifying language to the recommendation could be viewed by the ED physician as deference to his or her clinical judgment, which allows him or her increased flexibility, while setting the recommendation apart within its own section makes it appear more important. Further research, perhaps with focus groups, would be useful to elucidate any additional causes.

The current data is limited by a variety of factors such as a relatively small sample size, the inherent selection bias associated with survey-based data, and the environment in which the study was generated (an academic Level I trauma center), which may not be entirely applicable to smaller EDs and community-based practices. Specifically, our institution has a full division of emergency radiology, which most hospitals do not have. It is possible that radiologists working within this division on a daily basis provide a more focused service to ED physicians in comparison to radiologists who work more sparingly in the ED setting, which could affect survey results. Additionally, we recognize that other groups of ED physicians may have differing opinions about appropriate turn-around times and the reporting of potentially urgent findings. Regarding non-traditional reporting practices, our survey did not consider situations in which the radiologist was already in contact with the patient, such as fluoroscopy or ultrasound. Finally, the survey did not specify the type of communication the radiologist would have with the patient. It is possible that if these circumstances had been considered within the context of the survey the ED physicians may be more amenable to radiologists delivering the results of examinations to patients directly. However, further research would be required to examine this possibility.

Continuing improvements in radiology interpretive services, including reporting practices, are essential to patient care in the emergency setting. Radiologist-led measures to improve reporting practices in the ED should consider the needs and opinions of both ED physicians and patients in order to optimize care. While continued research in this field is necessary to better understand these preferences, the current data do provide an excellent baseline for radiologists to begin discussions on these matters with their own referring physicians.

ACKNOWLEDGEMENT

The authors received no financial support in connection with this work.

REFERENCES

1. Fairbanks RJ, Guarrera TK, Bisantz AB, Venturino M, Westesson PL. Opportunities in IT Support of Workflow & Information Flow in the Emergency Department Digital Imaging Process. Proc Hum Fact Ergon Soc Annu Meet. 2010; 54: 359-363.
2. Radiologic Imaging and Teleradiology in the Emergency Department. Irving, Texas, USA: American College of Emergency Physicians.
3. ACR Practice Guideline for Radiologist Coverage of Imaging Performed in Hospital Emergency Departments. Reston Virginia, USA: American College of Radiologists. 2008.
4. DeFlorio R, Coughlin B, Coughlin R, Li H, Santoro J, Akey B, et al. Process modification and emergency department radiology service. Emerg Radiol. 2008; 15: 405-412.
5. Fischer HW. Better communication between the referring physician and the radiologist. Radiology. 1983; 146: 845.
6. Berlin LM. Failure of radiologic communication: an increasing cause of malpractice litigation and harm to patients. Applied Radiol. 2010; 39: 17-23.
7. Brenner RJ, Bartholomew L. Communication errors in radiology: a liability cost analysis. J Am Coll Radiol. 2005; 2: 428-431.
8. Slovis TL. The art of communication: strategies to improve patient and information flow : radiology perspective. Pediatr Radiol. 2008; 38 Suppl 4: S651-654.
9. Plumb AA, Grieve FM, Khan SH. Survey of hospital clinicians' preferences regarding the format of radiology reports. Clin Radiol. 2009; 64: 386-394.
10. Grieve FM, Plumb AA, Khan SH. Radiology reporting: a general practitioner's perspective. Br J Radiol. 2010; 83: 17-22.
11. Johnson AJ, Ying J, Swan JS, Williams LS, Applegate KE, Littenberg B.

Improving the quality of radiology reporting: a physician survey to define the target. J Am Coll Radiol. 2004; 1: 497-505.

12. Coakley FV, Liberman L, Panicek DM. Style guidelines for radiology reporting: a manner of speaking. AJR Am J Roentgenol. 2003; 180: 327-328.

13. Naik SS, Hanbidge A, Wilson SR. Radiology reports: examining radiologist and clinician preferences regarding style and content. AJR Am J Roentgenol. 2001; 176: 591-598.

14. McLoughlin RF, So CB, Gray RR, Brandt R. Radiology reports: how much descriptive detail is enough? AJR Am J Roentgenol. 1995; 165: 803-806.

15. Lafortune M, Breton G, Baudouin JL. The radiological report: what is useful for the referring physician? Can Assoc Radiol J. 1988; 39: 140-143.

16. Sistrom CL, Honeyman-Buck J. Free text versus structured format: information transfer efficiency of radiology reports. AJR Am J Roentgenol. 2005; 185: 804-812.

17. Sierra AE, Bisesi MA, Rosenbaum TL, Potchen EJ. Readability of the radiologic report. Invest Radiol. 1992; 27: 236-239.

18. Clinger NJ, Hunter TB, Hillman BJ. Radiology reporting: attitudes of referring physicians. Radiology. 1988; 169: 825-826.

19. Gunn AJ, Sahani DV, Bennett SE, Choy G. Recent measures to improve radiology reporting: perspectives from primary care physicians. J Am Coll Radiol. 2013; 10: 122-127.

20. Bosmans JM, Weyler JJ, De Schepper AM, Parizel PM. The radiology report as seen by radiologists and referring clinicians: results of the COVER and ROVER surveys. Radiology. 2011; 259: 184-195.

21. Boland GW. Voice recognition technology for radiology reporting: transforming the radiologist's value proposition. J Am Coll Radiol. 2007; 4: 865-867.

22. Hayt DB, Alexander S, Drakakis J, Berdebes N. Filmless in 60 days: the impact of picture archiving and communications systems within a large urban hospital. J Digit Imaging. 2001; 14: 62-71.

23. Towbin AJ, Iyer SB, Brown J, Varadarajan K, Perry LA, Larson DB. Practice policy and quality initiatives: decreasing variability in turnaround time for radiographic studies from the emergency department. Radiographics. 2013; 33: 361-371.

24. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap) – A metadata-driven methodology and workflow process for providing translational research informatics support. J Biomed Inform. 2009; 42: 377-81.

25. Paz D. The radiologist as a physician consultant. J Am Coll Radiol. 2010; 7: 664-666.

26. Safdar N, Shet N, Bulas D, Knight N. Handoffs between radiologists and patients: threat or opportunity? J Am Coll Radiol. 2011; 8: 853-857.

27. ammerman HJ. Communicating imaging results to patients: OnSite results. AJR Am J Roentgenol. 2009; 192: 852-853.

28. Johnson AJ, Easterling D, Williams LS, Glover S, Frankel RM. Insight from patients for radiologists: improving our reporting systems. J Am Coll Radiol. 2009; 6: 786-794.

29. Johnson AJ, Frankel RM, Williams LS, Glover S, Easterling D. Patient access to radiology reports: what do physicians think? J Am Coll Radiol. 2010; 7: 281-289.

30. ACR Practice Guideline for Communication of Diagnostic Imaging Findings. Reston Virginia USA: American College of Radiologists. 2010.

31. Gunn AJ, Alabre CI, Bennett SE, Kautzky M, Krakower T, Palamara K, et al. Structured feedback from referring physicians: a novel approach to quality improvement in radiology reporting. AJR Am J Roentgenol. 2013; 201: 853-857.

32. Twair AA, Torreggiani WC, Mahmud SM, Ramesh N, Hogan B. Significant savings in radiologic report turnaround time after implementation of a complete picture archiving and communication system (PACS). J Digit Imaging. 2000; 13: 175-177.

33. Mehta A, Dreyer K, Boland G, Frank M. Do picture archiving and communication systems improve report turnaround times? J Digit Imaging. 2000; 13: 105-107.

34. Krishnaraj A, Lee JK, Laws SA, Crawford TJ. Voice recognition software: effect on radiology report turnaround time at an academic medical center. AJR Am J Roentgenol. 2010; 195: 194-197.

35. Lawson DE, Siegel SC. A recommendation on recommendations. AJR Am J Roentgenol. 1997; 169: 351-352.

36. Kessler HB. The contemporary radiologist: consultant or film reader? AJR Am J Roentgenol. 1997; 169: 353-354.

37. Gunderman R, Ambrosius WT, Cohen M. Radiology reporting in an academic children's hospital: what referring physicians think. Pediatr Radiol. 2000; 30: 307-314.

Cite this article

Gunn AJ, Mangano MD, Pugmire BS, Sahani DV, Binder WD, et al. (2013) Toward Improved Radiology Reporting Practices in the Emergency Department: A Survey of Emergency Department Physicians. J Radiol Radiat Ther 1(2): 1013.