

The Radiology Report of the Future: A Summary of the 2007 Intersociety Conference

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A radiology report is the official record documenting the contribution of a radiologist to a patient's care. The use of structured reports and a common lexicon will help referring physicians better understand the contents of reports. These same features in electronic health records will enable radiologists to mine reports for utilization management information as well as form the basis for clinical investigations.

Key Words: Radiology report, structured reporting, quality improvement, best practices, multimedia report

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The Intersociety Conference was established in 1979 to promote collegiality, encourage communication among the national radiology societies, and make recommendations on areas of concern identified by the 53 member societies invited to participate in the Summer Conference. The 2007 meeting was held July 27 to 29 at the Loews Hotel in Annapolis, Maryland. As in prior years, the conference consisted of a series of plenary talks and breakout sessions in which each of 3 groups deliberated on specific aspects of radiology reports and reported their results to the conference attendees.

REPORT FUNDAMENTALS

A radiology report is the official record of a diagnostic, interventional, or therapeutic examination or procedure. It is communicated to a referring physician and is a permanent part of a patient's medical record. Because a report documents an examination procedure, it also serves as the basis for billing. A radiology report defines the examination or procedure performed, and the relative value units assigned to the examination are a commonly used method of assessing the amount of "work" done by the radiologist [1]. Should a medicolegal issue arise, the radiology report is the first document reviewed to determine if the standard of care was met. Thus, radiology reports are the most important documents used by practicing radiologists and radiation oncologists. Indeed,

the importance of radiology reports has been recognized for more than 85 years. In 1922, Preston Hickey suggested that all applicants for membership in the American Roentgen Ray Society be required to submit 100 radiology reports with their applications [2].

Every radiology report includes basic demographic information, such as the patient's name and identifying number within the health system and another number specific to that episode of care. In addition, a report describes what was done, including the examination protocol and the amount of medication or contrast material, if any, that was used. If a procedure was performed, a precise description of the key components of the procedure becomes part of the report. If a procedural complication or other untoward event occurred, such as an adverse reaction to intravenous contrast administration, it must also be noted in the report.

A diagnostic report includes a description of the imaging findings and a comparison with prior studies, if available. These imaging findings, along with the pertinent clinical information, are used to determine the most likely diagnosis or a short list of the most likely possibilities. Any limitations of a study, such as a contraindication to the use of intravascular contrast media when it would normally be given, should be included in the report. If additional imaging studies would clarify equivocal findings, they should be recommended.

Radiologists should follow the recommendations of the ACR's *Practice Guidelines and Technical Standards* for communicating reports for both diagnostic radiology [3] and radiation oncology [4]. They should include any accreditation or practice quality improvement requirements of the American Board of Radiology's [5] Maintenance of Certification Program, and mammographic

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examinations must be consistent with the Mammography Quality Standards Act.

Radiology reports have many “customers.” In addition to referring physicians, patients also may be sent copies of their reports, or they may access them electronically. Indeed, some courts have extended the communication responsibility of radiologists to include patients [6,7]. Health care systems often check to make sure that every examination, procedure, and treatment has been reported and track the time elapsed between the completion of examinations and when they have been formally signed. Radiology billing offices rely on formal reports to support requests for reimbursement.

STRUCTURED REPORTING

The participants of the 2007 Intersociety Conference recommended the use of “structured” reports. An ideal structured report is subdivided into meaningful sections, which are consistently ordered and contain standard language [8,9]. Structured reports are preferred by referring physicians and facilitate the extraction of key information from reports. Such information extraction is increasingly necessary to document quality metrics linked to financial incentives offered by the Medicare program and to satisfy regulatory and accreditation requirements. Indeed, the frequency with which structured reports are used is one of the quality metrics developed at the 2006 Intersociety Conference [10].

Except in breast and cardiac imaging where systems to create structured reports have been widely available for some time, few structured reporting systems are available for radiology. However, many advantages of structured reports can be achieved by off-the-shelf speech recognition systems that enable the use of standard “macros.” These macros contain “blanks” (fields that can be filled in with text) that prompt radiologists for specific data, making it more likely that pertinent information will be included, thereby improving the quality of reports [9].

Although the participants of the Intersociety Conference favored structured reports, they also recognized the continuing need to capture conventional free-text narrative. The option to include free text enables radiologists to expand on aspects of examinations that may require clarification and to personalize reports for specific patient circumstances, if needed.

One of the most challenging aspects of structured reporting is the use of a standardized lexicon, which ensures clear and unambiguous communication. In the past, most general medical lexicons have not contained many of the terms used in radiology reports [11]. To address this shortcoming, a standard lexicon, called RadLex, is being developed under the auspices of the Radiological Society of North America [11,12]. RadLex is a single

unified source of radiology terms that is intended to become a de facto standard for the information produced by radiologists. A preliminary version of the lexicon is publicly available [13]; a final version was presented at the annual meeting of the Radiological Society of North America in November 2007.

Because standardized reports likely will be necessary in many radiology practices in the coming years, the participants felt that a repository of “best practices” reports would be a helpful resource for these practices. These structured reports could be developed using a standardized lexicon across all radiologic examinations, image-guided interventions, and radiation oncology reports. For maximum impact, reports should be developed first for clinically important but less complex examinations where there have been communication issues. Lessons learned from these initial efforts can then be used to develop standard reports for more sophisticated studies and procedures.

Professional radiology societies should take a leadership role in the development of reporting best practices. Radiologists subspecializing in specific areas have the expertise to lead the development of a standard report template that includes all pertinent portions of a study. And because referring physicians are the most frequent recipients of radiology reports, one or more of these physicians also should be included in developing the report template. The consensus of national radiology organizations also would help foster consistency throughout the country.

Although the Intersociety Conference participants recognized that a repository of reporting best practices would be a helpful starting point, they also recognized that there may be significant local variation in disease prevalence, available imaging technologies, or preferred therapeutic approaches. Thus, local radiology groups may prefer to adapt consensus report templates to local practice patterns.

REPORT COMMUNICATION

Once a radiology report has been created, it must be communicated to the referring physician in a timely fashion. The urgency of the report depends on the clinical setting [14,15] and ranges from patients seen in emergency rooms with acute injuries to routine surveillance examinations. The method of communication varies with each practice and location. Whatever system is used, it must be compliant with the Health Insurance Portability and Accountability Act, and there should be an auditable mechanism to ensure that reports have reached referring physicians [16,17].

It is also important to monitor that appropriate action was taken as a result of an imaging examination [18,19].

To facilitate communication, a radiology report should include contact information for radiology consultation and possibly even educational materials.

There are several situations in which communication must be enhanced. If imaging findings are such that urgent intervention is required, communication must be immediate. This is often accomplished with a phone call or face-to-face discussion with a referring physician. Another category is the "unexpected finding." In such a situation, a potentially serious abnormality that was not anticipated by the patient's presentation is detected. Although immediate communication is not necessary, it is important to make sure that the referring physician is aware of the abnormality and its clinical implications.

Another category of special consideration is a changed report. In such a situation, the final report is substantially different from the preliminary interpretation. A preliminary impression may be offered by almost any health care professional, including a radiologist providing a preliminary interpretation via teleradiology, a physician extender, a radiology resident, or even a referring physician, who may see images before a radiologist. Personal communication with a referring physician may also be indicated when imaging findings are unclear.

If a report must be changed, it is essential that the new report is clearly distinguished from the preliminary report and that the differences are clearly stated. It is also appropriate to provide access to the original report. All physicians involved in the patient's care should be contacted to make sure that decisions for the patient's care reflect the revised interpretation.

Although it is inevitable that two radiologists will occasionally interpret an examination differently, these are opportunities for practice improvement. An analysis of the reasons for the variance in interpretation may be a learning opportunity for everyone.

Radiology reports are sent to referring physicians, and when the patients and practice are part of a health care organization, they are also sent to the patients' permanent medical records. The referring physicians have developed relationships with the patients and are in the best position to explain the significance of their radiologic examinations to the patients in the context of their clinical setting. However, many patients are knowledgeable about their medical conditions and seek access to their radiology report. Thus, radiologists should be aware that patients may read their reports. Furthermore, patients should have the opportunity to speak to their radiologists about their examinations and the interpretations that are rendered.

The improvements in imaging, especially cross-sectional techniques, have helped referring physicians and patients better understand the basis for radiologists' interpretations. The convincing evidence such images pro-

vide about the success (or failure) of a treatment regimen may convince treating physicians to continue (or change) their treatment plans or may help patients become more compliant. It was generally agreed among the participants of the conference that including images in reports may provide value to physicians, patients, or both [20]. Including the entire data set is not likely to be satisfactory, because it may be cumbersome to find the pertinent images. Instead, providing 1 or 2 annotated images, with arrows marking the relevant findings and comparisons to prior studies, if available, would be most useful. The ability to create this subset of the imaging examination is supported by Digital Imaging and Communications in Medicine [20,21].

THE ELECTRONIC MULTIMEDIA REPORT

The practice of radiology is increasingly electronic. In some institutions, physicians request diagnostic examinations through computerized order entry systems. Images are captured, routed to the appropriate radiologist for interpretation, and then stored in an electronic archive using a picture archiving and communication system. Radiology reports are often generated using speech recognition technology and stored in electronic medical records, which may be accessed by all members of the health care team. All of these functions are supported by radiology information systems and hospital information systems. It is essential that all vendors adhere to Digital Imaging and Communications in Medicine standards to facilitate the smooth transfer of information.

The integration of these systems is essential to improving the quality and efficiency of health care. If these electronic systems are not integrated, human intervention is needed but introduces the possibility of human error. Even simple steps such as entering a patient's name or other demographic data may create havoc. For instance, a variation of a patient's name, such as including or omitting a middle initial, may cause the electronic system to consider the individual to be a different person.

The need for human intervention and paper systems dramatically reduces system efficiency [22].

CONCLUSION

There are many obstacles to overcome before radiologists, radiation oncologists, and radiologic physicists will accept this ideal vision of radiology reports. It will require some effort on the part of radiologists to determine the standard report that works best for their practices. Although professional radiology societies may take the lead in offering a model report for common examinations, individual groups may need to modify this standard model to address local conditions.

If images are included in a report, there will be additional effort required to identify the desired images and transport them to the report. There also may be a tendency to provide less information by truncating a report. There may be a temptation to say “see image” rather than describe the findings. This temptation must be avoided, because part of the value of radiologists is lost if the findings are not described and their significance analyzed.

When comparing a current study with a prior examination, a radiologist may identify a finding that was not reported. Although this may be due to interval growth of a tumor that was too small to be detected on the prior examination, there may be reluctance on the part of the radiologist to highlight the lesion by including images of the area that proved to be abnormal on the following examination.

Radiologists should also be aware that once they begin to annotate images into structured reports using a standardized lexicon, they may not be able to return to their prior reporting systems. The enhanced value of these annotated images is likely to be so great that referring physicians and patients will demand that they continue to be a part of radiology reports. Referring physicians, administrators, and radiologists’ own billing offices are likely to have a strong preference for these new radiology reports.

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