Research article

Reason for exam Imaging Reporting and Data System (RI-RADS): A grading system to standardize radiology requisitions

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ABSTRACT

Radiologists often encounter imaging requisitions that lack important information needed for accurate diagnostic studies. Reason for exam Imaging Reporting and Data System (RI-RADS) is proposed as a grading system for evaluation of the quality of clinically pertinent information provided in imaging requisitions. Three categories of information are suggested as key indicators of quality: impression, clinical findings, and the diagnostic question. This scheme is intended to improve the quality of imaging requisitions and overall patient care.

1. Introduction

Medical practice is becoming increasingly reliant on imaging studies and demands for improvement of the quality of radiologic studies are growing [1]. Alongside the technological advancements in imaging techniques, standardization of the radiology reports is considered as an essential part of the quality improvement strategies [2,3]. The key role of such measures is reflected by the plethora of evidence emerging from standardized reporting systems, such as the Breast Imaging Reporting and Data System (BI-RADS) and Liver Imaging Reporting and Data System (LI-RADS) [2,4,5]. BI-RADS has shown to improve the communication between radiologists and referring clinicians, which allows structured interpretation and resultant improvement of patient care [2,6,7]. These standardized reporting schemes help radiologists provide concise results and evidence-based recommendations for patient management. However, considering the bidirectional nature of clinician-radiologist communication, the quality of the radiologic exam requisition is a key concept that has not been addressed in detail [8].

2. Medical, legal and financial impacts of sub-optimal requisitions

Detailed patient history is critical for accurate and efficient interpretation of imaging studies by radiologists. However, in daily clinical practice, the history provided to the radiologists is commonly incomplete or nonexistent [9]. Radiologists often encounter imaging requisitions with limited clinical information that fail to define a question or indication to perform the study. It is not uncommon to have a reason for the exams such as "daily," "room 135," "follow up," "new admit", and "as per chief complaint". This gap has been addressed in a large-scale study of the accuracy of clinical information provided in pediatric imaging requisitions, showing misleading, incorrect or incomplete data in nearly 27% of the cases, and variable quality of the provided information in the remainder of the requisitions [10]. These concerning findings have been confirmed in other settings, such as intensive care units where discrepancy rates as high as 62% have been reported [9,11–13]. A study on the influence of the clinical history on the accuracy of imaging reports showed that 19% of the computerized

tomography reports were amended when detailed history was provided, and more than 50% of these changes were perceived significant [14]. More granular research has been performed in the field of neuroimaging, showing that appropriate clinical history increases the sensitivity of the computerized tomography from 38% to 52% in early stroke diagnosis [15]. Meanwhile, failure to provide adequate clinical information is one of the major sources of potentially fatal diagnostic errors and consequent malpractice lawsuits [16]. Furthermore, with the advent of merit-based reimbursement strategies, more insurance programs are implementing specific regulations concerning the mandatory information in diagnostic requisitions. For instance, the policy implemented by the Centers for Medicare and Medicaid Services (formerly Health Care Financing Administration) requires imaging requisitions to include both a current diagnosis and an appropriate indication for the test [12]. Therefore, lack of such information may put the radiologists, imaging facilities and clinicians at risk of financial loss [12].

3. Existing methods for improvement of requisition

Despite being subjected to critical scrutiny, little has been done to change the status quo of the quality of imaging requisition, and most efforts have been focused on computerization of the process [3,17,18]. One of the earliest interventions dates as early as three decades ago, aiming to automate the radiology requests using electronic forms [18]. It has been suggested that the use of computerized systems for imaging requests increases the tendency of the referring physicians to provide more detailed clinical history [19]. However, the same study was inconclusive regarding the contribution of electronic requisition forms to improvement of the accuracy of information provided. Moreover, there are situations in which referring physicians are not equipped with computerized ordering systems, especially in the outpatient and rural settings. Cohen et al. introduced the "radiology clinical synopsis" as an online method of providing the clinical history for radiologists, which allowed the addition of pertinent information by the radiologists and feasible data retrieval for future requisitions [20]. Gunderman et al. implemented a feedback intervention aiming to inform the referring physician regarding the completeness of imaging requisition, restricting the imaging studies to the ones that complied with their 'criteria for acceptable requisition' [12]. Their intervention, based on the need for a qualified requisition, was designed on eight distinct points, as rationale behind the need for a qualified requisition: "to ensure that the imaging is indicated, to ensure that the appropriate study is requested, to ensure that appropriate facilities are available, to prevent complications, to tailor examination to key findings, to ensure that proper quality of images is provided to the referring physician, to derive relevant differential diagnosis and to ensure that a specific clinical question is answered" [12]. Early after implementing this intervention, the non-compliance rate decreased by nearly two-thirds. However, this intervention failed to sustain this effect, and the rates of improvement gradually decayed over time. They concluded that similar feedback interventions can be used as a means of increasing compliance, but a more powerful and ongoing intervention is required to sustain this effect. Although none of these interventions gained universal acceptance, their remarkable impact on the quality of diagnostic imaging signifies the importance of requisition standards and calls for improvements in this domain.

Other standardization schemes that are focused on the appropriateness of imaging exams may indirectly affect the quality of imaging requisitions, although appraisal of the quality of requisitions is not the primary function of such measures [21–23]. American College of Radiology (ACR) appropriateness criteria are well-known examples that were introduced to help physicians choose the appropriate imaging examination in various clinical conditions [21].

4. Reason for exam Imaging Reporting and Data System (RI-RADS)

We propose a new standardized reporting system to address the need for appropriate clinical information in radiology requisitions, namely, the Reason for exam Imaging Reporting and Data System (RI-RADS). The purpose of this system is to standardize clinical information on imaging requisition, to enable radiologists to evaluate the usefulness of clinical information provided in imaging requisitions, and to communicate this assessment in the radiology report. This system is broadly inspired by the American College of Radiology (ACR)'s practice guideline for communication of diagnostic imaging findings, which states "a request for imaging should include relevant clinical information, a working diagnosis, and/or pertinent clinical signs and symptoms. In addition, including a specific question to be answered can be helpful. Such information […] promotes optimal patient care" [24]. The rationale behind this new system is that, ideally, an imaging requisition should contain enough patient information and clinical context to enable radiologists to recognize the precise intent of the study [8,12,24]. This pertinent clinical information should include: indication for the exam, working diagnosis, chronicity, and location of signs and symptoms, mechanism of ailment, pertinent positives and negatives, any pertinent lab values, pertinent past medical and surgical histories, and any other significant clinical information.

RI-RADS categorizes requisitions solely based on the information provided in the requisition form. In other words, RI-RADS excludes information extracted from other sources, such as direct communications and electronic health records by the radiologist. Three key categories of information will be considered for grading (Table 1): 'Impression', which includes working or differential diagnoses; 'clinical findings', which includes information such as signs, symptoms and pertinent past medical/surgical history; and main 'diagnostic question', such as confirmation or exclusion of working diagnosis. In RI-RADS category A, requisitions should include all three indicators of information. Lower grades indicate the lack of information needed for accurate interpretation and reporting. Considering the simplicity of this grading schema, the scoring system is expected to be consistent across radiologists with different professional backgrounds and experience levels. RI-RADS follows the basic principles of writing clinical

Table 1
Grades, description and example of the proposed Reason for exam Imaging Reporting and Data System (RI-RADS).

Grade	Description	Information included in the requisition	Example of RI-RADS A
RI-RADS A	Adequate	All key categories* of information included.	- Impression: Acute abdomen
RI-RADS B	Barely adequate	All key categories of information included, some clinical findings missing.	- Clinical findings: 15-year-old boy, 2 days of periumbilical abdominal pain with nausea and bilious emesis, normal vital signs, prior open
RI-RADS C	Considerably limited	Two categories of information included.	appendectomy
RI-RADS D	Deficient	One or no category of information included.	- Diagnostic question: rule out SBO

RI-RADS, Reason for exam Imaging Reporting and Data System; SBO, small bowel obstruction

* Key categories of information:

1- Impression: working or differential diagnoses

2- Clinical findings:
- Signs and symptoms
- Chronicity of current episode
- Location of signs and symptoms
- Pertinent past medical/surgical history
- Pertinent laboratory findings
- Previous imaging reports (when available)

3- Diagnostic question: such as confirmation/exclusion of diagnosis, grading/staging, pre-operative planning, follow-up of progress or response to treatment etc.

information in requisitions. Therefore, it can be uniformly applied to requisitions from various referring groups.

5. Perceived impact of RI-RADS and future steps

RI-RADS grading is intended to eventually become a separate section of the imaging reports to enable the referring physicians and health systems to evaluate the quality of requisitions. Reports which are supplemented with RI-RADS will render regular feedback from radiologists and can be assembled into a provider "report card" to inform the referring physicians about the sufficiency of their requisitions and how they compare to their peers. With continuous feedback, clinicians may be encouraged to provide the best clinical information possible, leading to improved efficacy for the radiologists reviewing studies and better patient care. Furthermore, with improved communication between providers and radiologists, the potential for errors in patient management may decrease, and the overall risk of malpractice litigation for the entire healthcare team may decline. Meanwhile, the health system will be equipped with a tool to prompt referring physicians to convey detailed clinical information to the radiologists. Measures such as incentive reimbursements rewarded to the referring physicians with higher RI-RADS grades may persuade them to improve their requisitions, and in the meantime improve the communication between them and radiologists. Under current payment models, radiology practices and departments bear the risk of decreased or no reimbursement on studies that lack necessary clinical information and diagnosis codes. Therefore, RI-RADS may allow radiologists to become more effective gatekeepers to limit studies that are not indicated and increase the overall value provided. The health system may also administer RI-RADS scores as a tool to assess the quality of radiology requisitions. Reporting and Data Systems (RADS) framework was developed by the ACR to standardize the communications between radiologists and referring physicians. Similar to other RADS, further development and successful implementation of RI-RADS need the endorsement of the ACR as a leading initiative in the standardization of radiology reporting and data collection. Meanwhile, the inclusion of other major stakeholders would be of great importance.

As with other classification systems, the first step in the development of this system is to evaluate its content validity, comprehensibility, and comprehensiveness. Even though RI-RADS is designed based on the current guidelines and experts' opinion, it is important to critically appraise this new system by independent experts with sufficient diversity in terms of experience and professional background. Therefore, a consensus study needed to be conducted to validate this scheme internally. Further steps would be to evaluate the reliability of this system, to provide empirical evidence for the effect of this new system on quality of imaging requisitions, and to determine its contribution to improved diagnostic accuracy.

6. Conclusion

RI-RADS is a standardized method for evaluation and communication of the quality of the information provided in radiology requisitions. This simple and comprehensive system may increase the accuracy and efficiency of the interpretations, improve the interdisciplinary communications, and most importantly improve patient care.

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