Mini Review

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Assigning responsibility to close the loop on radiology test results

DOI 10.1515/dx-2017-0019
Received February 20, 2017; accepted April 27, 2017; previously published online June 15, 2017

Abstract: Failure to follow-up on test results represents a serious breakdown point in the diagnostic process which can lead to missed or delayed diagnoses and patient harm. Amidst discussions to ensure fail-safe test result follow-up, an important, yet under-discussed question emerges: how do we determine who is ultimately responsible for initiating follow-up action on the tests that are ordered? This seemingly simple question belies its true complexity. Although many of these complexities are also applicable to other diagnostic specialities, the field of medical imaging provides an ideal context to discuss the challenges of attributing responsibility of test result follow-up. In this review, we summarize several key concepts and challenges in the context of critical results, wet reads, and incidental findings to stimulate further discussion on responsibility issues in radiology. These discussions could help establish reliable closed-loop communication to ensure that every test result is sent, received, acknowledged and acted upon without failure.

Keywords: diagnostic error; health IT; medical imaging; patient safety; quality improvement; radiology; test result management.

Introduction

In medicine, as in life, many would agree with the age-old adage that "the only constant is change". More than ever before, we encounter increasingly complex patients being cared for by multiple care team members dispersed over time and space, a landscape of evolving health information technologies (IT), and an ever-escalating number of diagnostic tests at our fingertips. Many of these changes have exposed critical weaknesses in the follow-up of abnormal test results. Processes involving communication and test result follow-up are typically idiosyncratic and often involve patchwork solutions [1, 2]. The sheer volume of test results to review can feel overwhelming at times and lead to delays in follow-up and patient care [3, 4]. Indeed, the failure to follow-up on test results has been identified as a serious breakdown point in the diagnostic process that can lead to missed or delayed diagnoses and patient harm [5, 6].

Effective communication is paramount to safe patient care [7]. Closed-loop communication includes not just a one-way transfer of information from sender to recipient, but also the acknowledgment of receipt by the recipient, and importantly in the case of test result communication, follow-up action on the test result [8]. All of this is essential to prevent patient harm from care delays. Amidst discussions to ensure fail-safe test result follow-up, an important, yet under-discussed question emerges: how do we determine who is ultimately responsible for initiating follow-up action on the tests that are ordered? This seemingly simple question belies its true complexity. Is it the emergency room physician who orders the test, or the hospitalist who receives handover? Or the rheumatologist who suggests the extractable nuclear antigen antibody panel during an inpatient consultation? Or should it be the microbiologist who identifies a reportable disease, or the primary care physician (PCP) who follows the patient longitudinally? Academic teaching environments further complicate matters, with medical students, residents and clinical fellows also added to the mix of potentially responsible parties.

Additional complexity has emerged in the era of health IT. Health care providers have become progressively more reliant on electronic notification systems to manage test results. In one study of imaging results communication, radiologists manually assigned a code to imaging reports with unexpected abnormal findings which "alerted" the

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ordering provider (or designated surrogate and/or the PCP) through the electronic health record (EHR). During the study, almost 20% of imaging-related alerts were not acknowledged, and almost 8% of abnormal imaging results lacked timely follow-up at 4 weeks [9]. This occurred even when providers had acknowledged receipt of the results. Even a "dual" alert communication system designed to additionally notify the PCP in instances where the ordering provider was a trainee, subspecialist, or covering provider, unexpectedly increased the risk of follow-up failure due to diffusion of responsibility.

Medical imaging: a deeper dive

The field of medical imaging provides an ideal context to discuss the challenges of attributing responsibility of test result follow-up. We highlight three situations to stimulate further discussion on responsibility issues in radiology, although many of these concepts could be applied to other diagnostic specialities.

Critical results

The Joint Commission's National Patient Safety Goal 2 requires the timely communication of critical test results to the responsible caregiver. This goal includes the development of written procedures defining each critical result, specifying the sender and receiver of this information, and outlining the acceptable length of time elapsed between availability of critical results and their reporting [10]. Despite this, the implementation of such policies across radiology departments has been inconsistent to date [11]. This is complicated by lack of standardized and uniformly accepted definitions distinguishing critical, urgent, and unexpected significant imaging results.

Currently, communication of abnormal radiology results is typically achieved through varying combinations of automated alerts generated through the EHR and phone calls [2]. Emerging technologies, such as closed-loop communication software aim to notify specific concerning findings (rather than the entire radiology report) via pager, e-mail, and/or EHR with prespecified acknowledgement timeframes enforced by institutional escalation policies [12]. Nevertheless, any ambiguity in identifying the responsible recipient can lead to significant delays in communication and patient care. It can sometimes be difficult to reach anyone despite having an ordering clinician name on record, because phone numbers are outdated or calls are not returned. Moreover, the perceived urgency of an abnormal finding can differ between sender and receiver, be subjective at times, and vary depending upon the clinical context. In our experience, most institutions do not have robust policies that outline who is responsible for test result follow-up, nor do they have rigorous escalation procedures in the event of test result communication breakdown.

Wet reads

Most images performed after hours in the US and Canada are read twice. Although the term "wet read" refers to an antiquated time when films were initially read while still drying after processing, it is still used to describe the preliminary read of the digital image, often by a radiology resident, prior to a final report issued by the attending radiologist. Approximately one in 100 preliminary reports are discrepant with the final interpretation, with significant variation depending on trainee level and imaging modality [13, 14]. Again, the attribution of responsibility for following-up on these report addenda and the extent of communication required has not been standardized. Consider the example of a patient in the emergency department with a chest X-ray read overnight as being consistent with pneumonia. In this example, the patient is discharged home on antibiotics, oblivious to the addendum added to the report the next morning identifying a small cavitary lesion in the right upper lobe. Should the overnight physician who ordered the image, but whose shift may now be over, be responsible for following up on this additional finding? Or should the onus be on the radiologist making the amendment? Furthermore, who should the radiologist notify now that the ordering physician is off-shift? And, should they notify by calling or relying upon an EHR alert? The intricate processes related to handoffs, vulnerability associated with asynchronous communication, and perception of urgency clearly add additional layers of complexity.

Incidental findings

Incidental findings are results detected by the radiologist that are unrelated to the reason for imaging, such as a computed tomography scan of the abdomen intended to investigate a ruptured abdominal aortic aneurism (AAA) which happens to also identify an adrenal nodule of unclear significance. Incidental findings are exceedingly common. Overall, across all imaging modalities, it

is estimated that the frequency of incidental findings in medical imaging is almost one in four tests [15]. In these instances, much like the previous two examples, the clinician responsible for following up on these findings is not always certain, and the suggested follow-up periods can widely range from days to months to years. In fact, abnormal imaging results in which radiologists recommend additional imaging may be more vulnerable to lack of timely follow-up [16]. In the aforementioned example, the ordering physician is likely to be preoccupied with managing the acute issue at hand (i.e. the ruptured AAA), rather than the less urgent result (i.e. the adrenal nodule). Nevertheless, ensuring that the patient receives the appropriate investigations and follow-up for the adrenal nodule down the road should she survive the acute emergency is not an insignificant task. It requires fail-safe handover, communication, and test result management across multiple providers, settings, and timelines [17, 18]. Currently, the estimated frequency of clinical follow-up of incidental findings across all imaging modalities is only 65% [15]. This is an area of risk where discussions on responsibility are essential.

What next?

Determining the most responsible clinician for test result follow-up will require a solution that includes discussions of concepts that are currently in shades of grey, rather than black and white. It is incumbent upon us – as providers, policymakers, and patients – to advocate for these crucial conversations. The solution will almost certainly be multifactorial, and will likely involve significant improvements in policy, health IT, and patient engagement [19]. This complex sociotechnical problem will require a complex sociotechnical solution [20]. The Office of the National Coordinator for Health Information Technology has created a self-assessment guide designed to assist institutions with the integration of health IT into test result management processes [21, 22]. It emphasizes the need to ensure that the ordering clinician is identifiable on all ordered tests and test reports, and, if another clinician is responsible for follow-up, to have that clinician also identified in the EHR.

Ensuring that clear institutional- or system-level policies on communicating abnormal test results are implemented will be a necessary, but insufficient piece of the puzzle. For example, the policy established within the Veterans Health Administration (VHA) identifies the ordering provider, regardless of speciality or longitudinal relationship with the patient, as the person with whom responsibility rests for initiating follow-up of abnormal results, unless a qualified designee has been assigned to receive test results when the ordering provider is unavailable [23]. Equally necessary to the establishment of such policies will be their implementation to ensure accountability and adherence. Many institutions have begun developing policies to address these issues, but as it currently stands, these policies are frequently not implemented well or acted upon. Recently, the Centers for Disease Control and Prevention-based Clinical Lab Improvement Advisory Committee made recommendations to the Department of Health and Human Services and the Centers for Medicare and Medicaid Services (CMS) for further action in this area [24]. The committee recommended that CMS should convene a multidisciplinary group tasked with outlining "a process for health care institutions to improve safe communication and follow-up of diagnostic test results to providers and/or patients with clear guidelines on timelines for communicating those results" and providing an "implementation and evaluation plan for the process". This recommendation cites the 2015 VHA policy on communicating test results as an example [25], and aims to standardize some of the discussions surrounding responsibility in the US. Federal agencies outside the US and professional radiology societies are well positioned to facilitate the spread of similar principles in Canada and further abroad.

Improving patient engagement in test result follow-up also holds promise as being part of the solution. Direct patient involvement in test result management can serve as one of several safety nets for detecting errors and improving patient safety. Increasingly, online EHR-linked patient portals are facilitating direct patient access to radiology reports [26]. Enhanced patient access to medical records has been shown to improve identification of documentation errors and strengthen the patient-physician relationship [27]. Moreover, 28 states across the US have enacted legislation mandating the notification of women with dense breast tissue on mammography of their breast cancer risk profile [28]. Preliminary evidence studying the effect of breast density notification legislation on breast cancer outcomes suggests improvement in the detection of early-stage disease [29].

Importantly, it will be essential for everyone on the frontlines to establish reliable closed-loop communication, meaning every test result must be sent, received, acknowledged and acted upon without failure. We will need to apply lessons from team-training and teamwork principles [30], and use techniques from other industries, such as six sigma from manufacturing, to

improve reliability of responsibility-related care processes. We call upon key stakeholders to engage in the conversation, including clinicians, patient advocates, national professional societies, policymakers and malpractice insurers, in order to ensure progress in solving this complex problem. The foundational concepts outlined in this review can serve as a springboard from which these critical and necessary conversations can be launched.

Author contributions: All the authors have accepted responsibility for the entire content of this submitted manuscript and approved submission.
Research funding: Dr. Singh is supported by the VA Health Services Research and Development Service (CRE 12-033; Presidential Early Career Award for Scientists and Engineers USA 14-274), the VA National Center for Patient Safety, the Agency for Health Care Research and Quality (R01HS022087 and R21HS023602), and the Houston VA HSR&D Center for Innovations in Quality, Effectiveness and Safety (CIN 13-413).
Employment or leadership: None declared.
Honorarium: None declared.
Competing interests: The views expressed in this article are those of the authors and do not necessarily represent the views of the Department of Veterans Affairs or other funding agencies. The funding organization(s) played no role in the study design; in the collection, analysis, and interpretation of data; in the writing of the report; or in the decision to submit the report for publication.

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