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## Radiology report turnaround: expectations and solutions

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**Abstract** The ultimate work product of a radiology department is a finalized radiology report. Radiology stakeholders are now demanding faster report turnaround times (RTAT) and anything that delays delivery of the finalized report will undermine the value of a radiology department. Traditional reporting methods are inherently inefficient and the desire to deliver fast RTAT will always be challenged. It is only through the adoption of an integrated radiology

information system (RIS)/picture archiving and communication system (PACS) and voice recognition (VR) system that RTAT can consistently meet stakeholder expectations. VR systems also offer the opportunity to create standardized, higher quality reports.

**Keywords** Voice recognition · Report turnaround · PACS · RIS

Medical specialties are increasingly relying on imaging to aid patient diagnosis and assess treatment outcomes [1–6]. Radiology stakeholders (patients, referring doctors and hospital managers) are therefore demanding more, and faster, access to imaging services. The resultant increased workload, however, extends beyond imaging access alone. As referring doctors are facing pressures to make time-sensitive clinical decisions, they are, in turn, also expecting faster radiology report turnaround times (RTAT) [4, 7–12]. Indeed, radiology departments create little value until referring doctors have access to a finalized radiology report. From a referring doctor's point of view, the radiology report is the ultimate product of an imaging department, the reason why they refer the patient to radiology in the first place. Anything that delays this verified report will, therefore, undermine the radiologist's value [4, 10]. Indeed, some organizations now consider this service level so important, that radiologists are financially at risk for failure to meet the institution's RTAT guidelines.

Consequently, it is not unusual for referring doctors to expect a finalized report within 1 h for emergency room patients, within a few hours for inpatients and no longer than 24 h for outpatients. Otherwise, radiology departments risk losing significant outpatient business if RTAT are deemed unacceptably long by referring doctors [4, 13]. Due to the favorable reimbursement for outpatient imaging in the United States [computed tomography (CT) and magnetic resonance imaging (MRI) particularly], there is intense competition for this lucrative radiology business. Referring doctors are often at liberty to refer their patients to competing organizations, particularly if they perceive them to provide better radiology services. Once these patients are referred to the competition, it may be very hard to "win" them back. This situation is far from ideal, as these patients will often be examined on different radiology equipment, using different imaging protocols, and with different radiologists interpreting the images. Furthermore, the images and reports will probably reside outside the host's information systems, making it harder for the

referring doctors to make comparisons with prior studies. However, these potential deficiencies are often trumped by the referring doctors' demands for expedited RTAT—hence their willingness to refer patients out-of-network, if necessary.

Despite the clear mandate from referring physicians for faster RTAT, many radiology departments are struggling to meet these demands. This can partly be explained by inadequate staffing levels, which have not kept pace with the increased use of imaging [14–17]. Consequently, many departments are unable to report imaging studies as quickly as they would like. This problem becomes much magnified, however, in departments that lack the integration of three key information systems, critical to a productive workflow, namely, the radiology information system (RIS), a picture archiving and communication system (PACS) and voice recognition (VR) technology. Without this integrated digital platform, radiology departments will always be challenged to meet the demands for expedited RTAT. Indeed, traditional film and transcription-based departments (especially without RIS integration) are inherently inefficient, as there are too many potential failure points that counter the ability to deliver fast RTAT. Without a fully integrated RIS, patient work-list schedules cannot be downloaded onto the imaging systems (e.g., CT machines), and patient demographics, history and prior reports are hard to retrieve for the radiologist. For film-based departments, images require physical delivery and hanging for or by the radiologist, and old films, which are sometimes lost, must also be retrieved from storage sites. Report dictation onto digital or analogue tape requires transcription (usually at a later time by another individual), which will also require editing and correction by the radiologist. The net sum of this inefficient workflow is that it can take days for some radiology reports to be signed and finalized.

In response to the demand for increased RTAT, most radiologists have appropriately insisted that their organizations provide the additional resources to help them become more productive. For departments that are not fully digital, this may require the addition of ancillary personnel (i.e., film librarians to help collate prior studies, staff to pre-hang films for interpretation and additional typing staff to expedite report transcription). These initiatives may alleviate some bottlenecks in the workflow, but ultimately, it is only through the implementation of integrated digital platforms that radiologists, nowadays, can truly address and meet their stakeholder's expectations [18].

A RIS is critical to managing the radiologist's workflow, providing seamless access to the patient's history and prior reports [19]. Ideally, the radiologist also has easy access to other relevant clinical information (e.g., prior pathology, surgical reports, blood-work) on the hospital information system (HIS), which may be needed to generate an accurate report. Furthermore, radiologists require a contemporary PACS, ideally integrated with the RIS on the same work-

station [7, 20]. Images (including relevant prior studies) are thereby available for interpretation immediately after the examination has been completed: these images are also seamlessly linked to the patient's RIS information for those particular patients. In this way, all necessary information (images and patient text data) is available to the radiologist on a single workstation, promoting expeditious image interpretation. Indeed, integrated PACS/RIS systems have demonstrated up to a 50% improvement in radiologist productivity [21].

While an integrated RIS/PACS provides the necessary platform for early image interpretation, it is usually the reporting process itself that is the disabler for radiologist services, often resulting in delayed delivery of finalized reports. Many organizations with installed RIS/PACS systems still maintain inefficient reporting processes. In the traditional reporting method for instance, the radiologist must first dictate the report onto tape, which, if analogue, must be physically given to a transcriptionist. Then, expeditious transcription of either analogue or digital tape requires sufficient typists to meet reporting demands. Any unpredictable staff absences can prove detrimental to the workflow, and it is not unusual for RTAT to extend into days, rather than hours. More commonly it is the failure of the radiologist to expeditiously correct and sign the transcribed preliminary reports—an important point, as many referring doctors are uncomfortable making clinical decisions based on preliminary report findings [22]. Furthermore, due to busy workloads, radiologists may find it cumbersome to thoroughly read and edit the preliminary reports (and may often not recall the images in question). Finally, due to the pressures of providing early finalized reports, the reports may sometimes be signed by other radiologists (due to absences of the original reporting radiologist) who may have never seen the original images.

Ultimately, it will only be through the adoption of VR technology that the RTAT expectations can finally be met [10]. Although in some departments radiologists type their own reports, VR cuts a swathe across the conventional reporting process, removing multiple inherently inefficient steps. Most importantly, as soon as the report is dictated, it is immediately finalized and available across an organizational network, to all caregivers. Early studies demonstrated profound benefits, with reduction of RTAT from days to hours within a few weeks of implementation [21]. While this may be the most obvious benefit to referring doctors, other advantages are also soon realized. Radiologists will likely provide more accurate reports, as any report editing is performed at the time of the initial interpretation, while the images remain in front of them. Additionally, radiologists will naturally shorten their reports, to avoid the unnecessary editing incurred from longer reports, which is precisely what referring doctors prefer. Furthermore, VR offers the opportunity to standardize the report structure through the use of macros and

templates. Referring doctors also find this helpful, as they no longer need to navigate an unpredictable report format to glean pertinent findings embedded within the narrative [23].

Despite the clear service benefits of VR to radiology stakeholders, some radiologists remain skeptical, out of concern that it might slow down their workflow (just what they are trying to avoid). Certainly these concerns were partly justified with earlier, less efficient, VR models, but contemporary speech-engine software is fast and accurate, particularly if used in combination with macros. While

there is a brief (perhaps 2–3 week) period of adjustment for radiologists, most soon find there is no adverse impact to their workflow [18, 24–25].

Radiologists should therefore take the lead and recommend to their organizations that they provide the necessary funds to support VR (particularly as it can also yield a favorable return on financial investment within the first year) [21]. Furthermore, with VR integration into a RIS/PACS, a key stakeholder demand for radiology departments can thus be met, namely fast RTAT, with short, accurate and succinct dictations, delivered rapidly across an organizational network.

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