By Dr A Kansagra

Diagnosis Interrupted: disruptions of radiologists' workflow

Cognitively intensive tasks, such as interpretation of medical imaging, are easily derailed by unexpected disruptions. Emerging research suggests that, unfortunately, disruptions are surprisingly common in the modern reading room. In this article, we describe the scale of the problem facing radiologists and discuss strategies to protect their most critical workflows.

Medical imaging has taken an increasingly important role in patient diagnosis and management over the last two decades. While this trend has been a boon to patient care, it has come at the cost of considerably increased quantity and complexity of work for the radiologists who oversee and interpret medical imaging studies. As a result, radiologists find themselves shouldering growing responsibility for non-interpretive tasks that, while important, are disruptive to the basic workflow of image interpretation.

The problem with this new reality is simple: disruptions create distractions, and distractions create room for inefficiency and error. Medicine as a whole has begun to slowly respond to this threat in non-radiological arenas, adapting operational philosophies from the airline and manufacturing industries—crew resource management, lean production, and Six Sigma chief among them—in order to reduce error and improve efficiency. Unfortunately, solutions specifically tailored to radiology are lacking, despite a great need—interpretation of medical images and other cognitively demanding tasks are particularly susceptible to the harmful effects of disruption. Not surprisingly, there is growing interest in addressing these sources of disruption in pursuit of safer and more effective radiological care.

DISRUPTIONS IN RADIOLOGY

Just how bad has the problem become in radiology? Two recent studies highlight the scale of the challenge facing the specialty.

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In 2014, Yu and colleagues at the University of California, San Francisco reviewed the number of night, evening, and weekend phone calls to an on-call reading room staffed by a single radiology resident [1]. They identified over 10,000 after-hours phone calls during a 90-day period. At peak activity, incoming calls occurred at an average rate of once every four minutes, which translated to two or three interruptions during interpretation of a single cross-sectional study. One can easily imagine that such frequent interruptions can easily lead to diagnostic errors.

Indeed, a later study by Balint and colleagues at Indiana University attempted to examine the correlation between phone call volume and interpretive errors committed by on-call radiology residents in a pediatric reading room. Although their study only examined total interpretive errors independent of the actual number of imaging examinations, the authors nevertheless found some evidence that the likelihood of committing an interpretive error was positively correlated with a larger number of phone calls in the preceding hour [2]. These findings are alarming, particularly since phone calls represent only one of many sources of workflow disruption for the radiologist. Poorly designed systems for protocoling studies, retrieving patient information, and intra- and inter-departmental communication can all unnecessarily increase the burden of non-interpretative tasks such as study prioritization and care coordination.

SEARCHING FOR A CURE

Workflow disruption is not a uniquely radiological problem. Practitioners in other specialties have also had to confront sources of disruption during critical tasks, and many of the solutions they have devised are remarkable for their simplicity and effectiveness. Some notable examples include implementing "time-outs" before invasive procedures and "no interruption zones" around medication dispensing stations; building centralized information displays to efficiently and

- Defining protected activities during which interruptions are not permitted
- Classifying the importance of each interruption and allowing only those of high importance
- Implementing channels of asynchronous communication, so that providers can transmit and receive messages at a convenient time
- Using information technology tools to facilitate workflow
- Redesigning workflows to eliminate unnecessary or redundant tasks
- Redistributing some workload to others

FIGURE 1. Possible broad strategies for reducing clinical task disruption.

automatically gather relevant clinical data, and offloading communication tasks to designated assistants.

Naturally, many of the solutions developed for other specialties cannot be applied directly to the unique workflows of modern radiology practice. However, they can be grouped into more broadly defined strategies to reduce clinical task disruption [3], [Figure 1]:

These broader strategies can inspire solutions tailored to radiology practice.

ANSWERS FOR RADIOLOGY

What, then, can radiologists do to reduce disruptions in the reading room? Several specific solutions come to mind.

Facilitated communication. When radiologists identify time-sensitive or unexpected findings, they are obligated to communicate this information in a timely fashion. In many practices, this requirement amounts to identifying the requesting provider, searching for a phone number, and ultimately calling to deliver findings over the phone. For important but non-emergent findings, such as lung nodules, some practices have replaced the practice of making phone calls with electronic systems for automated communication of results by e-mail, facsimile, or designated assistants. Some systems even allow for automated communication of emergent findings by automatically paging the requesting provider.

Triage assistants. Several medical schools have incorporated medical students into the reading room as paid triage assistants tasked with answering telephone calls, returning pages, and protocoling studies with the help of the on-call radiology resident. This arrangement reduces disruptions to the radiology resident and provides educational and financial benefit to the medical student. As an alternate strategy, some groups have specifically designated a "quality control" radiologist that is excused from interpretive tasks but fields phone calls, protocols and triages imaging studies, and performs real-time scan checks. This approach preserves an undisrupted workflow for radiologists actively engaged in image interpretation, while also increasing the availability of consultative services and other value-based practices.

Computerized ordering and protocoling. Computerized ordering of medical imaging can reduce the likelihood of inaccurate or missing information accompanying each request for imaging, thereby reducing the need for laborious exploration of patients' charts prior to study protocoling or interpretation. When computerized ordering systems are combined with decision support tools, there is a reduced need for radiologists to interact directly with clinical providers to alter unhelpful aspects of imaging evaluation. Electronic systems which can protocol imaging studies can also aid workflow by aggregating patient-related data such as serum creatinine, allergies, and cardiac pacemakers from the EMR and automatically enforcing relevant safety checks.

Integrated imaging applications. Interoperability of PACS, EMR, radiology information system (RIS), voice dictation software, electronic protocoling applications, teaching files, and image post-processing software can dramatically reduce the barriers to efficient workflow. For example, a radiologist opening a study in PACS can be presented automatically and effortlessly with the patient's chart from the EMR and appropriate dictation template within the dictation software.

Workload optimization. Prioritization of high-acuity cases can reduce workflow inefficiencies by reducing the number of incoming interruptive communications from clinical providers in need of urgent results. In addition, diversified scheduling of non-urgent exams to reduce day-to-day variations in anatomy-specific imaging volume may permit more predictable and therefore more easily managed workload.

CONCLUSION

Disruptions of radiologist workflow occur commonly and come from a wide range of sources, including phone calls, pages, in-person consultation, coordination of care, and burdensome software tools. Other hospital-based specialties utilize different workflows than radiology but have developed solutions to mitigate workflow disruption; these approaches can inspire improvements in radiology. Through process redesign and improved IT tools, radiologists can streamline workflow to reduce the number of disruptions and competing demands during the cognitively intense task of image interpretation, and thereby facilitate the delivery of more efficient and higher quality radiological care.

REFERENCES

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