

## Editorial

Michael Bruno, Kevin Johnson, Nick Argy and Mark L. Graber\*

# Improving diagnosis in radiology – progress and proposals

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Diagnostic radiology is a specialty of medicine that is uniquely dedicated to the diagnostic process, and it is the only specialty that provides contributing information (and opinion) toward the diagnostic formulation of almost every hospitalized patient throughout the developed world today. As such, one can reasonably conclude that radiology contributes substantially to both successful diagnosis, and to diagnostic error as well, although the actual balance of each contribution is difficult to assess.

Diagnostic error in radiology also represents a microcosm of the more general problem and illustrates in very unique ways both the cognitive origins of diagnostic error and the many system-related complexities that can contribute. There is much to be learned about the global causes of diagnostic error by studying how they play out in this one specialty. Radiology also represents a role model for how diagnostic error can be effectively addressed, as illustrated by the many and detailed efforts of the American College of Radiology (ACR) to define effective interventions to reduce error and harm, as described in some detail in a contribution from Allen et al. [1]. The ACR was a key sponsor of the National Academy of Medicine's major report on Improving Diagnosis in Healthcare, and it is one of the pioneering professional societies that has recognized diagnostic error as a priority problem.

A unique approach to studying diagnostic errors involving radiology is the study of closed malpractice claims. Dana Siegal et al. [2] explore over 1300 such cases collected through the CRICO Strategies Comparative

Benchmarking System over a 5-year period. The analysis provides many lessons for improving diagnosis, both through insights provided by individual cases and the trends that emerged. Over half of the cases involved lapses in detecting or interpreting images, and a quarter involved breakdowns in communicating imaging results effectively.

Several of the articles in this special issue represent contributions from the guest editors: Kevin Johnson [3] presents the central role of Bayes' theorem and Bayesian reasoning on the diagnostic process and a very nice graphical way for learners to visually appreciate the power of this approach. Bruno [4] points out that radiology is practiced in an environment of very high uncertainty, and some of what we consider to be radiologic interpretive error is actually best understood as a reflection of that fundamental uncertainty. One could argue that the entire role of diagnostic radiology is to reduce the level of uncertainty for the clinician sufficiently to allow the physician to act, and radiology has succeeded once that goal is accomplished, even when the radiological impression does not match the final diagnostic outcome. The fundamental processes of diagnosis are reviewed, as well as radiology's role in the overall diagnostic process, and the various types of error to which radiologists are particularly prone. Remediation strategies to reduce error and resulting harms to patients are discussed.

Jim Duncan [5] of the Washington University in St. Louis shines a bright light on the problem of clinician information overload and attempts to place the role of radiology within the framework of Claude Shannon's mathematical theory of communication (better known as "information theory"). Dr. Duncan illustrates the complex and nonlinear relationship that exists between "data" and "information," the former being objective but lacking context and the latter being more difficult to ascertain, but having the benefit of being "actionable." He proposes that the action – in the form of a clinical intervention for a particular patient – can occur only when the level of uncertainty in the diagnostic information has been reduced to an acceptable level, which may be radiology's central role.

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\*Corresponding author: **Mark L. Graber**, SIDM, 5 Hitching Post, Plymouth, MA 02360, USA,

E-mail: [mark.graber@improvediagnosis.org](mailto:mark.graber@improvediagnosis.org)

**Michael Bruno**: Division of Emergency Radiology, Department of Radiology, Penn State Milton S. Hershey Medical Center, Hershey, PA, USA, E-mail: [mbruno@pennstatehealth.psu.edu](mailto:mbruno@pennstatehealth.psu.edu)

**Kevin Johnson**: Radiology and Biomedical Imaging, Yale University School of Medicine, New Haven, CT, USA, E-mail: [kevin.johnson@yale.edu](mailto:kevin.johnson@yale.edu)

**Nick Argy**: Health Law Management and Policy, Boston University Medical Campus, Boston, MA, USA, E-mail: [nargymd@gmail.com](mailto:nargymd@gmail.com)

Laura Zwaan and Hardeep Singh [6] provide a timely update on efforts to improve communication of radiology test results. A growing body of evidence finds that an unacceptable fraction of test results, even concerning critical abnormalities, falls into a void and is never communicated effectively or acted upon. They outline recommendations that could improve the reliability of the communication process, including the need for clear-cut and well-accepted policies on who “owns” the responsibility for following up on tests that are ordered, and being able to escalate alerts if the primary party responsible does not take appropriate action. Patients can play an important role as the safety net in this process, by asking for a copy of the results themselves.

George Taylor [7] provides two contributions to this special issue, one being the enchanting X-ray art images that grace the intermediary pages. For those of us who see X-rays used only for medical imaging, Taylor’s X-ray images of objects from nature are at once striking and beautiful. His artistic contribution is matched by an academic one, a comprehensive review of perceptual error in Radiology – why seemingly obvious findings are missed [7]. Using examples from his work in pediatric radiology, the major etiologies are explored and illustrated.

Leonard Berlin [8] is radiology’s unequalled medico-legal scholar, having spoken and published extensively in the area of radiology legal medicine for decades. In this issue, he writes about the “ill-fated triad” of medical errors, malpractice litigation, and the rise of defensive medicine, a practice that arose out of the malpractice crisis of the 1970s and has in recent years taken on a life of its own – with myriad negative downstream consequences for patient safety and diagnostic error. He makes a compelling argument that enhancing physician’s ability to learn from medical errors would have more value for patients than the current adversarial and punitive medico-legal system does.

What should medical trainees be taught about radiology? Laura Zwaan et al. [9] recommend that trainees receive better training on basic image interpretation and the value of collaborating with staff radiologists in selecting optimal imaging strategies. With imaging results now widely available to the ordering clinician, the authors argue that teaching the basics of image interpretation is now more important than ever, and that more curriculum time needs to be devoted to these topics.

Finally, two active projects are described, both aiming to improve safety. Rebecca Jones [10] presents an overview of a project underway at the Pennsylvania Patient Safety Authority to improve follow up of diagnostic radiology studies on patients seen in the emergency department.

It is our hope that this special issue will stimulate both discussion and thought on how to improve the safety of radiological imaging. Although we have tried to identify articles that reflect state of the art summaries in various areas, there are probably areas that we have missed and ongoing projects that we have failed to mention. We encourage readers to call these omissions to attention so that the advances to improve diagnostic safety in this broad field can be recognized and emulated in other areas that are still at the starting gate.

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