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Diagnostic errors: moving beyond 'no respect' and getting ready for prime time

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Over more than a decade of widespread attention to medical error and patient safety, a small group of academicians lamented that diagnostic errors have been relatively underemphasised and received 'no respect' in the larger conversation about improving care.^{1–3} In response, this dedicated group organised the annual Diagnostic Error in Medicine (DEM) conferences with support from the US Agency for Healthcare Research and Quality.⁴ The goal of the DEM conference (now in its 6th year)⁵ is to promote a better understanding of diagnostic error and to foster the creation of novel intervention strategies to improve the quality of diagnosis. Thus far, the DEM conferences have successfully united researchers and other experts in the field of diagnostic error, practitioners from a variety of clinical and non-clinical specialties, educators, patients, informaticians and several national stakeholders. This month's supplement to *BMJ Quality and Safety* reflects the novel scholarship and synthesis of knowledge that have been shaped through the DEM forum presentations and discussions specifically over the past 3 years.

At the outset, I would like to thank the 30 anonymous reviewers, many of whom are experts from outside the field of diagnostic error, who helped strengthen the contributions to this supplement. Their comments helped improve the rigour and overall quality of the papers. As a result of the contributors' and reviewers' hard work, this supplement offers a critical, up-to-date summary of the current state of the science for diagnostic error. Although the science is still early in its development, I am confident that these contributions will promote engagement between the diagnostic error community and others with a stake in improving the quality of healthcare.

Historically, diagnostic errors have been on the sidelines of patient safety research, in part because we do not have good

estimates on how common these events are relative to more well-known safety concerns such as hospital-acquired infections and medication errors. The challenges of measuring diagnostic errors have emerged as an unavoidable obstacle to progress in this area, particularly as the focus of research has shifted from autopsy reports^{6–7} and malpractice claims^{8–9} to more representative and sophisticated data sources.^{10–11} In this supplement, Graber summarises a variety of research methods that address the frequency and burden of diagnostic errors¹² and offers his perspective on how to improve measurement. However, at the heart of the measurement issue is the central question of how to define diagnostic error. Should diagnostic error be defined as any missed, delayed or wrong diagnosis,¹³ or should errors be defined only when there is a clear missed (ie, preventable) opportunity to make a timely or correct diagnosis?^{10–14–16} Should the defining feature of diagnostic error be the inaccuracy of the diagnosis per se, or should it be based on outcomes such as patient harm?¹⁷ Although we are far from consensus on this issue, Graber offers a useful roadmap for developing definitions that will help advance research in this area.

Another reason why diagnostic errors have remained elusive to researchers is that they are largely related to the cognitive performance of physicians. Croskerry *et al* present a two-part review^{18–19} of cognitive biases that may contribute to diagnostic error and the theoretical underpinnings of several 'debiasing' approaches. While they admit that the role of bias in diagnostic error remains ill-defined, they justify attention to cognitive prevention strategies by citing research findings from the fields of cognitive and behavioural sciences. The medical community will need to work closely with cognitive psychologists to translate scientific knowledge about cognitive processes into practice innovations, improved diagnostic

performance and better patient outcomes. Educational reform has been proposed as one strategy to enhance physicians' cognitive performance. Trowbridge *et al*, for instance, propose an educational agenda that focuses on concepts such as metacognition, intuitive reasoning and recognition of the role systems can play in diagnostic error.²⁰ While acknowledging the barriers and challenges of changing practice, they propose a plan to implement educational strategies focused on both current and future physicians.

Henriksen and Brady offer a human factors perspective on diagnostic performance,²¹ arguing that a single physician's knowledge and cognition, even in the best circumstances, are not always sufficient to ensure an accurate diagnosis. They emphasise the importance of considering human factors concepts such as shared mental models and distributed cognition, reminding us that diagnostic work is distributed across time and place and involves interactions among multiple players. One important player in this framework is technology. Technology can improve the diagnostic process by enhancing communication and providing decision support to busy front-line physicians.²² For instance, integrated electronic health records (EHRs) provide ready access to progress notes and other diagnostic information (eg, test results, referrals, etc) and facilitate closed-loop order entry.²³ El-Kareh *et al* present an overview of the current state of health information technology (IT) solutions in diagnostic error.²⁴ They propose a conceptual framework that aligns the diagnostic process with these solutions and highlights areas for further development.

The patient also plays a vital role in the diagnostic process. With growing recognition of the fallibility of the human mind and of the healthcare system, patients have become increasingly engaged in making decisions about their care. Several conversations at the DEM meetings have built momentum for development of novel strategies to enhance patient activation, particularly around issues of safety. Patients themselves are increasingly involved within the diagnostic error 'movement'. To further this momentum, McDonald *et al* review strategies for patient involvement in reducing diagnostic error and discuss the role of patients in not only improving their own diagnoses, but also in improving the diagnostic delivery system and influencing research and policy.²⁵

As we turn our attention to new practices and paradigms for understanding the complexities of diagnosis, we cannot overlook the diagnostic tools that physicians already rely on in everyday practice. The processes of ordering, performing, interpreting, communicating and acting upon diagnostic test results remain vulnerable to errors. Epner *et al* identify five major sources of diagnostic error related to the testing process and argue that laboratory medicine should adopt an outcomes-based approach centred on the reduction of patient harm.²⁶ Diagnostic testing has also been scrutinised from the perspective of efficiency and resource utilisation, as highlighted by the recent launch of the

Choosing Wisely campaign.²⁷ At the 2012 DEM research summit, Dr David Simel said, "the best diagnosticians are the ones who get the diagnoses with spending the least amount of resources." To explore this concept further, Newman-Toker *et al* propose ways to frame issues of cost-effectiveness of diagnosis within the larger context of diagnostic error.²⁸

Fortunately, our field is beginning to attract the attention that we have long hoped for, as many of the themes and topics of past DEM conferences are being progressively incorporated into the broader discourse on patient safety. For instance, a recent report from the American Medical Association Center for Patient Safety²⁹ highlighted the importance of diagnostic error and the critical need for future research on this topic. Although this is a welcome trend, we are now more compelled than ever to fulfil our promise of improving the quality and safety of diagnosis. In order to propel our emerging field forward, we need more novel ideas and better research methods to address some of the most important hurdles to progress. Furthermore, our methods must account for the inherently multidisciplinary nature of diagnostic error research. At DEM 2012, we introduced a research summit that is now a regular feature of the conference. Zwaan *et al* summarise existing research methods on epidemiology, contributory factors and interventions related to diagnostic error and propose an agenda for future multidisciplinary research in this area.³⁰ As studies better account for the distributed nature of healthcare systems³¹ and complex interactions of system and cognitive contributory factors,³ research on diagnostic error will present both greater challenges and greater rewards.

Several clear areas of opportunity have emerged for study and reduction of diagnostic error. First, measurement of diagnostic performance will likely become an important agenda item for policy makers, and the field should capitalise on this.³² In the USA, there is already a shift towards the Accountable Care Organisation model for healthcare delivery. Other recent healthcare reform efforts through the Affordable Care Act include the National Quality Strategy, an initiative whose aims include reducing harm caused in care delivery.³³ These initiatives further emphasise accountable care, improving communication and coordination and strengthening primary care. The UK has a large initiative focused on improving the timeliness of cancer diagnosis.³⁴ These and related national-level initiatives create the need for both research and implementation activities focused on measuring and reducing diagnostic error. The field must also seek opportunities to partner with key organisations (eg, in the US, the National Quality Forum)³⁵ to bolster efforts to measure diagnostic performance.

Second, reform initiatives created by the Health Information Technology for Economic and Clinical Health Act offer an opportunity to leverage health IT for safer diagnosis. For example, diagnostic errors related to test result follow-up are fairly common, and electronic communication and tracking of abnormal

test results is one method of improving diagnostic safety.²³ Our research group recently developed techniques to mine data from large EHR repositories to identify lack of timely follow-up on cancer-related abnormal findings.³⁶ Although advances in health IT bring opportunities, investments in health IT must also account for potential unintended consequences^{37 38} that might compromise the reliability of the diagnostic process. The diagnostic process in IT-enabled systems needs to be conceptualised as a ‘sociotechnical’ process³⁹ and supported by rigorous techniques to detect risks proactively rather than after the fact.⁴⁰ Some of these risks are now apparent. Clinicians face challenges in documenting care electronically, where critical thinking is often not captured within notes that are written to conform to billing requirements. A related challenge is information overload created by the EHRs that carry a voluminous amount of information, within which critical findings might be missed.⁴¹ Thus, the diagnostic error field must prepare itself to make the use of IT more meaningful for improving diagnosis.⁴²

Third, we have an opportunity to reconceptualise the process of diagnosis. Much of current thinking still focuses on diagnosis as a self-contained process that happens all within the brain of a single clinician. We are all well aware of the propensity for heuristics, biases, overconfidence and other cognitive challenges to interfere with such a process. Moreover, we recognise that this conceptualisation does not reflect real-world practice, in which systems, team members and patients themselves inevitably influence clinicians’ thought processes. Thus, the field must move towards a systems-based model of diagnosis that incorporates principles from high-reliability organisations. A more resilient healthcare system may embrace a culture that encourages more transparent discussion of diagnostic error. For example, we cannot continue to rely on malpractice claims and studies from the same handful of institutions that have been working in this area over the last decade. Adopting a systems-based approach to studying diagnostic errors may inspire more institutions to start identifying these errors within their own walls. This approach would also help the field of diagnostic errors better integrate with the rest of the systems-based patient safety movement.

Fourth, the media has created both public awareness and new opportunities for the field. In the past year, diagnostic error research and events have received unprecedented coverage in several major news outlets, including the *Wall Street Journal*, *New York Times*, *Washington Post* and *Time* magazine. The stories are powerful—at times sensational—and inspire the public to advocate for solutions. However, unlike some types of patient safety events, diagnostic errors do not have a ‘smoking gun’ that is poised for rapid intervention. Although the temptation of offering a quick fix is understandable, rushing into poorly understood or poorly implemented solutions might prove equally harmful. In reality, most solutions need

to target multiple points of vulnerability and should be developed and implemented with input from multiple perspectives. With attention from its new-found audience, the field of diagnostic error now has an opportunity to define its needs, including the unknowns. A critical task before us, then, is to effectively connect with and educate our larger public audience about the complexities of diagnosis, as well as their role in the process, so that public action and advocacy are on the side of the science.

Lastly, we have the opportunity to provide leadership, an essential element of patient safety. With many potential stakeholders who could assume a leadership role, there is the risk of losing the engagement of those who believe that others are taking care of the problem. Perhaps one of the greatest successes of the DEM conferences is the formation of the Society to Improve Diagnosis in Medicine (SIDM), a new, independent organisation dedicated to research, education and awareness about diagnostic error (<http://www.improvediagnosis.org>). SIDM is acting as a central hub to bring together key stakeholders, including clinician leaders, policy makers, software/EHR vendors, healthcare executives, medical education and certifying organisations, researchers from several diverse disciplines, patient advocates, accrediting organisations, funding bodies and the insurance industry. All are invited to the table for a conversation on reducing diagnostic error, and there has never been a better time to discuss this. Each article in this supplement offers a thought-provoking starting point for these conversations. I hope that readers will join in the discussion and extend the diagnostic error movement the respect it deserves as our field becomes ever more ‘ready for prime time’.

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