Improving Diagnosis Through Education

Andrew P.J. Olson, MD, and Mark L. Graber, MD

Abstract

Diagnosis is the cornerstone of providing safe and effective medical care. Still, diagnostic errors are all too common. A key to improving diagnosis in practice is improving diagnosis education, yet formal education about diagnosis is often lacking, idiosyncratic, and not evidence based. In this Invited Commentary, the authors describe the outcomes of a national consensus project to identify key competencies for diagnosis and the themes that emerged as part of this work. The 12 competencies the authors describe span 3 categories—individual, teamwork, and system related—and address ideal diagnostic practice for all health professionals. In addition, the authors identify strategies for improving diagnosis education, including the use of theory-based pedagogy and interprofessional approaches, the recognition of the role of the health care system to enhance or inhibit the diagnostic process, and the need to focus on the individual attributes necessary for high-quality diagnosis, such as humility and curiosity. The authors conclude by advocating for increasing and improving the assessment of individual and team-based diagnostic performance in health professions education programs.

Diagnosis is the cornerstone of providing safe, efficient, and effective medical care. A physician's ability to diagnose a patient's illness—that is, arrive at an explanation for a patient's health problem—is one of the hallmarks of medical expertise and is fundamental to assigning correct and effective treatments and delineating accurate prognoses.[1] Each patient's diagnostic journey is unique, and even common conditions have multiple "correct" paths to diagnosis. Yet, the outcomes of the diagnostic process are not nearly as reliable as they should be; the burden of diagnostic error is unacceptably high, with real costs in lives and dollars.[2]

While many clinical interventions to improve diagnosis have been suggested and some have been studied, we firmly believe that the most promising and effective way to improve the outcomes of the diagnostic process is to improve the education of health professionals.[3] The educational pathway through which health professionals learn to make diagnoses is just as idiosyncratic and unique as the means by which they make diagnoses during patient care. Thus, educators must ensure that trainees are prepared to walk along with patients and guide their diagnostic journeys when they enter practice. Educators also must stop trusting that health professions education programs are producing expert diagnosticians through the serendipity of the clinical experiences to which trainees are exposed.

The quality and safety of a diagnosis is determined by the competencies health professionals and patients bring to the diagnostic process. The time has come to reconsider which competencies are truly needed in this context.[3,4] Said differently, it is challenging, if not impossible, to improve a process without understanding what success in that process looks like. We must begin with the end in mind. Until now, the goal of health professions education has been to instill in trainees the knowledge core to the profession. Medical trainees are good at learning facts—yet, diagnostic errors are still common. We believe that educators must move past teaching facts alone and define the competencies necessary for trainees to achieve diagnostic excellence and reduce the likelihood of diagnostic error in practice. All good curricular design flows from an understanding of what that curriculum is trying to achieve,[4,5] and until now, the outcomes (competencies) needed for high-quality diagnostic performance have not been defined.

Outcomes of a Consensus Process on Diagnostic Competencies

As part of the Society to Improve Diagnosis in Medicine, we led an interprofessional, collaborative project funded by the Josiah Macy Jr. Foundation that took a very important first step in improving diagnosis education: defining the competencies necessary to achieve diagnostic excellence.

First, a scoping review identified the elements of a comprehensive diagnosis curricula and the ways that education could improve the diagnostic process.[3] This review affirmed the importance of trainees acquiring and effectively using the relevant knowledge base for their profession. The authors of the review also argued that focusing too much on the transmission of facts alone, rather than on the acquisition of true diagnostic competence, may have negative consequences for patient outcomes. Based on the findings of the scoping review, an interprofessional group, representing medical, physician assistant, nursing, pharmacy, and physical therapy educators as well as trainees and patients, used a modified Delphi process and a formal Q-sort process to identify 12 competencies (see List 1) in 3 domains—individual, teamwork, and system related—that, if met by all trainees, could lead to better diagnostic performance.[6] As the leaders of this group, we believe that all health professionals have a role in diagnosis; thus, these competencies are relevant for all health professions programs with appropriate contextual adaptation.

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List 1
Competencies to Improve Diagnosis[a]

Individual Competencies (I-Components)

The knowledge, skills, and attitudes that a health professional must demonstrate on an individual level to contribute to the diagnostic process in her or his specific role.

I. Demonstrate clinical reasoning to arrive at a justifiable diagnosis (an explanation for a health-related condition).

I-1. Accurately and efficiently collect the key clinical findings needed to inform diagnostic hypotheses. Use the following tools appropriately and efficiently in the diagnostic process: effective interpersonal communication skills, history taking, physical examination, and record review; diagnostic testing; and the electronic health record and health information technology resources.

I-2. Formulate, or contribute to, an accurate problem representation expressed in a concise summary statement that includes essential epidemiological, clinical, and psychosocial information.

I-3. Produce, or contribute to, a correctly prioritized, relevant differential diagnosis, including cannot miss diagnoses.

I-4. Explain and justify the prioritization of the differential diagnosis by comparing and contrasting findings and test results with accurate knowledge about prototypical or characteristic disease manifestations and atypical presentations and by considering pathophysiology, disease likelihood, and clinical experience.

I-5. Use decision support tools, including point-of-care resources, checklists, consultation, and second opinions, to improve diagnostic accuracy and timeliness.

1-6. Use reflection, surveillance, and critical thinking to improve diagnostic performance and mitigate detrimental cognitive bias throughout the clinical encounter. Discuss and reflect on the strengths and weaknesses of cognition, the impact of contextual factors on diagnosis, and the challenges of uncertainty. Demonstrate awareness of atypical presentations, information that is missing, and findings that don't "fit."

Teamwork Competencies (T-Components)

The knowledge, skills, and attitudes that a health professional must demonstrate in collaboration with the other members of the diagnostic team.

T. Partner effectively as part of an interprofessional diagnostic team. Communicate effectively and solicit information from all members of the team (including the patient and family) to create a shared mental model of the patient's illness and the plan for diagnostic evaluation.

T-1. Engage and collaborate with patients and families, in accordance with their values and preferences, when making a plan for diagnostic evaluation. Listen actively, encourage questions, and be alert to new or changing information. Explain the diagnostic process, including the patient's and family's role in helping to identify the most likely diagnosis. Share appropriately when diagnostic uncertainty exists.

T-2. Collaborate with other health professionals (including nurses, physicians, physician assistants, radiologists, laboratory professionals, pharmacists, social workers, physical therapists, medical librarians, and others) and communicate effectively throughout the diagnostic process. Acknowledge and constructively challenge authority gradients, especially between clinicians and patients\families.

T-3. Apply effective strategies at transitions of care to facilitate accurate and sufficient information transfer about a diagnosis, including any pending workup and areas of uncertainty. Close the loop on test result communication and clarify expectations with the team for test result follow-up.

System-Related Competencies (S-Components)

The knowledge, skills, and attitudes that a health professional must demonstrate in relation to how the diagnostic process operates within the health care system.

S. Identify and understand the systems factors that facilitate and contribute to timely, accurate diagnoses and error avoidance.

S-1. Discuss how human factors contribute to diagnostic safety and error by identifying how the work environment influences human performance. Take steps to mitigate common systems factors that detract from diagnostic quality and safety. Use local resources (including people, teams, and technology, especially the electronic health record) effectively and efficiently to optimize patients' access to care, diagnostic testing services, and appropriate experts for consultation.

S-2. Advance a culture of diagnostic safety that encourages open dialogue and continuous learning from analysis and discussion of excellent diagnostic performance, near misses, and errors. Give and receive feedback at an individual and team level to improve subsequent diagnostic performance.

S-3. Disclose diagnostic errors and missed opportunities transparently and in a timely manner to patients, families, team members, supervisors, and appropriate quality and risk management staff.

[a]Adapted from Olson A, Rencic J, Cosby K, et al. Competencies for improving diagnosis: An interprofessional framework for education and training in health care. Diagnosis (Berl). 2019;6:335–341.[6]

Several important themes related to diagnosis education emerged from and around these competencies. First, educators must ensure that curricula to improve diagnostic decision-making ability have solid grounding in theory from cognitive psychology and the learning sciences.[7,8] We in academic medicine have made significant strides in recent years in understanding the cognitive underpinnings of clinical reasoning as well as the profound implications of the dual-processing model and situated cognition.[9–11] We know then that curricula should be designed to enhance pattern recognition, improve critical thinking, emphasize an appreciation for the inherent fallibility of cognition, and minimize the negative effects of cognitive bias, all of which should be aimed at improving real-world clinical performance.

Second, most diagnosis curricula, especially in medical schools, are focused on an individual trainee arriving at a diagnosis, often in isolation. However, this is not how diagnosis occurs in the modern era (nor was diagnosis likely ever really performed this way). Instead,

all diagnoses are made through the rich, context-dependent collaboration of members of the diagnostic team, including patients, physicians, nurses, pharmacists, physician assistants, and others. Thus, educators must focus on preparing health professionals to be members of a diagnostic team and, further, assess trainees as members of such teams. This effort begins by teaching trainees to work with patients as partners in the diagnostic process. Diagnosis is not something health professionals do *for* patients, but instead it is something they do *with* patients. Health professionals, then, should teach and learn diagnosis with patients. The consensus project described above involved members of the patient community, and there is no reason that diagnosis curricula cannot do the same. Further, educators must ensure that trainees can explain their diagnostic reasoning, and the inherent uncertainty in it, to patients and show that they can take patients' values, experiences, and preferences into account when mapping out the diagnostic journey. As the diagnostic team includes every health professional who has contact with the patient, education and training need to provide experiences that illustrate the many ways these other team members can contribute to a successful diagnosis.

Third, the health care system has amazing power to enhance or inhibit the diagnostic process, and educators must ensure that trainees are prepared to work, and advocate for change, within this system. Thus, diagnosis curricula must not be removed from the health care system but instead ensure that trainees are exposed to the real ecosystem of medical practice with all its chaos, flaws, and opportunities.[12] Trainees must learn to practice with electronic health information technologies rather than in spite of them,[12] and they must know how to take advantage of the many affordances these technologies provide to improve diagnosis. These include immediate access to knowledge repositories, sophisticated decision support tools for differential diagnosis, and facilitated access to second opinions and tools to help ensure reliable communication. The pace of technological innovation in medicine is breathtaking, and it is important to ensure that trainees are able to use the most modern, evidence-based tools to improve diagnosis. Augmented intelligence and machine learning will play key roles in improving diagnosis in the future, and educators must equip trainees to use these technologies. Although faculty development is fundamental to this, many medical school faculty who teach diagnosis are unfamiliar with, if not resistant to, these technologies, a challenge that educators must overcome.

Finally, educators must help trainees acquire the values and perspectives that will position them to be safe and effective diagnosticians. While some of these traits, like curiosity, have long been valued, others, like humility, have been woefully undervalued.[13] Learning to balance risk, urgency, vigilance, and patience is important, as some diagnoses can play out over time and others may not need to be made at all. All health professionals should be hungry for, and equipped to give and receive, feedback that is fundamental to lifelong diagnostic calibration.[14–16]

Other Considerations

Coinciding with these curricular changes, there must be efforts to improve the assessments that educators use to determine trainees' competence with respect to diagnosis. Good science and theory in this space exist, but educators must incorporate this knowledge into their curricular design. Not only should educators continue to assess trainees' medical knowledge, but they also must iteratively assess trainees' diagnostic performance in simulated and real clinical environments. Trainees must be exposed to many and varied patient cases and receive continuous feedback (i.e., assessment for learning) to inform their future decision making. Finally, educators must assess teams of trainees (and teams in practice) with respect to their diagnostic performance to enable continuous improvement.[17,18]

The identification of the key competencies necessary for diagnostic performance, which we have described here, is an important catalyst for the much-needed coming revolution in diagnosis education.[19] Educators must adapt existing diagnosis curricula—and when needed, design new curricula—with the end goal of teaching trainees to provide excellent patient care. What we in academic medicine have done in the past, and what we are doing presently, is not enough to ensure safe, timely, and efficient diagnosis. We must do better; identifying diagnostic competencies is an important step.

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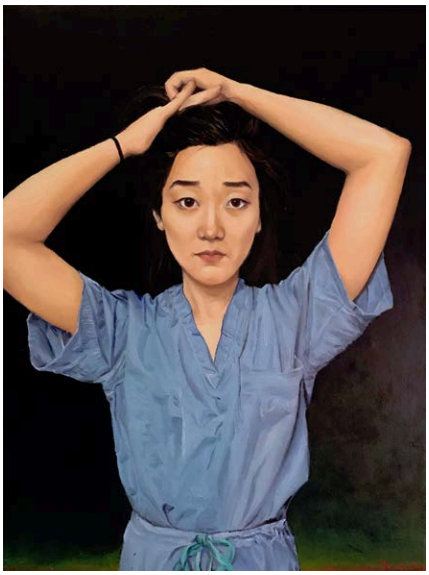
Cover Art
Artist's Statement: MS2

Medical school can be an intellectually, emotionally, and spiritually transformative experience, as demanding as it is rewarding. Recognizing this as a critical period of my life, I felt inspired to capture my growth as a person and student through an annual series of oil self-portraits (including *MS2*, on the cover of this issue)—somewhat cheekily in the same grand, traditional medium used to feature deans, chairmen, and other prominent figures around our school and its affiliated hospitals. Though this series began as a personal artistic endeavor, I have found that these paintings often hold up a mirror for other physicians to reflect on their own journeys through training as well.

An unparalleled change occurs in the transition from preclinical to clinical education. As several schools shift clerkships earlier in their curricula, what it means to be a second-year medical student (MS2) can fundamentally change. My MS2 year consisted of 12 unforgettable months rotating through various departments of the Massachusetts General Hospital. Reflecting on what



MS2

image of myself I wanted to preserve for that year, I recalled the first time I performed chest compressions on a real patient, the first babies I helped deliver, the first goals of care I helped patients and families articulate. I recalled the faintest dawns during my overnight and 24-hour shifts, with my clinical skills just beginning to emerge out of the pitch black of inexperience.

During MS2, the idealized image of what it means to be a doctor, of caring for a patient in the truest sense, became a realistic, tangible thing—complete with eye bags, wrinkly scrubs, and hair out of place. For me, MS2 was all about tying my hair up and diving in, so in my self-portrait, I captured that moment of preparation right before action, that familiar gesture and pose I saw every morning in the mirror. The background, an abstract early dawn, invokes my recognition that the inevitable sunlight of knowledge would come soon. My literal reflection turns outward, asking my future self and other viewers to remember this feeling, to remember this stage in training.

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