Diagnosis, the Missing Course

By Susan Carr, Senior Writer

Mark L. Graber, MD, founder and now chief medical officer of the Society to Improve Diagnosis in Medicine (SIDM), has said, "There is no course on diagnosis in medical school."

How can that be?

The ability to diagnose patients' medical problems is central to being a physician. How is it possible that diagnosis is not taught in medical school? The answer in part is a clarification: diagnosis is a process learned in practice, more through on-the-job training than dedicated coursework in the classroom or even in simulation. Students begin to gain building blocks of diagnosis—eg, basic science knowledge and illness scripts—in medical school and then become increasingly proficient as interns and residents through clinical apprenticeship with experienced physicians. Classically, diagnosis is more learned than taught.

In recent correspondence, Graber noted that the classical approach is currently being revisited as part of a new focus on diagnosis education:

> *This new field emphasizes two major shortcomings of the current apprenticeship model: First, thanks to myriad contributions from the fields of cognitive and social psychology, we know much more about the clinical reasoning process and how it goes astray in cases of diagnostic error. Second, it is increasingly appreciated that successful diagnosis depends on many factors outside of clinical reasoning.*

Clinical reasoning is a complex process that until recently has been taken largely for granted. A simple definition includes the cognitive process by which "clinicians observe, collect, and analyze information that ultimately leads to an action (i.e., diagnosis and therapy)"[1(p111)] and reflects the physician's knowledge base and experience, in addition to process-based skills.

In *Teaching Clinical Reasoning,* Robert Trowbridge, MD, Joseph Rencic, MD, and Steven Durning, MD, recognize the influence of factors outside the physician's control, including the clinical environment, interactions with the patient, and subconscious dynamics that affect the cognitive process.

> *Historically, clinical reasoning focused on the clinician's brain ("the world inside the clinician's head") but has now expanded to include patient and environmental factors (the clinician's head inside the world")[2(np),3]*

This concept, referred to as *situativity,* explores how interactions affect the clinical reasoning process. Collaboration is fundamental to leveraging an individual's knowledge with that of others, including patients and colleagues, together with data and technology, for improved outcomes.[3] Situativity would be one element of the missing course on diagnosis. Other essential elements would be content on health information technology, critical thinking, cognitive psychology, and cognitive bias.[4-6]

The National Academy of Medicine, in its landmark report, *Improving Diagnosis in Health Care,*[7] also emphasizes the collaborative, social nature of diagnosis. The process must include effective communication and teamwork, wise use of consultants and decision-support resources, productive working relationships with laboratory and imaging services, and life-long learning from feedback on performance. Recognizing the need to include this aspect of diagnosis in training, Graber notes:

> *Diagnosis is a process that interdigitates with every other part of a healthcare system. If there is no specific training on this, students will be sub-optimally prepared to achieve high levels of diagnostic quality and safety in real-world practice (written communication, September 2019).*

Competencies Form a Foundation

This new approach to teaching diagnosis is consistent with a recent trend toward using competencies to "define and codify essential professional abilities"[8(np)] in health care professions education. Competencies are performance-based outcomes of training, things that students must learn to do, as well as know.[9]

With support from the Josiah Macy Jr Foundation, SIDM convened an inter-professional group of experts to develop a consensus curriculum based on competencies for diagnosis. The competencies span three domains: individual, team-based and system-related and range, for example, from collecting clinical findings, to collaborating with patients and families, and identifying how the work environment affects human performance. They are relevant for all health care professionals and may be adapted for all specialties and disciplines.[9] Viewed as a first step toward improving diagnosis education, the competencies can be used to fill gaps in programming and assess the results, and serve as content guidelines for that missing course on diagnosis.

Implementation Challenges

It is one thing to identify gaps in current medical school training and another to actually implement new curricula. Having defined competencies to work with helps but is not sufficient for addressing the very real barriers programs face. Competition for program time and a paucity of interested and qualified faculty are the major challenges innovators encounter.

The June 2019 issue of [Diagnosis](#) is devoted to diagnosis education and includes reports from medical schools that have recently implemented new programs and curricula. These early efforts demonstrate both opportunities and challenges.

In 2013–2016 Albert Einstein College of Medicine/Montefiore Medical Center, offered PGY-2 residents in internal medicine an elective curriculum in clinical reasoning.[10] Seven classes covered strategies and reflection, cognitive error, and methods for strengthening medical knowledge. A total of 47 students participated in three sessions. Two different surveys were used for assessment. In 1 survey, all 30 participating residents reported they had improved their skills across 15 domains of clinical reasoning. On the other, 25 residents' scores on a multiple-choice test of knowledge (eg, cognitive error, Bayesian analysis) rose from 58% to 81%. The authors acknowledge the study has limitations: a lack of standardized tools for assessing the effects of this kind of curriculum and their inability to measure the effect of the training on the rate of diagnostic error in clinical practice.

Another article describes a program at the University of Pittsburgh School of Medicine, which introduced a clinical reasoning curriculum for 1 of 4 groups of third-year students in an internal medicine clerkship, thus delivering somewhat randomized and controlled results.[11] The curriculum consisted of 6 interactive online modules and 1 case-based workshop. Students were evaluated after completing the curriculum with a 20-question quiz, comparative analysis of their hospital admission notes, and a survey about clinical reasoning skills. The results showed improved knowledge and skills in clinical reasoning among the intervention group (66 students) compared with students in the control group. While this study shows positive results and will be extended with a similar program for pre-clinical students, the authors acknowledge that "optimal methods for teaching clinical reasoning skills have not been established."[11(p169)]

Pilot Programs to Teach Clinical Reasoning

In addition to a small number of medical schools that already have focused programs on specific aspects of clinical reasoning (eg, communication or Bayesian reasoning) and other early efforts to implement curricula, more than 20 professional schools of medicine or nursing are currently developing pilot programs to improve diagnosis.

With support from the Macy Foundation and SIDM, these schools aim to improve the diagnostic performance of their students and advance what is known about how best to design, implement, and evaluate these programs. The following list is a sample of pilot programs designed for medical schools:

> A series of online video lectures with quizzes and exercises about the use of clinical decision support.

> Clinical reasoning curriculum plus a workshop for interns that will cover dual process theory, problem representation, and illness scripts.

> Comprehensive curriculum of 4 didactic sessions and 10-15 case-based modules with individual practice through an app, podcast-based assignments, and interprofessional case discussion.

An instructional tool to help students develop and justify differential diagnoses by comparing a patient's results to prototypical and atypical disease manifestations.

A guided reflection tool designed for use with inpatients who do not have a diagnosis after 24 hours in the hospital.

A curriculum that promotes synergies between diagnostic accuracy and high-value care.

A program that uses gamification, adult learning theory, and core clinical reasoning principles to reduce diagnostic error.

Clinical Reasoning and Resilience

The process of clinical reasoning in pursuit of a diagnosis is highly complex and full of risk. Trowbridge and Graber observe, "Given all these challenges, it is remarkable that physicians establish the correct diagnosis at the current level of accuracy…,"[2(np)] and point out that improvement is still possible and compelling. To avoid patient harm, as well as harm to clinicians and others, formal education and self-reflective practice should be part of all healthcare professional training from the beginning.

With education and training, physicians will be more likely to know and accept that everyone is vulnerable to making faulty judgments and committing errors. And they will have the ability to mitigate that risk. Armed with knowledge and strategies for clinical reasoning, the ability to reflect on their own thought processes, and exchange constructive feedback with colleagues, physicians will be in a position to improve the performance of their diagnostic teams. They will be a source of resilience in care delivery, able to perform at the highest level possible, recognize potential diagnostic errors, and work continuously to improve.

References

1. Holmboe ES, Durning SJ. Assessing clinical reasoning: moving from in vitro to in vivo. *Diagnosis (Berl).* 2014;1(1):111-117.
2. Trowbridge RL, Rencic, JJ, Durning, SJ, eds. *Teaching Clinical Reasoning.* Kindle ed. Philadelphia, PA: American College of Physicians; 2015. *Teaching Medicine Series.*
3. Durning SJ, Artino AR. Situativity theory: a perspective on how participants and the environment can interact: AMEE Guide no. 52. *Med Teach.* 2011;33(3):188-199.
4. Croskerry P. From mindless to mindful practice--cognitive bias and clinical decision making. *N Engl J Med.* 2013;368(26):2445-2448.
5. Croskerry P. The importance of cognitive errors in diagnosis and strategies to minimize them. *Acad Med.* 2003;78(8):775-780.
6. Saposnik G, Redelmeier D, Ruff CC, Tobler PN. Cognitive biases associated with medical decisions: a systematic review. *BMC Med Inform Decis Mak.* 2016;16(1):138.
7. Balogh EP, Miller BT, Ball JR. *Improving diagnosis in health care.* Washington, D.C.: National Academies Press; 2015.
8. Holmboe, E. Competencies for improving diagnosis: an important developmental step forward [published online ahead of print June 14, 2019]. *Diagnosis (Berl).* doi:10.1515/dx-2019-0042.

9.   Olson A, Rencic J, Cosby K, et al. Competencies for improving diagnosis: an interprofessional framework for education and training in health care [published online ahead of print July 4, 2019]. *Diagnosis (Berl).* 2019. doi:10.1515/dx-2018-0107.

10.   Iyer S, Goss E, Browder C, Paccione G, Arnsten J. Development and evaluation of a clinical reasoning curriculum as part of an Internal Medicine Residency Program. *Diagnosis (Berl).* 2019;6(2):115-119.

11.   Bonifacino E, Follansbee WP, Farkas AH, Jeong K, McNeil MA, DiNardo DJ. Implementation of a clinical reasoning curriculum for clerkship-level medical students: a pseudo-randomized and controlled study. *Diagnosis (Berl).* 2019;6(2):165-172.

AHRQ Spearheads Initiatives to Improve Diagnostic Quality & Safety

The Agency for Healthcare Research and Quality (AHRQ), one of the federal agencies supporting the Coalition to Improve Diagnosis, is spearheading three initiatives focused on improving diagnostic quality and safety.

Working with health system leaders, clinical experts, researchers, patient advocates, and others, AHRQ has identified three critical challenges in today's digital healthcare ecosystem. One of those challenges is to improve diagnosis and reduce diagnostic errors that take place each year by applying evidence-based patient safety strategies, predictive analytics, personalized and precision medicine, and new technologies at the point of care.

To achieve this goal, AHRQ is leading the following efforts:

Partners Enabling Diagnostic Excellence research grants – The goal of this initiative is to fund investigator-initiated health services research projects that will expand the field's understanding and advance diagnostic safety and quality. This project will fund four grants, at approximately $500,000 per year for each project. The request for applications highlighted three research areas of interest: 1) establishing the incidence of diagnostic errors; 2) understanding the contributing factors for those errors for unique clinical conditions and healthcare settings; and, 3) understanding the association between diagnostic errors and outcomes (e.g., adverse events, costs, and utilization).

Patient Safety Learning Laboratories – These learning laboratories are created for transdisciplinary teams to identify threats to diagnostic or treatment efforts associated with a high burden of harm and cost. Following a systems engineering methodology, the learning laboratories stretch professional boundaries, envision innovative designs, and take advantage of brainstorming and rapid prototyping techniques that other leading industries employ. AHRQ plans to support eight grants for four years at $625,000 per year per project to continue this impactful collection of work.

"Our hope is that these partnerships will help to not only drive high-quality research, but that they will also set the stage to improve safety based on the broad application of the findings," says Jeff Brady, MD, MPH, Director, Center for Quality Improvement and Patient Safety, AHRQ.

AHRQ is in the process of reviewing applications and will announce awardees in the fall.

Federal Interagency Workgroup on Improving Diagnostic Safety and Quality - AHRQ convened this workgroup in March 2019, uniting representatives from several different U.S. Health and Human Services (HHS) agencies (CDC, CMS, HRSA, Indian Health Service, Office of the National Coordinator for HIT, Assistant Secretary for Health, multiple institutes within NIH), the U.S. Department of Defense, and the U.S. Department of Veterans Affairs. AHRQ manages this workgroup, which will foster interaction between federal agencies that share interests in diagnostic safety and quality and facilitate activities outlined in the 2015 National Academy of Medicine report, *Improving Diagnosis in Health Care*. Over time, the group can serve as a focal point that's complementary to the work of the Coalition and function as a hub for innovation and progress*.*

"As we work on this together, the role of the Coalition is critically important. We need to continue to be collaborative and coordinated," says Dr. Brady. "The Society to Improve Diagnosis in Medicine and the Coalition play important roles in understanding the problem and using what we know to solve the problems that are related to diagnostic quality and safety."

AHRQ is celebrating its 20th anniversary this year, with a dedicated mission to make health care safer, higher quality, more accessible, equitable, and affordable in the future. The Agency continues to implement their core competencies: funding investigators on the cutting edge of health systems research; developing initiatives to help health systems implement the most effective strategies for practice improvement; and supporting greater use of data and analytics to improve healthcare decision-making.

Additional resources on AHRQ's diagnostic safety and quality tools and findings are their Diagnostic Safety and Quality webpage and Improving Diagnosis flyer.

New Research Showcases the Extent of Diagnostic Error Harm

On July 11, 2019, David-Newman Toker, president of the Society to Improve Diagnosis in Medicine (SIDM), Helen Burstin of the Council of Medical Specialty Societies, Thomas Heymann of the Sepsis Alliance, and Diana Cejas, a pediatric neurologist from North Carolina, joined SIDM co-founder and CEO Paul Epner on Capitol Hill to release important new research showcasing harm attributable to diagnostic errors and share the results with media and Senate and House healthcare staff.

According to the new research, which appeared in *Diagnosis*, one-third (34%) of malpractice cases that result in death or permanent disability stem from an inaccurate or delayed diagnosis, making diagnostic error the number one cause of serious harms among medical errors.

Of the diagnostic errors causing the most harm, three quarters (74.1%) are attributable to just three categories of conditions: cancer (37.8%), vascular events (22.8%), and infection (13.5%). These severe cases resulted in $1.8 billion in malpractice payouts over 10 years. The authors also show that the top five errors in each category collectively account for nearly half (47.1%) of all the serious harms.

Researchers from the Johns Hopkins University School of Medicine and CRICO Strategies analyzed more than 55,000 malpractice claims from CRICO Strategies' Comparative Benchmarking System database to determine how many were attributable to diagnostic error.

The findings suggest potential areas of focus for future research and interventions at a time when the federal government is taking inaccurate and delayed diagnosis seriously. In fact, the Agency for Healthcare Research and Quality has made reduction of diagnostic errors one of its three strategic priorities.

Epner spoke at the research release and noted that, "This work showcases the fact that myriad factors contribute to missed and delayed diagnosis. And it highlights the need for further collaboration across the healthcare system to significantly improve diagnosis and ensure the best possible outcomes for patients."

Members of the Coalition to Improve Diagnosis, which includes more than 50 organizations representing leading healthcare and patient advocacy organizations shared the research findings with their members. The release was made possible through a grant from the Gordon and Betty Moore Foundation and the Mont Fund, which also supported the launch of the *ACT for Better Diagnosis*™ initiative last fall to illustrate Coalition members' commitment to taking action, sharing best practices, and working collaboratively to improve diagnostic quality and safety.

Watch the release here.

From the Field: Shaping Policy to Improve Diagnosis

The Policy Committee of the Society to Improve Diagnosis in Medicine (SIDM) guides the Society's efforts to prioritize diagnosis in public policy conversations about healthcare quality, safety and value. The committee includes policy, clinical, and patient experts from SIDM and the multi-stakeholder, Coalition to Improve Diagnosis.

Currently, diagnostic error is the most significant yet most under-studied of all healthcare harms, representing just .02% of the government's healthcare research budget. Clearly, more investment is needed and for the last two years, SIDM's top policy priority has been to increase federal investment in diagnostic quality and safety research. SIDM's has prioritized the idea of new Research Centers of Diagnostic Excellence and a Council of key federal health agencies to identify opportunities for interagency coordination and collaboration to close gaps in the research pipeline.

SIDM leaders and volunteers have met with dozens of policymakers from both political parties to raise awareness about diagnostic error. In addition, members of the Coalition have signed a Consensus Statement in support of increased federal research funding for diagnostic quality and safety. In July, SIDM hosted a Capitol Hill briefing to release a new study which offers a potential path forward for shaping research priorities.

The work is yielding significant results. Last year, for the first time, Congress appropriated dedicated funding to the Agency for Health Care Research and Quality (AHRQ) for research to improve diagnostic quality and safety. At $2 million, the funding was modest but an important milestone. This year, the

House is proposing to at least double that amount. Meanwhile, AHRQ has announced that reducing diagnostic errors is now one of its three strategic organizational priorities, and the agency already has convened the interagency coordinating Council to begin to coordinate federally-supported research efforts to improve diagnosis.

As SIDM continues to highlight the need for a significantly greater federal investment in research that is proportional to the scope and scale of diagnostic harm, SIDM also is broadening its focus to other critical policy domains. For example, the organization is exploring how policies at the U.S. Department of Health and Human Services that govern health information technology and electronic health records might better support clinicians and patients in arriving at accurate and timely diagnoses. SIDM is also asking how CMS's experiments with new payment models could advance diagnostic quality.

The theme of SIDM's 12th Annual Diagnostic Error in Medicine conference in Washington DC (November 10-13, 2019) is "Shaping Policy, Improving Practice". A variety of sessions will highlight the link between featured research, quality improvement and education strategies from the field and opportunities for policymakers to support diagnostic quality and safety. Through interactive workshops and multiple networking opportunities, as well as an afternoon of scheduled visits with lawmakers on Capitol Hill, attendees will be able to use their expertise and experience to inform and help move SIDM's policy agenda forward. Though SIDM is not a large organization by Washington DC standards, it is "punching above its weight class" because the mission and message resonate so broadly—everyone has a story tell.