ImproveDx

The Newsletter of the
Society to Improve Diagnosis in Medicine
Volume 3 · Number 2
April 2016

Future Directions for Diagnostic Decision Support

By Susan Carr
Newsletter Editor

Clinical reasoning has been referred to as "the clinician's quintessential competency."[1(p53)] Two kinds of reasoning—quick, intuitive pattern recognition, or System 1 processing, and slower, more analytical problem solving, or System 2 processing[1]—are in play as physicians work their way toward deciding on a diagnosis. Both kinds of thinking contribute to success and failure, and both can be enhanced with various kinds of clinical decision support. Physicians can turn to colleagues, published literature, or computerized decision support systems to further their thinking. Each of those aids comes with advantages and disadvantages.

Circumstances sometimes discourage physicians from seeking any kind of help. Consulting with professional peers, journals, and computers takes time, which may not be available in the current practice environment. Physicians in solo or under-resourced practices may not have easy access to support, and some may not want to ask for help, equating the need for support with weakness.

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Trends related to new sources of information and improvements in technology, as well as cultural and generational changes, are contributing to developments that may improve the use of decision support. In *Improving Diagnosis in Health Care,*[2] the Institute of Medicine (now the Health and Medicine Division of the National Academies of Sciences, Engineering, and Medicine) recognizes that health information technology "has the potential to support the diagnostic process through clinical decision support tools"[2(p233)] and calls for researchers to further evaluate the impact of diagnostic decision support.

Learning From Experience

A 2015 study of primary care focuses on the importance of recognizing patterns—System 1 processing—as a strategy in diagnosis and links diagnostic errors to failures in pattern recognition. "Errors resulted when atypical presentations meant that symptoms did not fit a known and recognizable pattern."[3(pe839)] Those atypical presentations—uncommon diseases, uncommon presentations of common diseases, and limitless variation among patients—represent a constant challenge to a physician's ability to recognize patterns. Symptoms, family history, demographics, environmental factors, treatment response, and other details provide important clues to diagnosis, but are helpful only when connections become apparent.

The authors of the study observe that a physician's ability to recognize patterns typically improves with practice. As physicians acquire personal knowledge based on experience, they may also hone an intuitive sense for a patient's condition that, for example, seems more serious than obvious symptoms indicate. That sense of severity is one thing physicians take into account when deciding whether or not to enlist help in evaluating the case. Physicians also, of course, may sense that their analytical thinking

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With thanks for their assistance with this article:
Jeannine Cyr Gluck, MLS
Mark L. Graber, MD
Michael Grossman, MD
Lorri Zipperer, MA

about the case—System 2 processing—would benefit from consultation with another clinician or other kinds of support.

The study, which was the subject of a journal club meeting sponsored by the Society to Improve Diagnosis in Medicine (SIDM) in March 2016, emphasizes the role of experience in diagnosis and acknowledges that "…there is an art to decision making that develops only with experience." [3pe842] The IOM observes that experience in System 2 can improve System 1 processing:

> *As a clinician accumulates experience, the repetition of system 2 processing can expand pattern matching possibilities by building and storing in memory mental models for additional diseases that can be triggered by patient signs and symptoms.*[1(p61)]

Experience can certainly contribute to a physician's acumen as a diagnostician, but is experience enough? The limitations of what is effectively on-the-job training are obvious: it's slow, haphazard, subjective, opaque, unregulated, and exposes patients to risk. It is increasingly difficult for physicians to keep pace with what can be learned from published literature, as well as from their own patients and colleagues. And what about the inherent disadvantages of inexperience or solo practice, where the learning curve is steep and can be lonely.

Although not a replacement for collegial consultation, computerized diagnostic decision support (CDDS)—patient-specific recommendations for further testing and possible diagnoses—offers at least a partial solution to the challenge of supporting diagnostic decision making. These systems have been available for decades[4,5] and continue to improve in usability and accuracy. But they are not widely used, primarily because physicians don't think they have to time to use them or don't feel that they need help. [4,6,7]

Following the journal club meeting, discussion continued on the SIDM Listserv[i] and expanded to explore the role of CDDS. Computers are an obvious aid for pattern recognition. Can they also improve thinking and clinical reasoning? It is one thing to identify a pattern among symptoms, link the pattern to feasible causes, and produce a list of possible diagnoses. It is something else to apply experiential knowledge and intuition to those results, decide on a diagnosis, and begin treatment.

i The Society to Improve Diagnosis in Medicine hosts a Listserv, which is available to anyone who would like to register. More information is available at http://www.improvediagnosis.org/?page=Listserv

Developments in Computerized Diagnostic Decision Support

Most computerized aids to diagnosis require physicians to initiate the process by recognizing that they need help, know how to ask for it, and be willing to follow through. Typically, physicians enter the patient's symptoms and other health data into the system, which provides a list of possible diagnoses or suggested actions to help inform the next step. Linking CDDS to electronic health records (EHRs) helps streamline this process, but still often runs into problems with divergent vocabularies and other integration issues.[4]

In *Diagnosis,* Eta Berner, EdD, professor of health informatics at the School of Health Professions at the University of Alabama at Birmingham, suggests ways to improve current systems and encourage adoption.[4] As mentioned above, integration with EHRs will help. When CDDS can run in the background and push meaningful patient-specific suggestions to physicians, the process will be more compatible with clinical workflows. It would also be helpful if the system were able to suggest the next question to ask, or diagnostic tests, such as labs and imaging, that the system knows relate to the patient's symptoms but which the physician has not yet ordered, possibly indicating a missed diagnosis. Only if and when this works efficiently will alert fatigue and potential workarounds be avoided.

User interfaces need to continue to improve for all computerized systems. CDDS systems that include feedback about response to treatment, follow-up care, and patient outcomes, if ever enabled, may help fill a serious gap in communication and learning.[8] Berner speculates that optimizing the potential for CDDS would add more than patient-specific information to the diagnostic process [emphasis added]:

> *If such a system were able to be implemented it would produce a mechanism for modifying diagnoses and therapy in a timely manner, it could mitigate the harm to patients from diagnostic errors, and* ***it might even help physicians become better calibrated, increase the physician's knowledge and lead to more reflective practice.***[4p122]

During the Listserv discussion, Art Papier, MD, co-founder and CEO of a CDDS system called VisualDx and a member of the SIDM Board of Directors, also imagined a future where "clinical decision support transforms the electronic record to a thinking aide"—a transformation that he believes is "already underway" (SIDM Listserv, February 28, 2016).

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Collective Intelligence

The Human Diagnosis Project, or "Human Dx"—a new approach to using computers to improve diagnosis through physician collaboration—may be part of that transformation (https://www.humandx.org).

In a 60-minute podcast,[9] physicians Nic Szecket and Art Nahill talked with Shantanu Nundy, MD, director of medicine at Human Dx. Nundy describes Human Dx as a "Worldwide effort to map any health problem to its possible diagnoses."[9] Human Dx is an online repository of information about specific (de-identified) clinical cases presented in a "self-organizing, meritocracy-based system,"[9] which means it works somewhat like Wikipedia. In Wikipedia and other wikis, individuals contribute their knowledge to a shared resource that reflects the collective wisdom of contributors, who are recognized for the expertise they demonstrate, not necessarily for their credentials or notoriety. The community self-regulates, conferring authority to contributors who demonstrate expertise through their participation over time.

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Human Dx enables physicians to collaborate on clinical cases, either as cases with a known diagnosis or as cases to be solved, from any connected device. The computerized system automatically records the steps physicians take as they think through cases, evaluating all variables from patient-reported symptoms to test results, treatments, ongoing care, and management. The physician's thought process, decisions, and actions are encoded so that their individual insights are made available to inform future decision making. A choice that goes down the wrong path, leading to a wrong diagnosis, perhaps back out again to a different path, other test, and a correct diagnosis all contribute learning to the system—about what does and does not work. When physicians solve cases within Human Dx, the brief case simulations mimic real-world clinical practice and provide an objective measure of clinical reasoning.

Nundy and other founding members of the Human Dx team envision that, ultimately, anyone will be able to tap the knowledge that the system aggregates. Everyone will benefit from the experience of physician colleagues, not just down the hall, but from around the world. Being an open access system, Human Dx will be available to anyone on any device and within EHRs, where it will run in the background.

Talking with Szecket and Nahill, Nundy explained the origins of Human Dx by saying that he and others recognized that physicians share a common pain point: "Why am I doing this alone? How can I collaborate on cases? How can I benefit from the wisdom in medicine that came before me?"[8]

Human Dx leverages collective intelligence, which combines human intelligence with computers and communication technologies to work smarter than either humans or computers can work on their own.[10] The primary content of the system—the database—comes from physicians who have contributed their experiences and knowledge.

Human Dx plans to offer computer-enhanced collegial consultation at scale—the collective medical insight of physicians across the world, on any clinical case, available to anyone at anytime. In the meantime, advancements in current systems, cultural changes that encourage physicians to welcome help with diagnostic decision making, and the benefits of physician peer support will continue to improve diagnosis.

References

1 Kahneman D. *Thinking, Fast and Slow.* New York, NY: Farrar, Straus and Giroux; 2011.

2 Balogh EP, Miller BT, Ball JR, eds. *Improving Diagnosis in Health Care.* Washington, DC: National Academies Press; 2015.

3 Goyder CR, Jones CHD, Heneghan CJ, Thompson MJ. Missed opportunities for diagnosis: lessons learned from diagnostic errors in primary care. *BR J Gen Pract.* 2015:e838–e844. doi:10.3399/bjgp15X687889.

4 Berner, ES. What can be done to increase the use of diagnostic decision support systems? *Diagnosis.* 2014; 1(1):119–123. doi:10.1515/dx-2013-0014.

5 Weed LL, Zimny NJ. The problem-oriented system, problem-knowledge coupling, and clinical decision making. *PT.* 1989;69(7):565–568.

6 Riches N, Panagioti M, Alam R, et al. The effectiveness of electronic differential diagnosis (DDX) generators: a systematic review and meta-analysis. *PLoS One.* 2016;11(3):e0148991. doi:10.1371/journal.pone.0148991. Accessed April 10, 2016.

7 Berner E, Graber ML. Overconfidence as a cause of diagnostic error in medicine. *Am J Med.* 2008; 121(5S):S2-S23.

8 Schiff GD. Minimizing diagnostic error: the importance of follow-up and feedback. *Am J Med.* 2008;121(5 Suppl):S38–42. doi: 10.1016/j.amjmed.2008.02.004.

9 Szecket N. Episode 9: the Human Diagnosis Project. http://imreasoning.com/episode-9-the-human-diagnosis-project/. Presented October 15, 2015. Accessed March 15, 2016.

10 MIT Center for Collective Intelligence. (n.d.) http://cci.mit.edu/index.html. Accessed March 16, 2016.

Coalition Welcomes New Members

Seven organziations recently joined the ***Coalition to Improve Diagnosis in Medicine,*** bringing the number of members and partners to more than 20. Member organizations commit to take measurable action to improve diagnosis. SIDM established and leads the Coalition.

To learn more, visit www.DxCoalition.org.

Members

- ABIM Foundation
- Alliance for Academic Internal Medicine (AAIM)
- American Academy of Pediatrics
- American Association of Nurse Practitioners
- American Board of Internal Medicine
- American Board of Medical Specialties
- American College of Emergency Physicians
- American College of Physicians
- American Society for Healthcare Risk Management
- Association of Clinical Scientists
- Consumers Advancing Patient Safety
- The Leapfrog Group
- Massachusetts Coalition for the Prevention of Medical Errors
- National Association of Pediatric Nurse Practitioners
- National Partnership for Women and Families
- National Patient Safety Foundation
- Society of Hospital Medicine
- Society to Improve Diagnosis in Medicine
- Veterans Health Administration

Government Partners

- Agency for Healthcare Research and Quality
- Centeres for Disease Control and Prevention

FROM THE FIELD

ABMS and NPSF Issue Report on Certification and Diagnostic Accuracy

The American Board of Medical Specialties (ABMS) and National Patient Safety Foundation (NPSF) have issued a report[1] summarizing the results of a one-day summit meeting the two organizations held in December 2015. The summit featured presentations by experts representing ABMS, NPSF, and other organizations, including the American Medical Association, American Board of Internal Medicine, American College of Radiology, and the Society to Improve Diagnosis in Medicine (SIDM). In addition to SIDM President Mark L. Graber, MD, Research Committee members Gordy Schiff, MD, and Hardeep Singh, MD, spoke at the summit.

The report summarizes current understanding about components of the diagnostic process, including cognition, clinical judgment, and system-related factors, especially related to the flow of information. Reflecting the summit, the report explores what can be done to reduce errors and improve the accuracy of diagnosis in 3 categories: 1) education and training, 2) assessment and improvement, and 3) practice environment and culture. It also notes, "The majority of diagnostic errors occur in ambulatory settings where there is less social and technical support."[1(p2)]

'The majority of diagnostic errors occur in ambulatory settings where there is less social and technical support.'

Among the reports' specific recommendations are calls to:

- Include training and education focused on diagnostic reasoning and the science of diagnosis in medical school, as well as in interprofessional education.
- Teach physicians how to include patients more effectively in the diagnostic process.
- Include diagnostic processes in quality improvement initiatives.
- Engage physicians in the process of designing and testing electronic health records, especially as they relate to supporting diagnostic accuracy.
- Provide patients with access to their health records.

In addition to providing adequate training in medical school to support diagnostic accuracy, the report recommends paying increased attention to diagnosis in continuing education, including Maintenance of Certification for physicians.

Reference

1 American Board of Medical Specialties, National Patient Safety Foundation. *Summit on certification & diagnostic accuracy.* December 7, 2015. Washington, DC. http://www.abms.org/media/100055/npsfsafetysummitsummarydigital.pdf. Accessed March 31, 2016.