The next
Andrew Olson, MD, teaches residents and medical students how to make a diagnosis—but his work doesn’t stop there. The hospitalist and assistant professor of medicine-pediatrics at the University of Minnesota also helps them learn how to avoid making the wrong diagnosis by making them aware of common errors in thinking that doctors make, and of communication breakdowns and other system glitches that can contribute to the problem.

Most medical schools don’t teach this, and Olson says it’s high time they start doing so. “Diagnosing is the most important procedure physicians do, and we all get it wrong sometimes,” he says. “We need to learn why. We need to learn how to prevent it, and we need to get comfortable talking about diagnostic errors so we can learn from our mistakes.”

A diagnostic error is any diagnosis that is missed, delayed or wrong. Finding such errors and reducing them is the next step in medicine’s patient safety/quality improvement effort that began after the Institute of Medicine (IOM) released its 1999 report “To Err is Human.” That report prompted hospitals, clinics and nursing homes to reduce medication errors, falls, health care-acquired infections and wrong-site surgeries.
Now it’s time to deal with the more challenging problem of diagnostic error, says national patient safety expert Mark L. Graber, MD, president and founder of the Society to Improve Diagnosis in Medicine and author of numerous journal articles on diagnostic error. “On average, doctors get it wrong 10 to 15 percent of the time,” Graber says, citing data from autopsies, physician surveys, peer-reviewed studies and malpractice payouts. “We’re not as good as we often think we are.”

In September, the IOM will release a report on diagnostic errors—how big the problem is and what to do about it. Graber, who petitioned the IOM to do the report and helped write it, says it will include steps physicians, patients, hospitals, clinics and insurers can take to prevent them from happening.

Scary high numbers
If air travel was like physician diagnostic accuracy, one in 20 planes wouldn’t land where and when they should, and one in 40 would put passengers at risk for significant harm, according to a study out of the VA Medical Center and University of Texas at Houston. Graber notes that studies estimate between 40,000 and 80,000 patients in the United States die each year because of diagnostic errors. “These are scary high numbers,” he says.

Fortunately most diagnostic errors are inconsequential, caught in time or their harm mitigated. “The odds of a truly catastrophic outcome are rare, but they still happen more often than they should,” Graber says. “The average busy physician might be involved in one or two cases of fatal error during their career and they may never even know it because so much time may pass after the diagnostic error is made and its effects known.”

Nevertheless, diagnostic errors are the reason cited most often in malpractice claims in which patients died, according to Laurie Drill-Mellum, MD, MPH, chief medical officer and vice president of patient safety solutions for MMIC Group, a medical liability insurance company in Minneapolis. “For all of our pay-outs, diagnostic error is the third most common reason for the claim and the second most expensive in terms of legal fees and settlements,” she says. A review of 2,000 MMIC-paid claims shows 313 were caused primarily by diagnostic error and cost $47.2 million in payouts. “We’re talking big dollars here. Diagnostic error plays a huge role in bad outcomes.”

Missed, delayed and wrong diagnoses are common across all specialties. A 2009 survey of physician self-reported errors, published that year in *Archives of Internal Medicine*, found the most frequently missed diagnosis was pulmonary embolism, followed by drug reaction or overdose, lung cancer, colorectal cancer, acute coronary syndrome, breast cancer and stroke. A review of MMIC claims found the top three missed outpatient diagnoses are cancer, heart disease and orthopedic injury. Graber emphasizes that it’s not just rare diseases causing the problem. “It’s the everyday ones we’re missing.”

Misdiagnosed cancers can be especially costly to both patients and doctors. According to Drill-Mellum, MMIC had 139 cases from 2010 to 2013 involving misdiagnosis of cancer, totalling $17 million in payouts. “Reducing diagnostic error is a huge opportunity to improve outcomes and reduce costs,” she says.

So why has it taken medicine so long to even start talking about the problem?

It’s complicated
For starters, doctors don’t appreciate how common and costly diagnostic errors are, says Graber, who points out that the IOM’s “To Err is Human” barely mentioned diagnostic errors.

Finding the root cause of diagnostic errors is harder than it is for medication and
surgical errors because diagnostic errors play out over a long period of time across many health care settings involving many health care professionals. A physician’s error in thinking is often a factor, but Graber says communication breakdowns, lack of care coordination or other system issues also contribute to the problem at least half the time.

Consequently, Graber says, “many diagnostic errors go undetected because we don’t have tools to identify them or procedures for reporting them. I’m not aware of a single health care organization in the United States that systematically measures diagnostic errors. It’s hard to fix something you’re not measuring.”

Even if reporting systems were in place, physicians may be reluctant to admit to diagnostic errors or to implicate a colleague, says Gordon Schiff, MD, associate professor of medicine at Harvard Medical School and associate director of Harvard’s Center for Patient Safety Research and Practice. Schiff conducted the 2009 physician self-report study of diagnostic error.

And despite how common diagnostic errors are, Graber says most physicians seem to think they’re not the ones at fault. “A lot of us think we’re doing a pretty good job when it comes to diagnosis, and we may well be, but mistakes that may lead to harm are inevitable in a small number of cases,” he says.

Two types of errors
Researchers divide the causes of missed, delayed and wrong diagnoses into two categories: cognitive errors and system errors. Cognitive errors are errors in thinking—“what goes on between our ears,” Olson says. Common cognitive errors include jumping to conclusions, attributing a symptom to another existing diagnosis, not noticing or following up on an abnormal test result, and failure to do a thorough differential diagnosis or not expanding it to consider other options.

“Most diagnostic errors are caused by simple flaws in synthesizing available data to arrive at the correct diagnosis,” Graber explains.

Common cognitive errors

**Anchoring.** Quickly and firmly locking onto a single diagnosis despite clues that something else might be going on

**Premature closure.** Accepting the first diagnosis that comes to mind that explains all the facts at hand without seriously considering other possibilities

**Blind obedience.** Showing undue deference to a diagnostic test or a specialist’s opinion

**Overconfidence.** The universal tendency to believe our decisions are correct

**Visceral bias.** Allowing your emotions or feelings about a patient to influence your thinking

**Psych-out error.** The tendency for patients with psychiatric illnesses to have any symptom or sign attributed to their mental illness

**Confirmation bias.** The tendency to look for signs and symptoms that support a diagnosis, rather than looking for signs and symptoms that refute that diagnosis

**Momentum bias.** Accepting a previous diagnosis without sufficient skepticism. The more often a patient is labeled with a possible diagnosis, the more momentum that diagnosis gains and the less likely clinicians are to consider other possibilities

**Availability bias.** When diagnosing is adversely affected by extraneous factors, including a recent case or malady that was seen in the news or featured in an article

Sources: Croskerry P. The importance of cognitive errors in diagnosis and strategies to minimize them. Acad Med. 78(8):775-80; and interview with Andrew Olson, MD.
ON THE COVER

“Health care organizations need to create a culture of actively seeking to uncover, learn from and share errors.”

–GORDON SCHIFF, MD

Clinical judgement is listed as a cause in 95 percent of MMIC’s inpatient malpractice claims and 87 percent of its outpatient claims in which delayed or misdiagnosis is the principal allegation. One-third of MMIC’s outpatient claims cite failure or delay in ordering a test; 24 percent cite misinterpretation of test results; and 17 percent cite failure to respond to a patient’s concerns or symptoms.

System errors are process errors such as someone dropping the ball in scheduling a referral or arranging for care coordination; a laboratory error; or an incorrect handoff of a patient from one provider or facility to another. They occur when patients referred to a specialist aren’t seen for months or when medical students and residents aren’t adequately supervised. They happen because physicians must cope with time pressures, excessive workloads, administrative distractions and what Graber calls “clumsy features of electronic medical records that are hard to use or bury important patient information under too many mouse clicks.” And they happen when lab tests get ordered, but are never done or when results are lost or go unreported.

“Communication problems are the most common system-related cause of diagnostic error,” Graber says.

Many diagnostic errors are the result of both cognitive errors and system errors, according to Schiff. This makes it hard to pinpoint the exact cause of many of them. A diagnostic error evaluation and research tool Schiff created on behalf of the Agency for Healthcare Research and Quality (AHRQ) identifies 32 stages in the diagnostic process where things can go wrong. Combine those 32 stages with places within the system where things can go wrong and the propensity for a diagnostic error to occur becomes more apparent.

What can be done?

Raising awareness that diagnostic errors are common, costly and harmful is the first step toward solving the problem, Graber says. The IOM’s September 2015 report will hopefully get as much media attention as “To Err is Human” did and will help put diagnostic error on medicine’s radar.

Meanwhile, Diagnosis, the first peer-reviewed journal on the topic, began publishing in January 2014. The AHRQ recently announced some limited funding for academic and non-profit organizations wishing to study diagnostic errors. And the Society to Improve Diagnosis in Medicine (www.improvediagnosis.org), founded eight years ago, continues to gather statistics and research how serious the problem is and what to do about it.

Drill-Mellum says one thing physicians can do to prevent diagnostic errors is to listen closely, which can be challenging given the fact that doctors spend an average of 10 to 15 minutes with each patient. She notes that a good patient history provides 80 percent of what goes into a diagnosis.

Following best practices and using clinical decision-making guidelines is another. “You’d be surprised how many of our malpractice claims involve physicians who didn’t use them, especially for common cancers,” she says.

Second opinions can be helpful as well. A study of 6,791 patient-initiated second opinions published in the April 2015 American Journal of Medicine found 41.3 percent of patients sought second opinions to help choose treatment options and 34.8 percent because of diagnostic concerns. Second opinions led to changes in diagnosis in 14.8 percent of cases, changes in treatment in 37.4 percent or changes in both in 10.6 percent of cases.

Electronic differential diagnosis tools such as Isabel, DXplain, DiagnosisPro and PEPID also can be used to generate second opinions based on a patient’s history, signs and symptoms, and lab results.

Changing the culture is also critical to reducing diagnostic errors. Schiff says many physicians are willing to report
Electronic safety net

Progress has been slow in finding ways to use electronic medical records (EMRs) to identify and prevent diagnostic errors, according to Gordon Schiff, MD, associate professor of medicine at Harvard Medical School and associate director of Harvard’s Center for Patient Safety Research and Practice. “We haven’t seen any game-changing approaches in the past decade,” he says, “partly because there is no ‘electronic yardstick’ for measuring diagnostic accuracy and partly because we need EMRs that are easier to use.” He says EMRs need more space in which physicians can enter text about a patient’s history, write notes about unanswered questions and record their thoughts about the patient.

Trigger tools

EMR-based trigger tools that catch diagnostic errors are gaining traction, according to studies done at the Veterans Affairs Medical Center and Baylor College of Medicine in Houston. Some catch diagnostic errors that have already happened—the first step in preventing them from happening again. Others flag missed opportunities that can still be corrected.

For example, studies conducted by Singh and colleagues at the Houston VA used trigger tools to flag patients who have an unscheduled hospital admission within two weeks of a primary care visit. Initial results show that the frequency of diagnostic error identified among these patients was 20 percent, compared with 2 percent caught in randomly selected patient charts. Other investigators report success using a similar trigger tool that identifies patients hospitalized shortly after a treat-and-release visit to an emergency department.

Kaiser-Permanente uses a condition-specific trigger tool to catch patients who have abnormal test results but have not received follow-up. For example, Kaiser’s colorectal cancer “safety net” flags patients who had a positive colorectal cancer screening but haven’t seen a doctor about it.

Between 2006 and 2009, 8,000 patients were caught in Kaiser’s PSA safety net. Of those, 3,833 were scheduled for urology appointments and 2,204 underwent biopsy, resulting in 745 patients diagnosed with prostate cancer. Kaiser also has safety nets for overdue labs and for monitoring patients on digoxin, anti-convulsants, ACE inhibitors and diuretics.

Differential diagnosis tools

Another way to reduce diagnostic error is by using differential diagnosis tools such as Isabel, DXplain, DiagnosisPro and PEPID. These electronic second opinions list possible diagnoses based on a patient’s history, signs and symptoms, and lab results. They can be integrated into EMRs or used separately. MMIC, a medical liability insurance company in Minneapolis, offers a screening tool that helps diagnose and predict risk for shoulder dystocia.

Physicians rarely use these, however. That’s partly because right now there are no standardized plug-and-play tools to reduce diagnostic error that are both easy to use and easy to embed in an EMR system, says Paul Kleeberg, MD, chief informatics officer at Stratis Health in Minneapolis, which is helping clinics and hospitals statewide implement and use EMRs. “For now, we don’t have a standardized way to embed decision-support tools like DXplain or Isabel. Instead, they need to be built into the EMR at each health system and custom-tailored to fit the workflow at each site that’s part of that health system. That requires a lot of sweat equity.”

As for stand-alone differential diagnosis tools, Kleeberg says they require time most physicians don’t have. “They’re more useful to medical students and residents as part of their training.”—HB
diagnostic errors if they’re encouraged to do so, given the time to do so and offered a way to do so in a blame-free manner.

“Health care organizations need to create a culture of actively seeking to uncover, learn from and share errors, so that they become institutional knowledge for learning and improvement instead of remaining hidden in the memories of individual physicians,” he says. “Only then can we pinpoint problems and find solutions.”

He notes that Maine Medical Center in Portland recently did a pilot study of an institutional approach to reducing diagnostic errors in which physicians were encouraged to report both cognitive and system-based errors. During the first six months, 36 diagnostic errors were reported that would not have been otherwise. Most were for common diagnoses such as acute coronary syndrome and stroke. Half caused moderate harm to patients and 22 percent resulted in serious harm.

These findings prompted the medical center to design ways to expedite specialty referrals, educate physicians about how to avoid cognitive errors and construct symptom-specific diagnostic pathways for common complaints prone to diagnostic errors.

Engaging patients is another way to help reduce such errors. Beyond getting as much information as possible during the history and physical, Graber says it’s helpful to give patients access to their test results and encourage them to communicate with their providers through web-based patient portals. “Doctors are just like everyone else,” says Drill-Mellum. “We frequently let things slip through the cracks, but the reasons why must be addressed by systems, because it takes a village to get a diagnosis right. … Patients are willing and eager to be part of that village.”

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10 steps physicians can take to avoid diagnostic errors

1. **Take a diagnostic time-out.** Pause and reflect. Ask yourself: What else could it be?
2. **Really listen** to your patients and their caregivers.
3. **Learn** the causes of cognitive error.
4. **Don’t trust your intuition.** Always do a thorough differential diagnosis.
5. **Take advantage** of second opinions.
6. **Use diagnosis-specific decision-support tools** such as DXplain, Isabel, VisualDx and clinical decision-making checklists.
7. **Make the patient your partner in diagnosis.** Encourage them to review their test results through patient portals. Make sure they know how to reach you if their symptoms change or persist.
8. **Ensure all ordered tests and consults are completed and that you know the results.** Designate a surrogate to review results if you plan to be away.
9. **Speak directly with the staff** providing you with diagnostic test results. If you aren’t sure of the most appropriate diagnostic strategy, ask or use online test-ordering advice.
10. **Empower your colleagues** to let you know if they become aware that a diagnosis you made has changed.

Source: The Society to Improve Diagnosis in Medicine
Teaching error prevention
All of the physicians interviewed for this article agree that teaching medical trainees how to avoid making diagnostic errors must be a priority. “Right now, medical students are taught how to diagnose, but not how to avoid making the wrong diagnosis,” Drill-Mellum says.

Only a few medical schools in the country teach diagnostic error prevention. Olson is leading the effort at the University of Minnesota, where he developed a curriculum with colleagues Pat Croskerry, MD, PhD, an internationally known expert on cognitive error in clinical decision-making, and Emily Ruedinger, MD, now at the University of Washington.

Pediatric residents at the university are now two years into the curriculum, which includes case analysis discussion with a local family whose daughter died after a diagnostic error. They also talk with malpractice attorneys. “It’s all been helpful and powerful,” Olson says. “Residents are more tuned in to identifying diagnostic errors and more at ease with acknowledging and talking about them. It’s striking to hear them matter-of-factly use cognitive error terms like ‘premature closure’ and ‘anchoring.’” Olson has adapted the curriculum for internal medicine residents at Hennepin County Medical Center and other institutions. He also has been tapped to co-direct an effort to create a curriculum for third- and fourth-year medical students on behalf of the Society to Improve Diagnosis in Medicine and MedU.

Olson, who became interested in the issue as a chief resident when he noticed an absence of attention to diagnostic error as compared with medication errors, hopes the university will soon become one of a handful of medical schools where third-year medical students participate in online virtual cases involving every stage of a real patient’s diagnosis that unfolds over the course of an hour using text, photos and videos. “These cases will help students understand how and where diagnostic errors unfold so they can avoid them.”

In another effort, internal medicine residents and faculty at the university will soon engage in diagnostic error debriefings, in which physicians on the day shift give feedback to those on the night shift and vice-versa. “Physicians often never learn they made a diagnostic error because no one tells them,” Olson says. “Near real-time feedback makes us more aware of errors and helps us recognize situations where they’re most likely to occur.”

Diagnosis will always be an inexact science, but as physicians and educators try new ways to prevent errors, the issue becomes how to get these plugged into everyday practice. It’s important to do so because, Olson says, “Our ability to diagnose is a deeply personal part of what makes us physicians.”

Howard Bell is a medical writer and frequent contributor to Minnesota Medicine.