

MINNESOTA **MEDICINE**

AUGUST 2015

*The next
frontier*

Eliminating diagnostic errors is the latest challenge in quality improvement.

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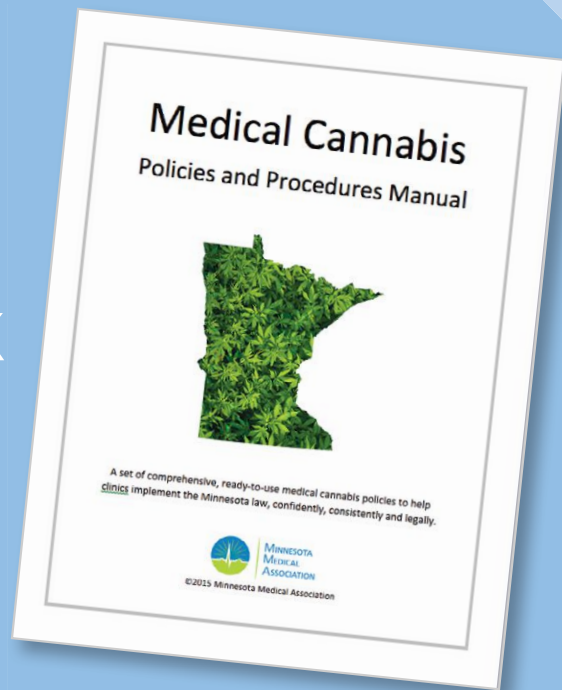
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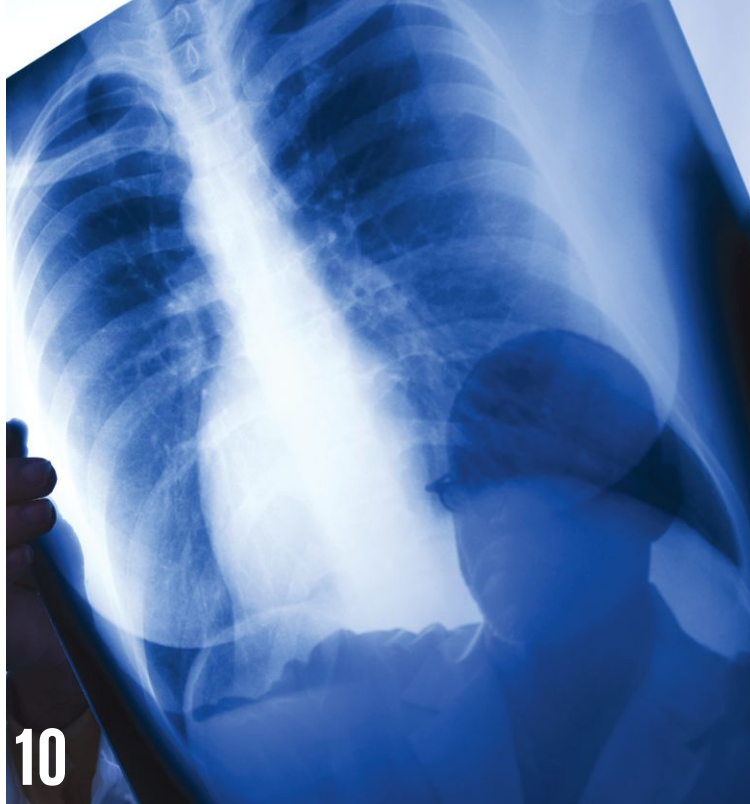
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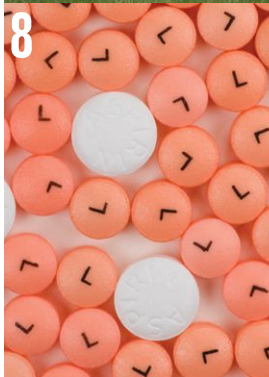
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A memory connects a physician and his young patient.

BY KAMIAB DELFANIAN, MD, MPH



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PHOTO BY SCOTT WALKER

Charles R. Meyer, MD, Editor in Chief

As diagnosticians,
we tiptoe through
minefields of lethal
possibilities and
hope we step in the
right place.

Diagnostic dilemmas

My patient had been short of breath for a long time. For years, his asthmatic bronchitis had led to escalating doses of inhalers and more frequent courses of steroids. But now he seemed to be resistant to the tricks that had worked before. Regular albuterol, pulmicort and higher doses of prednisone weren't rescuing him from his struggle to breathe. He walked into my office, pausing every 10 feet to sit on his walker and catch his breath.

Mentally, I scoured my therapeutic armamentarium and came up with nothing. Finally, grasping for the unlikely when the usual wasn't working, I said, "I guess we can check a D-dimer to rule out the distant possibility of a blood clot to the lung." The man had had a deep venous thrombosis but that was years ago, and he had no chest pain, no sudden increase in dyspnea. Despite his struggles, he was maintaining his oxygen level without supplemental oxygen. Later that day, the D-dimer returned elevated and a CT scan of the chest revealed multiple pulmonary emboli. Once again, my most dread diagnosis had almost thrown me and my patient a fatal curve ball. Luck, as much as diagnostic brilliance, had bailed us both out.

Every physician has diagnoses they dread. We are all trained to fear missing any diagnosis but the consequences of error frequently can be as minor as a slight delay in treatment or a sheepish grimace when a colleague makes the right call. For me, dreaded diagnoses are the ones where my misstep can kill a patient—the mundane neck pain subtly signaling the aortic dissection, the nausea and vomiting that turns out to be a myocardial infarction masquerading as gastroenteritis or the

"migraine headache" that ends up being an intracranial hemorrhage. As diagnosticians, we tiptoe through minefields of lethal possibilities and hope we step in the right place.

Some would say their most dreaded diagnosis is no diagnosis. We all see patients with exhausting histories of confusing symptoms, who've had reams of tests and multiple doctor visits, who come to us looking for even just a label to explain their pain. Sometimes we strike pay dirt, finding the obscure "zebra," such as some of the cases in this month's case reports, that finally gives the sufferer at least an explanation for their symptoms and maybe also a treatment. Too often, we fail like diagnosticians before us and the patient trudges home with their misery and we trudge home wondering perhaps if we had read one more journal or textbook maybe ...

Not making a diagnosis or making the wrong diagnosis is not only painful for doctor and patient, it can be an expensive provocation for legal action, which is why educational and insurance institutions are focusing on the diagnostic process, defining what works and what doesn't, where doctors shine and how they fall short. Interestingly, one more journal article is rarely the explanation. Instead, aside from system errors, physician missteps result from disorders of attitude, taking shortcuts to conclusions, not following up on test results or being content with the obvious. If you don't force yourself to think outside the box you'll never see what's outside the box.

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For the love of honey

Joshua D. Friese admits the adage about farms and boys applies to him. “I grew up on a farm, so you can’t take the farmer out of me,” says the family physician as explanation for the life he’s chosen for himself and his family. Friese practices at ACMC Redwood Falls and lives on an acreage with his wife and four children a few miles (three stop signs, he says) outside of town. A few years ago, he built a barn on the property and now is raising a cow, nine chickens, two cats, a dog and several hundred thousand honeybees.

Actually, the adage doesn’t explain the honeybees.

That he blames on his wife, Rachel. “It’s probably more of my wife’s hobby,” he says of beekeeping. “It all started with my wife’s grandfather. She grew up going to his house and having fresh honey all the time,” he explains. “Once you get a taste of real, natural honey, you tend to want more.”

About eight years ago, the couple decided to try their hand at beekeeping. They talked with Rachel’s grandfather to find out how to get started and, one March, made the three-hour drive to Hackensack, Minnesota, to pick up their first box of bees and the equipment needed to set up the hive. (Hackensack is home to beekeeping supplier Mann Lake Ltd.) That fall, their one hive produced “some honey,” and they were hooked.

The bees died over the winter, so the couple started over the next year and have been beekeeping ever since. This year they have eight hives, which stand along the fence near their barn. Friese says each one will have about 50,000 bees “once it’s all up to speed.”

Friese says bees require tending about once a week or so. Early in the spring,



PHOTO BY JOSHUA DIXON

Joshua Friese, MD, tending his beehives. Friese says one reason he loves beekeeping and other farming tasks is that they get him outdoors. “For me, it’s relaxation time,” he says. His partner in beekeeping concurs. “My wife says I’m a much happier person if I go outside.”

when the bees are waking from their winter’s nap, he and his wife place a one-gallon container of sugar water on top of each hive and a “pollen patty” inside the part of the hive where the queen lives. The sugar water stimulates the workers to build the comb and the queen needs the pollen for laying eggs. Once the temperature

reaches about 65 degrees, the bees have free range among the family’s apple, cherry and linden trees as well as other flowers and plants.

During the summer months, the beekeepers’ main job is making sure the bees have enough room to grow and make honey. Friese explains that each hive con-

tains a brood box, in which the queen lays eggs and “makes” workers, and smaller “supers,” in which the workers build the comb and make the honey. When a super looks full, the keepers add another one on top. Friese says they check the hives about every 10 days or so.

Sometime after Labor Day, they collect the honey, which means taking off the supers, brushing (or sometimes vacuuming) off the bees and putting the frames containing the honeycomb into a centrifuge that separates out the honey. They filter the honey and then put it into five-gallon buckets, from which they fill smaller jars. “We give a lot away to friends and teachers,” Friese says. The family also makes lip balm from the bees’ wax.

Friese’s role in the process? “I’m the grunt guy because you have to lift all those heavy boxes. They can weigh up to 50 pounds.”

Actually, he is much more integral to the whole operation than he first lets on. He knows each step of the process and each piece of equipment, and he’s clearly fascinated by the creatures. “You look at the frame,” he says, his voice rising with excitement, “how organized it is; it’s amazing.” He still marvels that bees can fly more than a mile from the hive and find their way back, and that they can communicate where pollen is.

Friese likes the fact that others are fascinated by bees as well. People come to his farm to see them. “They get their suit on and go down there, and we open it up and show them everything,” he says. His patients and staff ask about them, too. He’s glad he can teach his children, who range in age from 8 to 15, about the process. “I want them to enjoy certain things,” he says, “being outside and caring for nature and living off the land.” And, like his wife, he’s come to love the final product. “The honey is why you do it.” – CARMEN PEOTA



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Ask about **aspirin**

Cardiologist Russell Luepker, MD, has been taking a baby aspirin daily since the 1980s, when he was one of the 20,000 or so doctor-subjects in the Physicians' Health Study. That trial, which set out to test the benefits and risks of aspirin and beta carotene for primary prevention of cardiovascular disease and cancer, showed low-dose aspirin reduced the risk of having a first myocardial infarction by 44 percent. Now a researcher in the University of Minnesota's School of Public Health, Luepker is trying to get more Minnesotans to do what he does.

Luepker is one of the drivers of a recent campaign urging Minnesotans to "ask about aspirin." It's the latest focus of the School of Public Health's Minnesota Heart Health Program, which for 30 years has been encouraging Minnesotans to adopt heart-healthy behaviors. "We've worked in the areas of diet, exercise and high blood

pressure and things like that," he says.

Luepker says the idea to focus on aspirin use emerged several years ago, when he and his colleagues began to ask, What else can we do to prevent first heart attacks and strokes? In addition to exercising, eating right and controlling their blood pressure, taking aspirin was one thing people could do to reduce their risk. Aspirin is readily available and it's cheap. But it isn't right for everyone and is actually contraindicated for people with conditions such as bleeding ulcers or who take certain medications. "Anybody can buy a year's supply of aspirin for about \$5," he says, "but self-prescribing is always a problem we worry about. And while a large percentage of people will be aided by taking aspirin, a substantial number of people won't be helped and will have the side effects

of aspirin without any of the benefits."

The research team settled on a strategy of urging people to ask a clinician about aspirin and fleshed out a plan for reaching the public (via billboards and radio spots) with the message "ask about aspirin." They developed training for clinicians and online and print materials. And they designed a study to assess the effectiveness of their campaign.

In 2013, they piloted the campaign in Hibbing, Minnesota. Survey results showed aspirin use among eligible patients increased from 31 percent before the campaign to 52 percent afterward.

Now, the Ask about Aspirin is going statewide. Researchers will be working with 134 clinics across the state (excluding the Twin Cities and Rochester) to train staff and ensure the right patients are getting the right message about aspirin. Then they'll be assessing whether their efforts are having an impact on people's behavior

and on such things as mortality rates and hospitalizations. "It's a five-year study," Luepker says, explaining that they're using North and South Dakota, Iowa and Wisconsin as controls. (The campaign and study are funded by Lillehei Heart Institute and NIH grants, respectively.)

Luepker is optimistic more Minnesotans will soon be taking aspirin. "I'm always surprised by how much Minnesotans are interested and willing to do things like this," he says.

And he believes it will result in even fewer Minnesotans having heart attacks and strokes in the future. "This is one effort among many to improve health," he says. "It will push the stone a little farther down the road." – CARMEN PEOTA



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a genetic basis for why some women might be more resilient than others. Specifically, she's looking at a gene called apolipoprotein E, which she's found to be associated with PTSD symptom severity.

James and her team are asking female vets about their military experience, trauma history and mental health status; drawing blood for genetic tests; and having the women spend about five minutes lying on a table while recording their brain activity using MEG. She hopes the work will have clinical applications. "Our goal is that we'd have this neural signature for PTSD in women that we can then use to potentially diagnose women vets and track treatment outcomes," she explains.

Although James says it's too early to talk about findings, this research has already attracted the attention of the American Association of Medical Colleges, which is highlighting projects aimed at rectifying a health or health care inequity related to mental health (see "Snapshot"). "We're recognizing that there are women vets," she says, "and they merit study as well as men." — CARMEN PEOTA

A focus on **female vets**

When Lisa M. James, PhD, arrived at the Brain Sciences Center at the Minneapolis Veterans Affairs Medical Center in 2010, the young scientist was very much aware that researchers there had just shown that magnetoencephalography (MEG) could be used to diagnose post-traumatic stress disorder (PTSD). In a 2010 article published in the *Journal of Neural Engineering*, they reported being able to distinguish, with better than 90 percent accuracy, between brain scans of people who did and did not have PTSD.

James was interested in building on that work, most of which had been done using male veterans as subjects. But she had a fresh question: What about female veterans?

James knew women had higher rates of PTSD than men (the rate is estimated at 20 percent for women compared with 8 percent overall) and experienced different types of trauma. "Whereas combat exposure might be more common in male veterans, things like sexual trauma are more common in female veterans," she explains. And there was some evidence

that women might have a different neural signature of PTSD than men. Most important, women were participating in the military in unprecedented numbers and hadn't been studied much. It seemed to her that an intentional focus on female veterans was warranted.

James designed a research project, applied for and got a VA grant, and last August began a three-year study that will eventually include 200 female veterans in this region. She has two main goals: defining the neural signature of PTSD for women and finding

Snapshot

The "2015 Health Equity Research Snapshot" highlights how research can be used to end a mental health or health care disparity. To watch brief videos about the work of Lisa M. James and others, go to www.aamc.org/initiatives/research/healthequity/427334/2015snapshot.html#.



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ON THE COVER

A doctor in a white coat and glasses is holding a large chest X-ray film. The X-ray shows the ribcage and lungs. The background is a solid blue color. The text "The next" is overlaid on the X-ray in a white, italicized serif font.

The next

frontier

Eliminating diagnostic errors is the latest challenge in quality improvement.

BY HOWARD BELL

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



"On average, doctors get it wrong 10 to 15 percent of the time."

—MARK L. GRABER, MD

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.

“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."

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." MM

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

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The burden of ambiguity

When there are no clear-cut answers

BY PATRICK BOLAND

I knock on the door, walk in, smile and survey the room. It's a pediatric visit.

Both parents are seated; the child, a 7-year-old boy, lies in his mother's lap. I have already perused the chart and saw the red flags: A series of recent ER visits. A strange series of lab tests—Lyme titers, surveys for Kawasaki disease, a Mono-spot—all with negative results. Seemingly random imaging tests.

I begin by taking a history, which evokes only a series of *non sequiturs* and logical perambulations. The timeline is difficult to construct. I find myself at times unable to understand even what the chief complaint is—the current presentation (fever, an old scalp abrasion, a sore throat) or this strange notion of chronicity. It's as if all the random minor illnesses common in childhood were part of a larger syndrome that threatens to kill their child at any possible moment.

The mother hands me a folder containing printouts from all their visits since birth. It has the breadth and haphazardness of a cold-case file. I read a few of them—benign finding by an ophthalmologist, the seemingly bemused meditations of an ER doc. As much as I want to leave the room feeling reassured the child is perfectly fine, I sit at my desk, staring at a spot on the wall, running through my rather short medical student's repository of knowledge.

That evening, still puzzled by the case, I peruse UpToDate for more than two hours, searching terms such as “recurrent fevers” and “Bell's palsy.” With a patient like this, you are faced with one of two possibilities: “paranoid parents” or “Am I missing something?” As medical students, we hear both of these phrases used in practice. In fact, I heard a doctor call this boy's parents “nice people, but a bit ... you know ...” the day of their visit, and two days later describe the time he nearly missed a serious diagnosis in a history that seemed perfectly benign.

I keep returning to the room. I check the boy's skin. I check his eyes. I complete the physical exam to the best of my ability. I read some more. I repeat the tests looking for new findings. I ask the parents for more history. And still, nothing. I can't even feel confident that the findings they report at home have actually happened. It's clear that the kid has a minor illness today, but might it be related to something larger?

The word "diagnosis" embodies this internal tension. The etymological roots *dia* (meaning "apart") and *gignoskein* (meaning "to learn") suggest that we can pry apart our patients' histories and physicals to truly "know" the nature of their disease and give it a label. A label has power. (Why else create ones such as "idiopathic?") It gives certainty even to things that seem—if not implicitly, at least by current standards—grey.

A label has power. It gives certainty even to things that seem—if not implicitly, at least by current standards—grey.

As I walk the family out of the exam room, I fumble awkwardly to give them the semblance of an answer. To "know" whether this is pattern or coincidence. To prognosticate so they know what to expect. But there is no certainty here. I am left grasping and say things I've heard more practiced physicians often say: "We'll let you know when we get the lab results back." "I'll keep researching to see what

else I can learn." "It may be nothing at all. Let's see how things play out."

In private, I wonder: Would I join a chorus I have heard so many others fall back on? "They're crazy." "He's probably healthy." "I think they're just making all of this up." No one likes a cold-case file. We would all much rather have a label for our patients or their families.

To be honest, I don't know which I would have chosen for this young man and his parents. I think of his case often. It remains unresolved. I find something truly unsatisfactory about that.

Dreaded diagnosis? I dread finding no diagnosis at all. **MM**

Patrick Boland is in his third year at the University of Minnesota Medical School.



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Conference one-upmanship

How an average guy can appear brilliant

BY HARRISON H. FARLEY, MD

During my 60-some years in medicine, I have witnessed enormous changes in the way we physicians and surgeons diagnose and treat illness and injury. In spite of all the advances, a few areas of teaching and practice remain remarkably unchanged. First and foremost is the need for doctors and nurses to be patient and kind to their patients. This is the *sine qua non*, and it remains the major part of good medical practice. Others are less important and seldom discussed. One of these is the fine art of “conference one-upmanship.”

I discovered this quite by accident during one of my first lectures on diagnosis at Cornell University’s medical school (now Weill Cornell Medical College) in New York City. It was 1950—before the advent of cardiac surgery as we know it.

We students were nervous and apprehensive as we sat in the auditorium and listened as our gray-haired professor presented a young patient, dusky in color, short in stature and with markedly clubbed fingers. The professor politely greeted the young man, then turned to us and asked if anyone would care to guess as to the young man’s medical condition. No one raised a hand—except me. I was from a small Midwestern college and sitting among mostly Ivy League graduates, many of whom had advanced degrees, but my hand was the only one that went up.

“It appears to me that he may have a condition known as Tetralogy of Fallot,” I said.

The professor was obviously shocked but acknowledged that I was correct. He went on to ask whether I had any knowledge as to

the exact nature of this condition. My fellow students could barely hide the smirks on their faces. But their expressions changed to looks of admiration when I was able to describe the four major cardiac defects that comprise the condition.

Afterward, in the hallway outside the lecture room, many of the other students complimented me, exhibiting a respect bordering on awe that bolstered my self-confidence. Rather than confess how I happened to know those facts, I decided that silence was the way to go. The truth of the matter was that during the previous year, I had done an extensive review for my college biology class on Helen Taussig's groundbreaking description of the condition and Henry Blalock's surgical solution. It was the only congenital cardiac condition that I knew of. Nevertheless, outspoken and unafraid of making a mistake, I had taken a big leap and hit the diagnosis head on.

I do not say that this was the correct, nor the most forthright, way for me to present myself (in fact, it could be considered deceitful), but it was an enormously effective way for me to gain my peers' respect. And it bore out the value of the master poker player's well-known adage: "Never show a winning hand if you don't have to!" I didn't realize it at the time, but I had made a running start in developing the fine art of conference one-upmanship. **MM**

Harrison Farley is a retired surgeon living in Lilydale, Minnesota.



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News Briefs



Second survey shows physicians want more research on medical cannabis

Nearly half of Minnesota physicians who are not taking part in the state's medical cannabis program say it's because there's not enough scientific research to demonstrate the drug's benefit, the MMA found in a poll of physicians.

The email survey was sent June 30 to more than 14,000 physicians, both MMA members and nonmembers; more than 400 responded. The survey solicited physicians' reasons as to why they are or are not certifying patients for the state's medical cannabis program.

Along with the lack of scientific evidence, 25 percent of those surveyed said they would not participate until the U.S. Food and Drug Administration (FDA) tests and approves it. Currently, medical cannabis is classified as a Schedule I drug, which means it has no medical benefit. Heroin and LSD are also Schedule I drugs.

Of the physicians who said they will take part in the program, the leading reasons include: having patients who are asking for medical cannabis, their belief that the drug does have medical value and the fact that the information gathered through the program will help the state better understand the drug's efficacy.

An earlier MMA survey (sent June 2) found a majority of Minnesota physicians were not planning to participate in the state's medical cannabis registry at the time. Of 457 respondents to that survey, 9 percent said they plan to participate, 68 percent said they do not, 17 percent said they hadn't decided and 7 percent noted that they don't have patients who have a qualifying condition.

MMA leader to take ACMC top post in January



Cindy Firkins Smith, MD

MMA Immediate Past President Cindy Firkins Smith, MD, will become president and CEO of Willmar-based Affiliated Community Medical Centers (ACMC) on January 1, 2016.

Smith has practiced dermatology and dermatologic surgery at ACMC for 25 years and is a professor in the University of Minnesota's department of dermatology. Last year, Gov. Mark Dayton appointed her to the Blue Ribbon Commission on the University of Minnesota Medical School. She recently was awarded the Distinguished Alumni Achievement Award by her undergraduate alma mater, Minnesota State University, Mankato.

"I'm excited and honored about this new role," Smith says. "ACMC's physicians and staff have a long history of providing

outstanding care to the people of west central and southwest Minnesota. It's a privilege to continue that tradition."

MMA works to address esthetician law

The MMA is working to fix legislation that would require physician clinics offering cosmetology, esthology or nail services to obtain a salon license. The law was to take effect August 1. MMA representatives met with the Board of Cosmetologist Examiners and the Board of Medical Practice to ensure that services provided in a medical office can continue without the need for new licensure.



Annual Conference registration open

Physicians can now register for the 2015 Annual Conference, "Looking at Medicine's Future." Go to www.mnmed.org/ac2015 to sign up.

The conference will include:

- "Future of Medicine and the Physician's Role in Innovation," presented by Ian Morrison, PhD, an internationally known futurist, author, lecturer and consultant,
- "Scanning Tomorrow's Technology," presented by Kyra Bobinet, MD, MPH, researcher, behavior designer, innovator and entrepreneur, and
- "Hippocrates Cafe — Arc of a Physician's Career: Readings from *Minnesota Medicine*," presented by Jon Hallberg, MD, MPR commentator.

Additional educational programs include: "Motivational Interviewing," "Using Patient and Team Communications to Improve Safety," "Healing the Healer" and "Practice Tips to Reduce Burn-out." For more information, call 612-362-3755.

On the calendar

Event	Date	Location
Healthiest State Summit	Aug. 6	University of Minnesota Continuing Education and Conference Center, St. Paul
Preconference Hippocrates Cafe	Sept. 24	DoubleTree by Hilton, St. Louis Park
2015 Annual Conference	Sept. 25-26	DoubleTree by Hilton, St. Louis Park

Check the MMA's website (www.mnmed.org/events) for more information and to register.



Maya Babu, MD

MMA members make an impact at AMA meeting

The MMA was well-represented at June's AMA Annual Meeting in Chicago. Member Maya Babu, MD, won a second term on the Board of Trustees and member Steven Meister, MD, led a discussion on physician autonomy regarding the Avera Marshall Medical Center staff.

Babu and Meister were just two of many MMA members at the meeting. Others included: President Donald Jacobs, MD, Immediate Past President Cindy Firkins Smith, MD, Sally Trippel, MD, Will Nicholson, MD, Ray Christensen, MD, David Luehr, MD, Stephen Darrow, MD, Paul Matson, MD, Benjamin Whitten, MD, Dionne Hart, MD,

Ken Crabb, MD, Blanton Bessinger, MD, Peter Amadio, MD, Eric Tangalos, MD, Laura Dean, MD, Gary Bryant, MD, Lyell Jones, MD, Daniel Brown, MD, and John Abenstein, MD. In addition, Sagar Chawla and Elizabeth Fracica attended as medical student delegates, and Kerri Chung, DO, went as the RFS delegate.

MMA staff attending included: CEO Robert Meiches, MD, Dave Renner, director of state and federal legislation, Janet Silversmith, director of health policy, and Teresa Knoedler, JD, policy counsel.

Renner gave a presentation on the MMA's prior authorization reform efforts.

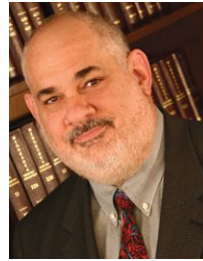
Opioids seminars scheduled for Mankato, Duluth

The MMA will host two free REMS (risk evaluation and mitigation strategy) seminars on opioids for physicians who prescribe extended-release and long-acting opioid medications.

The first event will take place August 13 at the Courtyard by Marriott in Mankato; the second will take place October 1 at the Black Woods Banquet Center in Duluth. Both events will take place from 5:30 to 8 p.m. and will feature food and a cash bar. This activity has been approved for AMA PRA Category 1 Credit™. Both seminars will be led by MMA member Charles Reznikoff, MD, an addiction medicine specialist. Visit the events section on the MMA website for more information.

Physicians could get reimbursed for talking about end-of-life with Medicare patients

In early July, the federal government proposed paying physicians, nurse practitioners and other health-care providers for discussing end-of-life care with their Medicare patients. The proposed rule would build on the current Centers for Medicare and Medicaid Services' payment to physicians for advance care planning discussions that occur during a patient's annual wellness visit. This new proposal would allow reimbursement for advance care planning consultations regardless of when they occur.



Robert Meiches, MD



Kathleen Baumbach



Mandy Rubenstein



Dave Renner



Eric Dick



Juliana Milhofer

MMA in Action

MMA President **Donald Jacobs, MD**, met with new Interim Fairview Chief Medical Officer, Lisbeth Thomas, MD. He also met with Minnesota Hospital Association Medical Director Rahul Koranne, MD. Jacobs, **Robert Meiches, MD**, MMA CEO, and **Kathleen Baumbach**, manager of physician outreach, also met the physician members of Ear, Nose and Throat Specialty Care of Minnesota.

Immediate Past President **Cindy Firkins Smith, MD**, Meiches and Baumbach met with leaders at Hutchinson Health in late June.

Meiches, Trustee **Marilyn Peitso, MD**, and **Mandy Rubenstein**, manager of physician outreach, met with CentraCare CEO Ken Holmen, MD, in June.

Meiches, Dave Renner, director of state and federal legislation, **Eric Dick**, manager of state legislative affairs, **Juliana Milhofer**, MMA policy analyst, **Teresa Knoedler, JD**, MMA policy counsel, and **Janet Silversmith**, director of health policy, met with staff from the Minnesota Hospital Association in June to discuss post-legislative topics, including the all-payer claims database, the new Health Care Financing Task Force, telemedicine, the interstate licensure compact, medical cannabis and prior authorization.

Dick also traveled to Sanford Health's Bemidji Clinic in July to present a review of the 2015 legislative session and field questions about the state's medical cannabis program.

In late June, Rubenstein attended the Minnesota Rural Health Conference in Duluth.

In late July, **Dennis Kelly**, MMA Foundation CEO, met with the leadership of Westside Community Health Services in St. Paul to discuss the Foundation's Physician Volunteerism Program.

VIEWPOINT

Avoiding the “dog days” of health care

The dog days of summer are here. I heard that expression on the radio the other day and decided to look up its origin. I shouldn't have been surprised to learn that it has little to do with dogs but instead dates back thousands of years and refers to a roughly six-week period of hot and sultry weather in July and August associated with the conjunction of the sun and the star Sirius (the “dog” star). OK, that's explains the dog part.

I read where the phrase is also used to refer to any period of stagnation or languid activity—and that's what really caught my attention.

If you have been reading my Viewpoints over the past 10 months, you may have picked up on a theme. Much of my writing has dealt with our collective strength as physicians (to say nothing of the respect our profession still holds with the public) to reshape health care into a system that makes sense for us and for our patients.

Although we have seen both the Minnesota and the U.S. Supreme Courts support principles we believe are vital to a robust health care system, the flawed implementation of law, the burdensome over-regulation of practice and the competing actions of strong third-party payers continue to frustrate physicians.

In my view, our only reasonable recourse is vocal activism. Much of what frustrates us now is the result of well-intended decisions made without consideration for how they will play out. These decisions just add or shift cost without actually achieving measurable improvement. We have to stop playing the game that way. We lose and so do our patients.

I know we can find workable solutions to health care's problems if physicians make the commitment and get involved. Nobody understands how the system should work and how the important pieces should be connected better than we do. For us to do that, we need to work together.

The MMA needs the engagement and, quite frankly, financial support from all physicians in Minnesota if we are to succeed in making the state the best place to practice medicine. We need to partner, not compete, with our specialty societies. We need all oars in the water, pulling hard in the same direction. If we do nothing, the results won't be pleasant.

Talk with your colleagues. Encourage discussion and debate. Join us in September at the Annual Conference in St. Louis Park. Fight back against stagnation. Our profession's future depends on it.

As always, let me know your thoughts. I appreciate the feedback I have had from many of you over the past year. Let's ramp it up.



Donald Jacobs, MD

I know we can find workable solutions to health care's problems if physicians make the commitment and get involved.



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- Policy and open-issues forums
- Networking and renewing acquaintances

Don't miss this great event. Take a look at this program and then register to join me.

See you there.

Donald Jacobs, MD
President MMA

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Conference Schedule

PRECONFERENCE SESSION:

Thursday, September 24

- 6-8 pm Hippocrates Cafe
 "Arc of a Physician's Career—Readings from *Minnesota Medicine*"
Jon Hallberg, MD, Minnesota Public Radio Contributor, University of Minnesota Physicians

Friday, September 25

- 7 am Registration
 8 am Exhibits open
 8-9 am Breakfast with futurist Ian Morrison (ticketed event)
 9-10 am **KEYNOTE "Future of Medicine and the Physician's Role in Innovation"**
Ian Morrison, PhD, futurist, lecturer author
 10-10:30 am Break time with exhibitors
 10:30 am-noon **CONCURRENT POLICY FORUMS**
- Value-based payments
 - End-of-life issues
- Noon-12:30 pm Break time with exhibitors
 12:30-2 pm **Welcome luncheon**
- *State of MMA: Robert Meiches, MD, MMA CEO; Donald Jacobs, MD, president; Doug Wood, MD, board chair*
 - *Audience feedback on improving the health of Minnesota — Healthy Minnesota II Janet Silversmith, MMA director of health policy*
- 2-2:30 pm Break time with exhibitors
 2:30-3:30 pm **Educational programming I**
- CONCURRENT SESSIONS**
- *Changing Patient Behavior through Motivational Interviewing, Michael Schommer and Brian Rubenstein, RSI Institute, Fargo*

Do you have an issue to raise at a policy forum?

Here's your opportunity. The MMA Policy Council is seeking physician input at three policy forums:

- **VALUE-BASED PAYMENTS.** We'll explore the use and growth of value-based payment models and identify challenges associated with their design and implementation.
- **END-OF-LIFE ISSUES.** We'll examine policy changes that could improve advance care planning and delivery of end-of-life care.
- **OPEN-ISSUES.** You'll have the opportunity to bring additional issues or ideas to the attention of the MMA for discussion and consideration.

Sharing your ideas for the open-issues forum is easy. Visit www.mnmed.org/AC15issues and complete the form. **Deadline is Aug. 22.** Submissions received after that date may not be considered at the conference.

- *How Your Mobile Device Can Make You a Smarter Doc, Nancy Baker, MD, University of Minnesota Physicians, and James Beattie, reference librarian, University of Minnesota Biomedical Library*
- *Reclaiming the Joy in Your Practice, Lynne Fiscus, MD, MPH, FAAP, University of Minnesota, and Katie Holley, MPH, Fairview Eagan and Rosemount clinics*

- 3:30-5 pm **Open-issues policy forum**
 5-6 pm **MEDPAC reception**
 5-6 pm **MMA Foundation reception**
 6-7 pm **Poster session**—Enjoy a beverage and hors d'oeuvres while browsing student and resident posters
 6-7 pm **Inaugural reception**
 Reception will be in exhibit area. A quartet will provide background music.
 7-10 pm **President's inaugural**
 MMA Foundation awards
 Inauguration of President David Thorson, MD
 Music by the White Bear Big Band

Saturday, September 26

- 7-8 am **Section meetings**
- Medical students
 - Residents/fellows
 - Young physicians
- 7 am Breakfast in exhibit area
 7-8 am **Breakfast with technology entrepreneur Kyra Bobinet, MD, MPH** (ticketed event)
 8-9 am **KEYNOTE "Scanning Tomorrow's Technology"**
Kyra Bobinet, MD, MPH, researcher, behavior designer, innovator and entrepreneur
 9-9:30 am Break time with exhibitors
 9:30-10:30 am **Educational programming II**
- CONCURRENT SESSIONS**
- *Who Heals the Healer? Resiliency-Building Tips for Those Who Care for Others Laurie Drill-Mellum, MD, MPH, MMIC, Edina*
 - *Emerging Technologies for Physicians — panel discussion Kyra Bobinet, MD, MPH, moderator. Jack Cosentino, senior director, enterprise technology solutions, Medtronic. Additional speakers to be announced*
 - *Improving Patient Care and Safety through Strong Team Communications Robert Thompson, RT, JD, MMIC, Edina*
- 10:30-11 am Break time with exhibitors
 11 am-noon **Closing keynote** — speaker to be announced
 Noon Adjourn

Conference Speakers



Future of Medicine and the Physician's Role in Innovation

Ian Morrison, PhD, futurist, author, lecturer
Morrison is an internationally known author, consultant and futurist specializing in long-term forecasting and planning with an emphasis

on health care and the changing business environment. He has worked with more than 100 Fortune 500 companies in the health care, manufacturing, information technology and financial services sectors. Morrison is president emeritus of the Institute for the Future and a founding partner of Strategic Health Perspective, a joint venture between Harris Interactive and the Harvard School of Public Health's Department of Health Policy and Management. He is well-known for his provocative views on physician and hospital reimbursement and the Affordable Care Act.



Scanning Tomorrow's Technology

Kyra Bobinet, MD, MPH, researcher, behavior designer, innovator and entrepreneur

You've heard all the hype about the vast array of consumer technology heading our way. How will it affect your practice and your patients?

Join Kyra Bobinet, who will take a neuroscience-

based approach to making sense out of future health technologies. She will help you understand how to use consumer technologies and wearable devices to your advantage.

Bobinet teaches patient engagement, mobile health technology and health design at Stanford School of Medicine. She is also CEO and founder of engagedIN, a behavior design firm that serves the health and wellness industry. She received her medical degree from the University of California at San Francisco Medical School and her master's in public health from the Harvard Chan School of Public Health.



Arc of a Physician's Career Hippocrates Cafe

Jon Hallberg, MD, MPR contributor, University of Minnesota Physicians, MMA member since 1996
Hippocrates Cafe is the brainchild of Jon Hallberg, MD, an associate professor of family medicine at the University of Minnesota, medical director of Mill City Clinic in

Minneapolis and a regular Minnesota Public Radio commentator. Hippocrates Cafe uses professional actors and musicians to explore health care topics through story and song. Since 2009, Hallberg has presented 60 shows around the country covering 30 topics. This one will feature readings from *Minnesota Medicine*.



Changing Patient Behavior through Motivational Interviewing

Michael Schommer and Brian

Rubenstein, co-presidents and co-founders of RSI Institute, Fargo
How many times do you ask your patients to make health-related changes but don't get the results you want? Join two experts from outside health care to learn the collaborative techniques of "motivational interviewing," a skill that can encourage behavior changes in your patients. Michael Schommer and Brian Rubenstein will discuss how to have deeper, more intense conversations with your patients that can lead to lasting change. The pair has worked with health care, mental health, chemical dependency, law enforcement and corrections groups across the country to implement this evidence-based technique.



Improving Patient Care and Safety through Strong Team Communications

Robert Thompson, RT, JD, director of education, MMIC, Edina

This workshop focuses on improving communication among physicians, their teams

and their patients to improve the quality and safety of patient care. Robert Thompson will discuss how communication breakdowns can lead to patient injuries and offer methods that can lead to improved patient understanding, engagement and clinical outcomes. As director of education for MMIC, Thompson develops and delivers educational programs for local and national health care organizations and other clients.



How Your Mobile Digital Device Can Make You a Smarter Doc

Nancy Baker, MD, University of

Minnesota Physicians, and James Beattie, reference librarian, University of Minnesota Biomedical Library

The Internet has revolutionized the way physicians access medical literature and evidence-based clinical guidelines. Smartphone and tablet apps can provide information at the point-of-care. Baker and Beattie will help physicians identify apps that adhere to the principles of evidence-based medicine. The speakers will lead an audience discussion about favorite apps and select three "must-haves" to install on portable devices.

Conference Speakers



Emerging Technologies for Physicians—Panel Discussion

This continuation of the keynote presentation will feature local technology leaders who will discuss trends about which physicians need to be aware.

- Moderator – Kyra Bobinet, MD, MPH, Saturday’s keynote presenter
- Jack Cosentino, senior director, enterprise technology solutions, Medtronic. Cosentino is focused on identifying, understanding and developing technologies to monitor and manage patients across various disease states and in a variety of patient care environments.
- Additional panelists to be announced.



Who Heals the Healer? Resiliency-Building Tips for Those Who Care for Others

Laurie Drill-Mellum, MD, MPH, chief medical officer, vice president of patient safety solutions MMIC, Edina, MMA member since 1991

There is an epidemic of stress and burnout among America’s physicians. Drill-Mellum will discuss the far-reaching impact of this epidemic and how it affects patient safety, patient care and physician satisfaction. She will examine what contributes to stress and burnout and discuss practices and techniques that can promote health and healing among physicians. Drill-Mellum is a board-certified emergency medicine physician who has practiced at Ridgeview Medical Center in Waconia. She is a Bush Medical Fellow and completed a two-year fellowship in integrative medicine at the University of Arizona.



Reclaiming the Joy in Your Practice

Lynne Fiscus, MD, MPH, FAAP, executive medical director, ambulatory clinics and surgery center, University of Minnesota, and Katie Holley, MPH, clinic administrator, Fairview Eagan and Rosemount clinics

The practice of medicine continues to change rapidly. As the expectations for productivity, outcomes and patient experience continue to increase for physicians, so does the risk for burnout. Fairview Clinics – Rosemount has transformed its systems to help physicians rediscover the joy of practice. The transformation focused on a team-oriented approach—using support staff to assist physicians with their work, making their days more manageable and more enjoyable. Fiscus has been involved in practice transformation and physician leadership development over the past six years. Holley is the clinic administrator for Fairview Eagan and Rosemount clinics.

MMA’s Wall of Inspiration

Stop by to share your story of why you became a doctor. We’ll post responses at the conference.

“Why did you become a doctor?”

CME Credits

Accreditation Statement

The Minnesota Medical Association (MMA) is accredited by the Accreditation Council for Continuing Medical Education to provide continuing medical education for physicians.

Credit Statement

The Minnesota Medical Association designated this live activity for a maximum 4.0 AMA PRA Category 1 Credit(s)[™]. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Special Events

Hippocrates Cafe

Hippocrates Cafe was developed by Jon Hallberg, MD, in 2009 and uses professional actors and musicians to explore health care topics through song and story. The performers present carefully selected readings and music to provide an insightful view of the topic. Our presentation, "Arc of a Physician's Career—readings from *Minnesota Medicine*," looks at the stages of a physician's professional life and the joys, challenges and changes we face.

Poster Session

A poster session will feature the work of our medical student, resident and fellow members. There will be several opportunities to view the exhibits, talk with the participants and vote for a "People's Choice" award winner.

Presidential Inaugural

Join us as President Donald Jacobs, MD, inaugurates David Thorson, MD, as the 149th president of MMA. Then enjoy the sounds of the White Bear Big

Band, a 17-piece band offering something for every musical ear with their big band, swing, jazz and pop selections.

MMA Foundation Awards

The inaugural evening will recognize our colleagues as the MMA Foundation presents the Community Service Award, the President's Award and the MMA's highest honor, the Distinguished Service Award.

Family Fun

You'll find shopping, dining, arts, parks, zoos, museums and college and professional sports just minutes away. Downtown Minneapolis is 10 minutes to the east, The Mall of America is 25 minutes to the southeast and The Shops at West End are across the street from the conference hotel. There are activities for kids and adults (in-room babysitting is available).

Registration Information

Registration

Go to www.mnmed.org/AC15register to register and pay by credit card or call 612-362-3755.

Registration deadline is Monday, Sept. 21.

Registration Fees

Early Bird Special: Register before Sept. 1 and take 10% off (use promo code EARLY).

- **Members \$99** (\$89 before Sept. 1)
- **Nonmembers \$149** (\$134 before Sept. 1)
 - **Nonmember special: Join the MMA for 2016 before the Annual Conference and receive your registration at no cost — a \$149 value. Contact our membership team at 612-362-3728 or enroll@mnmed.org for details.
- **Students, Residents, Fellows No cost**
- **Keynote/half-day special member rate \$50** (attend a keynote and stay any half day. This offer includes Hippocrates Cafe and excludes inaugural dinner).
- **Keynote/half-day special nonmember rate \$70** (attend a keynote and stay any half day. This offer includes Hippocrates Cafe and excludes inaugural dinner).
- **Sponsor a student, resident or fellow.** Help a young member experience the Annual Conference. **\$99 each**
- **Breakfast with the Keynotes.** Here's your chance to have small group conversations with our two keynote presenters about their ideas for the future of medicine and technology.
 - Friday morning breakfast with Ian Morrison — \$89
 - Saturday morning breakfast with Kyra Bobinet — \$89

Lodging

Lodging is available at DoubleTree Park Place at the discounted rate of \$109 a night for single or double occupancy standard rooms (including tax and service fees). Call DoubleTree at 1-952-542-8600 to reserve your room. Make sure to mention that you are with the Minnesota Medical Association. You must book your room by Sept. 3 to receive the MMA rate.



How Your Smartphone or Tablet Can Make You a Smarter Doc

BY NANCY J. BAKER, MD, AND JIM BEATTIE, MLIS

Increasingly, physicians and medical students are integrating apps that run on smartphones and tablets into their clinical work. This article describes a small anecdotal study of app use among third-year University of Minnesota medical students and their faculty preceptors. We describe apps used by the students and physicians we interviewed and offer guidance for choosing apps that are reliable, useful and up to date.

Smartphones and tablets have become as much a part of medicine as scrubs and stethoscopes. Epocrates' 2013 mobile trends report noted that soon, nine out of 10 clinicians will be using smartphones. That survey of 1,063 health care providers also found that more than half said they consider themselves "digital omnivores," meaning they routinely use a smartphone, tablet, laptop and/or desktop computer for their professional activities.¹

Apps for smartphones and tablets can serve as an important resource for clinicians. In 2012, Braekkan Payne and colleagues surveyed medical students and junior doctors in the United Kingdom and found the majority used one to five apps on a regular basis.² In their report on the study, they suggest that medical apps have the potential to save physicians time and may contribute to better decision-making, in addition to reducing medical errors.

Both physicians and medical students use apps to review information about the diagnosis and treatment of various medical conditions. However, not all medical apps are created equal. Some are free; others must be purchased. Some can be downloaded to a number of operating

systems (Android, iOS, Windows); others are designed to work on one specific system. Some apps adhere to the rigorous principles of evidence-based medicine,³ while others are simply built on expert opinion and clinical experience. There is no standardized review process for apps to evaluate their usefulness and the validity of their content before they are made available. So when contemplating whether to use a particular app, consider these questions:

Who authored the app? Was it a government agency, professional society or a for-profit publisher? Government agencies such as the Agency for Health Care Research and Quality (AHRQ) or specialty societies such as the Society of Teachers of Family Medicine (STFM), the American College of Physicians (ACP) and the American Society for Colposcopy and Cervical Pathology (ASCCP) require substantial vetting of content by peer review before they release an app.

Is the content current and correct? Apps including Epocrates and the Johns Hopkins and Sanford antibiotic guides are routinely updated. On the other hand, the Centers for Disease Control and Preven-

tion's STD treatment guidelines were updated this year after having not been since 2010.

Does the app do the job? In other words, is it user-friendly and is it worth the price? Most physicians have little time or patience for tools that are inefficient or that don't provide useful information. When choosing apps, ask colleagues about those they would recommend and why.

How faculty and students use apps

Despite their potential limitations, apps on mobile devices can provide doctors and medical students with valuable assistance at the bedside or when doing point-of-care teaching.

We wanted to learn more about how faculty and students at the University of Minnesota Medical School are using apps. In October 2014, we did face-to-face interviews with four third-year students about their use of apps to assist them with point-of-care medical decision-making during clinical rotations. These students were participants in the Rural Physician Associate Program (RPAP) and Metropolitan Physician Associate Program (MetroPAP),

two nine-month longitudinal integrated clerkships that place students in rural and underserved communities. Similarly, four family physician faculty members who work with the clerkship programs were interviewed about their use of apps to assist with patient care, as well as with teaching medical students.

Findings

We were surprised to learn from the students that they are reluctant to use mobile devices to look up medical information during office visits. They indicated that they feared patients will lose confidence in their knowledge and clinical acumen. In addition, they said they were specifically advised by fourth-year medical students to “put away” their mobile devices before starting clinical rotations out of concern that their attending physicians would assume they are using them to access social media. In addition, the students who lacked experience using medical apps said they found it difficult to access them in a time-efficient manner. They also did not know which ones contain the most relevant and valid information.

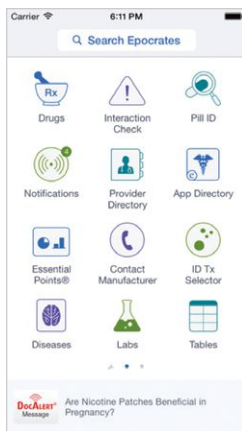
The physician faculty members said they used smartphone and tablet apps routinely to assist them with patient care and during point-of-care medical student teaching activities. Some also said they recommend specific apps to patients to support lifestyle changes and to assist them with chronic disease self-management.

Although physician specialty dictates which apps are most useful for clinical and teaching activities, we asked the physicians and students we interviewed which ones they found most useful. Here are some they mentioned.



Dynamed and UpToDate

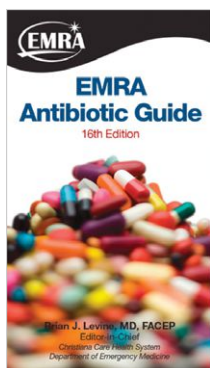
Both the students and faculty interviewed said they most often use either the Dynamed or UpToDate app to review general information about disease diagnosis and treatment. Both apps are available for Android, iOS and Windows devices but individual subscriptions are costly.



Epocrates

The RPAP and MetroPAP students said they found the Epocrates app’s drug reference and medical calculator most useful. Epocrates allows them to search drug doses; learn

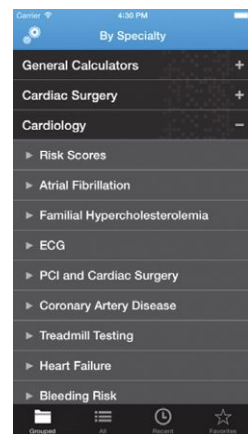
about contraindications and cautions to drug use as well as adverse drug reactions and possible drug interactions; and understand drug pricing. It also provides pictures of pills. Free versions are available for Android and iOS devices. A paid version of the more robust Epocrates Plus with clinical practice guidelines and in-depth content about diseases and alternative medicine is also available.



Antibiotic guides

The Emergency Medicine Residency Association (EMRA) antibiotic guide for management of infectious diseases, as well as the Johns Hopkins and Sanford antibiotic guides

are all available for purchase and can be downloaded on Android and iOS devices. These are updated annually and were used more by the faculty than the students we interviewed.



QxMD's Calculate

The medical calculator app most frequently used by the RPAP/ MetroPAP students is Calculate by QxMD. It is free and available for Android, iOS and Windows devices.

It contains formulas to calculate such things as anion gap, APGAR and Bishop scores, due date by last menstrual period and ultrasound and renal function. It also has numerous calculations related to cardiac, pulmonary, neurologic and neoplastic conditions. One student specifically discussed how he used Calculate to determine the Glasgow Coma Scale for a patient who presented to the emergency department with acute confusion.



AHRQ Electronic Preventive Service Selector (ePSS)

Students and faculty alike routinely use the AHRQ ePSS app to identify appropriate age-specific screenings for patients. The app

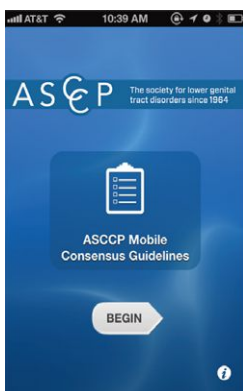
also includes supplemental tools such as a scoring system for BMI and for osteoporosis. This app is free and available for download on Android, iOS and Windows devices.

Vaccine	Birth	1 mo	2 mos	4 mos
HepB >	1st dose	2nd dose		
Rota >			1st dose	2nd dose
DTaP >			1st dose	2nd dose
Tdap >				
Hib >			1st dose	2nd dose
PCV >			1st dose	2nd dose
PPSV >				
IPV >			1st dose	2nd dose
Flu >				
MMR >				
Var >				
HepA >				
HPV >				
MCV >				See Note >

Shots

Faculty said they find the Shots immunization app helpful. Produced by the Society of Teachers of Family Medicine, it includes the most current

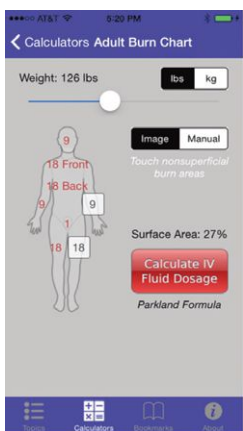
immunization recommendations and the annual schedules published by the CDC. The free app is available for Android and iOS devices.



The ASCCP Algorithms

The students and faculty use the ASCCP Cervical Cancer Screening Guidelines algorithm for management of abnormal Pap smears. The app is available for

purchase for Android and iOS devices.



Other apps

Students and faculty also mentioned the Center to Advance Palliative Care's palliative care **Fast Facts**, which is free but available only for use on iOS devices (iPhone, iPad); the **ACLS critical**

care guide, which is available for purchase for Android and iOS devices; and the **Brancel prenatal OB** and **Brancel Ortho** apps available for purchase for Android and iOS devices.

Where to find recommended apps

Dynamed medical reference

www.dynamed.com/home/access-options/mobile-access

UpToDate medical reference

www.uptodate.com/home/uptodate-mobile-access

Epocrates drug reference guide

www.epocrates.com/?CID=PPC-epoc+Branded-Google-epocrates+app-epocrates+General-e

EMRA antibiotic guide

www.emra.org/publications/mobile-applications/

Johns Hopkins antibiotic guide

<http://www.hopkinsguides.com/hopkins/ub>

Sanford antimicrobial therapy guide

www.sanfordguide.com/publications/the-sanford-guide-to-antimicrobial-therapy/mobile-applications

Calculate by QxMD

www.qxmd.com/apps/calculate-by-qxmd

ePSS by AHRQ (USPSTF screening recommendations)

<http://epss.ahrq.gov/PDA/index.jsp>

Shots immunization guide by STFM

www.immunization.org/Shots-Mobile-App

ASCCP algorithm for management of abnormal Pap smears

www.asccp.org/Bookstore/ASCCP-Algorithms-Mobile-App

Fast Facts hospice and palliative care resource

<https://itunes.apple.com/us/app/palliative-care-fast-facts/id868472172?mt=8>

ACLS critical care guide

<https://itunes.apple.com/us/app/critical-care-acls-guide/id366564136?mt=8>
Bibliography

Brancel Medical Guides

<https://sites.google.com/site/pocketreferenceguidelines/home/obstetric-prenatal-care-guidelines>

Discussion

We shared our findings with 187 primary care providers at the 2015 Minnesota Academy of Family Physicians (MAFP) Spring Refresher in May. During our talk, we demonstrated several of the aforementioned apps by illustrating how they could assist physicians in a variety of clinical scenarios. For example, if a 51-year-old married white male presents for a complete physical exam, the ePSS app recommends the following preventive measures: discussion of daily aspirin use, colorectal cancer screening, blood pressure monitor-

ing and screening for HIV. If a 62-year-old man presents to the emergency department with head and neck pain four days after experiencing closed head trauma, the Calculate app provides a tool to determine if cervical spine films are indicated. Conference attendees were overwhelmingly enthusiastic about the value of the presentation and requested more detailed information about specific apps as well as more time to practice using apps to answer other point-of-care clinical questions.



A significant limitation to our findings is the fact that only eight individuals were interviewed. All are currently affiliated with the University of Minnesota's RPAP and MetroPAP programs. The participants represent a convenience sample and may not be representative of other third-year medical students and faculty at the university or practicing physicians in Minnesota. In addition, there is likely variation in physician and medical student mobile app preference simply because of differences in experience and areas of clinical focus. For example, clinicians who do more women's health are likely to use an app that contains algorithms to assist with management of abnormal Pap smears, whereas those who provide well-child care are more likely to use one with a current pediatric immunization schedule.

There are also apps physicians and medical trainees can recommend to pa-

tients that focus on lifestyle change and self-monitoring for chronic disease.⁴ Remote monitoring of patient health status is an area that will only grow in importance as handheld technologies become more sophisticated. During our interviews, we did not explore whether the students or faculty physicians routinely use and recommend such apps. However, this is a potential area for further study.

Conclusion

Smartphones and tablets are commonplace in the United States and are used increasingly in resource-poor countries. Medical apps available for use on these devices have the potential to save a busy clinician time by providing ready access to clinical guidelines and disease treatment algorithms. They also can help physicians be more effective when teaching both students and patients.

It is important that physicians test apps before using them in exam rooms with patients and verify that the content was

produced by a reliable source and is up to date. MM

Nancy Baker is an assistant professor in the department of family medicine and community health at the University of Minnesota. Jim Beattie is a library liaison to the University of Minnesota Medical School.

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MAKE A DIFFERENCE IN YOUR COMMUNITY

Volunteer!

Make a difference in the lives of children, women and men across the state by volunteering your time and talents in the **Physician Volunteer Program (PVP)**.

PVP is a one-stop resource that connects physicians with eight community clinics in need of skilled medical professionals.

- Physicians are needed in 20 specialties, from primary care to cardiology.
- Positions in 17 Twin Cities and Greater Minnesota locations are available.
- More clinical and non-clinical opportunities coming soon!



Find the right volunteer opportunity at www.mmafoundation.org/PVP.

Contact Dennis Kelly, CEO, at 612-362-3767 or dkelly@mnmed.org.

MMAF thanks UCare and the physicians of Minnesota for their generous support.



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About this Section

This spring, *Minnesota Medicine* put out a call asking physicians, residents and medical students to tell us about challenging cases they have seen recently. These may be cases in which the diagnosis was difficult to make or was an unusual one, or in which figuring out a treatment was as arduous as making the diagnosis.

We would like to thank all who submitted case studies as well as our reviewers: Charles Meyer, MD, Barbara Yawn, MD, and Zeke McKinney, MD, MHI.

Unexplained Cardiac Arrest in a 28-Year-Old Medical Resident

BY PRAKRITI GABA, MAYO MEDICAL SCHOOL; SAMUEL ASIRVATHAM, MD, DEPARTMENT OF CARDIOVASCULAR DISEASES, MAYO CLINIC

A 28-year-old medical resident and marathon runner was admitted to the cardiology unit after experiencing cardiac arrest while jogging. On admission, she was noted to have a prolonged QT interval and a low potassium level (2.4 mmol/L). However, no signs of ischemia, prior arrhythmias (such as ventricular fibrillation), prior syncopal episodes or other cardiac findings were noted on history or ECG (Figure 1). An echocardiogram during subsequent workup documented normal left ventricular size and systolic function. A CT scan revealed slight right ventricular abnormality; however, this finding was attributed to her strenuous exercise routine and therefore ignored. A diagnosis of prolonged QT syndrome aggravated by hypokalemia was made, and the patient was advised to undergo implantation of a cardioverter defibrillator (ICD).

Several weeks later, the patient underwent another ECG, which showed no evidence of a prolonged QT interval and was normal at 448 millisecond. Her PR interval was also normal as was her heart rate of 66 beats per minute.

Further evaluation over the following months and several consecutive ECGs that were negative for QT prolongation led to the removal of the long QT syndrome diagnosis and consideration of the possibility of atypical catecholaminergic polymorphic ventricular tachycardia (CPVT), especially because of the patient's strenuous exercise regime. Upon CPVT testing (resting ECG, stress test and genetic testing), however, the patient showed no signs of the condition. Because of the patient's lack of symptoms and maximal protection with an ICD, she was advised to continue

her exercise regimen, which was an important part of her life.

Approximately five years later, the patient was admitted to the hospital because of increasing shocks and cardiac events occurring both during exercise and at rest. She underwent another ECG, which showed T-wave inversion and premature ventricular complexes (PVCs) (Figure 2), as well as a chest CT scan (Figure 3), which indicated right ventricular enlargement, fibrofatty change and apical hypokinesia, all of which raised the possibility of arrhythmogenic right ventricular cardiomyopathy (ARVC). Genetic studies confirmed the patient's diagnosis of genetic (PKP2-positive) ARVC.

Discussion

Diagnosis of cardiac events in young athletes can be challenging. In any differential for such patients, we must consider several possibilities (left ventricular hypertrophy, right ventricular arrhythmias, cardiomyopathies, long QT syndrome, sinus bradycardia, atrial fibrillation, valvular heart disease and coronary disease) in order to prevent misdiagnosis and downstream complications.

Arrhythmogenic right ventricular cardiomyopathy is a rare cardiomyopathy that can lead to sudden cardiac death.¹ It is caused by a combination of genetic (ie, desmosome mutation) and/or acquired environmental factors (ie, exercise). Diagnosis of ARVC remains a challenge because of its heterogeneous clinical presentation as well as its variable genetic expressivity and penetrance.² In fact, only 30% to 50% of cases of ARVC reported show evidence of family history.²



Practical ways of distinguishing ARVC from other cardiac conditions that have similar presentation (ie, long QT syndrome and CPVT)^{3,4} involve a combination of the following: 1) ECG, 2) right ventricular angiography/CT scan and 3) genetic testing. Although an ECG can show prolongation of the QT interval in patients with and without long QT syndrome, the QT interval is consistently prolonged only in those patients with a diagnosis of long QT syndrome. Second, a key diagnostic tool for ARVC is the use of right ventricular angiography or CT scan to detect an akinetic or dyskinetic subtricuspid, apical or infundibular right ventricle. In a young patient, this finding is characteristic for ARVC and unlikely for long QT syndrome or CPVT. Third, although genetic testing is not the most sensitive test for ARVC, testing of common mutations that can provoke ARVC (ie, PKP2/plakophilin-2) is likely to aid in excluding other diagnoses.³ Although our patient did have a temporarily prolonged QT interval and a cardiac event, there was no evidence of genetic long QT syndrome or a consistently prolonged QT interval, thus her diagnosis of long QT syndrome was appropriately rescinded.

Treatment of ARVC can be equally difficult. Although current therapeutic options include beta blockers, antiarrhythmic drugs, catheter ablation and implantable cardioverter defibrillator (ICD),⁵ lifestyle modifications may be as, if not more, important in treatment of these patients. In fact, studies conducted by La Gerche et al. have found that endurance exercise such as marathon running can induce right ventricular dysfunction and potentially worsen ARVC.⁶ In this case, even though the patient was maximally protected from a cardiac event with an ICD and had a healthy lifestyle, she still suffered from subsequent cardiac deterioration, which is likely the result of her strenuous exercise plan coupled with her genetics.

This case teaches us that we must consider the patient's whole

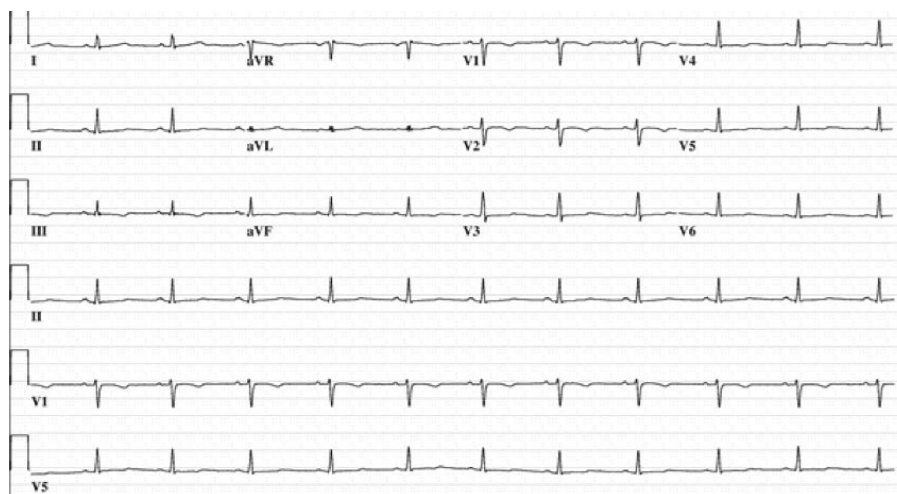


Figure 1. ECG upon admission (2007). Note sinus rhythm and low-voltage QRS.

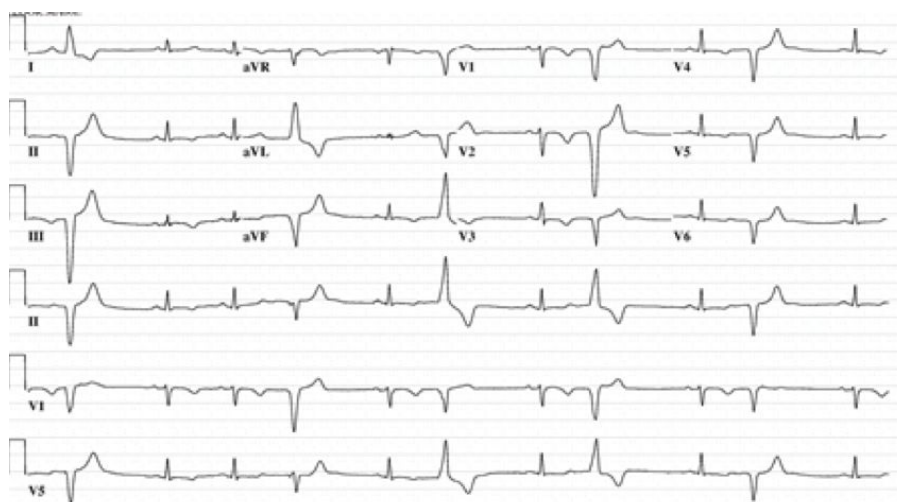


Figure 2. ECG upon follow-up (2012). Note sinus rhythm, low-voltage QRS, T-wave inversion, premature ventricular complexes and T-wave abnormalities (suggestive of inferior and anterior ischemia).

story before diagnosing and treating. Lifestyle practices such as exercise, which is typically encouraged by the medical community, must be prescribed carefully and individualized to the patient prior to implementation; otherwise, patients may suffer from preventable complications. **MM**



Figure 3. CT scan showing stable RV dilatation, reduced function and myocardial fatty deposition consistent with ARVC (2012).

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An Unusual Intra-abdominal Inflammatory Reaction to Intraperitoneal Chemotherapy

BY SUSAN LEE, UNIVERSITY OF MINNESOTA MEDICAL SCHOOL

A 65-year-old female with a history of ulcerative colitis, hypertension and diabetes presented to her primary care provider with dysuria, bloating, abdominal pain and decreased appetite and urination. She was treated with a 10-day course of antibiotics for presumed urinary tract infection. She presented 10 days later with abdominal pain and bloody diarrhea presumed to be suggestive of acute exacerbation of ulcerative colitis. She reported increased abdominal distention and bilateral lower extremity edema, which warranted routine labs and ultrasound that showed an 11-cm cystic adnexal mass in the left pelvis. Follow-up CT scan showed extensive abdominal ascites and thickened omental cake suspicious for ovarian carcinoma, which prompted referral to a gynecologic oncologist. Cancer antigen (CA-125) was found to be elevated, at 4926 U/mL.

She underwent exploratory laparotomy with evacuation of 5 liters of ascites fluid, bilateral salpingo-oophorectomy, omentectomy, lysis of adhesions, left ureterolysis, tumor debulking and cytoreduction with <1 cm residual disease, intraperitoneal port placement for subsequent chemotherapy, cystoscopy and proctoscopy. Frozen-tissue analysis showed high-grade serous carcinoma of the ovary. Final pathology was stage IIIC ovarian carcinoma. Her postoperative course was uneventful and she was discharged to transitional care and then home.

The patient's initial CA-125 after surgery was 2034 U/mL. The treatment plan was to start eight cycles of IV/IP chemotherapy with cisplatin/paclitaxel. After three cycles of IV/IP chemotherapy, CA-125 decreased to 372 U/mL. However,

between days 2 and 8 of the third cycle, she began to experience fatigue, incomplete bladder emptying and increased abdominal distention. After four cycles of IV/IP chemotherapy she presented to the clinic with increasing abdominal distention and pain, worsening nausea, diarrhea, inability to urinate and shortness of breath, and was admitted to the hospital.

During this admission, CT of the abdomen/pelvis showed left hepatic vein thrombosis and severe multiloculated abdominal ascites. Three interventional radiology paracentesis procedures removed 1350 mL, 370 mL and 2800 mL of ascites, respectively, which were sent for cytology and cell count.

The patient also was found to have leukocytosis and mild transaminitis; hepatic serologies were negative. She tested positive for *Clostridium difficile* colitis and was treated with oral flagyl. A gastroenterology consult for hepatic vein thrombosis and ongoing diarrhea recommended therapeutic lovenox for hepatic vein thrombosis, and IV flagyl and oral vancomycin for *C. difficile* colitis. After an infectious disease specialist was consulted because of concern about spontaneous bacterial peritonitis (SBP), the patient was started on IV ertapenem and IV flagyl was discontinued. At this time, the possibility of Budd-Chairi syndrome, peritoneal carcinomatosis or SBP was considered. However, all cultures of ascites fluid were negative and cytology was negative for malignancy. The patient improved and was discharged home with instructions to return for follow-up diagnostic laparoscopy and evacuation of ascites in one week if symptoms worsened.

The patient presented one day after discharge with continued diarrhea and failure

to thrive at home. Her IP catheter was removed intraoperatively without event and she underwent IR paracentesis with minimal fluid evacuation. She subsequently had diagnostic laparoscopy (converted to mini-laparotomy for lysis of multiple intra-abdominal adhesions and loculations), removal of 7 liters of ascites fluid and IP drain placement. A frozen specimen showed necrotic inflammatory tissue consistent with diffuse resolving peritonitis. She improved, was discharged to a skilled nursing facility and completed the remaining four cycles of IV Taxol chemotherapy without event or recurrence of ascites.

Discussion

Epithelial ovarian cancer is a leading cause of mortality in women. To further complicate the disease, symptoms are vague and include abdominal bloating, early satiety and urinary problems. Thus, patients frequently present with advanced disease.¹ Determining grade and stage can guide medical management. As was the case with our patient, optimal cytoreduction and combination intravenous/intraperitoneal (IV/IP) chemotherapy significantly improves survival for those with stage III to IV epithelial ovarian cancer compared with IV chemotherapy alone.² The current standard of management of these patients includes IV therapy with a platinum agent in combination with paclitaxel.³

Combination IV/IP chemotherapy has been shown to be advantageous compared with systemic therapy alone; however, it is important to be aware of the complications of IP chemotherapy. Most reasons for discontinuing IP chemotherapy include IP catheter infection, IP catheter blockage,

access problems and major bowel complications possibly related to IP infusion or catheterization.⁴ Other toxic effects often reported with IP chemotherapy include abdominal pain, dose-related neuro- and renal-toxicities, neutropenia, thrombocytopenia, gastrointestinal and metabolic toxicities.⁵⁻⁷

Extensive investigation into the etiology of this case using blood work, ascites fluid analysis and tissue specimen was unremarkable. After a lengthy evaluation, the conclusion was that this patient experienced an inflammatory reaction to intraperitoneal chemotherapy. Literature review found no documented cases similar to this one. With increasing evidence in support of combination IV/IP chemotherapy, there may be a future for standardizing this treatment. However, it is important to be cognizant of the risks and continue to investigate other causes of complications. **MM**

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Severe Cutaneous Bleeding: An Unusual Complication of Dual Antiplatelet Therapy

BY BASSEM ROUPHAEL, MD, DEPARTMENT OF MEDICINE, UNIVERSITY OF MINNESOTA

A 78-year-old Caucasian female with a medical history significant for hypertension, diabetes and coronary artery disease was brought to the hospital for hemoptysis, cough and shortness of breath. Her symptoms had been going on for some time, but what prompted her to seek medical attention was the development of diffuse skin changes over large areas of her body.

Upon admission, the patient was placed on oxygen for hypoxia. Physical examination revealed bilateral crackles on chest auscultation and widespread ecchymoses affecting the upper and lower extremities, abdomen, chest and back. A petechial rash was also noted on the lower extremities (Figures A-F). CT scan of the chest demonstrated diffuse alveolar and interstitial pulmonary infiltrates with bilateral pleural effusions. Diffuse alveolar hemorrhage was confirmed at bronchoscopy. No endobronchial lesions were identified and bronchial washings were negative for fungal elements, acid-fast bacilli and *Pneumocystis carinii*. She had no family or personal history of bleeding disorders. Nevertheless, a review of her medications showed she had been started on aspirin and clopidogrel more than a year earlier after undergoing percutaneous coronary intervention (PCI) with drug-eluting stent (DES) placement. Aspirin and clopidogrel were withheld, and a workup was initiated to rule out a bleeding disorder, given the extensive and diffuse character of the bleeding.

CBC showed a mildly decreased platelet count at 99,000/mL. Fibrinogen and fibrinogen degradation products were normal and the peripheral smear was nondi-



Figures A-F. (A,B) Large subcutaneous ecchymoses covering the entire left (A) and right (B) upper extremities. (C) Petechiae on bilateral lower extremities, scattered and in crops, with no purpuric manifestations. (D) Large ecchymoses of the lower legs with few scattered petechiae noted on the upper legs. (E) Smaller ecchymoses of various ages on the back. (F) Multiple ecchymotic patches of variable size on the abdomen.

agnostic. The coagulation parameters were within an acceptable range. ANA, ANCA, anti-glomerular basement membrane antibodies and cryoglobulins were all negative. Complement proteins C3 and C4 levels were mildly low at 71 mg/dL (normal: 79 to 152 mg/dL) and 13 mg/dL (normal: 16 to 38 mg/dL), respectively; the significance of this finding was not completely under-

stood. Levels of factor VIII, factor IX and von Willebrand factor (vWF) were within normal range. Factor XIII assay was normal. Infectious workup did not reveal any pathogen to be responsible for the etiology.

Because the workup came back unrevealing, it was suspected that the combination of aspirin and clopidogrel was the

cause of the patient's symptoms. Within a few days of stopping both drugs, the hemoptysis and dyspnea improved. The lung infiltrates also began to clear and the ecchymoses started to fade. Cardiology was consulted and recommended discontinuing clopidogrel and resuming low-dose aspirin once the symptoms resolved.

Discussion

This case illustrates a very rare clinical presentation of serious blood dyscrasia with extensive bleeding involving the skin as a consequence of dual antiplatelet therapy (DAPT). Antiplatelet therapy has become the mainstay of treatment for acute coronary syndrome. Although some patients with established coronary artery disease are maintained on a single antiplatelet agent with aspirin, DAPT is now considered standard of care for prevention of stent thrombosis in those undergoing PCI with stent implantation.¹⁻³ However, bleeding remains a major concern with dual therapy as the risk is greater than with monotherapy.⁴⁻⁷

Severe bleeding events with DAPT are uncommon, yet potentially life-threatening. Intracranial hemorrhage and gastrointestinal bleeds are consistently reported as major bleeding events; however, extensive bleeding into the skin has not been described before. Previous studies suggested the use of DAPT for at least a year after PCI to prevent stent thrombosis. There is recent evidence that such therapy beyond the one-year mark is beneficial in terms of reduction of the rates of stent thrombosis.³ Thus, with the increasing use of DAPT for longer periods, severe bleeding events may not be uncommon.

Both aspirin and clopidogrel inhibit platelet activation and aggregation but exert their antiplatelet effect using different mechanisms. Although aspirin acetylates platelet cyclooxygenase, leading to its inhibition and reduction of thromboxane formation, clopidogrel acts by modifying the platelet ADP receptor so that ADP does not bind to it.⁸ Thus, the two drugs act synergistically to inhibit platelet aggregation, which may explain the increased risk of bleeding when they are combined.

The severity and diffuse character of the subcutaneous hemorrhages along with the petechial lesions led us to believe our patient had a platelet defect; hence, aspirin and clopidogrel were withheld from the beginning. Moreover, the presence of petechial lesions is not characteristic of clotting factor deficiencies, and this possibility was excluded with the negative workup. Finally, a vasculitic process should always be considered in the differential diagnosis of an elderly person presenting with diffuse alveolar hemorrhage and a petechial skin rash, although our patient's large ecchymotic areas were not a characteristic feature.

This case highlights the fact that severe bleeding events, although rare, need to be recognized in patients on DAPT. It is noteworthy that a thorough review of the patient's medications is necessary to look for association with the presenting symptoms. Given the potential life-threatening nature of these complications, patients on DAPT should be educated about these side effects and advised to report any symptom of blood dyscrasia. Physicians should also weigh the benefits and risks of continuing such therapy beyond one year in high-risk patients. **MM**

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MPO-ANCA Vasculitis Pachymeningitis with Bilateral Vision Loss

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A 71-year-old woman presented to the general medicine floor with a two-week history of profound fatigue and anorexia in the setting of chronic bilateral vision loss. Ten months earlier, she experienced sudden painless unilateral vision loss in her right eye. This was followed by progressive loss of visual acuity in her left eye culminating in complete vision loss three months before admission. Once hospitalized, she was started on corticosteroid therapy and subsequently regained partial vision in her left eye. Review of systems revealed a history of chronic sinus infections and progressive unilateral right-sided hearing loss.

Upon admission, she was afebrile and her vital signs were normal. Physical examination demonstrated a right afferent pupillary defect with marked loss of visual acuity in the right eye and decreased visual acuity in the left eye. The remainder of the physical examination was unremarkable. Laboratory testing demonstrated markedly elevated inflammatory markers, including erythrocyte sedimentation rate of 67 mm/hr and C-reactive protein of 195.3 mg/L. Antinuclear antibody, anti-double-stranded DNA IgG, proteinase 3 (PR3), Lyme titers, Epstein-Barr virus, CMV, toxoplasmosis, HIV, syphilis, West Nile virus and angiotensin-converting enzyme tests were unremarkable. Cerebrospinal fluid studies showed IgG index of 0.58, 3 oligoclonal bands and normal myelin basic protein. Anti-myeloperoxidase antibody was positive at 1.9 U and p-ANCA was positive. The c-ANCA was negative.

Magnetic resonance imaging revealed diffuse dural enhancement over the cerebral hemispheres, more so on the right than the left. Dural thickening and enhancement along the tentorium and cerebellar hemispheres were also present,

consistent with pachymeningitis (Figure). An abnormal T2 signal was identified in the right optic nerve with equivocal bilateral optic nerve sheath enhancement.

Ophthalmology was consulted to evaluate the patient's vision loss; no evidence of ischemic optic neuropathy was found. Bilateral temporal artery biopsies were negative for active or healed arteritis. A chest CT was assessed for pulmonary findings consistent with granulomatous polyangiitis, but only insignificant pulmonary nodules were found.

Several days after admission, the combined medical history, MPO-ANCA positivity and imaging consistent with pachymeningitis resulted in the diagnosis of MPO-ANCA vasculitis pachymeningitis. Other considerations were a more classic ANCA vasculitis and temporal arteritis. Induction therapy with intravenous methylprednisolone was prescribed for three days followed by oral prednisone and IV rituximab. The patient had marked clinical improvement after three days of high-dose Solu-Medrol. Her left visual fields were full at the time of discharge.

Discussion

Idiopathic pachymeningitis is a rare clinical entity that has only been described in a few cases.¹⁻⁷ Its presentation is variable but it often has features of a limited-type vasculitis with myeloperoxidase and ANCA positivity. It appears to have a predilection for the cranial nerves and has been particularly implicated in optic neuropathies, visual field losses and blindness.¹ The disease responds to corticosteroids, which are often continued long-term because recurrence is common with treatment tapers. If untreated, it results in progressive neurological dysfunction.

Since MPO-ANCA vasculitis pachymeningitis is an uncommon problem, it

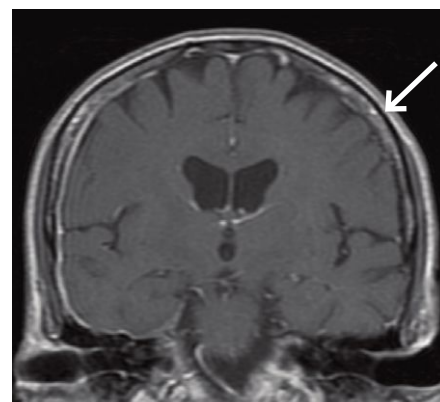


Figure. Magnetic resonance image of MPO-ANCA pachymeningitis. Diffuse dural enhancement is shown over the cerebral hemispheres (arrow).

was ultimately a diagnosis of exclusion for this patient. However, it was also the diagnosis most consistent with the clinical scenario and evidence. A lesson learned during the care of this patient was to persist when patients present with definitive unexplained symptoms. **MM**

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A Rare Complication of Lithium Toxicity

BY ASHLEY COBB, MAYO MEDICAL SCHOOL; ALLEN KLOMPAS, MBBCH, ALEXIS MESSERLI, MD, HEATHER KLINGEMAN, MD, CHRISTOPHER AAKRE, MD, MAYO SCHOOL OF GRADUATE MEDICAL EDUCATION; ARYA B. MOHABBAT, MD, DIVISION OF GENERAL INTERNAL MEDICINE, MAYO CLINIC

A 75-year-old woman presented to the emergency department (ED) after a three-day history of word-finding difficulty, confusion, dysarthria, tremor, impaired short-term memory and ataxia. Relevant medical history included bipolar type I disorder treated with lithium for 34 years. Head CT, ECG and CXR performed in the ED were normal. Labs results demonstrated a Cr of 2.0 mg/dL (baseline: 1.1 mg/dL) and otherwise normal extended electrolytes. Her lithium level, which was previously normal, was checked on admission and found to be 2.2 mEq/L (normal: 0.8 to 1.2 mEq/L). Although the differential diagnosis is broad, including stroke, seizure activity and other metabolic derangements, given the acute kidney injury and lithium toxicity she was aggressively hydrated and monitored clinically.

Upon admission to the hospital, she was confused and had difficulty giving a history. Physical exam showed a fine rapid tremor of the upper limbs and facial muscles. The neurological exam was notable for a positive Romberg sign, perseveration and bradykinesia. Mental status exam was notable for inattentiveness and difficulty with memory, calculation and recall. The medical team discontinued lithium and continued aggressive hydration and moni-

toring of electrolytes, lithium level and renal function.

On hospital day 2, the patient developed dramatic choreoathetosis—involuntary, irregular, nonrhythmic, high amplitude, dance-like writhing. Her movements were unremitting, requiring one-on-one nursing care to ensure her safety. Voluntary muscle control was limited. The patient did not report any discomfort with these movements. Despite normalization of her renal function and lithium level, her choreoathetosis continued.

On hospital days 3 to 5, the patient showed minimal improvement in choreoathetoid movements, despite improvements in cognition, memory and speech. By day 6, the patient noticed an increase in choreoathetoid movements while speaking, but otherwise noted symptomatic improvement. Her symptoms continued to improve and she began ambulating in the hospital with assistance. Upon discharge (hospital day 10), the choreoathetosis had completely resolved and she was back to her baseline level of cognitive and physical functioning.

Discussion

This case highlights the uncommon manifestation of choreoathetosis in acute lithium toxicity¹⁻⁴ seen during periods of impaired renal function when the lithium therapeutic index is surpassed. As is common with this complication, choreoathetoid movements began after discontinuation of lithium and continued despite normalization of serum lithium levels; our experience demonstrated an approximate one-week lag time. Based on previous case reports, there are two drastically different outcomes for patients who develop neurologic complications of lithium toxicity.⁵ One is complete resolution (typically

within one to two weeks) and the other, an irreversible condition called syndrome of irreversible lithium-effectuated neurotoxicity (SILENT).^{5,6} SILENT describes patients without previous neurological impairment in whom neurologic symptoms induced by lithium toxicity persist for more than two months following discontinuation.⁶

Although rare, recognition of choreoathetosis as a complication of acute lithium toxicity and understanding its potential outcomes are critical when communicating this sensitive information to patients and their families. **MM**

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Mycobacterium haemophilum Skin Infection in the Setting of Systemic Lupus Erythematosus and Multiple Drug Allergies

BY ADEEL S. ZUBAIR, MAYO MEDICAL SCHOOL; DANIEL K. ROGSTAD, MD, AND MARY J. KASTEN, MD, DIVISIONS OF GENERAL INTERNAL MEDICINE AND INFECTIOUS DISEASES, MAYO CLINIC

A 52-year-old female presented to her rheumatologist with a rash and tender skin nodules involving all four extremities. She had painful, inflamed, nodular skin lesions in the proximal interphalangeal joints of the second and third fingers on her right hand; the lesions extended proximally. Her left arm and both thighs also became involved. The patient had long-standing systemic lupus erythematosus (SLE) treated with immunosuppressants (short courses of azathioprine, cyclophosphamide, mycophenolate mofetil and belimumab, and long-term corticosteroids) as well as hypertension, hyperlipidemia, depression and non-alcoholic steatohepatitis.

Shortly before the rash developed, she swam in a hotel pool with “dirty water.” This played a limited role in suspecting a nontuberculous mycobacterial (NTM) infection.

On examination, she was found to have patches of erythema associated with erythematous, mildly tender, nodular lesions on both arms near the elbows. The lesions on her thighs included plaques and nodules that were erythematous and desquamating. Her rheumatologist initially entertained a diagnosis of vasculitis and increased her methylprednisolone dose. This resulted in reduced swelling of her hand, although new lesions continued to appear. A biopsy of the right forearm revealed subcutaneous granulomatous inflammation with acid-fast bacilli (AFB) noted on AFB stain. Repeat biopsies were sent for mycobacterial culture, and treatment was withheld until the organism was identified and the susceptibilities confirmed. Final cultures were positive for *Mycobacterium haemophilum* suscep-

tible to clarithromycin, rifampin, trimethoprim/sulfamethoxazole (TMP/SMX), amikacin, linezolid, ciprofloxacin, doxycycline and minocycline.

Initially, the patient was treated with clarithromycin and rifampin for one week. Treatment was switched to azithromycin and rifabutin because of a significant interaction between rifampin and methylprednisolone, which led to adrenal crisis requiring hospitalization, and because of significant nausea and vomiting from the clarithromycin. After three weeks, amikacin IV five times weekly was added because of unclear response to two-drug therapy. This three-drug regimen was continued for six weeks, after which the amikacin was stopped because of ototoxicity. Two months later, because of continued concerns about poor response to therapy, doxycycline was added to her program of azithromycin and rifabutin. Doxycycline was discontinued after one week because of concerns it had caused the patient’s SLE to flare.

The patient was seen in follow-up by both an infectious disease specialist and a dermatologist, and slow-but-significant reduction in her skin lesions was noted. The lesions became less confluent and lighter in color. At her most recent follow-up, the patient had completed 12 months of therapy; an additional six months or more is tentatively planned.

Discussion

Mycobacterium haemophilum is an acid-fast bacillus that is known to cause skin and joint infections in immunocompromised patients.^{1,2} It is slow-growing and can be difficult to isolate because of its requirements for media containing fer-

ric ions and incubation at 30°C.³⁻⁵ It is the second most common cause of cervical lymphadenitis in children and occasionally causes lymphadenitis in adults. Skin and joint infection have been described in patients with cellular immunodeficiency including HIV infection, immunosuppression after organ transplant, and who are taking antirheumatic drugs; they also have been described in patients who have undergone chemotherapy treatment for malignancy.⁶⁻¹⁰

It is believed that immunocompromised patients are at risk because of difficulty with granuloma formation from impaired cell-mediated immunity.^{11,12} Therefore, *M. haemophilum* should be included in the differential for such patients who present with cutaneous lesions, particularly nodules around joints. Classically, the infection presents with skin lesions that initially start as nodules or tender erythematous papules that progress to painful ulcers. Other reports have described the presence of cysts, scales and plaques.^{11,13,14} These skin findings are usually on the extremities in close proximity to joints; this is believed to be caused by the organism’s low-temperature requirements for growth. Less commonly, infection of the bone, lungs, blood or lymphatics has been reported.^{11, 13-15}

Currently, there are no specific guidelines for treating *M. haemophilum*. Cervical lymphadenitis can usually be treated with surgical excision alone. Susceptibility data should be used cautiously when creating a treatment program since there is no standardized testing methodology. Skin, soft-tissue and disseminated infection are usually treated with a multidrug regimen for varying durations. Successful regimens have included combinations of

ciprofloxacin, clarithromycin or azithromycin, rifampin or rifabutin, TMP/SMX, tetracycline and an aminoglycoside (usually amikacin).¹¹ In this case, although the organism was drug-susceptible, treating this patient was difficult because of drug interactions and the patient's extensive drug-allergy history, which included TMP/SMX, ciprofloxacin, tetracycline, cephalexin and clindamycin.

Previous reports have stressed the importance of discontinuing immunosuppression along with antibiotic therapy for cure of disseminated *M. haemophilum* infection.¹¹ However, in some instances, this is not feasible.

The diagnosis and treatment of *M. haemophilum* infection were challenging in this case. Skin biopsies are often critical for diagnosis of NTM and other atypical infections in immunosuppressed patients who present with new skin lesions. In this case, they were diagnostic. The case also illustrates that clinical

improvement can occur with long-term combination antimicrobial therapy when complete cessation of steroids is not possible. **MM**

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St. Cloud/Sartell, MN




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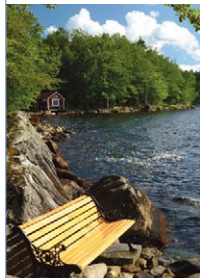
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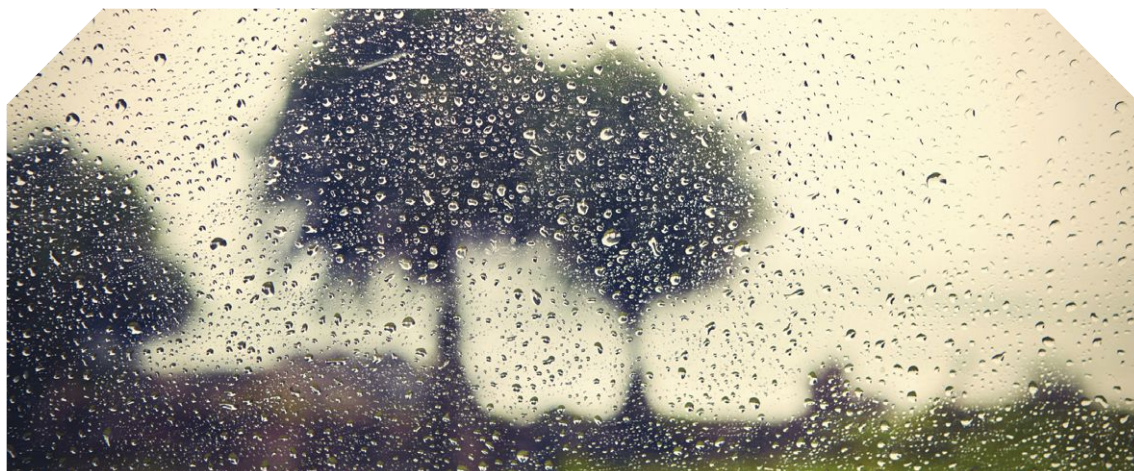
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Doctor, remember the roof

A memory connects a physician and his young patient.

BY KAMIAB DELFANIAN, MD, MPH

I was evaluating 5-year-old Leah* during a follow-up visit for her congenital vascular syndrome. She had a combined capillary and venous malformation that I had been following for several years. During her initial visit, Leah was accompanied by her mother and grandmother; she was timid and quiet, and she clung to her grandma. She cooperated for the exam, but other than that interacted very little with me.

This time, Leah came in with her mother, who had many questions about her condition. As her mother asked question after question, Leah repeatedly interrupted, trying to tell me something about the roof of the house in which her family lived. Leah's mom reminded her that she needed to talk to the doctor and asked her to please be quiet. Leah would abide briefly with mom's request only to ask, "What are you going to do about the roof, doctor?" Curious, I asked Leah what was on her mind. Why was she being so persistent?

Her mother finally permitted Leah to speak. As it turned out, a tornado had damaged the roof of their house a few days prior to this office visit, causing rainwater to seep through the ceiling into the living room. Leah told me how scary it was for her to see the water coming in and that she couldn't sleep at night because of this.

Leah's description of the problem took me back to my own childhood in a very small Kurdish village in the foothills of the Alborz Mountains off the southern

coast of the Caspian Sea—an area that sees heavy rainfall, especially in fall and early spring. I lived with my sister and paternal grandmother in a one-room, dilapidated house with a shingled roof. My grandmother could not afford roof repairs and would place pots and pans in the living room to catch the rainwater and keep it from saturating the floor.

My childhood memories of the unrelenting sound of raindrops hitting the pots and pans came alive as Leah told her story. As I shared my memories of the old shingles and the leaky roof with Leah's mother, I was overcome by emotion. I felt a tangible connection to Leah and understood the thoughts that were running through her mind. Even as an adult, when I hear the sound of raindrops, I am fearful that the rain will penetrate the roof. After a quick apology, I left the exam room for a few minutes to regain my composure.

This surreal encounter was instrumental in communicating to Leah's mother how fear and mental anguish can have a profound impact on a child at a critical age. In retrospect, it was Leah who connected with me, rather than me with her.

After the visit, I watched Leah walk through the waiting room holding on to her mother's hand. Before she stepped out of the office, Leah turned around with a worried look on her face and admonished me, saying, "Doctor, remember the roof." I assure you, Leah, I always will. **MM**

Kamiab Delfanian has a solo practice in Lakeville, Minnesota, dedicated to children and adults with vascular anomalies.

*The patient's name has been changed.



Pain, Opioids and Addiction LECTURE SERIES

The Minnesota Medical Association (MMA), the Steve Rummeler Hope Foundation (SRHF), and the University of Minnesota Medical School began a collaboration to bring medical education on the topic of opioids to medical students, residents, and practicing doctors. The lectures are recorded live at the University of Minnesota Medical School and made available for CME on the MMA website, with underwriting by the SRHF. The hope of the series is to create a medical curriculum on pain, opioids, and addiction, as it should be in a medical school setting: balanced, practical, evidence-based information free of commercial bias.

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VIDEO 3: "How to Choose an Opioid: Practical Pharmacology" Charles Reznikoff, MD, Division of Addiction Medicine, Hennepin County Medical Center, Assistant Professor of Medicine, University of Minnesota Medical School

VIDEO 4: "A Differential Diagnosis for 'Pain'" Charles Reznikoff, MD, Division of Addiction Medicine, Hennepin County Medical Center, Assistant Professor of Medicine, University of Minnesota Medical School

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Fall 2014 Lectures

VIDEO 1: "Opioid Addiction and Pain, A Quagmire for Healthcare Professionals" Marvin D. Seppala, MD, Chief Medical Officer, Hazelden Betty Ford Foundation

VIDEO 2: "An Editorial on Pain" Bret Haake, MD, MBA, HealthPartners Medical Group, Regions Hospital

VIDEO 3: "Pain Psychology, Mental Status Exam, and Non-Opioid Options for High Risk Patients" Charles Reznikoff, MD, Division of Addiction Medicine, Hennepin County Medical Center, Assistant Professor of Medicine, University of Minnesota Medical School. Adeya Richmond, PhD, LP, Senior Clinical Psychologist, Psychology Department, Hennepin County Medical Center. Sebastian Ksionski, MD, Pain Program/CMC Director, Hennepin County Medical Center

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James R. Miner MD FACEP, Chief of Emergency Medicine, Hennepin County Medical Center, Professor of Emergency Medicine, University of Minnesota Medical School

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