

MINNESOTA **MEDICINE**

MAY 2013



PAD

PERIPHERAL ARTERY DISEASE

**SHINING
LIGHT ON A
NEGLECTED
CONDITION** PAGE 18

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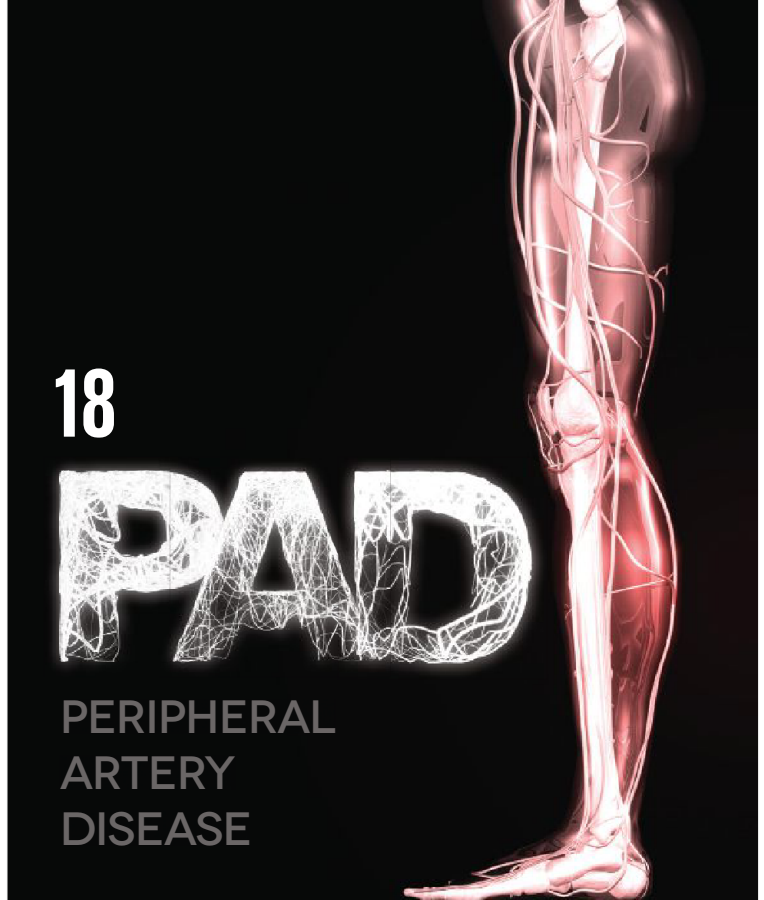
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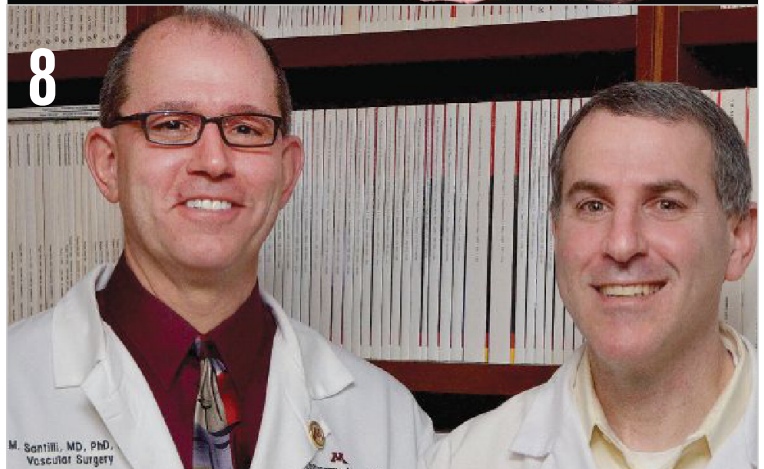
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PHOTO BY SCOTT WALKER

Charles R. Meyer, M.D., Editor in Chief

These conduits
are a complex
organ system
whose secrets we
are just beginning
to unlock.

Admiring the body's plumbing

Plumbing pipes seem so straightforward. They're either straight or take a right-angle bend. Connecting them looks like it ought to be simple; just attach the appropriate fitting and all should be well. In your house, they perform their fundamental function of transporting water from one place to another. Yet apparent simplicity is really devilish deception, lulling the unsuspecting home handyman into thinking that his advanced degrees should make a required plumbing repair a veritable snap. I have spent tortuous hours jackknifed under a sink or craning my neck to work on overhead pipes, confidently tightening connections only to see the maddening drip-drip come from my handiwork when I turned on the water. After decades of homeownership, I know fixing pipes is not as simple as it looks.

Our blood vessels certainly resemble plumbing pipes. They too carry fluid from place to place. Some of their maladies seem analogous to plumbing problems: Rust in an old galvanized pipe seems a lot like atherosclerosis and ruptured aneurysms like a burst pipe in the basement. Yet as many of our articles this month demonstrate, these conduits are a complex organ system whose secrets we are just beginning to unlock. That rust in the pipes, atherosclerosis, is not just a deposition of cholesterol from last night's pizza but the result of an intricate interplay between blood chemistry, blood pressure and endothelial cell and myocyte metabolism. Those arterial walls are subject to the same travails that plague other organs—they deteriorate, they get inflamed and they stiffen.

Physicians battle deterioration when they repair aneurysms. They treat inflam-

mation with meds. And they try to prevent plugging by addressing risk factors for atherosclerosis. Advances such as endovascular stents to fix abdominal aortic aneurysms, steroid-sparing pharmaceuticals to treat the various forms of vasculitis and more potent statins to lower lipids have aided our efforts.

Yet when an artery clogs, the fixes are basically mechanical. Fortunately, new techniques and technologies have also advanced this work. Angioplasties and stents for coronary and peripheral arteries have exceeded Dr. Gruentzig's wildest dreams when he did the first coronary angioplasty on a patient in 1977. Catheter-wielding cardiologists and radiologists now use improved angioplasty catheters, drug-eluting stents and "roto-rooter" catheters to squeeze open, drill open and keep open heretofore unreachable arteries. Vascular surgeons also have better devices for performing endarterectomies. And when the clogged is uncloggable, those surgeons resort to the ultimate mechanical fix, bypass. They become medicine's vascular plumbers.

Everything we do to diseased arteries is directed at one goal—bringing that red fluid to the tissues where it's needed. For, in the end, blood is what stops most pathological processes. Good blood flow is the *sine qua non* for most healing.

In recent years I've given up my wrench. So when on a quiet Saturday morning I heard a hissing sound coming from our utility room and found a jet of water coming from the main pipe, I called my friendly plumber. Skillful pipe fixers are needed for both house and body. **MM**

Charles Meyer can be reached at meyer073@umn.edu.



Article prompted me to act

Congratulations on the April 2013 issue. I don't remember a better one. There were several very valuable articles. But the one that caused me to take action was "Lost in translation," (p. 24) by Kristina Krohn, M.D., and Patricia Walker, M.D., DTM&H, about the immigrant woman who didn't understand the 911 system. I sent a letter to a friend of mine who is a principal at a school in St. Paul that serves a number of immigrants, proposing they create a flier in Karen (and Somali, Hmong, Spanish and any other languages that are relevant) explaining how the 911 system works. I also thought the topic should be discussed during assemblies. I want the authors to know that I appreciated their article and that it caused me to take action.

Cynthia Olson, M.D.

Physician engagement is good, but it doesn't form MMA policy

I was puzzled by a statement made by Dr. Dave Thorson in his Viewpoint article (April, p. 29). In the midst of an informative piece on MMA efforts to increase physician engagement, he states that "we are exploring how to replace the House of Delegates with multiple policy forums to increase opportunities for members to have their say." This statement may reflect an assumption by Dr. Thorson that the decision to eliminate the House of Delegates already has been made or he is confusing how to establish MMA policy

with how to engage physicians. Most members are aware of the recommendations made by the first Governance Task Force and the Board of Trustees regarding the House of Delegates. The delegates at the 2012 Annual Meeting did not accept all of those recommendations and passed a resolution requiring more information and more time to consider the implications of potential governance changes. Many MMA members value the House of Delegates and its democratic, representative form of governance and wish to improve and strengthen it and the process that has set policy for our association for many years. It is not personal opinion, anecdote or the Board of Trustees that will decide this issue. That is the responsibility of the House of Delegates.

Lyle Swenson, M.D.

A point of clarification

I have a comment regarding the use of the term "midwife" in the articles "Cesareans and savings" (April, p.5) and "Paying for

and delivering pregnancy care" (April, p. 36). In Minnesota, there are two terms for two licensing categories for midwives: "nurse midwives" and "traditional midwives."

Nurse midwives are advanced practice nurses who are licensed and regulated by the Board of Nursing. Traditional midwives may or may not be trained as nurses and may or may not be licensed. Licensing for them is voluntary and is handled by the Board of Medical Practice. This is an area where there is much confusion among both consumers and medical professionals.

Mark Eggen, M.D.

Correction

The article "The Opioid Crisis" (p. 20, March 2013) incorrectly reported that the national overdose death rate was 1.9 per 100,000. The correct rate is 11.9 per 100,000. We apologize for this error, which was a made during the editing process.

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Coping over coffee

A program brings stroke survivors together as they rebuild their lives.

BY CARMEN PEOTA

About 20 people ranging in age from their 20s to 70s are gathered around tables on a snowy Tuesday morning in a ground-floor room at Methodist Hospital in St. Louis Park. They've come for Coffee Talk, one of myriad events for stroke survivors offered by Inspire, a program based at the hospital but open to all.



Karen Bjorgan

The group's leader, Karen Bjorgan, throws out a question: "How has stroke enhanced your feelings of happiness?"

A gray-haired man immediately raises his hand. "I can't remember how I felt [before my stroke]," he says haltingly. "I don't think of it. It's not happiness or unhappiness, it just is."

A woman shares that she thinks her family is worried about her mood. "They wonder what's going on. They wonder about depression."

Bjorgan asks if she has talked to her family about her feelings, and the woman tells her that it seems too hard. Then Bjorgan turns to the group: "How would you say something like that to your family?"

"Very carefully," a man across the room quips, and laughter erupts. "Caregivers get mad easily. They're stressed out. They get pissed off," he says. Heads nod.

Then a woman in a stocking cap changes the tone. "Since my stroke, I have changed into how I am," she says slowly, as if carefully considering each word. She explains she used to try to please others, but they were indifferent. "Now I don't try, and they're still indifferent. But I'm happier," she says.

The conversation meanders around the topic of happiness for the next hour.

Exceeding expectations

The weekly support/chat group is the brainchild of Bjorgan, who 22 years ago after the Cesarean birth of her daughter, had two strokes herself. Bjorgan found herself with an altered reality (among her problems was aphasia). As part of her rehabilitation, she made a list of things she wished were available to her as she recovered.

A few years later, in 1997, she and her speech therapist took that list to the Park Nicollet Foundation, and in 1998 Inspire was launched. In 2000, Bjorgan left her job in commercial banking to run the program, and ever since has been dreaming up new ways to get people who've had strokes doing more than they think they can.

Through Inspire's support and interest groups, stroke survivors are able to connect with others who understand what they're going through. By putting participants to work as volunteers (many visit hospitalized stroke patients) and involving them in book, chat, public speaking, dining, photography, singing and writing groups, the program also gets them doing what's often hardest after stroke—moving, talking, learning, reaching out to others.

Although Bjorgan is not a therapist and conceived of Inspire long before much was known about the brain's neuroplasticity, the program's design reflects her belief that people who have had strokes have untapped potential. "I think a stroke survivor can do anything someone else can do," she says, adding that they might have to do things in a new way.

She points to a man across the room who is taking attendance and says that a year ago he wasn't walking. "It's amazing. People start in a wheelchair and can't talk. Now they walk and volunteer here."

The human connection

During the Coffee Talk session, Bjorgan subtly weaves in advice—things she's learned over the years. She reminds the group that because 40 percent of stroke survivors experience depression, they'll do better if they connect with others. Human contact is part of happiness, she says.

Many in the room already know this. They've been coming to Inspire's events for years, finding activities—like talking with a roomful of people who will wait for them as they search their injured brain for a word or who nod knowingly when they talk about an overly helpful loved one—not just enjoyable, but life-saving.

When Bjorgan asks what the group thinks about the idea that nothing matters more than human relationships, one man answers: "I like that a lot. It inspires me. I'd die without being able to communicate."

Carmen Peota is managing editor of *Minnesota Medicine*.



Ways to inspire

The third annual Step to Inspire 5K walk/run/roll to support the Inspire program will be held Saturday, September 21. To participate or make a donation to the Inspire program, call the Park Nicollet Foundation at 952-993-5023 or go to <https://pnfoundation.parknicollet.com>.

For information about participating in Inspire's programs, call Karen Bjorgan at 952-993-6789.



Another reason to eat tomatoes

Not only are tomatoes considered a superfood that may help prevent cancer and heart disease, they might also be associated with lowering one's risk for stroke.

Tomatoes are high in the antioxidant lycopene, which gives them and other red fruits their color. Lycopene has been associated with a number of health benefits.

Researchers from the University of Eastern Finland studied a group of 1,031 men ages 46 to 65 years over 12 years to test whether there was an association between various antioxidants and stroke.

They found men with the highest levels of lycopene in their blood were 55 percent less likely to have a stroke than those with the lowest levels. Among the 259 men with the highest level of lycopene, 11 had a stroke during the study period. Among the 258 with the lowest levels, 25 suffered a stroke. Those with high levels of lycopene were even less likely to suffer a stroke caused by blood clots.

The researchers also found a no such benefits associated with high levels of other antioxidants including alpha-carotene, beta-carotene, alpha-tocopherol and retinol.

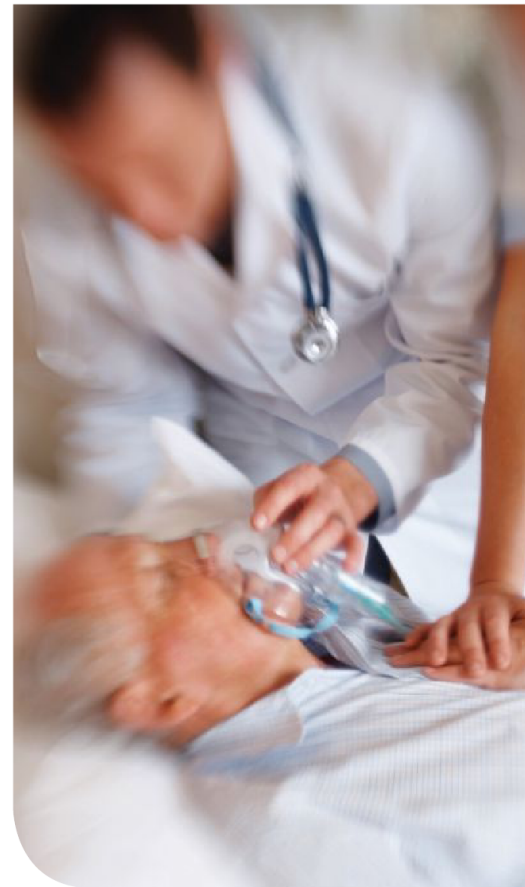
Source: Karppi J, Laukkanen JA, Sivenius J, et al. Serum lycopene decreases the risk of stroke in men. *Neurology*. 2102;79(15):1540-7.

Discharged patients return to the ED

A quarter of patients discharged from the hospital return within a month to the emergency department, according to a study published in April's *Annals of Emergency Medicine*. Researchers examined more than 15,000 patient discharge records and found nearly 24 percent of those discharged during a five-month period in 2010 made at least one visit to the ED within 30 days. Of those, 54 percent were not readmitted.

The study's authors pointed out that the Centers for Medicare and Medicaid Services has overlooked a significant area of hospital utilization as they have sought to reduce readmissions. Lead author Kristin Rising, M.D., of the University of Pennsylvania, was quoted as saying in a statement: "By limiting the focus only to inpatient-to-inpatient events and omitting ER visits, they [CMS] are missing a substantial source of health care utilization that is managed solely in the emergency department."

Source: Rising KL, White LF, Fernandez WG, Boutwell AE. Emergency Department Visits After Hospital Discharge: A Missing Part of the Equation. *Annals of Emergency Medicine*. April 2013.



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and to make that the priority over fitting into uniform algorithms designed more to ensure profitability to others – folks for whom the priority isn't always patient health. We're an independent physician owned practice offering patient centered, physician directed primary and specialty care in three modern clinics. And we're always looking for independent minded, energetic talent to join us. To arrange a confidential interview at your convenience, **please call Matt Brandt: 763-785-7710.**



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Steven Santilli, M.D., and Steven Levin, M.D. Santilli is chief of vascular surgery at the University of Minnesota. Levin is in the vascular fellowship program.

PHOTO COURTESY OF THE UNIVERSITY OF MINNESOTA

SAVING *life* AND *limb*

Vascular surgeons take pride in their specialty.

BY SARAH T. WILLIAMS

Among the many mounted and framed artifacts in Steven Santilli's office is a model of one of the first commercially available stent-grafts for the endovascular repair of aortic aneurysms. The device, circa 2000, resembles a tiny pair of long underwear, frayed at the waistband and cuffs. It was a revolutionary device at the time, but by current standards it's regarded as primitive and crude—a far cry from the super-flexible, branched, fenestrated, durable, drug-eluting and elaborately anchored stent-grafts currently or soon-to-be available.

“Looking back, I wonder, ‘What were we thinking?’” says Santilli, chief of the University of Minnesota's Division of Vascular Surgery, who finished his training just as the first endograft systems were introduced into the market. “But it was all we had. And the same happens with all technology: You're the first generation out, and it's not the greatest, and then people refine it to get better and better.”

Santilli says the treatment of aortic aneurysm represents the most significant advancement in the field of vascular surgery, with minimally invasive endovascular procedures overtaking traditional open surgeries by 2004. Aneurysms have an 80 percent mortality rate upon bursting and are the 13th leading cause of death in people older than 67 years. In his practice, Santilli says, more than 80 percent of these deadly arterial bulges are now repaired with an endovascular stent-graft, with much lower morbidity rates and much faster recovery times. Where patients once spent five to seven days in the hospital and took three to six months to recover after open surgery, he says, they now spend a day in the hospital and feel back to normal in less than a week.

Audra Duncan, M.D., a vascular surgeon at Mayo Clinic since 2000 and director of the fellowship and integrated residency program there, agrees that the specialty has evolved rapidly. But, she says, the very long-term outcomes of endovascular surgery remain to be seen. She cites concern about the durability of the devices and the consequences of the procedures,

including radiation exposure for the patient and surgical team.

Even as they keep pace with these quantum leaps in technology, both Duncan and Santilli say they were initially attracted to the field after witnessing a good old-fashioned endarterectomy, an open procedure that Santilli admired as “precise” and Duncan as “elegant.”

Double the trouble

Ever since the Society for Vascular Surgery was founded in the mid-1940s, vascular surgeons have remained uniquely devoted and qualified to treat arterial, venous and lymphatic disorders (not involving the brain or heart)—most commonly aneurysm, carotid stenosis and limb ischemia.

Santilli and Duncan say the bulk of their patients are men age 65 and older, and many of them also have comorbid and complicating conditions. The most common risk factors for vascular disease are smoking (even as few as 100 cigarettes across a lifetime), diabetes, obesity, hypertension and hyperlipidemia.

Whether or not it is a coincidence, the rapid evolution of endovascular devices and delivery techniques happens to be taking place alongside a big demographic change that has been more heralded than a Minnesota snowstorm: The number of people age 65 and older, the very people who present to vascular surgeons, will double by the year 2025. The aging of the population, along with the attendant rise in diabetes and obesity, have raised the question: Will vascular surgeons be able to handle the incoming patient load? The number of practicing vascular surgeons is few, and many will be retiring in the next decade. According to the Association of American Medical Colleges, there were 2,853 vascular surgeons (1 per 108,325 people) in the United States in 2010. Of those, 223 (7.8 percent) were women. About 40 percent were age 55 and older. In Minnesota, a search of healthgrades.com yielded the names of 68 vascular surgeons, nine of whom are women.

An analysis published in the October 2009 issue of the *Journal of Vascular Sur-*

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and are ready to join a practice that prioritizes solving the puzzles of individual patients' aches and abnormalities over navigating or negotiating others' pre-set algorithms for care and reimbursements. We're a healthy, independent physician owned practice offering patient centered, physician directed primary and specialty care in three modern clinics. And we're always looking for energetic talent to join us. To arrange a confidential interview at your convenience, **please call Matt Brandt: 763-785-7710.**



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gerly found that there could be a shortage of 330 surgeons by 2030, assuming vascular operations will remain at 284 per 100,000 people. The cost of training enough surgeons (3,047) by that time was estimated at \$1.2 billion. By 2050, the shortage is expected to worsen—to 746. The anticipated shortages and the cost of training vascular surgeons have prompted professional and accrediting organizations to rethink the training path.

Off the beaten track

The traditional track is five years in a general surgery residency, followed by a two-year vascular surgery fellowship. Anticipating the shortage and addressing the cost of training, the Accreditation Council for Graduate Medical Education has approved new tracks for trainees. The newest, shortest is the 0+5 track, in which applicants enter vascular surgery training directly from medical school and get the equivalent of two years of general surgery training.

Duncan says Mayo, which has six fellows at any given time and graduates two per year, accepted its first 0+5 fellow last year and added another this year. The changes, she says, actually will have the opposite effect of what was intended in the short term: Because the 0+5 fellows will be with Mayo for a longer period of time, fewer fellows will be accepted to their program. She expects

this will change as Mayo and other institutions budget for having more fellows for longer periods.

Santilli says for now the University of Minnesota, which also graduates two fellows per year, adheres to the 5+2 pathway, believing that a full five years in general surgery is critically important. “We know it produces very well-trained surgeons who are very competent to handle most problems,” he says. “Given the fact that we are the people in the hospital who most people



PHOTO COURTESY OF THE MAYO CLINIC

Mayo Clinic's Audra Duncan, M.D., is one of a growing number of women in vascular surgery.

call when there is a problem, particularly when it relates to bleeding, it's good to be well-versed and feel comfortable anywhere you need to be to stop it.” Among the country's 104 vascular surgery residency programs, 42 now offer shorter training paths. And more people, most notably more women, are entering the field.

Both Duncan and Santilli are seeing changes in who's applying to their programs. Three of Mayo's six fellows are women; next year, four of six will be women. Duncan says she's also seeing many more female applicants for the 0+5 track. Santilli says although the university has had no female fellows and very few female applicants, that changed this year, when eight out of the 13 applicants were women. “I am 90 percent certain that our next two fellows [starting July 1, 2014] will be women,” he says, wel-

coming the change. “I think we will see this change all across the country.”

The path that lies ahead

As for the future of their field, Duncan and Santilli appear non-plussed by the predicted shortages.

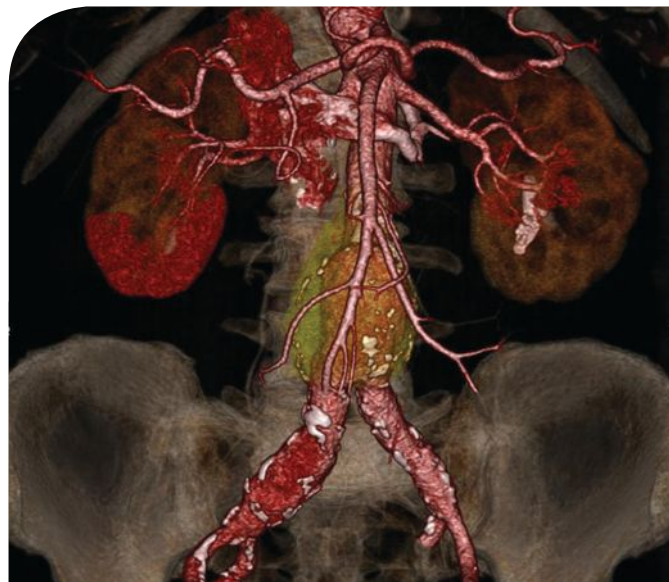


IMAGE COURTESY OF MEDTRONIC

A 3-D reconstruction of an abdominal aortic aneurysm (AAA). Medicare now pays for AAA screenings for eligible seniors.

A LITTLE-USED lifesaver

Abdominal aortic aneurysms (AAA) can be easily detected with a painless, low-cost ultrasound. However, most of them are discovered by happenstance, when doctors are investigating a different problem. To save more lives, Congress passed the Screening Abdominal Aneurysms Very Efficiently (SAAVE) Act in 2007, which provides screening for eligible seniors as they transition onto Medicare.

Men who have smoked at least 100 cigarettes in their lifetime and men and women with a family history of AAA are eligible for the free, one-time screening. The benefit is linked to their Welcome to Medicare physical exam, which must be completed within the first six months of Medicare enrollment. A proposed update to the law would detach the one-time benefit from the Welcome exam and extend it to all 65- to 75-year-old at-risk Medicare beneficiaries.

The screenings could save millions of dollars and 15,000 lives per year, but less than 5 percent of the eligible population is making use of them, says Steven Santilli, M.D., chief of vascular surgery at the University of Minnesota. “We want to raise awareness, especially in Minnesota, which has a higher-than-average mortality rate from aneurysms as compared with the rest of the nation.”—S.T.W.

“Job security,” says Santilli.

“It keeps me busy,” says Duncan.

Rather than fretting over what lies in store for their specialty, they are directing their energies toward staying abreast of technical and medical changes, which include advances in stent-graft technology. Eventually, these innovations may accommodate the small number of patients who currently are not good candidates for endovascular surgery—those with especially tortuous arterial anatomy or branched arteries that are simply too small.

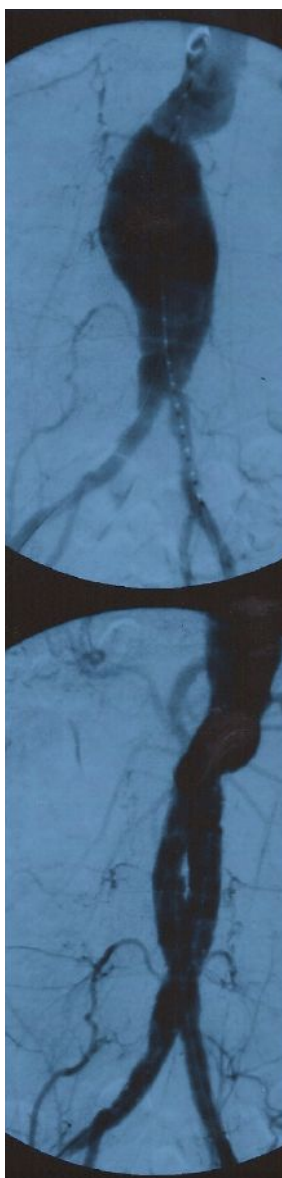
Santilli says he also anticipates advances in nonsurgical care, including gene therapy and medications that will shut down the cellular activity that generates arterial plaque. In the meantime, he'd like to see earlier diagnoses of potential life- and limb-threatening diseases. He says he sees far too many patients with late-stage peripheral artery disease, advanced ischemia, leg and foot wounds, and gangrene, who are at risk of losing a limb. “What that really tells me is that about one-third of those people are going to have a heart attack or a stroke in the next three to four years,” Santilli says. He sees earlier diagnosis and management of risk factors, especially smoking cessation, as critically important.

Both Duncan and Santilli say their specialty demands technical precision, attention to detail, quick problem-solving skills and calm under fire. And both like that it allows them to build long-term relationships with their patients.

“We follow our patients forever,” Santilli says. “That’s one of the beauties of the specialty. If we don’t treat them, we follow them indefinitely to see if their disease progresses. If we do treat them, we follow them after the procedure.”

Duncan says she was drawn to the field for the very reason that deterred some of her fellow students: the challenge of caring for patients who are typically geriatric and acutely ill. “You really have to love it to do it.” MM

Sarah T. Williams is longtime Twin Cities journalist.



TOP: An image of an abdominal aortic aneurysm. BOTTOM: The aneurysm after treatment.

IMAGE COURTESY OF MEDTRONIC

FOR HE'S A *vascular* FELLOW



Steven Levin, M.D.

On a recent Friday, Steven Levin, M.D., started his rounds at Abbott Northwestern Hospital at about 5:45 a.m., checking first on a 57-year-old man who had presented with acute limb ischemia, requiring emergency embolectomies of his distal blood vessels. He moved on to an 82-year-old man who had had endovascular surgery for an aortic aneurysm and was doing well enough to be released—just one day after his surgery. He then had to deliver bad news to a 64-year-old man with ischemia and bruising in his right leg. When the Doppler failed to pick up an ankle pulse, Levin told him there was a good chance he would have bypass surgery that day. With rounds complete, Levin headed for the operating suite to surgically debride and pack a wound (using state-of-the-art xenographic skin).

After more procedures and consultations, he'll head home at about 7 p.m., and may or may not return, depending on whether or not he's on call (which is every other night and every other weekend).

This is typical of Levin's days as one of three surgeons in the vascular fellowship program at the University of Minnesota.

Unlike most, Levin took a circuitous path to the specialty. After six years in general surgery (with one year of research) in New Jersey, he followed up with a three-year fellowship in cardiothoracic surgery, practiced for a few years, then came to the U of M for a two-year fellowship in vascular surgery. When he finishes next year, he'll be able to say that he took the 6+3+2 path.

The pull to vascular surgery was irresistible. Says Levin: “I really enjoyed the process, the ability to improve blood flow in various arterial segments in a patient, without necessarily having to perform a big open procedure with all of its attendant complications, pain and long postoperative recovery. It was really neat to be able to see these patients get out of the hospital a lot quicker with really almost no morbidity and with good results.” That said, Levin says the fellowship is also exposing him to the evidence regarding indications for endovascular versus open procedures.

Levin takes a philosophical approach to his work—and to his life, which he says is reflected in a favorite nonfiction book he's just finished reading: *Finding Flow: The Psychology of Engagement with Everyday Life*, by University of Chicago psychologist Mihaly Csikszentmihalyi. The book, he says, is a study of how people are happiest when they are absorbed in the moment. “What I love about this field,” he says, “is how I lose myself in the procedure and become so focused on what I'm doing that I completely lose track of time. There's nothing else I'm worried about or thinking about—except what I'm doing at that time.”—S.T.W.



FAST-*acting*

Minnesota's proposed

ACUTE STROKE SYSTEM

calls on outlying hospitals to become "stroke-ready."

BY JEANNE METTNER

We have known for some time that when it comes to treating ischemic stroke, every minute counts. For each one that passes without treatment, the patient loses 2 million brain cells. In addition, there is a narrow window—4.5 hours to be exact—during which the

clot-busting tissue plasminogen activator (tPA), administered intravenously, has a positive effect. Despite this knowledge, fewer than 5 percent of people who are having a stroke caused by a blood clot receive tPA.

The disconnect between what is known and what is done has prompted officials in every state to focus on developing faster, more effective ways to respond when patients are having a stroke—the fourth leading cause of death and the leading cause of disability among adults in the United States and in Minnesota.

To create a more standardized approach to caring for those patients in Minnesota, a steering committee convened by the Minnesota Department of Health and the American Heart Association has been developing an acute stroke system that will

be similar to the state's trauma system. The Acute Stroke System Council, which first met in March 2011, includes EMS directors, EMTs, hospital administrators and staff, and representatives from advocacy groups. One of their proposals was to expand the network of hospitals that are considered ready to treat acute stroke. Sixteen hospitals in Minnesota are already recognized as primary stroke centers (PSCs) by the Joint Commission. But all of them are in the Twin Cities, Duluth, Rochester or St. Cloud.

The council's proposal, which was put forth in legislation sponsored by the American Heart Association and coauthored by Rep. Tina Liebling and Sen. Kathy Sheran, would enable the Department of Health to designate hospitals as "acute stroke-ready" if they meet certain

criteria (see box). At presstime, it appeared likely the legislation would become law.

“We want to optimize care for Minnesotans, regardless of geography, by using all of our resources to reduce time to appropriate stroke care,” says David Anderson, M.D., a neurology professor at the University of Minnesota who practices at Hennepin County Medical Center and the University of Minnesota Medical Center, Fairview.

Standardizing care

Designating hospitals as “acute stroke-ready” is the first step toward developing a fully operational response system. The next is to integrate acute stroke-ready hospitals into the triage process—allowing for more timely treatment and fewer unnecessarily long trips to primary stroke centers.

In formulating a Minnesota plan, the steering committee researched how other states were developing their acute stroke systems. Some were recommending that

Department of Health’s Minnesota Stroke Registry Program. “What will likely happen is that we will have a hybrid of the hub/spoke model,” he says.

The Department of Health will compile the list of the hospitals that are either acute-stroke-ready or are nationally accredited comprehensive stroke centers or primary stroke centers. “From there, EMS systems can move forward in designing their own protocols for triage and transport based on what they now know about the hospital capacity in their service area,” Tsai says. Justin Bell, government relations director for the American Heart Association’s Midwest Affiliate, says the proposed system is an extension of what the state is already doing. “We’re not really reinventing the wheel of how we are managing stroke care in Minnesota,” he says. “We’re standardizing it and coordinating it so all the participants in the system have clear expectations and we can streamline the process.”

treatment

all stroke patients be transported to the nearest PSC. Others employed a “hub and spoke” model, which consists of a central PSC that provides outreach to hospitals within a designated area.

Neither strategy quite fit the bill for Minnesota because more than one-third of residents live 60 minutes or more from a PSC. Many of those who live in areas not served by a PSC are older than 65 years of age—the group most affected by stroke. Committee members knew they needed a different solution. “We discovered that about a third of stroke victims in Minnesota go first to a rural hospital, so we realized we needed to make sure rural community hospitals are meeting standards that allow them to provide high-quality stroke care to these patients,” says Albert Tsai, principal investigator for the

Reducing “door-to-needle” time

To understand what the acute stroke system will look like requires only to look at the way things work now—in the best of circumstances. A patient experiences stroke symptoms, then calls 911. The dispatcher recognizes that the patient meets the criteria for stroke and notifies the paramedics. The paramedics stabilize the patient and call the admitting hospital, notifying them that a stroke patient is on the way. The hospital assembles their stroke team and meets the paramedics in the emergency department. The patient then undergoes a thorough assessment, which requires an examination and CT imaging to rule out bleeding in the brain. (tPA is associated with some bleeding risk and is not appropriate for patients having a hemorrhagic stroke.) If there is no bleeding

“ACUTE STROKE-READY” criteria

Under proposed legislation, the Minnesota Commissioner of Health will be able to designate hospitals as “acute stroke-ready” if they have the following in place:

- 1 An acute stroke team available or on call 24 hours a day, seven days a week
- 2 Written protocols that outline how to do triage, how to stabilize vital functions, which diagnostic tests to perform, and which medications to use and how to use them
- 3 A written plan and letter of cooperation with emergency medical services regarding triage and communication that are consistent with regional patient care procedures
- 4 Emergency department personnel who are trained in diagnosing and treating acute stroke
- 5 The capacity to complete basic laboratory tests, electrocardiograms, and chest X-rays 24 hours a day, seven days a week
- 6 The capacity to perform and interpret brain injury imaging studies 24 hours a day, seven days a week
- 7 Written protocols that detail available emergent therapies and reflect current treatment guidelines, which include performance measures and are revised at least annually
- 8 A neurosurgery coverage plan, call schedule, and a triage and transportation plan
- 9 Transfer protocols and agreements for stroke patients
- 10 A designated medical director with experience and expertise in acute stroke care.

Source: Minnesota Department of Health

and there are no other contraindications, the patient receives intravenous tPA within 60 minutes of arrival at the hospital (which is recommended by the National Institute of Neurological Disorders and Stroke) and is stabilized for transport to a PSC if necessary.

“That’s what happens when everything goes well,” says David Larson, M.D., medical director of emergency services at Ridgeview Medical Center in Waconia. But not all hospitals have those systems in place, and even if they do, things don’t always go as they should.

A study published in *The Journal of Hospital Medicine* in September 2010 found that the use of tPA in patients hospitalized for ischemic stroke was dismally low—a mere 2.4 percent. And a February 2010 article in *Circulation* indicated that of those who do receive tPA, only 27 percent receive it within 60 minutes.

Larson thinks community hospitals will be “very motivated” to meet the criteria

for designation as acute stroke-ready. “Our health care system is so fragmented,” he says. “Having these systems in place within that fragmentation ensures that the process will follow a certain path, which

will hopefully help systems reach the optimal health outcomes for their patients.” **MM**

Jeanne Mettner is a frequent contributor to *Minnesota Medicine*.

STROKE CARE from a distance

Some of the hospitals that are likely to seek designation as “acute stroke-ready” are already using telemedicine to connect with experts at a primary stroke center who can guide them through a case. Allina Health System, Mayo Clinic and HealthEast all have telemedicine programs that help small- or medium-sized hospitals—in both rural and metro settings—rapidly evaluate and treat acute ischemic stroke patients 24/7.

Each program places movable, high-resolution cameras and video conferencing equipment in the emergency department of a smaller hospital. The equipment enables neurologists who specialize in stroke care to provide real-time assessment of patients presenting with stroke at the remote hospital’s emergency department. Allina’s program serves 16 hospitals, Mayo’s serves 10, and HealthEast’s serves eight facilities.—J.M.

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Leg work

What's behind the upsurge in **vein clinics**?

BY PHOEBE LARSON



One of the many billboards advertising a vein clinic in the Twin Cities.

The billboards lining the interstates, tout the possibilities: “Hope for Varicose Veins.” “Restless Legs? Leg Pain? Change Your Lifestyle Today.” They’re the marketing efforts of a fairly recent player in health care—the stand-alone vein clinic. Run by enterprising clinicians called phlebologists, the clinics have a very narrow focus: leg veins.

Vein clinics have proliferated in Minnesota in recent years. St. Paul Radiology opened one of the first ones in Minnesota in 2003 and became a training center for physicians from throughout the United States. Hogue Vein Institute, which started in 2004, now has eight locations across Minnesota and one in Fargo, North Dakota. Vein Clinic P.A., established its first facility in 2009 and now has nine across

the state, employing four staff physicians. In addition, area hospitals and multispecialty clinics have gotten in on the business. For example, Park Nicollet’s Methodist Hospital in St. Louis Park and CentraCare Clinic in St. Cloud both indicate on their websites that they do vein procedures.

Physicians on the forefront of the industry say they are meeting the needs of an underserved community—the more than 30 million Americans who suffer from chronic vein disease and have varicose veins. In addition to being unsightly, varicose veins can be painful and associated with heaviness, itching, swelling, restless legs syndrome and, in extreme cases, nonhealing ulcers. “Patients say they are in misery,” says Dan Morehouse, M.D., a board-certified vascular surgeon and medical director of Vein Clinic P.A. “The conditions we treat won’t kill you, but they are uncomfortable and often extremely painful,” he says. (Vein clinics do not address arterial issues associated with diabetes and peripheral artery disease.)

New treatments, new business

Until about 2000, surgeons treated bulging veins with stripping and ligation. The procedures were usually done in hospitals under general or regional anesthesia. Although they might go home the same day, patients often couldn’t return to work and other activities for several days. Complica-

PHOTO BY KATHRYN FORSS



Membership in the American College of Phlebology has grown on average 10 percent a year.

tions from the surgery could include damage to nerves, infection, scarring and pain. Some patients also experienced recurrence of symptoms.

In 1999, new technology began to change the way clinicians treated vein problems, launching the industry. Radio-frequency ablation, a minimally invasive, catheter-based treatment was approved by the FDA for treatment of veins. Guided

by duplex ultrasound, a specialist inserts a catheter into the affected saphenous or perforator vein, then uses high-frequency alternating current to seal it shut. Once the veins are sealed, the body naturally dissolves them.

In 2002, another procedure, endovenous laser ablation, was approved as well. In endovenous laser ablation, an optical fiber is used to obliterate the problematic vein. It is less expensive, and some believe it is more efficient and effective than radiofrequency ablation. It also can be used in veins of a larger diameter.

Both procedures can be performed on an outpatient basis in less than two hours, using local anesthesia and without need for surgical backup. Patients return home with little pain, requiring only oral, non-narcotic analgesia, and recovery quickly.

A specialty in flux

The technologies not only sparked the growth of vein clinics, they also gave a boost to a fledgling specialty—phlebology. The American College of Phlebology was founded in 1985 with 15 members. Over the past five years, it has seen an average annual growth rate of 10 percent; and today, its membership stands at more than 2,000. Its leaders are working to help the field earn full-fledged medical specialty

status. In 2005, the American Medical Association recognized it as a self-designated specialty; it still awaits recognition by the American Board of Medical Specialties.

Despite its indeterminate status, phlebology is attracting physicians from a wide range of specialties including radiology, obstetrics, dermatology, vascular surgery and primary care. Some are drawn by the regular hours and reduced call duty. Others like doing procedures that are relatively low-risk yet quickly yield positive results.

Sam Gupta, M.D., founder of Vein Clinic, P.A., who is board-certified in family medicine, says he found phlebology by accident when he was pursuing training in wound care and saw that patients with chronic leg ulcers improved dramatically after venous treatment. “It changed everything. After that, I worked on the underlying source—veins causing poorly healing ulcers far more than the wound itself,” he says. “The specialty fell into my lap.”

For those wishing to enter the field, the American Board of Phlebology (ABPh) has created a certification process, including an exam. The ABPh, which was established in 2007, recognizes two training paths: a residency or fellowship in vascular radiology or surgery or personally directed training and clinical practice under a certified phlebologist. The American College of Phlebology offers a series of online courses and videos along with a preceptorship program, which allows physicians to train with an ABPh-certified phlebologist. It also funds a 12-month, post-graduate fellowship program, which is awarded annually to one physician.

To qualify for the board exam, physicians must have performed at least 100 vein procedures and 100 ultrasound exams, in addition to having done coursework. Minnesota has an estimated 12 ABPh-certified phlebologists.

Despite these efforts, there is still concern about the qualifications of some practitioners. “Phlebology training is still spotty,” says Steven Zimmet, M.D., who practices in Austin, Texas, and serves as president of the ABPh. “The goal of the ABPh is to standardize and improve core curriculum and training across programs



PHOTOS COURTESY OF HOGUE VEIN INSTITUTE

Before (left) and after pictures of two patients with varicose veins treated at a vein clinic.

2013 CME Activities

(All courses in the Twin Cities unless noted)

MID-MAY - OCTOBER 2013

Dermatology 2013:

Advances & Discoveries

May 17, 2013

Topics & Advances in Pediatrics (in cooperation with MN-AAP)

May 30-31, 2013

Midwest Cardiovascular

Forum: Controversies in CVD

June 1-2, 2013

Bariatric Education Days

(9th Annual)

June 5-6, 2013

Update in GI Surgery

(77th Annual)

June 7-8, 2013



For a full activity listing, go to www.cmecourses.umn.edu.

Workshops in Clinical Hypnosis

June 6-8, 2013

Maintenance of Certification in Anesthesiology (MOCA) Training

June 15, 2013

Lillehei Symposium:

Cardiovascular Care for Primary Care Practitioners

September 5-6, 2013

Care Across the Continuum: A Trauma & Critical Care Conference

September 27, 2013

NPHTI/Pediatric Clinical Hypnosis

October 3-5, 2013

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and provide a way of determining who has at least a foundation of knowledge as well as experience," Zimmet says.

Lack of regulatory oversight is another cause for concern. "Patients need to be cautious," says Carl Dando, M.D., of Hogue Vein Institute. "Are you ABPh certified?" and "How many procedures have you performed?" are primary questions for patients to ask." Additionally, with ultrasound as the main imaging tool for assessing venous anatomy and flow dynamics as well as catheter placement, expertise in that modality is critical as well. Clinics need a highly skilled ultrasound technician and a physician who can interpret the images for diagnosis and optimal procedural success.

Here to stay

In September, phlebologists from around the world will convene in Boston at the World Meeting of the International Union of Phlebology. According to Zimmet, this year's meeting will be the largest ever—

another sign the field is on the rise. This doesn't surprise Michael Rosenberg, M.D., of The Vein Center of St. Paul Radiology. "There is an incredible need," he says. "The cost of venous disease to the medical care system is billions per year. These

procedures are minimally invasive and offer rapid, positive feedback—symptoms improve almost immediately and there's often an associated cosmetic benefit." MM

Phoebe Larson is a St. Paul writer.

The cosmetic question

Although treatment for varicose veins is generally covered under insurance, eliminating spider veins (using sclerotherapy, ohmic thermolysis or lasers) is not. Because vein clinics typically offer both services, insurers may require preauthorization for vein procedures, and they may require patients to try other treatments first. "They may require conservative therapies to start, for example, that a patient wear medical-grade compression stockings for three months," says Michael Rosenberg, M.D., of The Vein Center of St. Paul Radiology. "Sometimes that makes sense, but other times, you're just delaying inevitable treatment and the condition may even get worse." —P.L.



PAD

PERIPHERAL ARTERY DISEASE

SHINING LIGHT ON A NEGLECTED CONDITION

PERIPHERAL ARTERY DISEASE

has been long underappreciated.

But researchers are working to change that.

BY KATE LEDGER

By the time a 78-year-old woman—we'll call her Nancy—consulted Alan T. Hirsch, M.D., the ulcer on her heel had been plaguing her for months. She'd been told it was the result of her diabetes and that nothing could be done about it. Her children explained that she hadn't been able to walk for several weeks, and she'd become housebound and depressed. Hirsch wasn't surprised by the case. Nor was he surprised when a simple, inexpensive and risk-free test showed the ulcer likely was caused by another treatable condition: peripheral artery disease (PAD). Nancy eventually underwent angioplasty to widen a leg artery, and the wound healed.

Although Hirsch was pleased with Nancy's outcome, the case gives him pause, as the scenario is all too common. "I see the same pattern quite often, and it's unfortunate," he says, explaining that the disease has long been overlooked by patients and physicians alike. "Despite major advances

in the past two decades, there is still incredible complacency within the medical community. Nobody's thinking about it."

A vascular medicine specialist and cardiologist at the University of Minnesota Medical School and School of Public Health, Hirsch has spent decades investigating PAD, publishing papers, giving talks and establishing national and international research collaborations in the hope of raising awareness about this condition that affects as many as 12 million people in the United States and yet has managed to stay under the radar.

A disease demanding attention

Peripheral artery disease occurs when atherosclerotic plaque blocks blood flow from the heart to other parts of the body, often the legs. The process is similar to the gradual clogging of heart vessels that occurs in coronary artery atherosclerosis. But unlike the immediate life-threatening urgency of a heart attack, the symptoms

of PAD—including exertional leg muscle fatigue—are vague enough that a person might be inclined to endure them rather than seek help. "Often these are symptoms that may either mimic those of other diseases or seem like normal aging," Hirsch says, adding that PAD symptoms can be easily mistaken for sciatica, lumbar disease, neuropathy, compartment syndromes or simple deconditioning.

Although PAD symptoms may seem subtle, the disease is not "mild," and when left untreated, it can be devastating. People with PAD are seven times more likely to experience a heart attack or stroke, which as Hirsch points out is a rate as high as or higher than that experienced by patients who have already suffered one of those events. In addition, when PAD is severe, blood flow to the legs can be decreased to the extent that it kills skin, nerves and soft tissue, essentially creating what Hirsch calls a "heart attack of the leg." Patients with critical limb ischemia can experi-

ence severe unremitting pain, nonhealing wounds and gangrene. Consequently, PAD is the primary cause of nearly 80 percent of all amputations that occur in both Minnesota and the United States.

Even with the alarming outcomes associated with untreated PAD, patients with the disease rarely receive appropriate medical attention. Few clinicians now test for it, despite national guidelines, and few patients ask about it. “We know that most patients do not actively bring these symptoms up during a busy doctor’s visit,”

The power of myth-busting

When Hirsch completed his medical training at the University of California, San Francisco in 1980, he was drawn to cardiology, eager to address health issues affecting a large number of people. At the same time, he could already see the field was getting crowded, with many studying hypertension and coronary disease. So when vascular medicine was established as a distinct subspecialty while Hirsch was doing a cardiology fellowship at Harvard Medical School and Beth Israel Hospital

that those at risk were victims of their own behaviors such as smoking, had poorly controlled diabetes or were nursing home-bound elders. Although true to some extent, they missed the fact that PAD affects a wider segment of the population, and they inappropriately blamed the patient, and not the health system, which, Hirsch says, “long has held the power to prevent, detect or treat PAD effectively.”

Over the years, as Hirsch learned more about the disease, he has worked to alter those misperceptions. His work has high-

“THE CONSEQUENCES OF THIS DISEASE ARE SO SEVERE TO THE AFFECTED PATIENT, THEIR FAMILY, BUSINESSES, HEALTH CARE PAYERS AND HEALTH SYSTEMS THAT IT’S ABOUT TIME FOR PEOPLE TO BE THINKING ABOUT IT.

—ALAN T. HIRSCH, M.D.

and a clinician might not ask about them,” Hirsch says.

Along with colleagues, he conducted a national survey that demonstrated that only 26 percent of adults older than 50 years with atherosclerosis risk factors and leg pain knew that PAD is a health risk; of those who were familiar with the disease, fewer than one in seven knew that it could lead to loss of a lower limb.

Fortunately, he says, awareness is growing. Along with Hirsch, several other Minnesotans are working hard to characterize the disease and prompt clinicians and the public to be more vigilant. “The consequences of this disease are so severe, to the affected patient, their family, businesses, health care payers and health systems,” he says, “that it’s about time for people to be thinking about it.”

in Boston, he decided to pursue it. (Today, there are still fewer than 600 who have completed specialty training in vascular medicine, which focuses on care of non-coronary artery, lymphatic and venous diseases.) But even as he was learning to care for individual patients, Hirsch maintained an interest in public health, seeking an issue “for which there was both an immense health burden and an equally large knowledge gap,” he says.

It was not until he was offered a faculty position at the University of Minnesota that he focused in earnest on PAD. From the patients coming to him in clinic, he observed that the disease was common and had as significant an impact on people’s lives as cancer, heart disease or stroke. At the core of the problem, Hirsch realized, was that little information about PAD was available or that the information that was available was wrong. Textbooks stated that PAD was a disease of men and

lighted the fact that women as well as men are affected by PAD. (Within the oldest age groups, PAD rates in women are even higher than those in men.) In addition, women may present with atypical, hard-to-diagnose leg symptoms.

Last year, Hirsch was asked to chair a group that authored an American Heart Association Scientific Statement urging physicians to devote more attention to PAD in women. This publication noted that fewer than 25 percent of women were aware of the signs of PAD and the health threats it presents.

Getting a handle on the numbers

One reason for the lack of familiarity with PAD is because only a few epidemiologists and cardiovascular researchers are studying it. As it happens, two of them are in Minnesota, and both are quick to say they’ve been inspired by Hirsch’s tireless energy and enthusiasm for the topic. One

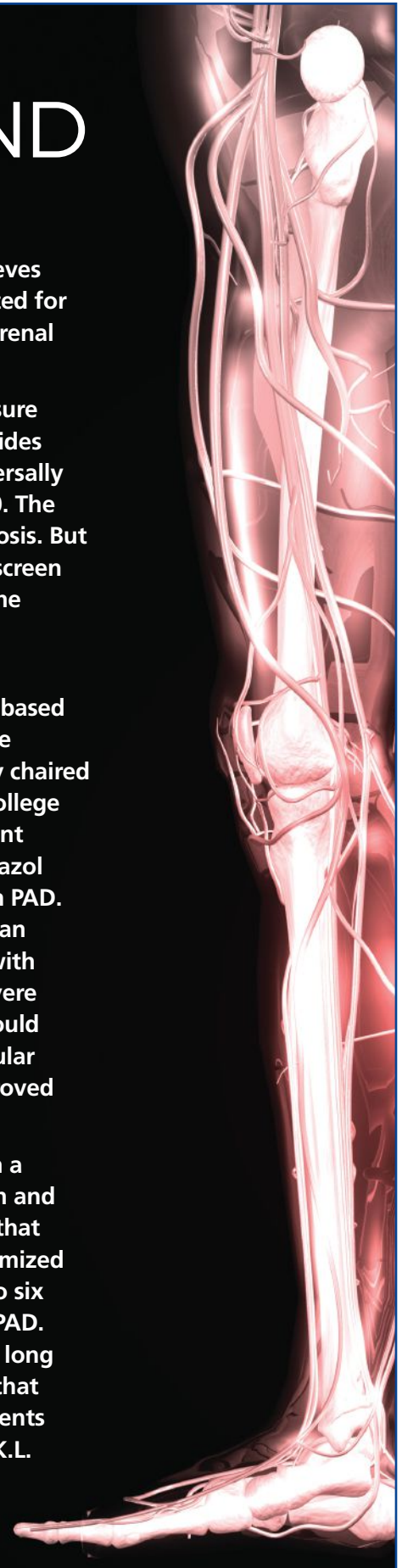
DIAGNOSING AND TREATING PAD

The University of Minnesota's Alan T. Hirsch, M.D., believes more cases of PAD would be diagnosed if clinicians tested for it, especially in patients who are diabetic, have chronic renal disease, smoke or are elderly.

Diagnosing PAD is fairly simple, involving a blood pressure test known as the ankle-brachial index (ABI), which divides the pressure in the foot by that in the arm. PAD is universally considered present when the ABI value is less than 0.90. The lower the index value, the worse the short-term prognosis. But he notes that even if clinicians were to more regularly screen these patients, it would not be enough to fully lower the burden of PAD.

In addition, Hirsch has worked with local and national colleagues to get the word out about several evidence-based approaches to treatment that can alter the course of the disease and improve outcomes for patients. He recently chaired the committee that wrote the intersocietal American College of Cardiology/American Heart Association PAD treatment guidelines. They note, for example, that the drug cilostazol can be effective in treating claudication associated with PAD. Aspirin, ACE-inhibitors, statins and smoking cessation can reduce the risk for heart attack and stroke in patients with PAD. The guidelines also indicate that patients with severe disease (those who may have critical limb ischemia) should be immediately referred for consideration of endovascular (angioplasty or stent) or open surgery to facilitate improved blood flow.

Drugs and surgery aren't the only treatment options. In a recent multicenter study published in *Circulation*, Hirsch and colleagues showed that supervised exercise, similar to that offered in a cardiac rehabilitation program, and a customized walking program led by trained therapists over three to six months, was more effective than stenting for treating PAD. "The beneficial effect of exercise has been known for a long time," he says. "What was surprising in our study was that exercise therapy was superior to the stent, even in patients with total blockages of the very largest leg arteries." —K.L.



is Sue Duval, Ph.D., a biostatistician and epidemiologist at the University of Minnesota. She had been studying cardiovascular disease for several decades, when she began learning about PAD five years ago while working on a project with Hirsch. A large international study co-led by Hirsch, the Reduction of Atherothrombosis for Continued Health (REACH) registry, which included 25,763 U.S. participants, identified 2,396 (9.3 percent) with symptomatic PAD and 213 (0.8 percent) with asymptomatic PAD. “I was just completely

are actually more cases of PAD in women than men, and she found PAD to be most prevalent in the oldest age group, which is made up of more women than men.

She’s also thinking about how those findings may help improve medical care. Last year, she used the REACH database to develop a scoring system that can be used by physicians and patients themselves to determine if they are likely to benefit from an ABI test. The system attributes points to being older than 45 years of age and having known risk factors such as smok-

lenge of pinning down numbers about the disease. “There really was very little information available from hospitalization data,” he says. He points out that chronic diseases in general tend to be understudied because they aren’t reported the way communicable diseases are.

To get at one aspect of PAD—prevalence of the most severe cases, he investigated the incidence of major and minor lower limb amputations not caused by trauma or cancer. He combed through the state’s inpatient hospital discharge claims from 2005 to 2008 and was surprised by the results. During the four-year period, the rate of PAD-related lower limb amputations in Minnesota was 20 per 100,000 (about 1,000 per year). The rate was significantly higher among older patients, men and people with diabetes. Significantly, he found amputations were more common in rural areas and in counties with Indian reservations, which seemed to reflect higher rates of smoking in those areas. In particular, many counties in the northern part of the state had amputation rates that were twice the state average, and up to four times higher than those in counties in the Twin Cities metro and southern parts of the state. The study also helped put a dollar figure on the costs associated with PAD.

The median total charge for hospitalizations leading to an amputation was \$32,129, and cumulative inpatient hospitalization charges were \$56.5 million in 2008.

What Peacock found remarkable was that although the risk factors for PAD are similar to those for heart disease, the amputation rate in Minnesota was steady even as the heart disease mortality rate declined. “There’s a lot of treatment available for heart disease, and it’s highly organized,” he says. “That’s not the case with PAD.”

The team on the bench

At Mayo Clinic, cardiologist Iftikhar Kullo, M.D., long had an inkling that the increasing attention being paid to PAD would eventually have an impact on basic-science research. He had been studying the underlying mechanisms of PAD, in particular whether family history and genetics make people more prone to the disease. “A lot is known about how having a family history

“THERE’S A LOT OF TREATMENT AVAILABLE FOR HEART DISEASE, AND IT’S HIGHLY ORGANIZED. THAT’S NOT THE CASE WITH PAD.

—JAMES PEACOCK, PH.D.

”

shocked by the scope of this disease and how many people are affected,” she says. “In all my reading, I hadn’t come across it. It really did surprise me.”

Since then, Duval has been culling information from the REACH registry and the Centers for Disease Control and Prevention’s National Health and Nutritional Examination Survey (NHANES) to provide more detailed information about the prevalence of PAD, the cost of care and the prognosis for patients. Accurate numbers, she says, remain hard to come by. Although NHANES is the largest national source of information about persons with PAD, its figures come from self-reported cases, “which, since we know patient understanding is quite low, is a little different from having information about diagnoses,” she says. In a meta-analysis of six U.S. studies related to PAD and a study of the NHANES data, Duval found that there

ing, diabetes, coronary artery disease and cerebrovascular disease.

“We published the score to try to trigger some conversation and maybe some action,” she says. “Patients might think to ask for the test, or clinicians would quickly compute a patient’s score and decide whether to recommend an ABI.” She’s not aware of it being used much yet, however. “Unfortunately, these things are hard to get integrated into general practice.”

A look at the home front

Another epidemiologist interested in PAD is James Peacock, Ph.D., who studied at the University of Minnesota and five years ago joined the Minnesota Department of Health in its Heart Disease and Stroke Prevention Unit. Having worked with Hirsch and Duval at the university, he was interested in looking at PAD patterns in Minnesota. Right away, he faced the chal-

of heart disease increases one's risk," Kullo says, "but very little is known about familial clustering of PAD."

Recent studies by Kullo's research group show that having a first-degree relative who has undergone surgery or stenting for PAD more than doubles a person's risk for developing the disease. The risk is even higher if that relative was young at the age of onset and if the person has more than one relative with PAD. These findings suggest that shared genes predispose one to PAD.

To identify the genes involved, Kullo's group began asking patients with PAD for permission to collect blood. They now have a biorepository with more than 2,600 samples. In 2007, when the National Institutes of Health established the Electronic Medical Records and Genomics Consortium, Mayo was one of the five sites chosen. The focus at Mayo would be on the genetics of PAD.

So far, Kullo's group has identified a genetic variant that seems to be associated with elevated risk for the disease. "Discovery of new genetic variants that influence

the risk for PAD may help identify pathways by which this disease develops and perhaps lead to new drugs and improved screening for risk of PAD," he says. To replicate the findings and increase the power to identify additional genetic variants, the group is starting to work with other centers that may have collected DNA samples from patients with PAD.

The road ahead

The hope among PAD researchers is that the growing body of knowledge about the disease will pique further interest in it. Hirsch hopes that as more information about PAD becomes available, more about the disease will be taught in medical school. To get information directly to patients, he has helped author pieces for the Vascular Disease Foundation and American Heart Association and co-written a handbook for PAD patients. And he uses his own Twitter account to disseminate details about PAD-related clinical trials.

Many questions remain. Researchers will need to study the clinical course of PAD to

understand its full progression. New risk factors need to be unmasked. New drugs and devices must be developed to improve outcomes. More work is needed to calculate the actual cost of PAD and to highlight how those costs can be lowered by earlier preventive interventions. Meanwhile, Hirsch, Duval and Kullo are continuing to push ahead. Kullo will continue to search for the genetic underpinnings of PAD and investigate the properties of blood vessels (nobody knows why, for instance, the plaque that occurs in leg vessels with PAD doesn't occur in the arms). Hirsch is promoting the study of stem-cell therapies to treat claudication and is co-chairing a new national evaluation of stem cell efficacy. Duval is using databases from across Europe to begin to consolidate accurate prevalence numbers on PAD worldwide. "Those of us in the field are passionate about it," Duval says of PAD. "It affects so many people. We just keep going, putting our work out there and doing all we can. We're not giving up." MM

Kate Ledger is a Twin Cities-based writer.



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Health care for everyone

Minnesota's Carol Backstrom on expanding Medical Assistance

BY MELISSA MRACHEK

It has been three years since the Affordable Care Act (ACA) became law. In that time, hundreds of state and federal workers have been preparing for its full-blown implementation just months from now. No one is more deeply engaged with the preparations than Carol Backstrom, the state's Medicaid director. Backstrom is charged with overseeing one of the biggest changes resulting from the ACA—the expansion of Medicaid, known in Minnesota as Medical Assistance (MA). Although she has only been in her current position since last No-

PHOTO BY DAN HAUSER



PHOTO BY DAN HAUSER

"I think the expansion (of Medicaid) is the showpiece of the ACA," says Carol Backstrom, the state's Medicaid director.

vember, she is well-aware that the next few months are critical ones. "When the ACA was passed, 2014 felt really far away—this is really where the rubber hits the road," she says.

Backstrom is no stranger to health care reform. Prior to her current position, she served as the Minnesota Department of Health's point person for overseeing implementation of state health reform legislation passed in 2008. She then became senior policy advisor at the Center for Medicaid and CHIP Services, part of the federal Centers for Medicare and Medicaid Services. In that role, she served as a liaison with states in creating and implementing Medicaid reforms across the country.

What's coming?

Nearly a million people receive health care coverage through MA and MinnesotaCare, the state's subsidized insurance program

for the working poor; but there are still thousands of low-income citizens who go without coverage. In 2011, Minnesota was one of the first states to get in on the first phase of Medicaid's expansion, extending coverage to adults with very low incomes who had previously been covered through the state's General Assistance Medical Care program.

The next phase, effective in 2014, will allow adults with annual incomes up to 138 percent of poverty guidelines (\$14,859 for a single adult) to qualify for coverage.

Projections show the expansion will increase average monthly enrollment in MA by 87,000 people; approximately 53,000 of those are currently covered through MinnesotaCare. "The expansion will offer health coverage to people who may have questioned their eligibility or the affordability of health coverage," Backstrom says.

Minnesota already is ahead of the game. DHS and several health care organizations throughout the state are involved in a pilot program testing new Medicaid payment models.

The federal government has guaranteed 100 percent of the funding for people who will now be able to enroll in MA. After three years, the federal contribution will gradually decrease to 90 percent. “I think the expansion is the showpiece of the ACA,” Backstrom says. “Minnesota has gone far beyond the federal minimum for many years, but getting even more people covered is a good thing.”

Quantity, quality and cost

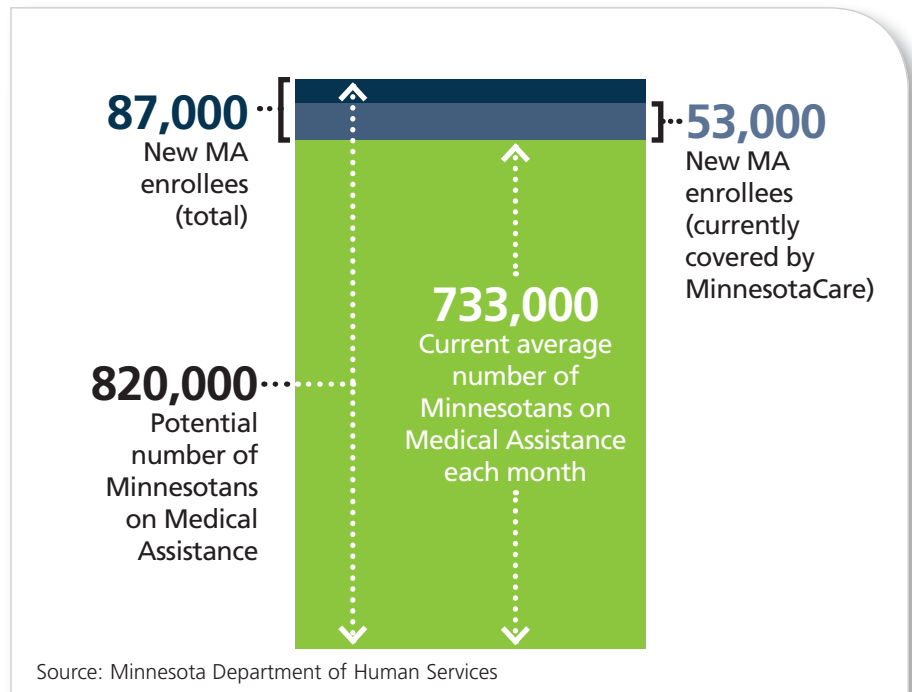
The potential influx of the newly insured has prompted concern among physicians about access to care—especially to primary care physicians. To develop the physician workforce, especially those willing to work in rural Minnesota, DHS is working to increase the amount of money going into the Medical Education and Research Costs (MERC) fund. The MMA has made restoring MERC funding and loan forgiveness funding a top legislative priority this session.

Encountering a swell of new patients isn't the only concern of physicians. Backstrom, who spoke on the future of MA and MinnesotaCare at an MMA policy forum in March, heard directly from them about the low reimbursement rates from Medicaid. “The Department of Human Services acknowledges that historically reimbursement rates have not been great,” Backstrom says. Knowing this, DHS has proposed a 5 percent fee-for-service rate increase across the board to be included in the governor's budget. “Not only do we have big changes coming in 2014 that will have physicians seeing more patients, but we also understand those same physicians have taken rate cuts during tough times and we are trying to turn that ship around,” Backstrom says.

MinnesotaCare: Stay or go?

The expansion of MA also puts in question the future of MinnesotaCare. Its future is tied to coming provisions of the ACA, one of which is the requirement for a Basic Health Plan (BHP). The BHP is intended to help low-income individuals who are not eligible for Medicaid and who may not be able to afford exchange-based

Medicaid in Minnesota BEFORE AND AFTER THE ACA



coverage. States that develop a BHP will receive 95 percent of the federal subsidies that would otherwise be used to help people buy coverage on the exchange. However, there is a catch. The BHP provision doesn't go into effect until 2015.

“Our interest is to keep MinnesotaCare intact to carry us to 2015 when we will get the [BHP subsidies],” Backstrom says. “It does mean more state expense for 2014, but we think it is the right thing to provide seamless care and keep beneficiaries on a known commodity with a 20-year history.”

Ultimately, MinnesotaCare may continue past 2015 as the state's BHP. For that to happen, the program would need to change in order to meet federal requirements. A bill (HF 214) authored by House Majority Leader Erin Murphy (DFL-St. Paul) would eliminate the \$10,000 limit on hospital benefits and the asset test used to determine eligibility. It also proposes decreasing cost-sharing, increasing provider payment rates and expanding the benefit set.

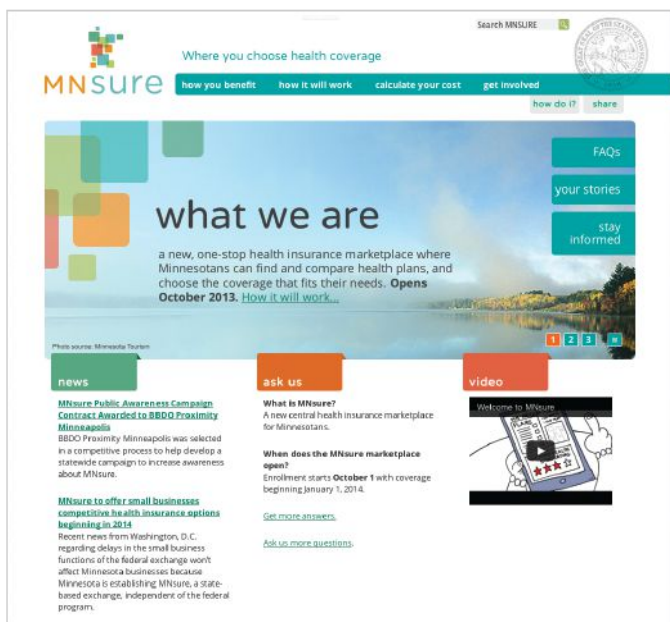
On the horizon

Care coordination and integration are a focus for Backstrom. “Better integrated care is the way of the future,” she says. “Physicians have embraced this phi-

losophy. The challenge will be getting integrated models to stand up on a clinic level.” Backstrom says state programs and health system administrators need to be thinking about how to financially support new models so clinics can staff appropriately, make time for huddles and implement other integration tactics. “We need to be paying for outcomes and quality of life versus the widget,” she says.

Minnesota already is ahead of the game. DHS and several health care organizations throughout the state are involved in a pilot program testing new Medicaid payment models that emphasize quality and preventive care, and reward providers for achieving certain health goals. In addition, Minnesota recently received a \$45 million State Innovation Model grant from the Centers for Medicaid and Medicare Services to expand health reform. “The grant allows us to create more of the infrastructure to support integrated care and the opportunity to focus in on public health,” Backstrom says. “It really is an exciting time to be involved with health care reform.”

News briefs



Minnesota exchange hits the final stretch; much to accomplish

Preparation for a Minnesota-based health insurance exchange is hitting a fevered pitch as it prepares to go live in October.

Shortly after a bill establishing the exchange became law in mid-March, the exchange received its official name, MNsure, and the Secretary of State began accepting applications from individuals interested in serving on the seven-member governance board. As this issue went to press, the only certain member is Lucinda Jesson, the commissioner of the Department of Human Services.

The MMA lobbied to ensure that a practicing physician would be allowed to serve on the board. That may occur. However, because of conflict of interest provisions in the bill, only physicians who are affiliated with an academic institution will be considered.

The board will oversee the operation of the exchange and establish budgets, policies and bylaws. It will also determine certification requirements for health insurance carriers, among other tasks.

Several other hurdles must be cleared before MNsure opens for enrollment in the fall. Insurance companies that want to have products on the exchange will need to submit them before a regulatory body by mid-May. Then there's the task of doing the programming for the website, which will allow users to compare plans. In addition, campaigns will be launched to educate Minnesotans about how to use MNsure.

The exchange is expected to serve up to 1.3 million Minnesotans, or about one out of every five citizens. Minnesota is one of 17 states plus the District of Columbia that will run its own exchange.

The exchange can be found at www.mnsure.org/hix.

Health care bills wither on the vine

Several health care-related bills the MMA has been following have failed to make progress this session.

The bills included some the MMA supported and some that concerned the MMA's legislative team.

One bill that caused concern would have granted advanced practice registered nurses (APRNs) more independence. It would have expanded the scope of APRNs' practice to include "performing acts of advanced assessment, diagnosing, prescribing and ordering." The legislation would have APRNs acting as primary care providers and given them authority to practice and prescribe outside of a prescribing or collaborative agreement with a physician. The MMA believes APRNs should work in a collaborative practice context.

Another bill that caused concern would have allowed sheriffs and police chiefs to require some applicants for firearm purchase or carry permits to seek a letter of approval from a physician. The MMA opposed this.

In addition, legislation that would have weakened restrictions on medi-spas' use of lasers in cosmetic procedures did not move forward. The MMA favors keeping current restrictions in place, so this is considered a positive outcome.

MMA leaders were disappointed when a bill that would have prohibited anyone younger than 18 years of age from visiting a tanning facility stalled. The MMA also supported a medical records bill, which stalled, that would align Minnesota law with federal HIPAA standards allowing for more flexibility in sharing patient records.

"Although these bills have stalled, we will certainly keep an eye on them. Until the Legislature adjourns in May, no proposal is truly dead," says Eric Dick, the MMA's manager of state legislative affairs.

MMA helps alter pharmacy legislation



Legislation from the Minnesota Board of Pharmacy that would redefine drug compounding and severely restrict physicians from repackaging often-used medications administered at clinics has been significantly improved because of work by the MMA.

Separate bills were introduced in March in the House (HF 1136) by Rep. Tina Liebling (DFL-Rochester) and in the Senate (SF 1081) by Sen. Julie Rosen (R-Fairmont).

"As introduced, these bills would have affected clinics that use compounded drugs for in-office procedures, especially specialty

practices such as ophthalmology, dermatology, pain medicine and otolaryngology,” says Dave Renner, MMA’s director of state and federal legislation.

“We were able to work closely with Rep. Liebling and Sen. Rosen to narrow the legislation to address the risks related to large, out-of-state compounding pharmacies without limiting practices that have been providing high-quality care to patients for years,” Renner says.

The legislation was in response to the meningitis outbreak last summer that was traced back to a large, Massachusetts-based compounding pharmacy that sold contaminated drugs. The original House bill was drafted so broadly that it would have prohibited in-office physician compounding.

The Senate version of the bill modifies the state’s Prescription Monitoring Program (PMP) so that physicians can track patients who may be “doctor shopping” for narcotics. The PMP was created to assist in efforts to address drug addiction and diversion.



Special issue on exchange wins PR award

A special MMA publication on Minnesota’s health insurance exchange won a PRSA Classic award in March at the 35th Annual Minnesota PRSA (Public Relations Society of America) Classics ceremony held in Golden Valley.

“A Look Inside: Minnesota’s Health Insurance Exchange” won in the Special Purpose Publications category.

Minnesota PRSA is the ninth largest chapter of the Public Relations Society of America, the world’s largest organization for public relations professionals.

Health care groups speak out on HHS cuts

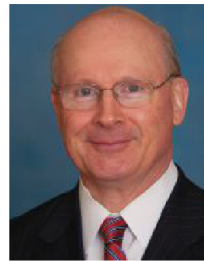
The MMA joined more than 50 other Minnesota health care-related organizations asking House and Senate leaders to reconsider their proposed HHS targets that cut \$150 million from “needed services for our most sick and vulnerable residents.” These cuts would come on top of the more than \$2 billion in HHS spending that has been slashed since 2009.

A letter signed by the organizations was delivered to Sen. Majority Leader Thomas Bakk (DFL-Cook) and House Speaker Rep. Paul Thissen (DFL-Minneapolis) on March 22. “These budget targets are even more perplexing in light of \$2 billion of proposed new revenues and, more important, the fact that the HHS budget

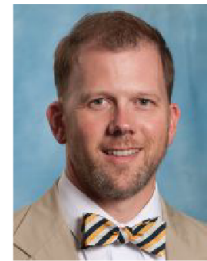
is one of the few areas with actual expenditures below projections in the February forecast,” the letter said.

In addition to signing onto the letter, the MMA sent an Action Alert to its members in late March urging them to send emails to their representative and senator.

“It’s crucial that our members and other health care providers let their legislators know that these cuts are unacceptable,” says Dave Renner, the MMA’s director of state and federal legislation. “Programs that provide care for the poorest and sickest among us have borne the brunt of cuts for years, and it simply can’t continue.”



Dan Maddox, M.D.



Brian Strub



Eric Dick

MMA in action

Terry Ruane, MMA director of membership, marketing and communications, held the MMA’s first Listening Sessions at Glencoe Regional Health Services in late March and Partners in Pediatrics in Plymouth in early April.

In April, MMA President **Dan Maddox**, M.D., attended the annual meetings of the Wisconsin, Iowa and Illinois medical societies.

Brian Strub, MMA manager of physician outreach, attended Match Day at the University of Minnesota, in early March. In April, Strub attended the U of M Medical School’s Transition Day, a day that prepares second-year students for the greater patient-care responsibilities that come in the third year. He and **Kathleen Baumbach**, MMA manager of physician outreach, also attended the Minnesota Academy of Family Physicians (MAFP) Spring Refresher.

Eric Dick, MMA manager of state legislative affairs, participated in a panel discussion at the Minnesota Ambulatory Surgery Center Association’s 2013 educational conference in Bloomington in April. Joined by other health care advocates, Dick presented the MMA’s legislative agenda and provided a mid-session update. Dick also participated in a District Dialogue event with Sen. Tony Lourey (DFL-Kerrick) and MMA members at Mercy Hospital in Moose Lake in late March. Lourey, chair of the Senate HHS Finance Committee, heard from members on a number of issues, including the health insurance exchange, health and human services funding and health care home certification.



Forums on prescription opioid misuse continue in May

The MMA will complete its series of policy forums on prescription opioid abuse, addiction and diversion May 9 in Rochester and May 16 in Duluth.

Carol Falkowski, former director of the Alcohol and Drug Abuse Division and Drug Abuse Strategy Officer for the Minnesota Department of Human Services, will lead the discussions.

Prescription drug abuse is the fastest-growing drug problem in the United States. According to the Centers for Disease Control and Prevention, approximately three out of four prescription drug overdoses are caused by prescription opioids. Minnesota is feeling the effect of the problem as well. During 2011, one in five admissions (20.2 percent) to addiction treatment programs in the Twin Cities metro area was for heroin or other opiates. This is compared with 8.7 percent in 2005.

The MMA convened a Prescription Opioid Management Advisory Task Force in December 2012 to find ways to increase physician awareness of the problem and to identify strategies to aid physician opioid prescribing and management. Physician input at the forums will support the Task Force's ongoing work.

These forums on opioid abuse are the second in a series aiming to bring physicians together to discuss important issues affecting the practice of medicine in Minnesota. Future topics include prior authorization for prescription drugs, primary care physician workforce capacity and Minnesota's quality measurement agenda.

The Rochester forum will take place at the Kahler Grand Hotel; the Duluth forum will be held at the Holiday Inn and Suites in Duluth. The events are free for MMA members (\$25 for non-members). To register, go to www.mnmed.org/policy-forum.

Members making a difference

The MMA and the MMA Foundation presented Therese Zink, M.D., with the Physician Leadership in Quality Award in March. The award is given each year to a Minnesota physician whose outstanding work advances the quality of health care and helps build a strong culture of quality improvement in Minnesota. Zink practices family medicine and is

a professor at the University of Minnesota Medical School in the department of family medicine and community health.

Eight physicians from Minnesota Oncology were recognized as "Top Doctors in Oncology" by *U.S. News & World Report* in March. The physicians, who were chosen through a nationwide peer-nomination process, were Thomas Amatruda, M.D.; Ellen Bellairs, M.D.; Catherine Casey, M.D.; Kathryn Farniok, M.D.; Patrick Flynn, M.D.; Thomas Flynn, M.D.; Burton Schwartz, M.D.; and John Schwerkoske, M.D.



MMA's podcasts provide regular legislative updates

MMA members can better keep up with all of the activity at the state Capitol with a new tool—The MMA Podcast. MMA staff are producing podcasts that address the complex health care issues being debated in St. Paul.

"We felt this was a great way to communicate with our members who are always on the go," says Terry Ruane, MMA director of membership, marketing and communications.

Members can subscribe to the podcast through iTunes and listen through their phone, tablet or computer.

The podcasts are also available online at www.mnmed.org/publications/TheMMAPodcast.

VIEWPOINT

Blame game

Two recent articles in large-circulation publications have addressed something the health care industry has known for some time—health care is incredibly expensive and getting more so every day. Although both articles raise many good questions, and anything that gets the dialogue started is a plus, they spend too much time playing the blame game and not enough providing solutions.

The March 4 issue of *Time* devoted an unprecedented amount of space to an exhaustive report by Steven Brill. In it, Brill focused much of his attention on the chargemaster, the menu a hospital uses to determine how much to charge for supplies and procedures. He provides several examples of how hospitals' charges for items might be a hundred times more than what the item would cost if purchased elsewhere. Brill also points out that some "nonprofit" hospitals pay executives seven-figure salaries and others enjoy double-digit profit margins. Brill's report, while raising many concerns, spends too much space blaming hospitals.

Hospitals are also in the bullseye in an April 3 *Forbes* piece that sets out to divert blame from physicians for rising costs. Written by The Physicians Foundation's President Louis Goodman and its CEO Timothy Norbeck, the op-ed faults hospitals, technology, administrative expenses, lifestyle choice and chronic diseases for rising health care costs.

The truth of the matter is that everyone in America is responsible for the increasing cost of health care. Hospitals need to cover their liability and administrative costs. Drug and medical device companies have liability and research and development expenses. Insurers drive up costs with their administrative expenses.

Patients, who because of their lifestyle choices—smoking, not exercising enough, excessive drinking, poor eating habits, not wearing helmets or buckling up—drive up demand for care, which leads to higher costs. And, yes, physicians play a role.

Instead of playing the blame game, we need to come up with solutions. Our physician colleagues agree. In a recent survey conducted by the MMA, we found that many members are concerned with the future cost of health care. They say that we have to become more efficient and pare back on defensive medicine.

So, how do we solve the problem? First off, we start a conversation about solutions. A few ideas come to my mind. I think we could significantly cut our medical costs if as a culture we could embrace the 95 percent rule—that is, if we are 95 percent sure that you're fine without the CT scan or the magnetic resonance scan, then you have no grounds for a lawsuit. We could also cut our health care costs if we restructured the system so that patients were given incentives for lifestyle changes. Why not reward people for staying in better shape? How about embracing the Choosing Wisely campaign, which urges physicians to cut back on unnecessary tests and procedures? And then there's the whole issue of transparency. Why not make the costs of procedures, tests, office visits, etc., accessible to patients? Why not make quality scores more available?

What do you think? Can we slow the increase in costs? Send your ideas to Viewpoint@mnmed.org. Let's get the conversation going so we no longer have to play the blame game.



Dan Maddox, MMA President

“The truth of the matter is that everyone in America is responsible for the increasing cost of health care.”



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Industrial silica sand mining and its potential public health risks

Further study is needed before expanding the industry in Minnesota.

BY WAYNE L. FEYEREISN, M.D., FACP

Sand mining has been occurring in Minnesota for many years. Until recently, the demand for industrial silica sand was relatively small. That is changing, and it is expected there will be an 8.9% annual increase in the need for this sand over the next four years.¹ The Minnesota Pollution Control Agency has noted that as of October 2012, industrial silica sand extraction was taking place at eight mines in the state. That number is expected to double or triple in the next couple of years.

The increased demand for silica sand is driven by the petroleum industry, which uses it for hydraulic fracturing or “fracking.” Sand is one of the least costly proppants—substances used to open layers of shale. In fracking, the proppant is introduced under high pressure, causing the shale layers associated with oil formation beneath the ground to crack. The proppant then keeps these cracks open, allowing the oil and gas to be extracted. The proppants that work best are round particles between 0.2 mm and 0.85 mm in size that have high compression strength. Sand in southeastern Minnesota, western Wisconsin and northeastern Iowa has these qualities.

After the sand is mined, it is processed and sieved to the desired size. Chemical flocculants are used to process it. The processed sand is then hauled by truck or loaded onto barges or trains for transport to the oil fields.

My concern is that the mining, processing and hauling of this sand may pose health risks to people living near the mines. I propose that more study be done

on these potential health effects before the mining industry expands in Minnesota.

Three concerns

I believe there are three main concerns.

The first is the dust generated during the mining, processing and transporting of sand. Silica dust exposure is known to cause acute and chronic silicosis. It is also known to cause chronic obstructive pulmonary disease, cancer and autoimmune disorders such as lupus, rheumatoid arthritis, Wegener’s granulomatosis and IgA nephropathy.² Sand particles smaller than 10 microns—and especially those smaller than 4 microns—pose the greatest threat, as they may be inhaled down to the level of the alveoli. At a certain level of exposure, inhaled dust will cause an inflammatory reaction in the interstitium of the lung that can lead to scarring and impair gas exchange.

Those who experience high-density, short-term exposure to silica dust are at risk for acute silicosis, an occupational hazard for miners. Chronic silicosis, on the other hand, is known to occur with low-level exposures over time and is more likely to be a public health threat as well as an occupational hazard. Although most studies on silica dust exposure have been done on miners, we can extrapolate to determine allowable limits. Six states including California and Texas have set standards for silica dust in ambient air. California’s standard at the particulate matter (PM) 4.0 micron level is 3 ug/m³ for silicosis risk, Texas’s standard at the PM 4.0 level is 0.27ug/m³ for cancer risk.^{3,4}

Minnesota, Wisconsin and Iowa have not set standards because there has not been a significant amount of silica mining done in those states. Once a standard is set, the challenge will be to adequately monitor levels of particulate matter in the air.

There have been conflicting reports about levels of particulates in the air at the periphery of several new silica mines in Wisconsin. Although industry-sponsored studies indicate no increase in the amount of silica in ambient levels, a recent unpublished study from the University of Wisconsin-Eau Claire found that there were times when the level of silica at the periphery of these sites exceeded the reference standards for all six states that have established them.^{5,6}

Strategies for dust suppression at mine sites include using water to keep the dust on the ground, washing undercarriages of trucks, covering trucks, placing hard surfaces at mine entrances and routinely cleaning them, and using various techniques to trap dust during the drying process. These are not employed consistently at mine sites.⁷

My second concern is the chemical acrylamide. Polyacrylamide, which is considered safe, is commonly used at sand-processing facilities. However, studies have shown that polyacrylamide can break down into acrylamide through sheer force, heat exposure and UV exposure.^{8,9} All of these stresses occur during sand processing.

Acrylamide is a known neurotoxin and a probable carcinogen. Current EPA standards set the allowable limit in drink-

ing water at zero.¹⁰ The World Health Organization (WHO) has a standard of 0.5 parts per billion.¹¹ The sand in waste water reservoirs at sand-processing sites could potentially contain acrylamide. Although I am not aware of studies on levels of acrylamide in this waste water or in the sand returned to the mines, it should be examined.

Diesel particulates are my third concern. The WHO and the International Agency for the Research on Cancer have declared that diesel particulates are a group 1 carcinogen.^{12,13} Diesel particulates are made up of a mixture of carbon particles, 92% of which are small enough to reach the alveoli of the lung. Polyaromatic hydrocarbons and other known carcinogens or mutagenic substances reside on the surface of these carbon particles. Diesel particulates also are associated with exacerbation of pulmonary conditions and myocardial infarctions.¹⁴⁻¹⁶

Most human exposure occurs when people are commuting or engaged in activities near heavily traveled roads. Four southeastern Minnesota counties where several mines are proposed currently rank between the 74th and 89th percentile in terms of diesel particulate exposure.^{17,18} Published environmental assessment worksheets predict up to 500,000 gallons of diesel per mine site could be used in Winona County.¹⁹ Five mines are proposed for locations within a five-mile radius of that site. It is not known what the impact of opening new mines and processing facilities would be on ambient diesel particulate levels.

Conclusion

Silica sand mining and processing are associated with several potential public health risks. Given that there will be pressure to increase both sand mining and processing in Minnesota within the next decade, there is an urgent need for further study of the health risks they pose.

We know silica dust is a public health threat and that we need to set standards for reasonable exposure limits. Once standards are set, then individual sites need to be monitored by independent contractors

to verify compliance. Dust mitigation policies should be standardized at the state level rather than be determined by counties or townships.

Acrylamide may or may not be a risk, but further study is needed to determine whether it is.

Diesel particulates do pose a health risk, and with concentrated mining activity, the amount of diesel particulates in the air near these mines is expected to increase substantially. The overall impact on the health of workers and individuals living and working near the mines and processing sites needs to be further investigated.

The Minnesota Pollution Control Agency and the Minnesota Department of Health have been actively involved in investigating these issues. It would be reasonable for the medical community to support further study of the effects of sand mining and processing on health as well. Until appropriate standards and regulations are in place and we can assure the public that all facilities are meeting acceptable standards and that silica sand mining and processing will not harm their health, we should be judicious about approving, or preferably place a moratorium on, development of new mines and processing facilities. **MM**

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Meeting the Million Hearts goal

What HealthPartners is doing and what others can learn from our experience.

BY THOMAS E. KOTTKE, M.D., M.S.P.H., MICHAEL P. MCGRAIL, M.D., AND NICOLAAS P. PRONK, PH.D.

Each year, heart attacks and strokes strike 2 million Americans and kill more than 800,000 of them.¹ In an effort to reduce those numbers, the U.S. Department of Health and Human Services launched Million Hearts in 2011, a campaign that enlists communities, health systems, nonprofit organizations, federal agencies and private-sector partners in the fight against heart disease.² The goal of the national campaign is to prevent 1 million (about 10%) of these events over a five-year period.

HealthPartners has signed on to the campaign and worked with Million Hearts organizers to identify HealthPartners-specific goals and a strategy for reaching them. We set as our overall goal: preventing or postponing 132 events per 100,000 persons ages 40 to 74. We then identified interventions that could help us achieve that goal and calculated how much each would contribute to our Million Hearts goal. We had previously developed a methodology for calculating the impact of various interventions for reducing the impact of heart disease on mortality.^{3,4} We used that methodology to calculate the effect of the interventions identified for the Million Hearts project on fatal and nonfatal heart attacks and stroke events.*

The following summarizes HealthPartners' efforts and what we have learned about the potential impact of various interventions. We hope others might learn from this exercise and adopt similar initiatives in order to help reduce heart disease and stroke.

The interventions

Although Million Hearts is focused more on clinical interventions for curtailing heart disease and stroke, we decided to also include interventions that address diet, physical activity, tobacco use and exposure to environmental tobacco smoke, as epidemiologic observations (related to diet, exercise, smoking cessation and avoidance of environmental tobacco smoke) or well-designed clinical trials (related to hypertension treatment, treatment of patients hospitalized for heart disease, adherence to prescribed medications after myocardial infarction or distribution of automated external defibrillators and training the lay community to use them) have shown these to be important.⁵⁻⁷

Healthy eating

In 2012, to help our members and patients eat more healthfully, we began a program called yumPower. Through yumPower, we have provided adults with free bags of vegetables at our clinics, an open-access mobile app that helps users find restaurants with healthier menu options, and free cooking classes done in collabora-

tion with a local cooking school. In 2012, HealthPartners piloted a four-week program in 32 Minnesota schools designed to encourage elementary school students and teachers to increase their consumption of fruits and vegetables. Participants tracked the number of servings they ate each week. The program resulted in consumption of an additional 16 tons of fruits and vegetables by students, increasing the amount of fruits and vegetables eaten by 11%. yumPower is being expanded to additional schools.

We calculated that if all the members of HealthPartners' health plans and all the patients in our clinics ate two servings of fruit and three servings of vegetables each day, we could meet 56% of our Million Hearts goal (Table).

Physical activity

We are encouraging our members and patients to increase their physical activity through several initiatives. The 10,000 steps program encourages individuals who participate in our corporate health and well-being programs to meet their physical activity goals by walking. Participants receive pedometers to track the number of steps they take, with the goal of taking 10,000 per day.⁸ Our health plans also subsidize memberships at health clubs for those who work out 12 or more times in a month. In addition, we encourage our own employees to bicycle as a way to increase

* The calculation methodology is available from the authors by request.

physical activity and have applied for recognition as a bicycle-friendly company.

In terms of promoting activities among kids, we have participated in community competitions such as the Double Dutch Jump Jam. Along with the YMCA and the City of St. Paul, we sponsor jump rope competitions for children and teens, drawing on connections with Radio Disney and local celebrities to help spread the word about the importance of physical activity. Three community organizations, five St. Paul recreation centers, 10 youth job core coaches and more than 300 children have participated in Jump Jam.

We calculated that if all HealthPartners members and patients met the physical activity goal of taking 10,000 steps per day or the equivalent, we would meet 36% of our Million Hearts goal.

Eliminating tobacco use

Limiting opportunities to smoke and raising the price of tobacco are two of the most effective ways to lower smoking rates. In addition to having smoke-free campuses, HealthPartners provides tobacco-cessation services at no cost to all members of our health plans and participates in the coalition that supports an increased tax on tobacco products.

According to our calculations, eliminating tobacco use would contribute 14% to our Million Hearts goal. In addition, eliminating exposure to environmental tobacco smoke would contribute about 6%.

Adhering to prescribed medications

Patients with heart disease who take medications shown by research to be of benefit markedly reduce their risk of a subsequent vascular event.^{9,10} Our Care Model Process is designed to help our

clinical teams prevent lapses in care and improve medication adherence rates.¹¹ Our process includes reviewing a patient’s medications at every visit and monitoring refills so the care team knows when that patient has stopped taking a prescribed drug. A records review published in 2011 documented that, among HealthPartners Medical Group patients with coronary artery disease without left ventricular dysfunction, 85% take aspirin, 88% take a beta blocker, 73% take an angiotensin-converting enzyme (ACE) inhibitor and 79% take a statin.⁴ Among patients with heart failure and a depressed ejection fraction, 77% take aspirin, 77% take a beta blocker, and 80% take an ACE inhibitor, but only 20% take spironolactone.

Increasing the proportion of patients who adhere to medications prescribed for their vascular disease to 100% would meet 8% of our Million Hearts goal.

TABLE

Potential Contribution of Selected Interventions to the Million Hearts Campaign Goal as Applied to HealthPartners Performance Data

GOAL OF INTERVENTION	CURRENT LEVEL OF GOAL ACHIEVEMENT (%)	NUMBER OF CARDIOVASCULAR EVENTS/100,000 MINNESOTANS AGES 40-74 THAT MAY BE PREVENTED OR POSTPONED IF GOAL IS ACHIEVED	CONTRIBUTION TO THE MILLION HEARTS GOAL (%)*
Everyone meets nutrition goals	13	74	56
Everyone meets physical activity goals	71	48	36
No one uses tobacco	91	18	14
Patients with heart disease take blood pressure medications, aspirin and cholesterol medications as prescribed	20-88†	10	8
Environmental tobacco smoke is eliminated	35	7	6
Patients hospitalized for acute coronary events and systolic heart failure receive all evidence-based care in hospital	30-100†	5	4
All patients participate in cardiac rehabilitation after hospitalization for coronary heart disease or heart failure	19-97†	4	3
Hypertension is controlled for individuals without heart disease	81	3	2
Automated external defibrillators are distributed, and the public is trained to use them	0‡	2	1

*The HealthPartners goal for Million Hearts will be achieved if 132 events/100,000 population ages 40 and older are prevented or postponed.

†Baechler CJ, Kottke TE. Identifying opportunities for a medical group to improve outcomes for patients with coronary artery disease and heart failure: an exploratory study. Perm J. 2011;15(2):4-14.

‡Data on deployment and public training are not available. The assumption that there have been no public training programs leads to the largest predicted impact with implementation.

Giving hospitalized heart patients "perfect" care

Since we began participating in the RARE (Reducing Avoidable Readmissions Effectively) campaign,¹² HealthPartners has seen a reduction in 30-day heart failure readmission rates at Regions Hospital.

Providing "perfect" care for patients hospitalized for heart disease would help us meet about 4% of our goal.

Provide cardiac rehabilitation to all eligible patients

Because cardiac rehabilitation is part of the cardiac care order set for patients who have been hospitalized for a heart attack or unstable coronary artery disease, all of these patients are referred to Phase II cardiac rehabilitation. In addition, a Regions Hospital Foundation grant allows patients hospitalized with heart failure to participate in cardiac rehabilitation, a service not covered by Medicare.

If all eligible patients participated in cardiac rehabilitation, about 3% of our goal would be met.

Treating hypertension

According to MN Community Measurement data, HealthPartners Medical Group achieved blood pressure control in 81% of its patients with hypertension in 2011 thanks to pre-visit planning and post-visit follow up.¹³ Pre-visit planning involves looking for prescriptions that might need to be refilled and laboratory tests (particularly serum creatinine and serum potassium) that might be due. Post-visit follow-up frequently includes asking the patient to keep a blood pressure diary and report back to the clinic with the values.

We calculated that improving hypertension control in patients without heart disease could help us meet about 2% of our goal.

A challenge to all

Our calculations suggest that the programs we are implementing will enable us to meet our Million Hearts goal. Although our estimates are imprecise, we think they

support the idea that adopting a broad-based approach is needed if we are to reduce the number of heart attack and stroke events by 10% over the next five years.

Some of what we have learned may seem counterintuitive. For example, one might think improving the care of patients with hypertension would make a bigger difference in preventing heart disease than getting patients to eat more healthfully; but we found that was not the case. Although both treating hypertension and meeting the nutrition goal would lower total mortality by about 25%, only about 30% of the population has hypertension. Of those patients with hypertension under the care of HealthPartners Medical Group, 81% are already controlling their condition. Thus, only about 5.7% (0.3 x 0.19) of the population can benefit from improved hypertension control, whereas 87% can benefit from better nutrition. Likewise, care in our hospitals is nearly optimal, so our goal there is to hold the gains.⁴ Because randomized trials have shown that training the public to use automated external defibrillators (AEDs) will have little impact on the number of deaths in the population,¹⁴ we are not emphasizing this tactic.

We know ours is not the only health care organization that is working on initiatives to fight heart disease and improve health, yet we believe we can all do more. In addition, we are challenging those outside of health care to join us in working to achieve the Million Hearts goal. Employers can adopt policies that promote the health of their employees and their employees' families.¹⁵ Schools can implement nutrition and physical activity programs in which entire families can participate. Community officials can promote active living, good nutrition and smoke-free environments through both policy and design efforts.

The goal of Million Hearts is to reduce a disease burden that is, by and large, unnecessary. HealthPartners shares that goal and will continue to search for and implement

novel clinical and community activities to achieve it. We hope our efforts inspire others in Minnesota to do the same. **MM**

Thomas Kottke and Michael McGrail are medical directors and Nicolaas Pronk is vice president and health science officer at HealthPartners.

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A Primer on Vasculitis

BY KENNETH J. WARRINGTON, M.D., AND ERIC L. MATTESON, M.D., M.P.H.

Vasculitides are rare but serious conditions involving inflammation of the body's blood vessels that can lead to organ damage and myriad complications. This article describes the various forms of vasculitis and their incidence, and discusses diagnosis and treatment of patients with the more common forms.

Vasculitis refers to a heterogeneous group of conditions characterized by inflammation of blood vessel walls, which results in vascular damage. Because inflammation can affect vessels of any size in any location, vasculitides have varying clinical presentations.

Vasculitides are generally classified based on the predominant type of vessel (large, medium or small) involved. Giant cell arteritis and Takayasu's arteritis are both large-vessel vasculitides that affect the aorta and its primary and secondary branches. Polyarteritis nodosa and Kawasaki disease predominantly involve medium-sized arteries. The most common forms of small-vessel vasculitis are granulomatosis with polyangiitis (formerly Wegener's granulomatosis), microscopic polyangiitis, and eosinophilic granulomatosis with polyangiitis (formerly Churg-Strauss syndrome). The latter three conditions are often collectively referred to as the anti-neutrophil cytoplasmic antibody (ANCA)-associated vasculitides. Other less common forms of small-vessel vasculitis include cryoglobulinemic vasculitis and Henoch-Schönlein purpura. Some forms of systemic vasculitis such as Behçet's disease can affect vessels of any size and type (arteries, veins and capillaries).

Typically, vasculitides are systemic diseases with multi-organ involvement; but

occasionally, they can be limited to a single organ. Cutaneous vasculitis, testicular vasculitis and primary central nervous system vasculitis are examples of single-organ vasculitides. Vasculitis may develop in the context of an underlying autoimmune disease such as systemic lupus erythematosus and rheumatoid arthritis as well as with malignancy, infection or medication use. (Table).¹

Incidence

In general, vasculitis is rare and therefore can be difficult to recognize clinically. The incidence of specific vasculitic disorders varies according to patient age, race and geographic location. For example, giant cell arteritis affects people older than 50 years of age and is most common among people of Northern European descent. It is one of the most common forms of vasculitis in adults, with an average annual incidence of about 19 cases per 100,000 persons 50 years of age and older. Conversely, Takayasu arteritis generally occurs in individuals younger than 40 years of age and is more common among Asians. In the United States, its annual incidence is about 2.6 per million population. Polyarteritis nodosa affects about five to 10 individuals per million per year, and it is becoming even less common in countries with a decreasing prevalence of hepatitis B infection.

The incidence of ANCA-associated vasculitis is approximately 10 to 20 persons per million per year, with granulomatosis with polyangiitis being more common than microscopic polyangiitis and eosinophilic granulomatosis with polyangiitis.

Etiology

In the majority of cases, the cause of vasculitis is unknown. The prevailing hypothesis is that vasculitis is initiated by an environmental agent in a genetically predisposed individual. Genetic polymorphisms in the human leukocyte antigen (HLA) genes and polymorphisms in genes encoding cytokines and other immunoregulatory proteins have been associated with an increased risk of several types of vasculitis.²

In certain forms of vasculitis, investigators have identified probable etiologies. About one-third of polyarteritis nodosa cases are caused by chronic hepatitis B infection, while hepatitis C can trigger cryoglobulinemic vasculitis. Neoplasms, particularly hematologic malignancies, can also cause vasculitis. Drug-induced vasculitis can occur with medications such as antibiotics, hydralazine, propylthiouracil and allopurinol.

Complications and Clinical Manifestations

The clinical manifestations and complications of vasculitis are varied and depend on the vascular bed that is involved by the inflammatory process:

- In giant cell arteritis, the lumen may become occluded through intimal hyperplasia, causing end-organ ischemia. Since the extracranial arteries are typically involved, patients often present with headaches and scalp tenderness. Patients frequently complain of symptoms of polymyalgia rheumatica including pain and stiffness in the neck and proximal extremities. The serious clinical consequences that may ensue include jaw claudication, vision loss caused by ischemic optic neuropathy, cerebrovascular ischemic events and limb claudication. In the aorta, damage to the vessel wall may lead to progressive dilatation, aneurysm formation and life-threatening events such as aortic dissection.³
- The inflammatory vasculopathy in Takayasu arteritis may lead to complications such as cerebrovascular events, limb claudication, renovascular hypertension and aneurysm formation. Less often, it involves the coronary arteries, causing ischemic heart disease and pulmonary hypertension. Patients often require surgical revascularization to restore vascular patency.
- Polyarteritis nodosa is characterized by necrotizing inflammation of muscular arteries, which often produces microaneurysms of the visceral arteries. Patients typically present with constitutional symptoms and evidence of multi-organ dysfunction. Neurologic manifestations such as mononeuritis multiplex, cutaneous lesions (eg, skin ulcerations) and gastrointestinal complications such as mesenteric ischemia, bowel infarction or hemorrhage are characteristic. Renal involvement often leads to arterial hypertension and ischemic nephropathy with renal failure. Peripheral arterial occlusions can result in ischemia and gangrene of the digits.⁴

TABLE

Nomenclature for Vasculitides¹

Large-vessel vasculitis

- Takayasu arteritis
- Giant cell arteritis

Medium-vessel vasculitis

- Polyarteritis nodosa
- Kawasaki disease

Small-vessel vasculitis

- Antineutrophil cytoplasmic antibody (ANCA)-associated vasculitis
- Microscopic polyangiitis
- Granulomatosis with polyangiitis (Wegener's)
- Eosinophilic granulomatosis with polyangiitis (Churg-Strauss)
- Immune complex SVV
- Anti-glomerular basement membrane disease
- Cryoglobulinemic vasculitis
- IgA vasculitis (Henoch-Schönlein)
- Hypocomplementemic urticarial vasculitis (anti-C1q vasculitis)

Variable-vessel vasculitis

- Behçet's disease
- Cogan's syndrome

Single-organ vasculitis

- Cutaneous leukocytoclastic angiitis
- Cutaneous arteritis
- Primary central nervous system vasculitis
- Isolated aortitis
- Others

Vasculitis associated with systemic disease

- Lupus vasculitis
- Rheumatoid vasculitis
- Sarcoid vasculitis
- Others

Vasculitis associated with probable etiology

- Hepatitis C-associated cryoglobulinemic vasculitis
- Hepatitis B-associated vasculitis
- Syphilis-associated aortitis
- Drug-associated immune complex vasculitis
- ANCA-associated vasculitis
- Cancer-associated vasculitis
- Others

SOURCE

1. Jennette JC, Falk RJ, Bacon PA, et al. 2012 revised International Chapel Hill Consensus Conference Nomenclature of Vasculitides. *Arthritis Rheum.* 2013;65(1):1-11.

- Because the various forms of ANCA-associated vasculitis primarily involve small vessels such as arterioles, venules and capillaries, the main target organs are the respiratory system and kidneys, where extensive capillary networks are present.
- Clinical manifestations of granulomatosis with polyangiitis may include sinusitis, otitis, pulmonary nodules and alveolar hemorrhage. The majority of patients will develop glomerulonephritis, which can lead to rapidly progressive renal failure. Other disease manifestations may include ocular

inflammation (scleritis, proptosis), cutaneous vasculitis and mononeuritis multiplex.⁵

- Rapidly progressive glomerulonephritis and alveolar hemorrhage are the most common clinical manifestations of microscopic polyangiitis, which clinically can be very similar to granulomatosis with polyangiitis.⁶
- Eosinophilic granulomatosis with polyangiitis has three main disease features: allergic rhinitis and asthma, eosinophilic infiltrative disease and systemic small-vessel vasculitis. It often involves the lungs, peripheral nerves and skin but less frequently the heart and gastrointestinal tract. However, cardiac involvement can be a significant cause of morbidity and mortality.⁷
- In cryoglobulinemic vasculitis, cryoglobulin immune deposits in small vessels typically lead to cutaneous vasculitis, glomerulonephritis and peripheral neuropathy.

Diagnosis

Vasculitis should be suspected in patients with an unexplained systemic constitutional syndrome (fevers, chills, night sweats, unexplained weight loss) and/or evidence of a multi-organ disorder. The diagnosis of vasculitis requires a careful integration of clinical, laboratory, imaging and histopathologic findings. Moreover, it is essential that conditions mimicking vasculitis (eg, infection) are considered in the differential diagnosis and excluded before initiating treatment. Whenever vasculitis is suspected, patients should undergo a comprehensive multisystem clinical evaluation, with particular attention to the vascular examination.

The American College of Rheumatology has established classification criteria for most forms of vasculitis.⁸ Although these were not designed as diagnostic criteria, they can be useful to clinicians.⁸ The definitions developed by the 2012 Chapel Hill Consensus Conference on the Nomenclature of Vasculitides are also helpful.¹

Laboratory findings suggestive of vasculitis may include normocytic anemia, thrombocytosis, and elevated erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP). Unfortunately, these tests are not specific and may be abnormal because of myriad inflammatory, infectious or neoplastic disease entities. Typically, ESR and CRP are markedly elevated in vasculitis; however, not all patients with vasculitis mount an inflammatory response—especially those with single-organ vasculitis.

There are no specific laboratory biomarkers for large-vessel and medium-sized-vessel vasculitides. The major forms of small-vessel vasculitis are associated with the presence of anti-neutrophil cytoplasmic antibodies. Most patients with granulomatosis with polyangiitis have antibodies to proteinase-3 (with cytoplasmic staining on immunofluorescence, c-ANCA) while patients with microscopic polyangiitis and eosinophilic granulomatosis with polyangiitis often have antibodies directed against myeloperoxidase (with perinuclear staining on immunofluorescence, p-ANCA). Although ANCA testing is helpful in diagnosing small-vessel vasculitis, physicians should be aware that a subset of patients can be ANCA-negative. Patients with suspected small-vessel vasculitis should also be tested for cryoglobulins, as these conditions can trigger cryoglobulinemic vasculitis.

Laboratory testing is also necessary to evaluate the extent of organ involvement, and all patients should have renal and liver function tests. When indicated, autoimmune serologies such as rheumatoid factor and antinuclear antibodies should be checked to evaluate for possible underlying systemic rheumatic disease. Vasculitis can be associated with viral infections (eg, hepatitis B, hepatitis C), and, therefore, clinicians should order serologic testing for these possible causes.

Imaging is often essential for diagnosing a patient with suspected vasculitis. The type of imaging study will vary according to the clinical presentation and form of vasculitis. Cross-sectional imaging may suggest internal organ involvement (eg,

lung nodules, alveolar infiltrates/hemorrhage, organ infarcts). Vascular imaging such as magnetic resonance angiography (MRA) or computed tomography angiography (CTA) is particularly useful for noninvasive imaging of medium-sized and large arteries. Vessel wall edema, contrast enhancement and/or wall thickening are characteristic findings of large-vessel vasculitis. In addition, MRA or CTA may reveal luminal changes such as long tapered arterial stenoses of the aortic arch branches or aneurysms.⁹ Conventional arteriography is rarely used but may be necessary to evaluate for microaneurysms in the renal and mesenteric circulation if polyarteritis nodosa is suspected. In some patients with suspected large-vessel vasculitis, positron emission tomography (PET) imaging may be required to evaluate for fluorodeoxyglucose (FDG) uptake in the aorta and major branches. Although costly, PET imaging is an attractive diagnostic tool for patients with a cryptic constitutional syndrome, as it can help distinguish between a vasculitic process and an occult malignancy or infection. Other diagnostic studies may be necessary depending on the patient's clinical presentation. For example, nerve conduction studies should be done if the clinician suspects mononeuritis multiplex caused by the vasculitis.

Whenever clinically feasible, a diagnosis of vasculitis should be made by histopathologic examination of a biopsy specimen from an affected vessel or organ. For example, histopathologic examination of a superficial temporal artery biopsy specimen is the “gold-standard” diagnostic modality for giant cell arteritis. In patients with suspected small-vessel vasculitis, biopsy of involved tissue, such as skin, nerve, lung or kidney, is generally necessary to confirm the diagnosis. In cases where surgical intervention is required, resected specimens (eg, from the small intestine) may demonstrate histopathologic evidence of vasculitis.

Treatment

Treatment of vasculitis needs to be carefully tailored according to the type of vasculitis, extent of organ involvement and

disease severity. Damage from vasculitis can progress rapidly and may be irreversible; therefore, patients with organ- or life-threatening disease require prompt and aggressive therapy. Initial treatment for patients with systemic vasculitis generally includes high-dose corticosteroids (CS) and immunosuppressive medications. Corticosteroids, generally oral prednisone at an initial daily dose of 1 mg/kg, are the gold standard treatment for giant cell arteritis. Patients whose vision is threatened by ischemic optic neuropathy caused by giant cell arteritis may benefit from intravenous pulse methylprednisolone. Corticosteroids should be tapered gradually over many months, and patients may require several years of treatment. For patients with recurrent relapses of giant cell arteritis and/or CS toxicity, use of methotrexate may be considered.¹⁰

Takayasu arteritis is treated with CS and immunosuppressive agents such as methotrexate, azathioprine or mycophenolate mofetil. Tumor-necrosis factor inhibitors are often effective in cases of Takayasu arteritis that is refractory to conventional immunosuppressive agents.

Idiopathic polyarteritis nodosa may respond to CS alone; however, patients with adverse prognostic indicators (eg, renal insufficiency or gastrointestinal, cardiac, or neurologic involvement) require CS combined with cyclophosphamide to induce disease remission. For most forms of severe small-vessel vasculitis, clinicians must attempt to induce remission with high-dose CS in combination with either cyclophosphamide or the B-cell-depleting monoclonal antibody rituximab. Plasma exchange may be indicated in the context of severe alveolar hemorrhage and/or rapidly progressive renal failure. Remission maintenance is usually achieved with methotrexate or azathioprine, or with repeated courses of rituximab.¹¹

In most cases, the morbidity associated with therapy is significant and preventive measures to attenuate risks associated with corticosteroids (eg, osteoporosis) and immunosuppressive agents (cytopenias,

infection) are essential. In particular, patients should receive prophylaxis against *Pneumocystis jiroveci* pneumonia.

Patients with nonsevere vasculitis and a known trigger (eg, drug-induced cutaneous vasculitis) may simply require discontinuation of the inciting agent. Patients with some types of single-organ vasculitis (localized disease) may be cured by surgical resection of the involved organ (eg, cholecystectomy in a patient with vasculitis limited to the gallbladder). In cases of vasculitis related to a viral etiology (eg, hepatitis B-related polyarteritis nodosa), anti-viral therapy should be given while controlling the inflammatory process with a limited course of CS. Paraneoplastic vasculitis will generally remit only with treatment of the underlying malignancy.

Patients with vasculitis should be re-evaluated frequently, often by a multi-specialty team, and careful monitoring of laboratory parameters is necessary. Most forms of vasculitis are prone to relapse, and therefore immunosuppressive therapy needs to be adjusted according to the level of disease activity. Over time, it can be challenging to distinguish recurrent disease activity (a flare) from damage caused by vasculitis. Standardized assessment forms and disease activity indices (eg, the Birmingham Vasculitis Activity Scale) are helpful for the longitudinal care of patients with vasculitis. Because treatment-related complications (eg, infection) can mimic a vasculitis flare, the clinician must thoroughly evaluate the patient before adjusting therapy.

Conclusion

Vasculitides are a heterogeneous group of rare conditions in which inflammation of blood vessel walls leads to vascular damage and end-organ ischemia. Vasculitis may result in rapidly progressive multi-organ dysfunction and premature mortality. The clinical manifestations can be quite varied, presenting a diagnostic challenge for clinicians. The evaluation and management of patients with vasculitis requires a prompt and comprehensive multi-disciplinary approach. Because of the uncom-

mon nature of vasculitic disorders and the potential for devastating clinical complications from these conditions, patients with vasculitis should preferably be managed by rheumatologists with expertise in the field. **MM**

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Vascular Malformations of the Brain

BY ERIC S. NUSSBAUM, M.D.

Vascular malformations of the brain are a heterogeneous group of disorders involving the blood vessels of the brain. These entities are relatively rare; therefore, most primary care physicians are somewhat unfamiliar with their clinical implications and management. Vascular malformations of the brain range from the completely benign capillary telangiectasia to the potentially fatal arterio-venous malformation. This article reviews the distinct natural histories, etiologies and treatments of four major types of malformations: capillary telangiectasia, developmental venous anomaly, cavernous malformation and arteriovenous malformation.

Vascular malformations of the brain represent a heterogeneous group of disorders that have very different natural histories and clinical implications.^{1,2} These malformations range from completely benign congenital lesions diagnosed incidentally by magnetic resonance imaging (MRI) or postmortem to potentially life-threatening lesions that require aggressive neurosurgical intervention. Vascular malformations of the brain occur in up to 1% of the population; most are benign and will never require treatment.^{1,2} With the ever-improving quality of MR imaging and as more patients are undergoing MR imaging of the brain for routine, often unrelated reasons, more vascular malformations are being identified as an incidental finding. As a result, physicians in a variety of specialties are encountering patients with these lesions. This article briefly describes the spectrum of vascular malformations of the brain that may be encountered in medical practice and their natural history and management recommendations.

Capillary Telangiectasia

The most benign of all malformations of the brain is capillary telangiectasia. Capillary telangiectasias are small areas of abnormal capillaries within otherwise normal brain tissue. These lesions are almost certainly congenital in origin and most commonly are identified as an incidental

finding at the time of autopsy, although high-quality MRI will occasionally reveal a capillary telangiectasia.^{1,2} Although capillary telangiectasias can develop anywhere in the brain, they seem to have a predilection for the pons.^{1,2} These lesions generally do not require treatment. An occasional follow-up imaging study may be appropriate, depending on the case.

Developmental Venous Anomaly

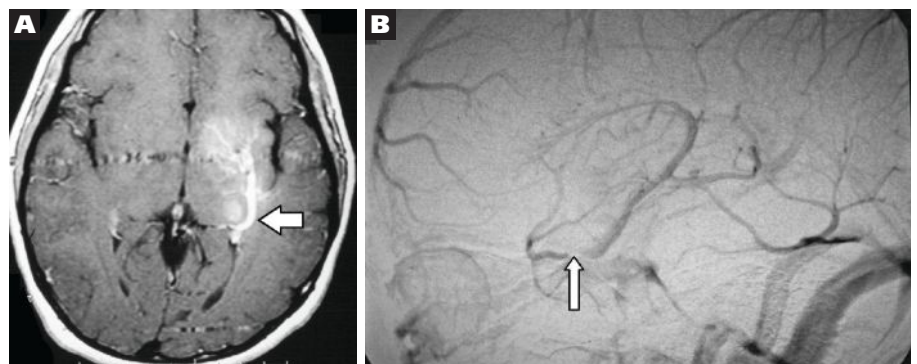
Developmental venous anomalies (DVAs), as their name suggests, are aberrantly formed venous channels within the brain.^{1,3} They are congenital and rarely produce symptoms. Previously, these lesions were known as “venous angiomas,” but the nomenclature has changed to reflect their benign natural history and to

discourage surgeons from contemplating their removal^{3,5} (Figure 1).

Developmental venous anomalies are most commonly identified as an incidental finding on MRI and, in isolation, require no treatment in almost all cases.⁵ We and others have reported rare instances when thrombosis of a portion of a DVA appears to have resulted in symptoms.⁶⁻⁸ Nevertheless, there is rarely a straightforward treatment option other than antiplatelet therapy, and such cases remain predominantly of academic interest. The most important thing for clinicians to know about DVAs is that they frequently coexist with cavernous malformations of the brain.⁹ In those instances, it is almost always the cavernous malformation that causes symptoms—typically, bleeding or seizures. If the cav-

FIGURE 1

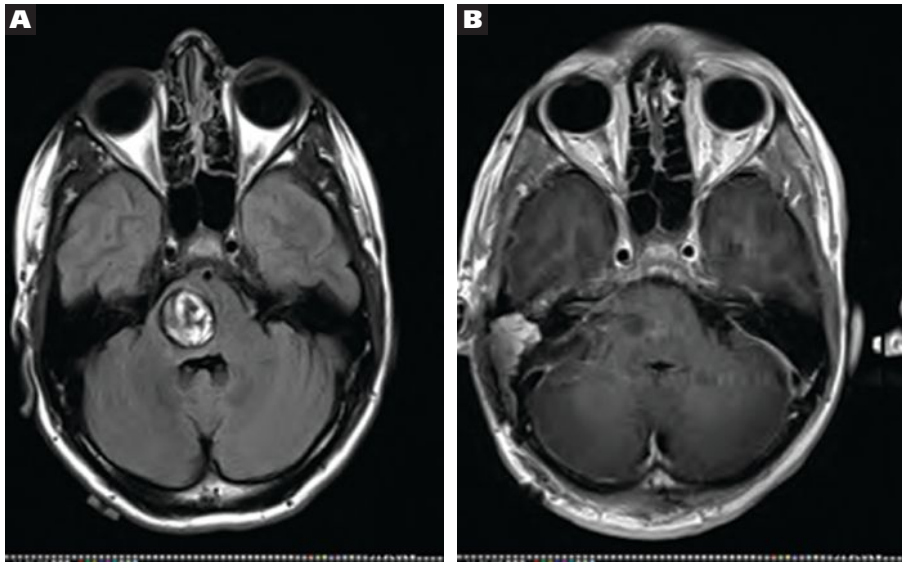
Developmental Venous Anomaly



A. Axial MRI demonstrating a large developmental venous anomaly (arrow) involving the left basal ganglia. B. Diagnosis confirmed by conventional catheter angiography.

FIGURE 2

Brainstem Before and After Surgery to Remove Cavernous Malformation



A. Axial MRI showing a large cavernous malformation of the brainstem in a young patient presenting with acute neurological deficit. B. Corresponding postoperative MRI showing complete resection of the lesion through a presigmoid approach. The patient had no postoperative deficit.

ernous malformation needs to be treated, the surgeon should leave the DVA intact as this structure represents the “normal” venous drainage pathway for the patient.^{4,5} Interruption of the DVA can interfere with venous outflow from that portion of the brain, resulting in venous hypertension, venous ischemia, hemorrhage and even death.

Cavernous Malformations

Cavernous malformations (CMs) are a fascinating and poorly understood group of vascular malformations that can occur anywhere in the brain. CMs are low-flow channels of aberrant blood vessels without normal intervening brain parenchyma.^{1,2,10-12} They appear to develop after birth and may be associated with previous head injury, other pre-existing conditions, and surgery or radiation.¹⁰⁻¹² There may be a strong genetic basis for CMs in some patients, and these individuals may have multiple CMs.¹³

Patients with CMs may present with seizures, headaches, bleeding and, rarely, mass effect if the CM is large or located in a critical portion of the brain (Figures 2 and 3). Cavernous malformations generally are diagnosed by MRI and are char-

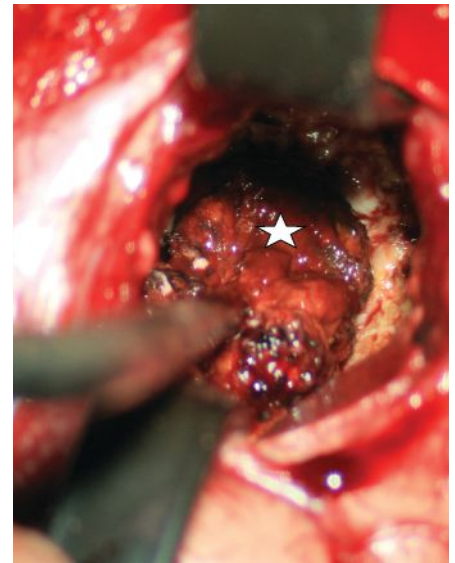
acterized as well-circumscribed lesions with a classic hemosiderin ring. There is great controversy regarding the actual annual bleeding risk for CMs, with estimates ranging from 1% per year to as high as 39% per year in posterior fossa lesions.¹⁰⁻¹² In our practice, we generally tell patients the risk of bleeding is 1% to 2% per year.

Most episodes of bleeding from CMs are not life-threatening. Instead, bleeding usually results in the development of a focal neurological deficit such as weakness or language difficulty and possibly a seizure. Over time, as the blood is reabsorbed, the deficit will improve, although the patient may be left with some slight deficit. Before the MRI era, many patients with CMs were misdiagnosed with multiple sclerosis (MS) because their lesions would bleed intermittently, producing a gradual, step-wise decline in neurological function, similar to that seen with typical MS.

The treatment of CMs generally consists of either observation with follow-up serial imaging studies or open microsurgical removal.¹⁴ Stereotactic radiosurgery has been used in select cases and at select centers; but most large neurovascular centers do not use radiosurgery for this le-

FIGURE 3

Removal of Cavernous Malformation



Operative photomicrograph reveals a large cavernous malformation (white star) being removed from its bed via a limited transcortical approach.

sion, and there has been some suggestion that people with CMs may be at high risk for developing post-radiosurgery radiation injury.^{10-12,14,15}

Patients with CMs generally should be evaluated by a vascular neurosurgeon who has expertise in treating these lesions. He or she can discuss the expected natural history and the advisability of surgical removal.

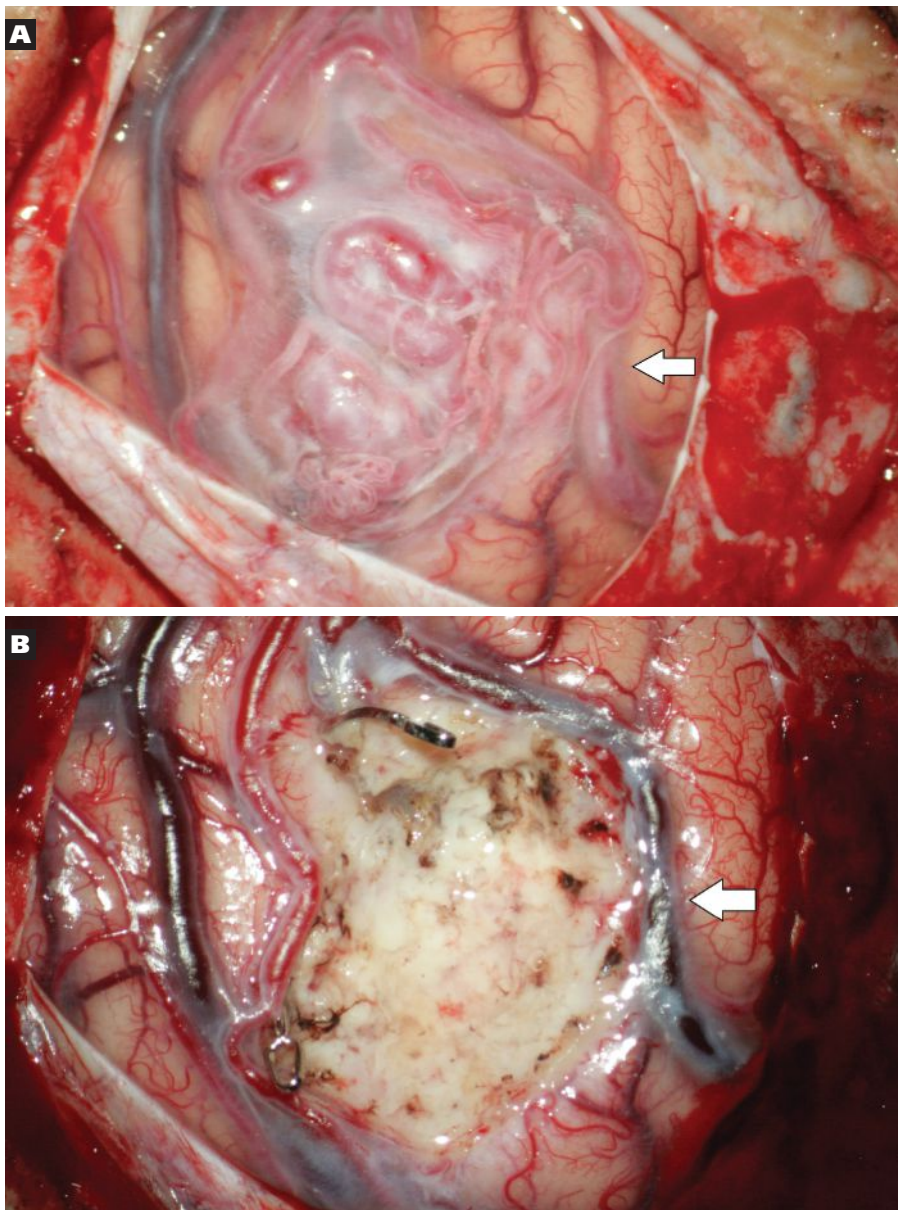
Arteriovenous Malformations

Arteriovenous malformations (AVMs) are probably the most recognized of the brain vascular malformations. They represent serpigenous collections of abnormal, congenital blood vessels, often with normal intervening brain parenchyma.¹² They are characterized by shunting of blood from the arterial to the venous system without normal intervening capillary channels (Figure 4). This can result in a very dangerous, high-flow system with the potential for devastating, life-threatening hemorrhage.

Arteriovenous malformations can present with bleeding, seizures or neurological deficit resulting from a “cerebral steal” phenomenon, in which the high flow through the malformation may actually

FIGURE 4

Arteriovenous Malformations



A. A large arteriovenous malformation (AVM) is seen on the cortical surface of the brain in this operative photomicrograph. Note the arterIALIZED vein (arrow), which appears red at the beginning of the procedure.
 B. Following complete removal of the AVM, the resection bed is seen, and the vein (arrow) has now turned blue.

rob the normal neighboring brain of its blood supply, resulting in local cerebral dysfunction.¹⁶⁻¹⁸ They are typically well-visualized with MRI, which demonstrates the classic tangle of abnormal blood vessels. The risk of rupture for a given AVM depends on a number of factors; estimated annual hemorrhage rates range from 1% to more than 30%.¹⁶⁻¹⁸

Bleeding from AVMs tends to be lobar, into the brain substance itself, and often occurs in young adults. Bleeding is life-threatening in more than 10% of cases.¹⁶⁻¹⁸

Each case requires evaluation by a multidisciplinary team.¹⁹

AVMs can be treated in various fashions or using a combination of therapies.²⁰ Some lesions—for example, unruptured AVMs in elderly patients discovered incidentally—are managed with observation and serial imaging, the goal being to watch for a change in blood flow or the development of associated aneurysms. If the venous outflow of the AVM shows a narrowing or the development of an an-

eurysm, treatment may be considered to avoid rupture.

Some patients, particularly those with malformations that are smaller or in critical locations, may be appropriate for stereotactic radiosurgery.²¹⁻²³ This therapy has emerged as an important option for such patients. Stereotactic radiosurgery can cure smaller lesions in more than 90% of cases and may obviate the need for an invasive procedure. At the same time, with stereotactic radiosurgery it can take longer than a year to eradicate most AVMs and during that time the patient remains at risk for bleeding.

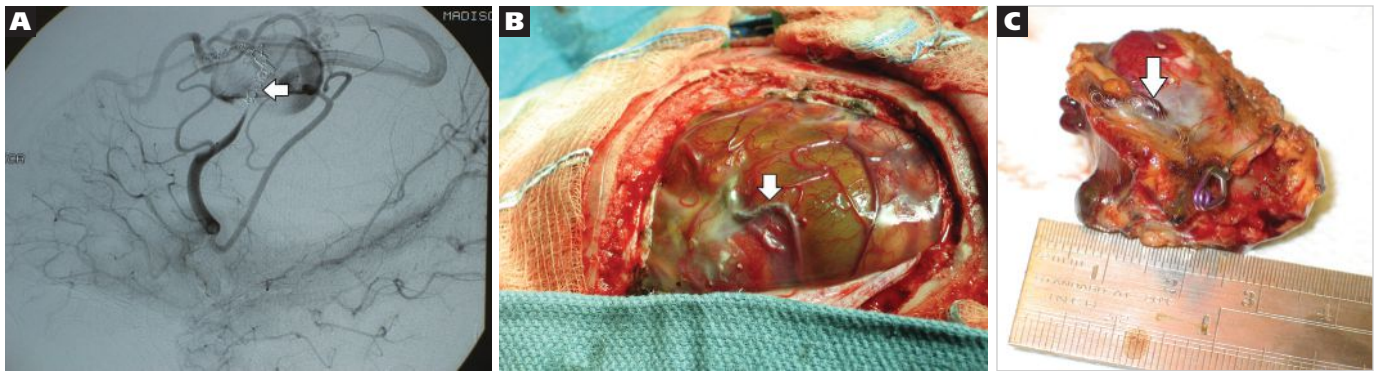
Endovascular embolization is another option for treating AVMs either as an attempt to treat the lesion without surgery or as an adjunct to stereotactic radiosurgery or open surgery.²⁴⁻²⁶ Embolization involves placing a microcatheter in the feeding arteries (or draining veins) of a malformation and then injecting a glue-like substance or embolic material to decrease flow through the malformation (Figure 5). In our experience, most AVMs cannot be cured with simple embolization and will require some additional therapy, although some groups have reported success with this option, particularly when treating AV fistulae, the simplest type of AVM.²⁴⁻²⁶

Open microsurgical excision is the final option for treating AVMs. Most centers use the Spetzler-Martin grading system to stratify surgical risk, with the simplest lesions assigned a Grade I and the most complex a Grade V.²⁷ These are complex surgeries that should be performed by vascular neurosurgeons with expertise in this area. Every effort must be made to limit intraoperative bleeding and to remove the malformation as quickly and efficiently as possible. Preoperative embolization may be very helpful in this regard.

Because of the controversy surrounding the natural history of these lesions and the many complex, sometimes overlapping treatment options, patients with AVMs need to be evaluated by a multidisciplinary service that can offer open microsurgery, embolization or stereotactic radiosurgery, alone or in combination.

FIGURE 5

Arteriovenous Malformations



A. Preoperative arteriographic image shows a large and complex arteriovenous malformation (AVM) in a young child. Embolic coils (arrow) have been placed in the feeding artery to decrease flow into the large venous varix (circular shaped structure seen under the coils). B. Operative view at the beginning of the procedure showing the very abnormal appearing brain and the coils (arrow) within the feeding artery. C. Pathological specimen following complete extirpation of the AVM again show the coils (arrow) within the feeding artery.

Conclusion

Vascular malformations of the brain represent a fascinating collection of diverse lesions that primary care physicians occasionally encounter and that vascular neurosurgeons frequently encounter. Because these lesions are so diverse in terms of natural history and because there are so many treatment options, most patients should be evaluated by an experienced vascular neurosurgeon who can determine a treatment plan. In patients with simple telangiectasias and DVAs, occasional follow-up can be coordinated through the primary care physician's office, and the patient can be reassured that there is little, if any, chance of a problem related to the lesion. Patients with CMs or true AVMs require a more detailed evaluation and may benefit from intervention to decrease the risk of bleeding, eliminate seizures or reduce mass effect. **MM**

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The Minnesota Heart Disease and Stroke Prevention Plan 2011-2020

A Progress Report

BY STANTON SHANEDLING, PH.D., M.P.H., AND SUELING SCHAR DIN, R.D., M.P.H.

The Minnesota Heart Disease and Stroke Prevention Plan 2011-2020 was developed to organize the efforts of individuals, health care organizations and communities around prevention, treatment and management of heart disease and stroke. This article provides a brief update on the state's efforts, pointing out that Minnesota has made the most progress in terms of disease management thanks in part to the widespread use of electronic health records and requirements for quality reporting.

Minnesota is now two years into the *Minnesota Heart Disease and Stroke Prevention Plan 2011-2020*.¹ The plan was developed by a steering committee convened by the Minnesota Department of Health to provide guidance for the state and serve as a call to action for individuals, communities and organizations to successfully prevent, treat and manage heart disease and stroke. In addition, the plan emphasizes the importance of improving cardiovascular health among certain racial and ethnic groups that have a higher prevalence rate of heart disease and stroke than the general population. The plan, which is aligned with federal Healthy People 2020 goals as well as with the state's plans for reducing diabetes, obesity, tobacco use and cancer, lays out strategies in three areas: primary prevention, acute treatment and disease management.

Since it was released in 2011, Minnesota has seen positive changes in terms of reducing the impact of cardiovascular disease. Thus far, we have made the most progress in disease management and more incremental advances in primary prevention and acute treatment. The *2013 State*

Plan Implementation Report provides a snapshot of where we are today with our efforts, assesses current risk factor and disease burden levels, and highlights success stories.² Here is a look at where we stand.

Primary Prevention

Teaching the public about heart disease and stroke is a first step in reducing morbidity and mortality. To educate Minnesotans, the Minnesota Department of Health created a series of four short videos describing the signs and symptoms of a heart attack or stroke, and the importance of knowing your blood pressure and cholesterol level in clever, easy-to-understand terms. The videos deliver messages about calling 911 when you have chest pain, recognizing that the signs of stroke appear on one side of the body, and checking your cholesterol and blood pressure every birthday (and following up with your doctor if the numbers are high). They can be shown in clinics or community settings and downloaded at (www.health.state.mn.us/cvhl/).

Primary prevention strategies related to decreasing tobacco use, improving nutri-

tion, increasing physical activity and supporting aspirin use are moving forward. Many of these have focused on schools and workplaces. The Statewide Health Improvement Program (SHIP) provided funds for local public health efforts aimed at adopting healthful eating habits and increasing physical activity in schools and implementing comprehensive worksite wellness programs. Currently, 215 schools offer Safe Routes to School programs, which make it easier for kids to walk or bike to school. In addition, 440 schools have been involved in Farm to School programs, giving students access to locally grown fresh fruits and vegetables. The State Bank of Faribault is one employer that now offers employees reduced health care premiums for taking certain steps to improve their health thanks to SHIP funding. The bank also encourages physical activity through walking and use of exercise balls and offers its employees information on good nutrition.

These efforts aside, more needs to be done to disseminate health-related messages to all populations and especially to those in certain ethnic groups. In Min-

nesota, we see disparities between the general population and African Americans, American Indians and Asian/Pacific Islanders in terms of heart disease and/or stroke mortality. More culturally sensitive efforts—that factor in language, diet and cultural practices unique to certain groups—are needed.

Acute Treatment

Minnesota has always prided itself on being one of the heart-healthiest states in the nation because of our commitment to using best practices to treat sudden cardiac arrest, STEMI and stroke. Yet, as a state, we still strive to improve our acute care systems. In 2012, Gov. Mark Dayton signed the CPR Training in Schools bill, requiring Minnesota schools to provide all students with hands-only CPR training before they graduate, starting in 2014. Timely CPR is one of the keys to surviving sudden cardiac arrest. Students exposed to CPR training will be more aware of the symptoms of sudden cardiac arrest and know what to do if they encounter someone having those symptoms. This training can be done by EMTs or fire fighters in as little as 30 minutes.

The present Legislature also is considering a bill that would create an acute stroke system that would ensure that a person suspected of having a stroke is taken to the most appropriate hospital in the shortest amount of time. The legislation would allow the Minnesota Department of Health to designate hospitals as being “acute stroke-ready.” Those hospitals would have protocols in place to treat acute stroke in the most timely, efficient manner. In addition, the health department would also identify hospitals that need additional resources to improve the quality of care they provide stroke patients.

Yet more work needs to be done in terms of collecting data on long-term patient outcomes following treatment of stroke, sudden cardiac arrest and STEMI and using it for ongoing quality-improvement efforts.

Disease Management

The state has made the most progress in the area of disease management, in particular, the use of electronic health records to assist with medication management and medication adherence and the use of cardiac and stroke rehabilitation services. For example, the University of Minnesota’s College of Pharmacy is implementing a program to reduce cardiovascular disease in Marshall, Minnesota, that involves Avera Marshall Regional Medical Center, Hy-Vee pharmacy and local employers. As part of the initiative:

- Pharmacists will use prescription records to identify and target patients with poor adherence to antihypertensive and/or cholesterol-lowering medications
- Physicians and other providers will increase use of aspirin in patients in order to prevent heart attack
- Local pharmacies and the Avera Marshall pharmacy department will work together to provide advanced medication management services for patients who take multiple medications or have several chronic conditions
- Employers will establish heart health programs for their employees.

Participants will share promising practices with other pharmacists, health care providers and communities.

Another example of a project improving disease management is the Minnesota Department of Health’s work with Hennepin County Medical Center clinics to better manage patients with hypertension and hyperlipidemia. The participating internal medicine clinics performed patient chart audits to determine whether patients were receiving treatment based on best-practice guidelines (JNC-7, ATP-3 and the Institute for Clinical Systems Improvement guidelines). They found most patients were not receiving lifestyle counseling nor were they attending follow-up appointments. Since then, the clinics have trained staff on care coordination, health coaching and following up with patients. In addition, pharmacists and physicians developed protocols for pharmacists to assess treatment and manage patients’ medication.

Seven months after implementation, the clinics saw the percentage of patients with normal blood pressure rates improve from 59.8% to 67.1% and the percentage with acceptable LDL cholesterol scores improve from 25.6% to 52.4%.

Conclusion

The next update on the extent to which the state is meeting its heart disease and stroke prevention goals will be in 2015. At that point, our progress will be measured against national goals, including those of Healthy People 2020 and the Centers for Disease Control and Prevention. We will continue to work with our partners to move the state plan ahead and bring attention to the need to reduce cardiovascular risk factors. Physician involvement not only is needed but is critical to lessening the burden of cardiovascular disease. We encourage physicians to use the state plan as a blueprint for assisting patients in reducing their risk for heart disease and stroke. **MM**

Stanton Shanedling is the supervisor and Sueling Schardin is the community health planner with the Minnesota Department of Health’s Heart Disease and Stroke Prevention Unit.

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For more information, go to www.health.state.mn.us/divs/hpcd/chp/cvh/documents/HDSPplanimplementation.pdf or contact Sueling Schardin at 651-201-4051 or sueling.schardin@state.mn.us.

Creutzfeldt-Jakob Disease in the Hospital Setting

A Case Report and Review

BY PEZHMÁN ROOHANI, M.D., MANISH K. SAHA, M.D., AND MICHAEL ROSENBLOOM, M.D.

Rapidly progressive dementia is a neurological condition that results in subacute deterioration in cognitive, behavioral and motor function. The most serious diagnosis for a patient with rapidly progressive dementia is Creutzfeldt-Jakob Disease (CJD), a prion-related illness that typically results in death within one year. However, there are numerous autoimmune, infectious and toxic-metabolic causes of rapidly progressive dementia that are potentially reversible with treatment. Thus, the differential diagnosis for a rapidly progressive dementia is critically important. In this article, the authors discuss a case of CJD diagnosed at a St. Paul hospital to illustrate the differential diagnosis of rapidly progressive dementia and highlight the role of neuroimaging.

Rapidly progressive dementia describes progressive deterioration in cognitive, behavioral and motor functions that occurs over a period ranging from weeks to months.¹ Unlike Alzheimer's disease, Lewy body dementia, vascular dementia and frontotemporal dementia, rapidly progressive dementia is subacute rather than chronic. There are numerous autoimmune, infectious and toxic-metabolic causes of rapidly progressive dementia, some of which are treatable. Thus, correctly identifying the etiology of the condition is essential.

Creutzfeldt-Jakob disease (CJD) is the most serious diagnosis for a patient with such a dementia, as it leads to death within one year. In this article, we present the case of a patient who was diagnosed with sporadic (having no known cause) CJD, after presenting with subacute onset of cognitive impairment, behavior changes, ataxia and dizziness. We use the case to discuss key aspects in the differential diagnosis of a rapidly progressive dementia.

Case

A 53-year-old, right-handed woman with a past medical history significant for otosclerosis with right-ear stapedectomy presented to our hospital with a two-week

history of dizziness and cognitive changes.

Initially, her symptoms consisted of light-headedness upon standing or walking. This was followed by progressive cognitive decline, characterized by difficulty transferring telephone numbers between mobile phones, following familiar recipes, misplacing objects and remembering television programs she watched the night before. She also experienced difficulty speaking. Her vital signs were within normal limits without evidence of fever, and her general exam was unremarkable. Her neurological exam showed disorientation to time with expressive aphasia. She was unable to follow three-step commands and could not draw intersecting pentagons. She demonstrated ideomotor apraxia of both hands, increased left upper-extremity tone with spontaneous choreiform movements on the left side, bilateral upper-limb ataxia on finger-nose-finger testing and bilateral grasp reflexes with intact deep tendon reflexes. Her gait was wide-based and unsteady. Within one week of admission, she became less conversational and experienced difficulty recognizing her husband.

Laboratory studies, all of which were within normal limits, included complete blood count, electrolytes, liver and renal function tests, urinalysis, urine drug

screen, HIV, copper, thyroglobulin antibody, thyroid peroxidase antibody, thyroid stimulating hormone, vitamin B12, erythrocyte sedimentation rate, C-reactive protein, anti-nuclear antibody, paraneoplastic panel and voltage-gated potassium channel complex antibody (VGKC-Ab). Cerebrospinal fluid analysis (CSF) was non-inflammatory with two nucleated cells/uL and normal glucose levels and protein concentration. Studies for herpes simplex virus polymerase chain reaction, *Coccidioides* Ab, oligoclonal bands, Whipple disease PCR and West Nile encephalitis (IgG/IgM antibody tests in CSF) were all negative. A full-body positron emission tomography (PET) scan failed to demonstrate hypermetabolic lesions suggestive of neoplasm.

Brain magnetic resonance imaging (MRI) showed abnormal findings on fluid-attenuated inversion recovery (FLAIR) and diffusion-weighted imaging (DWI) sequences. (In general, FLAIR images are ideal for showing such conditions as abnormal central nervous system lesions resulting from stroke, demyelination, tumor and infection. And DWI sequences are specific for showing acute cytotoxic brain injuries such as those resulting from stroke.) The FLAIR sequences revealed hyperintensities involving the right cau-

date nucleus, right parietal cortex and bilateral frontal cortices (Figure 1). There was restricted diffusion on DWI involving the same regions (Figure 2) but with a greater intensity as compared with FLAIR sequences. Apparent diffusion coefficient sequences showed hypointense regions that corresponded to areas of restricted diffusion (confirming that the lesion was not artifactual).

Electroencephalogram (EEG) revealed polymorphic theta-delta slowing and triphasic waves without epileptiform discharges. Cerebrospinal prion biomarkers were elevated, including neuron-specific enolase (175ng/mL [reference range <15 ng/mL]) and tau (19023 pg/mL [decision point: 1200 pg/mL]), and 14-3-3 protein was positive. (It should be noted that all of these proteins, which are released from neurons upon cell death and are most commonly associated with CJD, may also be elevated in Alzheimer's disease, vascular dementia, multiple sclerosis, stroke and other CNS-related conditions.)

The patient was administered empiric high-dose intravenous methylprednisolone for five days with no cognitive, behavioral or motor improvement. She was diagnosed with sporadic CJD and eventually discharged to a nursing home, where her health continued to decline. She died within three months of symptom onset. The family declined autopsy and brain biopsy.

Identifying Causes of Rapidly Progressive Dementia

Rapidly progressive dementia is distinguished by its subacute time course—having an accelerated rate of decline that affects cognitive, behavioral and/or motor function. The differential diagnosis for rapidly progressive dementia is extensive, encompassing neurodegenerative, autoimmune, infectious and toxic-metabolic etiologies. It is important to use a systemic approach to rule out potentially reversible conditions. Creutzfeldt-Jakob disease is an irreversible neurodegenerative process that should always be considered in the differential diagnosis of rapidly progressive dementia.

Obtaining an accurate, comprehensive medical history is essential. In addition to interviewing the patient, clinicians should talk to family members and caregivers to identify symptom onset and obtain specific details relating to cognitive, behavioral and motor deficits. As observed in this case, patients frequently have overlapping memory, language, motor and constitutional symptoms within a period of weeks to months. In fact, in 20% of cases, constitutional symptoms may be the first manifestations of CJD.²

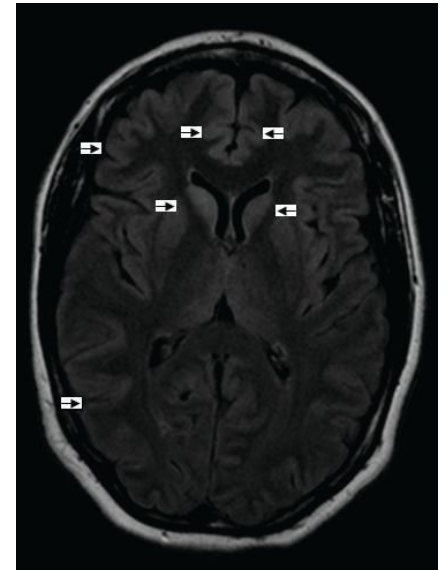
Regardless of presentation, all patients warrant basic serum labs to rule out reversible causes of subacute dementia. These can include hepatic and uremic encephalopathy, electrolyte imbalance, vitamin B12 deficiency, hypothyroidism, human immunodeficiency virus encephalopathy and neurosyphilis. If laboratory tests fail to result in a diagnosis, a more extensive evaluation, including lumbar puncture, EEG and brain MRI studies, should be performed.

Given that 38% of cases referred to tertiary care centers for suspected CJD involve a non-prion-related illness,³ addressing potential non-CJD-related etiologies is critical. Chronic neurodegenerative processes including frontotemporal dementia, Alzheimer's disease and Lewy body dementia may present in a rapidly progressive manner in rare instances.⁴ However, our experience shows that the majority of patients are misdiagnosed as having rapidly progressive dementia because of a poor delineation of the disease timeline during the history.

Various autoimmune conditions may mimic CJD both clinically and radiographically. Paraneoplastic neurological syndromes are caused by an inflammatory response directed against the central and peripheral nervous system in patients with cancers (commonly involving the lung, thymus, breast, testicles and ovaries).⁵ They result from antigenic response to the nervous system by antibodies; the antibodies recognize not only the antigens expressed ectopically in a tumor but also those found in the nervous system. The limbic structures, including the hip-

FIGURE 1

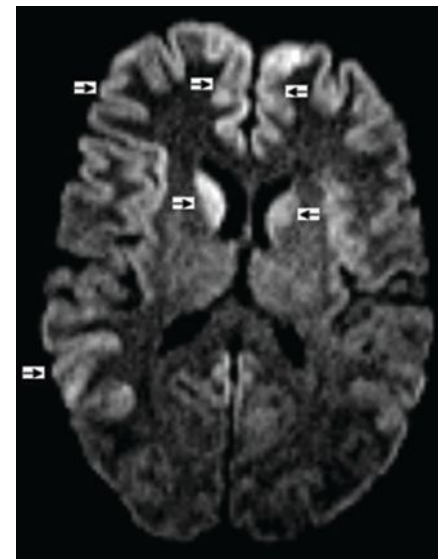
Fluid-Attenuated Inversion Recovery Image



MRI fluid-attenuated inversion recovery (FLAIR) sequence demonstrates hyperintensities involving the right caudate nucleus, right parietal cortex, and bilateral frontal cortices.

FIGURE 2

Diffusion-Weighted Image



MRI diffusion-weighted imaging shows restricted diffusion involving the right caudate nucleus, right parietal cortex, and bilateral frontal cortices with greater intensity compared with FLAIR sequences.

pocampus, are frequently vulnerable, and patients present with a limbic encephalitis characterized by acute-onset cognitive dysfunction and emotional lability, with or without seizures.⁶ Typical paraneoplastic syndromes that may present with limbic encephalitis include anti-Hu, CV2,

Ma2 and voltage-gated potassium channel antibodies (VGKC).⁵ Recently described syndromes resulting in rapidly progressing dementia have also been associated with antibodies against NMDA, GABA, amphiphysin and AMPA channels.⁷ All of these conditions involve autoantibodies expressed against cell surface proteins, namely neuronal ion channels within cortical and limbic brain structures. Consequently, patients with these syndromes often present with cognitive and behavioral changes.

Sometimes, encephalopathy related to antibodies against cell surface proteins (eg, anti-VGKC) may present in the absence of an underlying tumor. Many of these conditions may be treated either by addressing the underlying tumor or using immunotherapy (eg, IVIG, plasmapheresis, steroids). Another autoimmune encephalopathy associated with antibodies is Hashimoto's encephalopathy, a steroid-responsive encephalopathy presenting with either stroke-like episodes or seizures and anti-thyroid antibodies (anti-TPO and thyroglobulin antibodies).⁸ Often, diagnosis depends on assessing clinical response to empirical steroids.

Central nervous system vasculitis is a cell-mediated condition that may present with rapid cognitive, behavioral or motor deterioration and should be evaluated with conventional cerebral angiography and spinal fluid analysis. In addition, Sjogren's syndrome, a chronic inflammatory disorder resulting in lymphocytic inflammation of exocrine organs and sicca symptoms, has been shown to mimic CJD in both the rapidly progressive presentation and the radiological appearance on MRI FLAIR/DWI sequences.⁹ This condition can be diagnosed by checking SSA/SSB autoantibodies and is typically responsive to steroid treatment.

Several infectious diseases have a predilection for involving CNS structures and should be considered if the patient has elevated white count and fever. In addition, these processes often result in an inflammatory CSF, whereas the CSF in CJD would be expected to have normal cell counts, protein and glucose levels. HSV

encephalitis may infect the limbic system, and patients may present with acute confusion and seizure. In addition, Lyme disease and syphilis are both great mimickers and may be the cause of cognitive and behavioral changes. Whipple's disease, which typically involves the small intestine, also may cause rapidly progressive dementia.¹⁰ In general, infectious conditions resulting in rapidly progressive dementia may be distinguished from CJD by the presence of fever, elevated serum white count and inflammatory CSF.

Toxic-metabolic conditions also may present as rapidly progressive dementia. Wilson's disease, vitamin B12 deficiency, Wernicke-Korsakoff syndrome (or thiamine deficiency) and hepatic encephalopathy should all be considered and ruled out in patients with rapidly progressive dementia. Brain MRI may demonstrate hyperintensities involving the globus pallidus/putamen in Wilson's disease¹¹ and mediodorsal thalamus in Wernicke-Korsakoff syndrome.¹² In both cases, these may be confused with prion disease both clinically and radiographically.

Neoplastic conditions such as intravascular lymphoma, a rare non-Hodgkin-type lymphoma associated with neoplastic growth of lymphoid cells within the lumen of small and medium-sized cerebral vessels, may result in rapid cognitive, behavioral and motor decline through the development of subcortical strokes.¹³ Neuroimaging (MRI) is helpful in identifying the strokes. Since adrenal infiltration is present in 60% of cases, it is recommended that patients suspected of having this diagnosis undergo abdominal CT, but a definitive diagnosis can only be made with visceral tissue or through brain biopsy.¹⁴

Finally, it should be noted that complex partial status epilepticus may result in subacute altered mental status and confusion. Brain MRI may also reveal restriction diffusion localized to the hippocampus and the thalamus (pulvinar nucleus on DWI sequences).¹⁵ An EEG is essential to ruling out this condition during the evaluation of rapidly progressive dementia.

Recognizing Creutzfeldt-Jakob Disease

In cases where the aforementioned autoimmune, infectious and toxic-metabolic work-ups are unremarkable, prion-related illness should be considered. The most common presentation of CJD is rapidly progressive dementia along with myoclonus. The disease is also associated with ataxia and extrapyramidal abnormalities (tremor, rigidity, chorea, etc.). In addition, patients may present with a subacute progressive focal cortical syndrome such as cortical blindness and primary progressive aphasia.

Creutzfeldt-Jakob Disease is caused by misfolded prion proteins and may be classified as sporadic, acquired and familial. The sporadic type accounts for 85% of all CJD presentations.¹⁶

The World Health Organization (WHO) criteria (the most commonly used CJD classification) requires that the following be met for sporadic CJD:

- Progressive dementia
- At least two of the following four clinical features: myoclonus, visual or cerebellar abnormalities, akinetic mutism, pyramidal/extrapyramidal movements
- Atypical EEG during an illness of any duration and/or positive 14-3-3 CSF assay with clinical duration to death in less than two years
- Routine investigation not suggestive of an alternative diagnosis.¹⁷

Although EEG and CSF studies for 14-3-3 have traditionally been used to confirm the diagnosis of probable CJD based on the WHO criteria, recent investigations have shown brain MRI to have a higher sensitivity and specificity for sporadic CJD. Typical MRI findings in sporadic CJD demonstrate DWI>FLAIR hyperintensities involving the cortical and subcortical structures (thalamus and striatum, particularly putamen and caudate). A study of 23 patients showed that detection of DWI hyperintensities within the cortical and subcortical gray matter was 92.3% sensitive and 93.8% specific and considered superior to both EEG and CSF biomarkers, including 14-3-3 protein.¹⁸ Another study of 40 patients with probable

or definite CJD showed that the combined use of DWI and FLAIR sequences was 91% sensitive and 95% specific for sporadic CJD.¹⁹ More recent studies have shown that the addition of apparent diffusion coefficient sequences increases the sensitivity and specificity of MRI for sporadic CJD to 96% and 93%, respectively.²⁰ Additionally, MRI is helpful in identifying potential inflammatory, infectious and toxic-metabolic causes of RPD that may mimic CJD.

Other tools for diagnosing sporadic CJD include EEG and spinal fluid analysis. The most common EEG finding is diffuse slowing, yet the periodic sharp wave complex, which is present in later stages of the disease, has a specificity for sporadic CJD ranging from 66% to 91%.^{21,22} Protein 14-3-3 is the test of choice with a positive predictive value of 93% to 95%, but more recent studies have shown that the sensitivity is lower than expected.²³ Along with 14-3-3 protein, tau, and neuron-specific enolase may be elevated in CJD, but these proteins are also general markers of neuronal injury and therefore nonspecific.¹

Treatment for prion disease is limited to supportive therapy and palliative care, although antiepileptic drugs such as valproic acid may be used for myoclonic symptoms. Patients need not be isolated because the disease is not transferrable by touch or contact.

Our patient met WHO criteria for probable sporadic CJD and presented with rapid decline of language, behavior and motor function (choreiform movements). Interestingly, her initial symptoms were nonspecific and constitutional, characterized by positional-dependent dizziness. As mentioned earlier, she died within three months of symptom onset, which was consistent with epidemiological studies showing an 85% mortality rate within one year.³ Her diagnosis was largely dependent on neuroimaging. The utility of MRI in CJD diagnosis cannot be overestimated; it offers greater sensitivity and specificity compared with more traditional methods such as CSF biomarkers and EEG.

In Minnesota, cases of CJD and other prion diseases are reportable to the

Minnesota Department of Health. The National Prion Disease Pathology Surveillance Center at Case Western Reserve University provides a free autopsy service for confirmation of prion disease. More information on this service can be found on the National Prion Disease Pathology Surveillance Center website, www.cjdsurveillance.com.

Conclusion

Sporadic CJD is a rare, fatal disease with clinical and radiological presentation that occasionally may overlap with other disease processes that are potentially treatable. For this reason, it is important to rule out potential reversible causes of rapidly progressive dementia (autoimmune, infectious and toxic-metabolic etiologies) before making the final diagnosis of prion disease.

Although MRI is highly accurate in identifying sporadic CJD, it does not replace biopsy. Nevertheless, at some local hospitals, biopsy may not be available and the prolonged turnaround time for lab tests such as VGKC-AB and paraneoplastic panels make it impossible to rule out reversible causes of rapidly progressive dementia. Therefore, after ruling out certain potential infectious etiologies, it is our practice to administer an empiric dose of methylprednisolone (1 g IV for three to five days) to treat possible underlying autoimmune encephalopathy. This treatment may be considered for patients who have elevated CSF protein or a personal or family history of autoimmune disease. It must be noted, however, that there is no literature to support the use of steroids as a routine treatment in rapidly progressive dementia. **MM**

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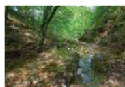
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Orthopedic Surgeon
 Southeast Clinic

Olmsted Medical Center, a 150-clinician multi-specialty clinic with 10 outlying branch clinics and a 61 bed hospital, continues to experience significant growth.

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 102 Elton Hills Drive NW
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 email: dcardille@olmmed.org
Phone: 507.529.6748
Fax: 507.529.6622

EOE

www.olmstedmedicalcenter.org

EMPLOYMENT OPPORTUNITIES



Built on a Community of Care

In the heart of the Cuyuna Lakes region of Minnesota, the medical campus in Crosby includes Cuyuna Regional Medical Center, a critical access hospital and clinic offering superb new facilities with the latest medical technologies. Outdoor activities abound, and with the Twin Cities and Duluth area just a short two hour drive away, you can experience the perfect balance of recreational and cultural activities.

Enhance your professional life in an environment that provides exciting practice opportunities in a beautiful Northwoods setting. The Cuyuna Lakes region welcomes you.

We invite you to explore our opportunities in:

- Family Medicine
- Internal Medicine
- Nocturnist
- PA, Orthopaedic Surgery
- PA, Family Medicine

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Contact: Todd Bymark, tbymark@cuyunamed.org
(866) 270-0043 / (218) 546-4322 | www.cuyunamed.org

WANTED: Medical Experts

The Medical Expert ("Contractor") shall provide services as expert witness in hearings pending before the Office of Disability Adjudication and Review (ODAR), Social Security Administration.

The contractor must be Board-Certified in his/her medical specialty by the American Medical Association (AMA) and/or the American Board of Medical Specialties (ABMS).

Responsibilities

The contractor shall review electronic case files copied onto compact discs (CDs) and testify, either in person or by video or teleconference. Material will consist of medical records as well as any additional materials submitted. In addition to reviewing case files, providing testimony at a hearing, and answering interrogatories, the contractor may also be called upon to review post-hearing material. Work may include: 1) study and evaluation of the medical evidence with or without medical assessment of the claimant's ability to do work-related activities; and 2) answer in writing, interrogatories on medical issues in a case. Thus, the contractor should provide a well-reasoned explanation supporting his/her opinion based on the record's medical signs and laboratory findings.

For addition information contact:

Kim Tolman
 250 Marquette Avenue, Suite 300
 Minneapolis, MN 55401
 877-512-3856, Ext. 20213 (Phone)
 612-348-1255 (Fax)



Live in a Beautiful Minnesota Resort Community

An immediate opportunity is available for a BC/BE general orthopedic surgeon in Bemidji, MN. Join our 3 existing board certified orthopedic surgeons in this beautiful lakes community.

Enjoy practicing in a new Orthopedic & Sports Medicine Center, opening spring 2013 and serving a region of 100,000.

Live and work in a community that offers exceptional schools, a state university with NCAA Division I hockey and community symphony and orchestra. With over 500 miles of trails and 400 surrounding lakes, this active community was ranked a "Top Town" by *Outdoor Life Magazine*. Enjoy a fulfilling lifestyle and rewarding career. To learn more about this excellent practice opportunity contact:

SANFORD
 HEALTH

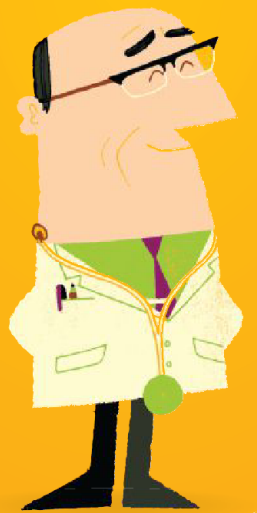
Celia Beck, Physician Recruiter
 Phone: 218-333-5056
 Fax: 218-333-5360
Celia.Beck@sanfordhealth.org

AA/EOE

Urgent Care

We have part-time and on-call positions available at a variety of Twin Cities' metro area HealthPartners Clinics. We will be opening a new Urgent Care clinic in Hugo, MN in the spring of 2013! Evening and weekend shifts are currently available. We are seeking BC/BE full-range family medicine and internal medicine pediatric (Med-Peds) physicians. We offer a competitive salary and paid malpractice.

For consideration, apply online at healthpartners.jobs and follow the Search Physician Careers link to view our Urgent Care opportunities. For more information, please contact diane.m.collins@healthpartners.com or call Diane at: 952-883-5453; toll-free: 1-800-472-4695 x3. EOE



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The Alexandria Clinic, P.A. is a multi-specialty group practice. We are located two hours west of the Twin Cities on I-94 in the heart of Lakes Country. Alexandria offers year-round recreation for the whole family and is home to a service area approaching 100,000 people and over 1,000 growing businesses.

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Employment Opportunities:

- ▶ Family Practice ▶ ENT
- ▶ Oncology ▶ Dermatology
- ▶ Neurology ▶ Rheumatology
- ▶ Emergency Room Physicians
- ▶ OB/Gyn

For more information, contact:
Alexandria Clinic
Attn: Tim Hunt, Administrator
610-30th Ave W,
Alexandria, MN 56308
Phone: (320) 763-2540
email: thunt@alexclinic.com
www.alexclinic.com

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For more information, contact
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Family Medicine Physician

Provides inpatient/outpatient primary medical care for patients in Rural Critical Access Hospital setting. For additional information regarding job duties, see <http://www.riversedgehealth.org/career.php>. Education required: M.D. or a D.O. from an accredited U.S. medical school, OR a foreign advanced degree equivalent to a first professional degree in medicine from an accredited U.S. medical school. Other requirements: (1) Board Certification in Family Medicine by the ABFM, OR satisfactory completion of 36-month Family Medicine residency program accredited by ACGME; AND (2) An unrestricted Minnesota medical license or a temporary permit to practice medicine in Minnesota issued by the Minnesota Board of Medical Practice.

Primary work location is 1900 North Sunrise Drive, St. Peter, MN 56082. Occasional shifts performed at 200 East Bowler Street, Le Center, MN 56057.

To apply, contact Jackie Kimmet, Director of Human Resources, at 507-934-7604 or by email at hadmin@riversedgehealth.org.

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The day you died

BY HECTOR MICHELENA, M.D.

The day you died was a hot summer day.
You had been preparing for your procedure since the night before.
I arrived a little late,
But still in time to see you ready—numb, tranquil.
A tube in your throat, which I gently pushed forward to insert my imaging contraption.

The day you died we were all excited to give you a new valve through your groin.
Yes, technology had come that far as to defy your age and your frailty.
Or so we thought.

The day you died I thought about my children and how I loved them.
We did other procedures on patients who fared so well.
I talked to my colleagues and had fish for lunch.
But the base of your aorta was too weak and gave out,
And your chest filled with clean, precious blood, suffocating your heart.

The day you died a courageous surgeon worked endless hours to repair your tears.
Successfully at the beginning. Less so towards the end.
The day you died I left the hospital late. I was writing about you.
I exercised and was thankful to be alive and healthy.
I went home and fell asleep by my wife, thinking about you.

The day you died was a strange day for me,
Because even without personally knowing you, I felt connected to you.
The day you died was a long day for you. A final battle lost.
A regular day for me, the final showdown for you. All in the same room.

I can't help but wonder what will the day be like for my doctor,
The day I die.

Hector Michelena is an assistant professor of medicine and director of the Intra-operative Echocardiography Division of Cardiovascular Diseases at Mayo Clinic.



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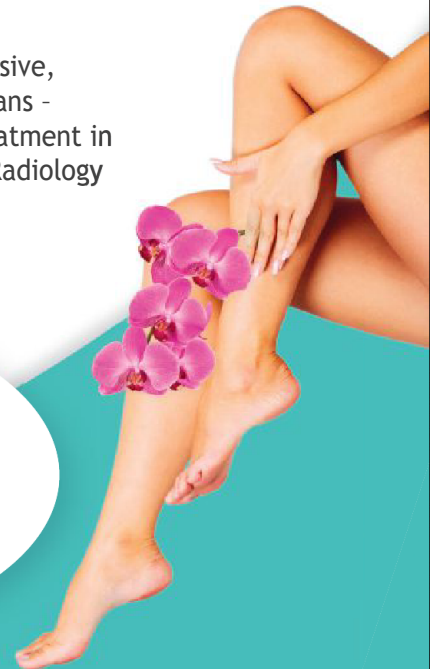
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