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LETTER FROM THE CHIEF MEDICAL EDITOR
Manish Mehta, MD, MPH, The Vascular Group, Albany, NY

FUTURE STEPS IN VASCULAR MEDICINE
Michael R. Jaff, DO, Harvard Medical School, Boston, MA

TREATING PERIPHERAL ARTERY DISEASE OVER THE NEXT DECADE
Stephanie Saltzberg, MD, The Vascular Group, Albany, NY

COMING CHANGES IN STROKE MANAGEMENT
Gary L. Bernardini, MD, PhD, Albany Medical Center, Albany, NY

MANAGING AORTIC ANEURYSMS IN 2020
Jeffrey Hnath, MD, The Vascular Group, Albany, NY

A PATIENT’S STORY: MICHAEL
Sharon Cillis, RN, Center for Vascular Awareness, Albany, NY

THE CHANGING PARADIGM OF VASCULAR TRAINING
Paul B. Kreienberg, MD, The Vascular Group, Albany, NY

THE NEXT WAVE IN VASCULAR HEALTHCARE DELIVERY
R. Clement Darling III, MD, The Vascular Group, Albany, NY

RESEARCH: BALANCING INNOVATION WITH PATIENTS’ NEEDS
Anita Suchdeve, RN, CRC, and Manish Mehta, MD, MPH, The Vascular Group, Albany, NY

THE FUTURE OF HEALTHCARE IS AT YOUR FINGERTIPS
Benita Zahn, MS, WNYT, Albany, NY
Letter from the Chief Medical Editor

Awareness, Innovation, and Technology: The New Tipping Point

In as little as 5 years from today, the United States Census expects 87 million people to be 55 years of age or older. This is the age group that is primarily affected by vascular disease. Current socioeconomic conditions have started to move the United States healthcare pendulum toward the patient’s ability to have personal control and accountability. Unfortunately, most Americans are exposed to risk factors such as diabetes, obesity, hypertension, hypercholesterolemia, and smoking without awareness of the implications to their vascular health. This lack of awareness leads to years of neglect through early adulthood, resulting in the high prevalence of vascular disease in the aging population.

The baby boomers’ thirst for information and their ability to acquire it via understanding information technology, such as the Internet and text messaging, however, are redefining culture and allowing personal control and accountability regarding their health.

Over the past decade, advances in vascular health care, driven by innovation and technology, have had a significant impact on providers’ ability to diagnose and treat complex vascular and cardiac problems. From the days of significant morbidity and mortality related to surgical procedures for aneurysm repair, to treatment of peripheral arterial occlusive disease, to heart bypass, healthcare providers and facilities have developed infrastructures that are technologically advanced and minimally invasive. Over the next decade, these systems will have significant impact in reshaping vascular and cardiac healthcare delivery and improving patient outcomes.

To keep up with this rapidly increasing demand from the aging population, technology, innovation, and vascular awareness will pave the road that will lead to the “new tipping point” for improving vascular health. Healthcare consumers will have the tools to better educate themselves and the younger generations in healthier dietary and lifestyle habits. Patients will be empowered to make choices that focus on risk factor modification earlier in life, and they will have more control over diabetes, obesity, hypertension, and hypercholesterolemia. Innovation will focus not just on better drugs and devices for treating vascular disease but also on information technology (the Apple iPhone, for example) that allows portability, remote monitoring, and self-management of health information.

I believe vascular awareness is vital to creating a “social epidemic” that can have a significant impact on improving vascular health for millions of Americans. In this issue of V-Aware, we are delighted to provide a discussion that looks into the future of vascular health awareness, innovation, and technology.

I hope you enjoy this issue of V-Aware, and we look forward to your comments and suggestions. Feel free to write to us at info@vaware.org
It’s tough to accurately predict what the future will bring regarding health care in the United States, particularly in the face of the largest reform effort in the history of our nation.

To concentrate my “crystal ball” specifically on the future of vascular medicine may have an even lower chance of success.

Let’s begin with a definition of vascular medicine, which is really the over-arching name of the specialized care of patients who have vascular disease. There are physicians who have dedicated their careers to the diagnosis and medical management of patients with vascular disease, and I am one of them. I have no stake in the game regarding whether patients should undergo surgical or endovascular (balloon angioplasty, atherectomy, or stenting) treatment. If I feel that a patient would benefit from either type of treatment, I refer him or her to the appropriate specialist. Once the procedure has been completed, I follow my patients to aggressively medically manage them and to ensure that their vascular procedure remains effective.

Vascular medicine specialists are represented by the Society for Vascular Medicine (www.svmb.org), a small but rapidly growing specialty medical organization. There is a board certification process for physicians who wish to demonstrate expertise in the field; the details of this process can be found at www.vascularboard.org.

PREDICTIONS

Now that I have set the stage, there are three major predictions I would like to make. These suppositions center on patient education, medical therapy, and re-establishing blood flow through a blocked or narrowed artery (revascularization).

Patient education

There is no doubt that, in general, patients know less about peripheral vascular disease than they do about heart and brain disease. For example, patients today know that if they experience chest pain or visual loss, they need to seek emergent medical attention, because they may be experiencing a heart attack or stroke. These same patients who develop predictable calf tightness with walking that resolves with rest but limits their ability to function, however, are convinced that this is just what happens as we age, or perhaps that their sciatica is acting up again. A study published in the American Heart Association journal Circulation demonstrated that only one in four patients at risk for peripheral artery disease of the legs even know the term.
Medical therapy
Currently, the only treatments available for vascular disease in arteries outside the heart are designed to treat the associated risk factors, including high blood pressure, diabetes, high cholesterol, and the use of tobacco products. We really don’t know how well these medical treatments actually improve symptoms and prolong life in patients with vascular disease.

We have very crude methods of predicting which patients will truly develop advanced vascular disease, however, and in those patients, we do not know what treatments will be more effective than others. Enter the world of genetics, genomics, and proteomics. The future definitely lies in this direction, with the ability to perform genetic sequencing testing to identify patients at risk. The next development will be medicines that can prevent the expression of these risky genes, thereby preventing vascular disease. Add to this our increasing understanding of the use of our own cells and genes to treat established vascular disease, and we have great potential to vastly improve patient outcomes.

Revascularization
Revascularization remains the hot topic in peripheral vascular disease. The push toward less invasive ways of re-establishing blood flow remains crucial for patients and for good reason: Patients prefer to avoid pain, spend less time in the hospital, and ideally want to reduce their risk for serious complications. Currently, technology has advanced to a number of less invasive treatments, including balloon catheters (for angioplasty), expanding metallic scaffolding devices (balloon-expandable and self-expanding stents), atherectomy (including laser), and blood clot removal devices.

What’s coming is even more exciting, however, and the evolution of minimally invasive devices is concentrating on maximizing interactions between devices that help maintain blood flow and drugs that can prevent the growth of cells that can cause re-narrowing of the blood vessels. The next step will be to enable the skeleton of the devices to ultimately be reabsorbed by the body, allowing the blood vessels to be maintained open without leaving a permanent metal structure behind.

Finally, we may be able to deliver cells that treat narrowed blood vessels through minimally invasive procedures, thereby fostering improved vascular health on the cellular level. In the distant future, it is inevitable that devices will be linked with genetic engineering to improve long-term vascular health.

OPPORTUNITIES ABOUND
In the United States, we are entering an unprecedented era in health care, and the challenges are matched by the potential advantages in treatment. Despite the uncertainties around how all of this technology will be paid for by the federal government, we must remain resolute in maintaining our position as the country with the most sophisticated health care in the world. Fasten your seatbelts and keep your eyes open. New medical opportunities abound, and your doctor remains the best key to your long-lasting health and happiness.

Ask Your Doctor
1. Do I have peripheral vascular disease?
2. Are my risk factors for artery disease being effectively managed?
3. What else should I be doing to prevent the development of vascular disease?
Peripheral artery disease (PAD) is one of the most serious problems affecting our health system as we experience a significant increase in our aging population.

It currently affects about 10 million Americans; however, less than 25% of those with PAD are diagnosed and treated.

PAD is the chronic progression of systemic atherosclerosis or hardening of the arteries. Plaque (a mixture of fat, cholesterol, calcium, and other substances) accumulates in the arteries causing them to narrow and restrict blood flow, resulting in poor circulation. This problem most frequently occurs in the lower extremities. Patients can have no symptoms, claudication (leg cramps relieved with rest), or chronic limb ischemia (leg pain at rest, gangrene, and ulcers).

In addition to being limb-threatening, PAD can be life-threatening because patients are at increased risk for cardiovascular events such as heart attack and stroke. Risk factors for PAD include smoking, high cholesterol, high blood pressure, diabetes, living a sedentary lifestyle, and family history of cardiovascular disease.

**REDUCING AMPUTATIONS**

The treatment of PAD has undergone revolutionary changes in the last several decades. Until the 1960s and 1970s, amputation was the main treatment for significant cases of PAD. Lower limb prostheses were ill-fitting, made of bulky materials, and had biomechanical flaws that limited function. Although the advent of surgical bypass was earlier, it was not until about 40 years ago that techniques for surgical revascularization of the lower limbs were improved leading to the widespread availability of the procedure with good results. This changed the history of PAD by significantly reducing the number of major amputations.

Advances in wound care such as hyperbaric oxygen therapy and the vacuum-assisted closure device became adjuncts in treating PAD, further limiting the need for amputations. In addition, research in biomechanics and materials resulted in higher-performance prostheses for those that still required amputation.

Open surgery, endovascular procedures, medicines, medical devices, and incorporation of lifestyle modification (for example, quitting smoking and losing weight) changed the future of patients with PAD by saving more lives and significantly reducing the number of amputations.
ENDOVASCULAR TREATMENT
In modern practice, minimally invasive endovascular techniques continue to evolve replacing open surgical revascularization for patients with PAD. Endovascular procedures are minimally invasive, can be performed with little anesthesia, and usually lead to fewer serious complications.

Endovascular therapy has become the procedure of choice for non-complex lesions such as superficial femoral artery disease. In our own practice, we have seen a shift in first-line treatment of superficial femoral artery disease from open surgical bypass to angioplasty and stenting. In complex disease (such as multilevel disease involving segments below the knee), endovascular therapy continues to expand its role, particularly in patients with limited surgical options. However, open surgical procedures may still be an option in these cases. In addition, surgery is required for lesions that are not technically suitable for endovascular procedures and in patients who show no improvement or have failed multiple endovascular interventions.

KEEPING OPTIONS OPEN
What does the future hold for PAD treatment? There are continuing developments in pharmacologic agents such as cholesterol-lowering drugs (statins) to prevent PAD and gene therapy such as stem cell treatment to develop new blood vessels around blockages. In addition, angiogenesis research continues to be heavily funded. The goal of therapeutic angiogenesis is to use growth factors to stimulate the development of new small blood vessels to improve circulation and restore tissue. Although advances in pharmacology, gene therapy, and angiogenesis have been made, further research is needed, as there is no single agent to cure or prevent PAD. Wound care will continue to play an adjunctive therapeutic role. In addition, computerized robotic lower limbs with sensors are on the horizon to improve the quality of life and performance of amputees. In the next decade, it is clear that interventions, either surgical or endovascular, will still play a significant role in treating symptomatic PAD. Consumer demand and market forces will continue to drive the expansion of minimally invasive procedures. The goal is to improve durability and treatment safety, while reducing the need for invasive surgery and limiting amputations.

Challenges remain in the development of minimally invasive techniques, including multilevel disease with eccentric calcification, mechanical forces such as bending of the knee joint, and restenosis. Vascular specialists need to balance endovascular interventions and surgery to provide patients with the best clinical outcomes while limiting risks and complications.

Technical advancement allows complex balloon catheters to treat vascular disease from head to toe. Image courtesy of Cordis Corporation. Used with permission.

The key element in the future of treatment of PAD remains collaboration of vascular specialists with the Food and Drug Administration and medical device companies to continue the evolution of technologies. There is a fundamental shift within the Food and Drug Administration toward the approval of more devices and medical therapies for PAD. New treatments include brachytherapy, laser- and radiofrequency-based interventions, drug-coated balloons, and below-the-knee stents. In the future, the majority of PAD patients will likely be treated with novel minimally invasive percutaneous procedures and medical therapies, but there will continue to be a role for open surgery for complex cases.

Patient selection for endovascular versus surgical treatment is complicated and will continue to depend on many factors including symptoms, anatomic suitability, lesion characteristics, device availability, institutional experience, patient comorbidities, and availability of conduit. There is not a single therapy to treat all patients. Clinical trials and research will continue to provide data that will influence best medical practice and technological advancements. The ideal treatment paradigm will be determined by vascular specialists who have direct experience with all treatment options.

Keep options open.

Medical therapy and wound care will continue to play an important role in the prevention and treatment of PAD.

As an endovascular specialist, what strategies will you use to improve outcomes for your patients?

As a patient with PAD, what questions will you ask your doctor about your treatment options?
COMING CHANGES in Stroke Management

Gary L. Bernardini, MD, PhD

Stroke, literally meaning “to strike down,” is associated with the sudden onset of slurred speech or the inability to speak; numbness or weakness in the face, arm, or leg; difficulty walking; or severe headache.

Stroke remains the third leading cause of death in the United States, with an estimated 750,000 new and 200,000 recurrent strokes each year. People who have had a stroke suffer significant disability and are often affected in the prime of their life.

Acute stroke therapies have to be delivered quickly after the onset of stroke symptoms to be beneficial, as “time is brain.” In this article, I focus primarily on current and future treatments and preventing ischemic stroke.

DRUGS AND DEVICES

Medical therapy for ischemic stroke involves the use of antiplatelet agents (such as aspirin, clopidogrel, or aspirin/extended-release dipyridamole (Aggrenox), anticoagulation (particularly in atrial fibrillation), HMG-CoA reductase inhibitors or statins, and antihypertensive drugs. In a recent study, atorvastatin (Lipitor) demonstrated a significant reduction in recurrent stroke in patients who received it within 120 days of ischemic stroke or transient ischemic attack.

Atrial fibrillation increases the risk of stroke and death. Although warfarin has been used to reduce the risk of stroke, it increases bleeding tendencies.

Future treatment for atrial fibrillation may involve direct, competitive inhibitors of thrombin or the placement of a device into the atrium to prevent embolism. The Watchman device, placed directly into one of the small chambers of the heart to prevent clots from leaving the heart, may become an alternative therapy to warfarin in preventing strokes for those with atrial fibrillation. Additionally, stroke patients who have a pre-existing hole in the atrium (called a patent foramen ovale) may be treated with placement of a patent foramen ovale closure device.

Stem cell research may offer the possibility of regenerating injured brain tissue after ischemic stroke. Finally, rehabilitation techniques, such as using goal-directed robotic training to aid in proper movement of stroke-affected limbs and the Bioness device to assist walking, may substantially help patients during the recovery phase after stroke.

CLOT-BUSTING MEDICATION

Before 1995, stroke treatment was limited to antiplatelet therapy (primarily aspirin) for prevention and rehabilitation. The negative view regarding stroke treatment changed that year with the introduction...
of the clot-busting medication recombinant tissue plasminogen activator (rtPA), given intravenously to stroke patients within 3 hours after symptom onset. The drug significantly increased the chances of patients being able to go home with little or no lasting neurological deficits.

Despite the benefits of intravenous rtPA, its effectiveness in dissolving large clots in the middle cerebral artery (MCA) in the brain is only about 50%. Future therapies with rtPA lie in the use of a noninvasive, continuous transcranial Doppler ultrasound signal placed directly onto the clot in the MCA while infusing rtPA or injecting microspheres along with continuous ultrasound and intravenous rtPA. These combination therapies can lead to improved recanalization rates for MCA clots.

Acute ischemic stroke remains a condition of high morbidity and mortality. Unfortunately, only 3% to 10% of patients receive rtPA, mostly due to the narrow window of time for effective treatment. Neuroendovascular stroke therapies have assumed an important role for treatment of ischemic stroke.

Current intra-arterial thrombolytic therapy uses alteplase and retivase instead of urokinase, but centers are moving toward using thrombectomy devices instead of extracting thrombus through a catheter (Figure 1). This approach may avoid potentially serious intracerebral hemorrhages associated with intra-arterial thrombolysis.

**ENDOVASCULAR APPROACHES**

The Merci clot retriever, specifically designed for intracranial thrombectomy and currently undergoing trials and the macerator-suction device Penumbra, also FDA approved for clot retrieval, have been successfully used at Albany Medical Center in patients within an 8-hour time window after stroke. Other endovascular techniques in development for ischemic stroke include snares, laser, and catheter-tipped ultrasound devices. The recently completed SENTIS trial looked at the NeuroFlo intra-aortic balloon device for treatment of stroke within 14 hours of onset. If the results are positive, potential other uses of the NeuroFlo could be in conjunction with intravenous rtPA or in “wake-up” strokes.

**SURGERY FOR STROKE**

Surgical therapy for ischemic stroke consists of opening up narrowed carotid arteries that lead to the brain. Options are conventional surgery with carotid endarterectomy (CEA) or interventional carotid angioplasty and stenting (CAS). The Carotid Revascularization Endarterectomy versus Stent Trial showed no difference between CAS and CEA in stroke, death, myocardial infarction, or ipsilateral stroke in treating carotid disease.

**DIAGNOSIS CHALLENGES**

Rapid diagnosis of stroke remains a challenge for patient management and treatment. Patients with acute stroke normally undergo a noncontrast computed tomographic (CT) scan. Head CT is useful in determining absence or presence of hemorrhage to assess a patient's eligibility for thrombolytic therapy.

Newer neuroimaging techniques can aid in the diagnosis and treatment of ischemic stroke. For example, diffusion-weighted imaging can show stroke within minutes of symptoms. Cerebral perfusion techniques using CT perfusion or perfusion imaging can highlight tissue at risk (the so-called penumbra). These techniques are helpful in guiding reperfusion.
therapies. In the future, brain-derived proteins as markers of brain injury in stroke could be used to monitor stroke onset and severity.

PROTECTING THE BRAIN
The search for effective ways to protect brain tissue after stroke has been the Holy Grail of ischemic stroke treatment. Recently, several agents have been tested, including recombinant erythropoietin and citicoline. Enthusiasm for neuroprotection in the past has been tempered by potential side effects or lack of efficacy of these drugs in translation from animal to humans.

Mild-to-moderate therapeutic hypothermia (cooling the body) to 32° to 34°C may become the gold standard for neuroprotection for patients with brain injury. Cooling patients has proven efficacy in postcardiac arrest patients. Therapeutic hypothermia blocks free radical production and calcium entry into cells and reduces brain edema and intracranial pressure following brain injury. Induced hypothermia appears feasible and safe in patients with acute ischemic stroke even after thrombolysis.

SPECIALIZED CARE
Finally, it is important as we move into the next decade that patients be treated in centers specializing in stroke treatment. The Joint Commission and the New York State Department of Health are involved in designating primary stroke centers. Since 2005, Albany Medical Center has been a designated stroke center. Furthermore, consideration for comprehensive stroke center designation is under way to identify centers that offer specialized treatment beyond intravenous rtPA, such as neuroendovascular and surgical therapies, stroke research, and treatment in neurointensive care units. Linking specialized stroke centers to community emergency rooms by telemedicine will aid considerably in expediting stroke care in rural areas. This is an exciting and promising time for stroke treatment. It is hoped that ongoing research, clinical trials, and advances in therapies will significantly decrease the incidence of and disability from stroke in the decade to come.

Ask Your Doctor

1. How can I reduce my risk factors for stroke?
2. Which centers close to where I live offer the most advanced stroke treatment?
3. Where can I get more information regarding stroke and its treatment?
MANAGING AORTIC ANEURYSMS in 2020

Jeffrey Hnath, MD

Very few things strike fear in a patient like hearing the word aneurysm.

This weakening of an arterial wall causes the artery to bulge or balloon outward in certain areas and this can occur anywhere from the brain to the leg. The most common site, however, is the abdominal aorta. Aortic aneurysms are particularly dangerous, as they are prone to rupture, which has an overall mortality rate of 90%. The aging population is at the greatest risk of developing aneurysms, and it is estimated that over 1.5 million Americans have aneurysms of which only less than 5% are treated.

BETTER DIAGNOSIS

The first step in improving management of aortic aneurysms in the future involves awareness and diagnosis. Providing information to physicians and patients alike will increase through the efforts of public health legislation as well as nonprofit vascular foundations. This process has already begun with passage of the Screening Abdominal Aortic Aneurysms Very Efficiently Act in 2007 that offered ultrasound screening for aortic aneurysms with initial Medicare enrollment. Ultrasound provides an inexpensive way to identify aortic aneurysms that sometimes are difficult to find on a routine physical examination. Increased awareness and access to ever-better ultrasound technology may lead to the diagnosis of a higher percentage of aneurysms in the next decade.

Advances in the field of genetics may allow for the diagnosis of an aneurysm even before the aorta begins to balloon in size. Aortic aneurysms seem to run in families; a gene on chromosome 9 has been found to have a link to aneurysm formation. A service offered by the biopharmaceutical company deCODEme can already stratify your personal risk of forming an aneurysm by analyzing your genes, specifically chromosome 9. Genetic testing may eventually refine and intensify the screening process for aortic aneurysms by 2020.

(Article continues on next page)
REFINED REPAIR
Aneurysm repair in the 1950s was primitive and included merely wrapping the aortic aneurysm in mesh or a similar material. The results were not very good, and this pushed innovations in surgery that led to aortic aneurysm replacement using a tube graft. This open aneurysm repair using an assortment of materials sewn to the healthy aorta above and below the damaged section remained relatively unchanged until the mid-1990s.

Minimally invasive endograft repair revolutionized aortic aneurysm repair over the last two decades. A stent graft can now be packaged up and inserted into the aorta through a catheter; the graft is deployed inside of the aneurysm to divert blood flow and prevent pressure on the walls of the bulging aorta. With this procedure, morbidity and mortality rates decreased. Patients also had less pain and quicker recoveries.

The earliest endografts were essentially a few metal stents sewn to a fabric tube. Over time, the metal skeletons and fabric were modified to prevent fatigue-related fractures and tears. New fabrics are still being developed that can be packaged into smaller delivery devices. The device packaging will become more compact and the outside more hydrophilic to enable access through smaller arteries. The metals and their configurations are also being refined to prevent fractures and to accommodate different types of anatomy.

MATCHING ANATOMY
The patient’s anatomy has always been the limiting factor in endograft use. The aorta from the aortic valve to the iliac arteries is essentially a long tube with multiple branches. Some areas are normal, whereas others may be aneurysmal. The primary issue with endograft placement is the landing zone. Endografts need a segment of relatively healthy aorta to ensure proper fixation and seal because they are held in place mostly by a pressure fit. Advances in graft fixation have advanced from a pure pressure fit to a variety of hooks and even screw tacks. The future may offer different adhesives or coatings that may enhance inflammation, causing the graft to adhere to the inside of the aorta. Some of the devices may have a ring of softer material on the outside to conform to the aortic wall for improved sealing ability.

NEW GRAFTS
There are patients whose entire aorta is affected, from their heart to their groin, and require specialized devices for treatment of their complete aneurysm. The next generation of stent grafts may have fenestrations or branches to allow preservation of blood flow to internal organs while extending the landing zones over the openings of important branch arteries.

Fenestrated endograft use is starting in specialized centers. The limitation has been the ability to place wires through each fenestration. The necessary cannulation times have led to relatively long procedures with significant radiation exposure. There are two new technologies that are being implemented in this area. The first is the use of robotic catheters. A robot at a location remote from the patient is used to manipulate specialized catheters to cannulate different branch vessels using three-dimensional imaging. This system allows for precise movements and accurate wire placement. A few preliminary bench studies have shown promise. The second technology is magnetically guided wires. The tip of the wire is guided by adjusting different magnetic fields to direct the wire to a specific location.
MORE EXACT IMAGING
Aortic imaging is also being refined to provide exact data on the aortic anatomy as well as reduce radiation exposure to patients. Three-dimensional intraoperative CT imaging is becoming available to give exact reconstructions of aneurysms. The use of intravascular ultrasound can be of use in endograft placement in patients that have concern for kidney toxicity related to the contrast dye that is required for CT. Postoperative surveillance is also shifting toward new “low-dose radiation” CT scanners and ultrasound technology to limit the radiation exposure to patients. Wireless pressure sensors placed into the aneurysm at the time of repair have shown promise in improving the success of the initial endovascular repair and postoperative follow-up.

SURGICAL ADVANCES
Endografts are not for everyone, and an open repair is sometimes necessary. Open repair has already come a long way in terms of safety and patient recovery. Advances in anesthesia have made most procedures safer than they were 20 years ago. Two modalities that have been almost perfected for general surgery are being applied to aortic procedures: laparoscopic surgery and robotic surgery. Laparoscopic aortic repair can be performed through very small incisions allowing for less pain and quicker recovery. Robotic aortic repair allows more complex movements simulating the human wrist and can also be performed from a remote location. What if a small hospital without a vascular surgeon could just set up the robot and the surgery could be performed remotely from thousands of miles away?

POSSIBILITY OF PREVENTION
What if aneurysms didn’t form at all? Studies have implicated a chromosome 9 abnormality that can cause aneurysm formation. At the risk of a legal and ethical debate, what if an individual’s genome could be altered to prevent an aneurysm? For example, perhaps a virus could be used as a vector to infect the patient’s current DNA with new, nonaneurysmal DNA.

The future of aortic surgery is bright, and the next decade should be exciting. Only time will tell if fenestrated endografts or robotic repair will become leading treatments. A new technology that isn’t even an idea yet may completely redefine the field. Regardless of what develops, it seems hopeful that the word aneurysm won’t be so scary in 2020.
At age 18, Michael was on his way to becoming an outstanding adult. He had just passed the rigorous Navy SEAL fitness test, which requires an applicant to swim 500 yards in 10 minutes, do 79 push-ups in 2 minutes, perform 70 sit-ups in 2 minutes, do 11 “dead hang” pull-ups, and finally run 1.5 miles in a little over 10 minutes in long pants and boots. Only a few people are able to do this, and Michael was one of them.

Becoming a Navy SEAL also requires passing a physical examination. During the examination, the Navy doctor was reviewing Michael’s old medical records. One of the reports from his family doctor mentioned an episode that occurred when he was a junior in high school. Michael had developed double vision in his left eye, which lasted about a week. He remembers that the doctors didn’t really know what was happening, but they put him on a steroid, and the symptoms improved. The Navy doctor took one look at that report and told Michael that he had multiple sclerosis (MS) and could not join the Navy.

FROM BAD TO WORSE
When Michael came home, he saw a neurologist who performed a lumbar puncture and drew off a sample of cerebrospinal fluid. The results came back positive; however, the neurologist said that he couldn’t clearly make the diagnosis of MS based on just one exacerbation.

Michael experienced another exacerbation at age 21. He had numbness around the left side of his rib cage, which ran down to his knee. He felt dizzy and severely fatigued and was once again placed on steroids. He was still functioning at a high level, but the exacerbations continued and became more frequent.

When Michael was 29, he married Kacey. Their daughter Riley was born when he was 30, and their son Gabriel was born when he was 33. During this time, Michael began to experience worse fatigue and depression. He had more problems with his vision, experienced difficulty finding words and other cognitive issues, and he became sedentary and quiet. Michael said that noise and activity bothered him. His kids learned to play quietly, and Michael withdrew from conversations with friends.
FINDING HOPE
Kacey said that Nick, a close friend of Michael’s, posted on her Facebook wall information that he saw on a Canadian news show about a Dr. Zamboni and his MS research and findings. Zamboni, an Italian physician whose wife was diagnosed with MS, has conducted preliminary studies suggesting that some MS patients have an abnormality in blood drainage from the brain and spinal cord, which may cause damage to the nervous system. This problem is called chronic cerebrospinal venous insufficiency.

Michael was in the hospital being treated for an MS exacerbation when Kacey received this information. She cried after hearing that Dr. Zamboni’s treatment had worked to improve some MS patients. She searched online for the study and went to thisisms.com, a forum for people with the disease. She began asking questions online and corresponded with many people, staying awake until 3:00 AM reading anything she could find on chronic cerebrospinal venous insufficiency.

Kacey works in an orthopedic office and, the next day, decided to show the information she had found to the doctors there. They suggested that Michael see the vascular surgeons of The Vascular Group in Albany. Kacey anticipated having their hopes dashed, but she was pleasantly surprised when they met with Dr. Manish Mehta, who examined Michael and said, “I don’t know if this treatment is going to help. I will look into this, but I need to make sure it is safe.”

Michael recalls going to the treatment appointment in January 2010 and hoping for a positive finding. Kacey sat in the waiting room while Michael underwent a venogram, scared and thinking to herself, “What if I pushed him into a procedure he didn’t need?”

After the procedure, Dr. Mehta said that Michael’s left jugular vein had been 80% blocked. It was opened by inflating a balloon inside the vein, which widened the narrowed area in the vein allowing increased blood flow to get through.

Michael went home hours later and slept for most of the night. In the next few days, Kacey noticed a change.

Here are excerpts from a note she sent to one of Dr. Mehta’s nurses in February 2010:

Dear, dearest Dr. Mehta,

From the bottom of my heart, I want to thank you for what you have done, not only for my husband, but for my family. You helped bring back to life a man who has been on a downward spiral for the past few years. Michael was truly a shell of a man for a long time, suffering exacerbation after exacerbation, enduring debilitating depression and fatigue. We all thought we were losing him, and truly, I felt there was no hope for him. When I found out about the Liberation Procedure and I took a chance calling your office, I was expecting to be scoffed at. To be told, “We don't do that here.” I was given the opportunity to unload my story of this “new experimental procedure.” I was listened to and was graciously told, “Come in. Bring all of your research. Dr. Mehta is the one you should see!” I thought I would feel foolish making the call, but hung up feeling incredibly hopeful.

It was comforting to be with you, to sit in your office, and listen to you. It was amazing to realize that you were actually listening to us. Not just listening, but you were interested! The nurses at the Vascular Health Pavilion were amazing, comforting, professional, and most of all, funny. So nice not to be treated “like a patient.”

We were encouraged at the post-op visit to learn that my husband’s relief could increase as more time passes. At this point in time (3 weeks post-op), he has a newfound energy. He runs and plays with our children! Last night, he ran throughout our home, screaming and laughing with my daughter and son for 35 minutes! Yes, I timed it! This never happens in my home, and because of that, my husband has always felt less than a father. Normally, when my children were loud, they would quickly be hushed because noise was almost painful to Michael. But last night, he was louder than they were! I was truly amazed! I did not know this man! His sleep has changed. He never rested while he was asleep. It was always an uncomfortable sleep for him and, to watch him, you would see a scowl on his face the entire time. He now sleeps deeply and peacefully. He has turned from a tired, morose, 35-going-on-90-year-old man into a happy, smiling/laughing, energetic, and POSITIVE person. This is all very strange and surreal. But, my God, we'll take it! While the numbness in his arm remains, we are elated to see the significant difference in his quality of life!

Thank you, thank you, thank you for giving my children a father that they have been craving since they were born. And thank you for returning to me the man I fell in love with when we were just 19! You are a Godsend! I truly believe that!

With our sincerest gratitude,
Kacey, Michael, Riley, and Gabriel

Kacey and Michael want people with MS to know that they should have a venogram to see if the jugular vein is narrowed. There is nothing to lose. “It might not be a cure, but we have no doubt that this treatment is beneficial,” they said. “It brought our family back together!”

- by Sharon Cillis, RN

V-AWARE THE JOURNAL OF THE CENTER FOR VASCULAR AWARENESS 15
Several months ago, I needed repair work done at my house. Prior to enlisting the services of the people who did the job, I checked several references and inquired about their experience and expertise regarding the problem.

I wanted to know if they had done this kind of work before and where they had learned to do it. I considered it routine to ask such questions before having a repair done to my house, which is why I am always amazed that very few patients ask me how and where I trained and what my experience level is as a vascular specialist.

**STEPS TO SPECIALIZATION**

Becoming a vascular specialist isn’t the easiest of tasks; the medical authorities won’t let just anybody operate on blood vessels. In fact, after college, it takes a commitment of 9 to 13 years to become qualified in vascular surgery.

The first step in becoming a vascular specialist is undergraduate school. There, you must take a number of required courses that emphasize biology and chemistry. These courses are very difficult and really don’t have much to do with medicine, but they weed out people who may not be academically qualified to practice medicine. These courses also prepare future doctors for the MCAT, a standardized test used in the selection process for medical school.

Once accepted into a medical school, the student will spend the next 4 years in a strenuous and competitive academic environment. The first 2 years mostly consist of classes and examining patients. The second 2 years provide more real-life medical experiences. Student rotations are completed in all the specialties, from internal medicine to orthopedic surgery.

Upon completion of medical school, graduates proceed to residency, where they train in a particular specialty such as general surgery or internal medicine. From there, individuals can go on to other subspecialty training, if desired.

**DEVELOPING THE VASCULAR SPECIALTY**

In the 1960s, vascular specialty training was not much more than a 1-year apprenticeship with a general surgeon who performed predominantly vascular surgery. As new techniques evolved, more training was required, and the American College of Surgeons (the governing body of surgery) decided that students undergoing this extra training should be allowed to have additional qualifications included in their general surgery boards. In this training scheme, the vascular specialist would spend 5 years in a general surgery residency and then undertake an additional year of vascular surgery-specific training. After completing these steps, the doctors would be considered board certified in both general and vascular surgery.

In the last 15 years, however, the landscape of vascular surgery has changed, and the concept of the vascular specialist has arrived. Not only do trainees need to learn surgery of the blood vessels, but now they must also master a variety of techniques such as
aortic endografts, stenting, balloon angioplasty, laser vein ablation, and medical management of vascular disease. To cover these additional techniques, vascular training was extended from 1 year to 2.

Thus, trainees have been required to undergo 7 years of intense training beyond medical school in order to become vascular specialists. Due to this fact, and related to the finding that many of these trainees no longer performed general surgery once in practice, another training paradigm emerged.

THE 5-YEAR PLAN
There are now training programs that allow a young doctor out of medical school to complete 5 years of training to become eligible for board certification in vascular surgery. The 5-year program includes the training in vascular surgery, as well as other rotations in cardiology, nephrology, intensive care medicine, and general surgery. Upon completion of the 5 years, these doctors are board eligible in vascular surgery only.

Even after this training, and the vascular specialist heads out into practice, the learning does not end. All vascular specialists must maintain certification, which requires passing a written test every 10 years and completing a certain amount of continuing medical education hours. This ongoing education is often in the form of conferences the physician attends where new techniques and results are presented and discussed. Often, these meetings are on the international level, where physicians from all over the world share ideas regarding current vascular care.

Additionally, as new techniques evolve, the use of medical simulation has become popular. Every year, new products are developed for vascular implantation; simulators allow physicians to deploy these devices in a realistic, controlled atmosphere before they use them in a patient.

I recently had the opportunity to deploy a new thoracic stent graft in a simulator. The experience is quite realistic and provides valuable information.

These “NASA-like” training devices are also used extensively by trainees for the development of basic catheter-wire skills before providing direct patient care. Simulation also allows for difficult real-life scenarios to be demonstrated and practiced, reducing the length of such procedures performed on actual patients.

TRAINING FOR THE FUTURE
Over the next decade, I anticipate that more vascular specialists will be trained in the 5-year paradigm right out of medical school. This scenario is probably the only way to meet the projected shortage of vascular specialists in the coming decades. I anticipate the bulk of procedures performed to be catheter based; thus, the use of simulation in training will increase. Additionally, the “maintenance of certification” process will most likely become more rigorous and include both cognitive and technical evaluation requiring specialists to stay on top of their game to provide the best possible care.

No matter what route is taken, the training to become a vascular specialist is and will remain exhaustive, all-encompassing, and ongoing. The stringent requirements of training are exactly what allow the vascular specialist to offer a variety of effective treatments tailored to patients’ specific vascular problems.
The Next Wave in Vascular Healthcare Delivery
R. Clement Darling III, MD

By the year 2020, care of the vascular and cardiovascular patient will be an increasingly complex issue; more than 80 million Americans will have developed significant atherosclerosis and its unfortunate consequences.

Almost two-thirds of these individuals will have primary vascular disease as their most pressing issue. The medical profession must accept this fact and formulate a strategy to manage this issue in both an efficient and cost-effective manner.

System for Success
The solution for vascular care in 2020 will require a unique approach. In other countries, rationing of care is an option and evaluation by a specialist is subject to prolonged waiting periods. I believe, however, that we will create a comprehensive vascular healthcare system here in the United States that will provide patients with easy access to vascular specialists. Patients, through an extensive vascular care network, will have an initial evaluation near their home. Their records will then be reviewed by a group of vascular surgeons who can provide input into medical risk factor modifications and then decide if intervention is both appropriate and necessary. If so, they can refer the patient for either minimally invasive endovascular treatment or open surgical therapy. The complexity of the intervention will determine whether care at a local hospital is reasonable, or if referral to a tertiary care institution that has ties to the local vascular surgeon is most appropriate.

Through this process, options will be maximized, and this system will preserve access to cutting-edge technology and expertise while minimizing inconvenience. For this streamlined approach to be feasible, however, we need to address several significant concerns: adequate access; efficient delivery; and accountability by physicians, insurance carriers, and hospitals. Only then can we maximize outcomes and minimize waste. The focus of this new paradigm must involve education, disease prevention, appropriate delivery of care, and adequate follow-up.

Problems of Today
Our present healthcare system involves excess redundancy, poor resource utilization, and significant interference from for-profit insurance companies who simultaneously deny and deliver care. More than 31 cents of every dollar in American health care is spent on insurance administration and oversight. This figure is in distinct contrast to most Western countries where the overhead ranges from 8% to 17%. Too much time, energy, and capital are spent on limiting patient care or denying both healthcare facilities and providers the proper reimbursement for procedures performed. At the same time, there is a significant amount of unnecessary testing ordered to avoid malpractice litigation, poorly directed patient care, and a nonsystematic approach to the workup of individuals with peripheral vascular disease.

We are at the tipping point and must make a decision about how to proceed. How can providers have access to the
newest technology, and how can patients see the appropriate physicians who will get them on the road to the quickest recovery without spending an ever-increasing portion of our gross national product on health care? Health care should start and end with the patient and the provider. Allowing Americans access to appropriate medical care is imperative but must be done through a cost-effective yet efficient system.

A SPECTRUM OF CARE
The best way to treat vascular disease is to prevent it, thus minimizing its destructive complications. Patients must be educated, taught healthy lifestyle choices, and given appropriate care when needed. These goals cannot be accomplished, however, by excluding individuals diagnosed with atherosclerosis from seeking specialty care, or, more importantly, by delaying evaluation.

Treatment of patients with vascular disease is not a one-stop occurrence; rather, this is a process that must continue throughout their life either at the level of the family practitioner or by the vascular specialist. In order to ensure a seamless transfer of information from the primary care physician to the vascular specialist, we must develop an integrated electronic healthcare record that can transmit correspondence, test results, and diagnostic imaging through the Internet. Office visits will be more efficient, so that the physician and the patient can make a more informed care plan without an unnecessary delay as data are located and gathered.

Insurance companies are investigating different avenues of remuneration for both physicians and hospitals in a global fashion instead of a fee-for-service basis. How each gets paid for services will change dramatically with incentives for quality and not quantity of treatment. Unfortunately, not all hospitals can offer every service. A network of hospitals will be established in each region to provide concise, cost-effective, and most importantly consistent vascular care. These networks would be set up through centers of excellence for the most complex issues with regional satellites that can assess individuals under standardized protocols, offer the options of therapy, allow evaluation by vascular surgical specialists as necessary, and ensure follow-up in their local region unless specialized imaging is required in a more centralized facility.

Cost containment doesn’t mean denying services as much as using services appropriately. Forming a network with centers of excellence allows vascular specialists to educate the public as well as the referring physicians such that both parties understand reasonable expectations through medical therapy, interventional treatment, or open surgery for vascular disease. By having cohesive, organized satellites in underserved areas, the vascular center can better analyze results, follow patients with a minimal amount of inconvenience, and identify failures in each of the three treatment arms. With early identification, we can modify risk factors, improve patients’ vascular health, and intervene only if it is truly necessary for patient benefit. This kind of change requires the use of evidence-based medicine, helps analyze emerging technologies, and provides all patients within a geographic region with appropriate and optimal vascular care.

ENCOURAGING COLLABORATION
The future of vascular care in America will require a comprehensive, multidisciplinary team approach to efficiently and productively treat patients with vascular disease. This tactic must include collaboration among primary care physicians, vascular surgeons, endocrinologists, cardiologists, neurologists, vascular nurses, and technologists, among other healthcare professionals. Much like treatment for cancer, we need a programmatic approach with evidence-based protocols and meticulous follow-up. Such efforts have to be performed in a collegial atmosphere where the insurance companies adequately and reasonably reimburse both providers and hospitals, and these entities work to minimize the overhead to insurance companies. For the benefit of our patients, we must develop a network that provides comprehensive coverage, quality results, and access to cutting-edge vascular care in a cost-effective manner.
Advances in technology have changed the way many people live their lives.

Smartphones, laptop computers, MP3 players, and Twitter are just some of the things most people cannot live without. People work and communicate with each other anywhere in the world, instantly. Medical technology has also evolved, changing the way patients are diagnosed and treated.

Physicians are now focusing on preventive care rather than just treating issues as they arise. People who need treatment have more options, including less-invasive surgeries. The general public has a better understanding of the disease process, making it possible for people to take charge of their health. But how did we get to this point?

COLLABORATION TO EVOLUTION

We are in an era where there is a growing collaboration between information technology, medical imaging, the pharmaceutical industry, and medical device manufacturers. With the newest technology, we are able to identify and target a disease at a cellular- and tissue-specific level to maximize therapeutic results and minimize side effects. A patient with an aneurysm is able to undergo a computed tomography scan, and within minutes that scan can be transformed into a three-dimensional image that can be viewed by physicians anywhere in the world. The ability to share such information has allowed physicians to gain access to devices in specific sizes to better fit patients' anatomy.

Today physicians are able to share ideas and learn of the newest technique by viewing live cases performed in operating rooms anywhere in the world. Robotic technology has also affected the way surgery is done. This technology has been studies in endovascular aortic aneurysm repair and potentially has the ability to reduce procedure time, add extra precision, and reduce radiation exposure time. Aortic devices that used to be hand-sewn are now made by robotic arms.

Changes in the way we manage peripheral artery disease has evolved to provide many choices to patients.
Today, patients with critical limb ischemia can choose from traditional leg bypass surgery or minimally invasive techniques such as stenting and angioplasty. Through research, data are now being collected to see if new blood vessels can form (vasculogenesis) using bone marrow concentrate. This treatment would essentially help salvage limbs that may have been amputated in the past.

Stroke prevention has evolved as well. Today there is an increased awareness of the signs and symptoms of stroke. Physicians are doing better screening for carotid stenosis and treating patients with improved outcomes. In the past, surgical carotid endarterectomy was the only available treatment for carotid stenosis, but with new and improved technologies such as stents and cerebral embolic protection devices, carotid stenting has also become an acceptable treatment approach, in select patients.

THE ROLE OF RESEARCH
The medical community bases practice on data-driven information. But where do the data come from? This is where research plays an important role in medicine and surgery.

Studies enable researchers to gain the knowledge they need to establish facts. In the United States, the Food and Drug Administration does not allow any drug, device, or procedure to be marketed to the general public without proof of safety and efficacy in human subjects. In order for technology to continue to evolve, voluntary participation from patients is necessary. Without volunteer patients’ participation in research trials the benefits of current available medical treatment would not be possible; furthermore future medical advancements would halt.

Today’s research will give us the treatments of tomorrow. With all the new and exciting changes in health care, however, we need to maintain a balance between the science, research, innovation, and patients’ needs, and it is vital not to compromise ethics for the sake of research. With this balance in mind, we can continue sound, ethical research and find cures for diseases, improve quality of life for patients, develop more minimally invasive procedures, and prevent health problems through improved innovation and technology.
Benita Zahn, MS

My husband is an old-fashioned kind of guy and, by that, I mean he hates computers.

If that's you, too, you should know that your world will be very difficult in the next decade because those who remain computer illiterate will be left behind.

Computers already dominate medical treatment—consider computed tomography (CT) and magnetic resonance imaging (MRI) scans and pharmacy departments, to name a few. Over the next 10 years, computers and the Internet will permeate all areas of medical care. Let’s start with the office visit.

THE ONLINE OFFICE
Who hasn’t had to wait to see the doctor? As Victoria Elliott writes in the March 8, 2010, issue of AMEDNEWS.com, if patients wait for what they perceive as a long time, they may leave the practice and never return. That’s why, by 2020, savvy medical practices will not only be offering wireless Internet service in the waiting room, they’ll have a Web site for their patients to access.

Ideally, such a site will provide information pertinent to care and treatment that patients can follow, questions and answers about conditions that commonly prompt an office visit, and an interactive area where patients can leave questions for their doctor or other healthcare professional in the practice. These questions could be answered even before the patient arrives. The interactive area of the Web site would also provide an opportunity for patients to detail the reason for the visit so the face-to-face time could be maximized. That Web site could also be updated based on the doctor’s schedule, so patients who have, for example, an appointment at 1:00 PM, could check and see if the doctor is on time. If it were a very busy day for the doctor, the patient would know that he or she could arrive 10, 15, or even 30 minutes later. Less waiting time means happier patients. Computers and the Internet will probably be used for scheduling appointments as well. How much simpler it would be to make an appointment online than to do the “phone dance” with the receptionist!

ELECTRONIC RECORDS
Have you made the switch to electronic medical records? By 2020, you will have done so. By then, we’ll have probably had to deal with some hacking crisis, which will have led to improved information security. Systems to allow medical practices and hospitals to speak to each other will have been established, so pertinent medical information will be available immediately in the event of an emergency. The result of this expanded electronic communication will be lives saved.

But these records won’t be a one-way street. Thanks to the Internet, patients will be able to create their own medical journals, which they can share with their healthcare providers. Although this could make it easier for physicians to know how their patients are living their lives and so be better able to tailor treatment, it won’t fix the ongoing problem of patients who lie about their lifestyles. The technology may be able to create a bar code you wear that records what you eat and drink, and the miles you log on the treadmill or stationary bike. But 10 years isn’t
enough time to change American attitudes toward “Big Brother,” so those coded bands won’t be accepted, at least not within the decade.

**EVER-BETTER TECHNOLOGY**

It’s been barely 30 years since CT and MRI scans made their way into the mainstream; now those imaging approaches are ubiquitous. Safer CT scans that deliver reduced radiation exposure to the patient are already here. In 10 years’ time, the cost of CT will also have dropped, making it a first-choice test rather than something saved for follow-up. Insurers will have figured out that ordering x-rays first, in many cases, is an unnecessary expense. Instead, we’ll cut right to the chase with the more-detailed tests.

Then there are the technology improvements that we can’t envision today but are surely in development. For example, currently, a person with hypertension can go to a chain pharmacy and have his or her blood pressure measured automatically. Now imagine a patient who is being treated with warfarin (Coumadin) to prevent a stroke. Instead of visiting a lab for regular testing, it’s possible within the decade the patient will be able to visit that same chain pharmacy and find a machine that does simple finger sticks and analyzes blood, on the spot. It’s possible because we can imagine the possibility.

Much of what we’ll see in 10 years will come out of nanotechnology. Already, that world is working on getting “wet” biomedical information onto discs. Again, if someone can think it, it can probably happen. Nanotechnology will also downsize many of the devices we currently use and accept as too big to move. Portable CT and MRI scans may truly be portable at the end of the next decade.

**EASIER GENETIC TESTING**

If all this talk of change has you seeing red and spitting, consider the role saliva will play over the next decade. Just the other day, I received a press release about a new genetic test. It’s called the Scoliscope Prognostic Test and was developed by Axial Biotech in Salt Lake City, Utah. As the release explains, the test is for people ages 9 to 13 who have been newly diagnosed with scoliosis. The test analyzes a sample of a patient’s saliva for 53 known genetic DNA markers for scoliosis. The doctor mails in the sample, and the results are returned by mail within 3 weeks. Test results can predict the odds of the scoliosis worsening or remaining stable.

By 2020, the “tempest in a pharmacy” over saliva tests to determine your genetic predisposition for developing disease will have been settled. As you may recall, Walgreen’s was going to be the leader in selling these tests but got tripped up, not by the technology, but by what to do with the results. Who would be handling the patient consultations? Could people make life-changing decisions at their corner drugstore? That, clearly, will have to be settled over the next decade.

**CUSTOM CARE IS COMING**

This little trip into the future hasn’t even explored all the tailor-made treatment headed our way as researchers learn how to better look at our genes and create therapies that work on our unique blueprints.

If you think these ideas read like a science fiction novel, consider this: It must have been 1987 or so when a friend who worked for Bell Labs came home with a PDA prototype. I was fascinated by the device the size of a legal pad that could potentially replace my day planner, note pad, and phone. But Bell scrapped it. My friend said that his employer thought the gizmo would never amount to much. Talk about missing a glimpse into the future! 🍀
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The Vascular Group was founded to establish a comprehensive vascular care center consisting of board-certified vascular specialists trained in endovascular, angiographic, and surgical techniques. Our physicians distinctively combine expertise in both traditional open surgery and cutting-edge, minimally invasive catheterization techniques to manage peripheral vascular disease. We are committed to promoting vascular health and delivering the highest-quality care to our patients and our community.

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– Joe Theismann  Former Professional Football Quarterback and Sportscaster