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VA Research Currents

RESEARCH NEWS FROM THE U.S. DEPT. OF VETERANS AFFAIRS

Study backs expansion of low-vision program

At 79, retired construction supervisor Melvin Green of Troutman, N.C., still likes to do repairs around the house, such as replacing electrical switches or even restoring a deck. His activity level is noteworthy for anyone his age, but it's even more so because Green has macular degeneration—an eye disorder that blurs sight in the center of the visual field. His condition worsened a few years ago when blood vessels burst in both his eyes. "It cut out my forward vision," says Green.

The Navy veteran has learned to partially compensate for his sight impairment, however, through low-vision therapy at the nearby Salisbury VA Medical Center. The program doesn't improve eyesight per se, but it does teach patients to use various adaptive devices—such as closed circuit TVs or handheld magnifiers—so they can keep on doing daily tasks.

Green received his therapy as a participant in the two-year VA Low Vision Intervention Trial (LOVIT). The study, which involved 126 legally blind veterans in Salisbury and Hines, Ill.,

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Goals in sight—Low-vision therapist Steve Rinne (left) works with veteran Clarence Mikus at the VA Medical Center in Hines, Ill. Mikus is learning how to use a pocket magnifier to read small print on items such as labels, menus and pill bottles.

HIGHLIGHTS

Building the next generation of physician-researchers

by Joel Kupersmith, MD
Chief Research and Development Officer

One of the key advantages of VA Research is that 7 in 10 VA investigators also provide direct patient care. As a result, our studies are strongly focused on the everyday health issues of veterans. By the same token, findings from these studies are more rapidly translated into the medical care provided at VA hospitals, clinics and nursing homes.

Recently, VA announced an exciting new partnership with the Robert Wood Johnson Foundation (RWJF) that will help develop the next generation of physician-investigators in VA and the nation at large. The initiative will involve VA's Research Career Development program and RWJF's Physician Faculty Scholars program, both of which provide crucial funding and mentorship to promising young investigators.

Under the agreement, five VA senior investigators will serve on the Physician Faculty Scholars national advisory committee, acting as mentors to VA and non-VA scholars and helping to direct the program. In addition, five VA career-development awardees will become eligible to take part in the Physician Faculty Scholars program. The first group of VA investigators will be selected for the three-year RWJF program in March 2009 and begin their appointments in July.

We congratulate and commend those senior VA investigators who have already been named to the Physician Faculty Scholars national advisory committee: Drs. Steven Asch, Leonard Egede, Seth Eisen, Mary Goldstein and Laura Petersen. Each in his or her own right has made significant contributions to VA Research and to the health and well-being of veterans, and we look forward to their expanded role in fostering the next generation of physician-investigators.

Artificial kidney will offer 'dialysis on the go'

A new device called an AWAK, the fruit of more than two decades of research by two VA kidney specialists, may soon enable veterans and others with end-stage kidney failure to undergo continuous treatment without being hooked up to a stationary dialysis machine.

AWAK stands for "Automated Wearable Artificial Kidney." It removes toxins and excess fluid from the blood for those whose kidneys can no longer do the job. While portable artificial kidneys have been developed in the past, this would be the first wearable one based on peritoneal dialysis—a process that requires no transfer of blood outside the body and is thus more self-contained.

"What's really new is the patient's freedom," said Martin Roberts, PhD, who invented the technology along with colleague David B.N. Lee, MD, both with VA and the Geffen School of Medicine at the University of California, Los Angeles.

Another plus: The automated technology of the unit allows it to work continuously, as opposed to most dialysis regimens, which provide treatment three times per week or at other specific intervals. "Because it's working all the time, instead of intermittently, you can do a much better job of treating the patient," says Roberts. "So we expect the patient to feel better and live longer."

UCLA and VA are joint holders of the patents for the device, which is being developed by Singapore-based AWAK Technologies and is expected to be ready within a year or two for a clinical trial in Singapore and the U.S., most likely within VA. The units could become commercially available by 2011.

The AWAK is based on peritoneal dialysis. A membrane that lines the abdomen, the peritoneum, acts as a filter for the blood. This contrasts with the more familiar hemodialysis, in which blood is removed from the body, circulated through a machine that purifies it and then returned to the body.

Replaceable cartridges click in and out

In a nutshell, here's how the AWAK works: A special salt solution is infused into the abdomen, where it picks up wastes from the blood vessels—wastes that in a healthy person are excreted in the urine. The solution is then drained from the abdomen and purified by a mixture of "sorbents"—chemicals that act like sponges to soak up the wastes. The clean solution is then sent back to the abdomen to pick up more wastes. The cycle continues indefinitely on an automated basis. All the patient has to do is replace the sorbent cartridge with a fresh one every few hours and occasionally dump out excess fluid and change the battery that runs the pump.

The fact that the AWAK is "bloodless"—that is, no blood circulates outside the body—avoids a number of potential risks, says Lee. And because the chemicals that cleanse the circulating salt solution also regenerate and recycle its protein content, patients can avoid protein loss, a common problem with conventional peritoneal dialysis. Moreover, the steady, continuous dialysis offered by the unit avoids drops or spikes in levels of fluids and body chemicals that could jar a patient's system.

Notwithstanding the complex inner workings of the AWAK, the exterior will have a streamlined look. In one proposed model, a pair of AWAKs—each containing a maze of tubes fitted around the cartridge and other components—will be mounted on either side of a sporty vest and tucked neatly inside removable pear-shaped covers.

According to Lee, a user's mobility will be limited "only to the extent that he or she has to wear the device." The AWAK weighs about four pounds, he said, but may get lighter with future models.

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Editor: Mitch Mirkin

A new approach to detecting mild brain injuries

Traumatic brain injury (TBI)—even when it is relatively mild—can have all the subtlety of a wrecking ball in terms of how it affects the lives of veterans and their families. But when it comes to diagnosis, mild TBI *is* subtle—to the point where it often can't be detected through conventional brain scans.

Mingxiong Huang, PhD, and Roland Lee, MD, of VA and the University of California, San Diego (UCSD), are among several VA scientists searching for a better way. With collaborators at UCSD and the Marines' Camp Pendleton, Huang and Lee are exploring whether newer brain scanning methods can detect injuries missed through ordinary MRI or CT scans. Their study will involve up to 150 veterans and military personnel.

One of the technologies being used is MEG, short for magnetoencephalography. A MEG scanner resembles a giant salon hair dryer. It records electromagnetic signals given off by brain cells as they "talk" with each other. The biggest plus of MEG relative to other scanning technologies is its speed: It captures bursts of neuronal cross-talk that last only a few milliseconds. (Think of the time it takes between seeing a red light and stepping on the brake pedal.) Other imaging methods that show brain activity, such as functional MRI or PET scans, have their own advantages but are far slower. Also, data from MEG scans can be overlaid on a map of the brain, and abnormalities—even subtle ones—can be visualized as patches of color, indicating precisely which areas of the brain may be damaged.

According to Huang, injured brains generate pathological low-frequency brain waves—like those seen in normal patients during deep, dreamless sleep. He believes

Eavesdropping on neurons—Mingxiong Huang, PhD (left), and Roland Lee, MD, study an image from a MEG scan of the brain. The technology captures electromagnetic signals from brain cells and may be able to show subtle abnormalities missed by other diagnostic methods.

Conventional MRI and CT scans may fail to pick up subtle signs of brain injury.

the reason may be that damaged neurons become like frayed wires, unable to conduct impulses efficiently. MEG's ability to noninvasively measure and "localize" these abnormalities, he says, may be critical in diagnosing brain injuries.

The costar in Huang and Lee's vision is DTI, or diffusion tensor imaging. A relatively new form of MRI, this method records how water molecules move, or diffuse, through the nerve fibers that make up the brain's white matter. These fibers link different regions of the brain, like the cables connecting computers on a network. Problems in the white matter—for example, nerve fibers that are not bundled together coherently or that have lost their fatty "myelin" coating—show up in DTI scans but not in regular MRI scans.

Huang says he hopes to eventually incorporate a third imaging technique, chemical shift imaging (CSI), also called MR spectroscopy imaging. This method reveals the distribution of certain chemicals in the brain—another potential marker for subtle brain injury.

"The measurements of neuronal electromagnetic signals using MEG, the diffusion property of the white matter fiber tracts using DTI, and metabolic information using CSI should provide a comprehensive picture of TBI," says Huang. "All of these imaging modalities are non-invasive and can be performed multiple times" over a long-term study. He notes that in addition to aiding diagnosis, they may be helpful in evaluating the effects of new TBI medications or other treatments.


Photos by Jerry DeLiegre

VISION *(from page 1)*

tested the effectiveness of providing low-vision therapy on an outpatient basis. Until recently, veterans with low vision were treated mainly at regional centers that were usually far from their homes—and that often had waiting lists. In Jan. 2007, however, VA announced a major three-year expansion of outpatient vision services. The move came before the findings from LOVIT were released—they were published in the *Archives of Ophthalmology* this past May—but the study offers a resounding confirmation of the benefits of outpatient low-vision therapy.

"Patients who were unable to independently read their mail, their newspaper or their VA appointment letters were able to do so after receiving low-vision therapy and obtaining low-vision magnifying devices to enhance their remaining vision," says lead investigator Joan Stelmack, OD, an optometrist in the Blind Rehabilitation Center at the Hines VA.

'Huge expansion of services'

Veterans who need the most intensive therapy—generally, those with total vision loss—can still receive comprehensive training at one of VA's 10 blind rehabilitation centers. But now, every VA eye clinic nationwide will offer at least basic low-vision services, and access to more advanced therapy is being expanded within every VA region. "This is a huge expansion of services, and we're thrilled," says Ricki Mancil, MA, COMS, CLVT, a low-vision therapist at Salisbury. Stelmack in Hines calls it "a significant milestone."

VA estimates there are more than a million visually impaired veterans over the age of 45, about 90 percent of whom have some remaining vision. About 80 percent of all visually impaired veterans have a progressive disability caused by age-related macular degeneration, glaucoma, or diabetic

retinopathy. Among the newest generation of war veterans, many of those who have suffered blast injuries experience vision problems. Some of these issues may be treatable through low-vision therapy, while others require different approaches.

VA provides adaptive devices for home use

For veterans like Melvin Green, expanded access to low-vision therapy is likely to mean huge gains in quality of life. Green learned strategies from Mancil such as shifting his eye slightly to the side when focusing on an object, to take advantage of his peripheral vision. He also uses a closed-circuit TV for paying bills and handheld magnifiers for reading food labels or other small print.

VA also made Green a special pair of glasses for working at the computer and provided him with a device called an Acrobat—a video magnifier with a 19-inch monitor and a removable camera that rotates 340 degrees. When changing a wall switch, for example, Green might first hold the camera up to the electrical box and view the wiring on the monitor. "I get a picture in my mind of what's in there, and then I can do it."

More than just therapy, Green says he also received plenty of encouragement from Mancil. "She told me there's nothing you cannot do, within reason. She worked with me and showed me that I could do a lot more than I thought. I think she created a 'monster'—now that I found out I can work, I work."

On the Web...

More information about VA's services for low-vision and blinded veterans can be found on the homepage of VA's Blind Rehabilitation Service at www.va.gov/blindrehab. The site does not yet reflect the recently enacted expansion of VA low-vision services but does include detailed descriptions of a variety of programs currently offered.

Low-vision clinic in action—At the Hines VA (facing page, from top), veteran Carl Darling tries on a head-mounted device called a teleloupe, used for watching TV or live events such as sports games or concerts, and practices using a monocular, used to look at street signs, supermarket aisle signs and other large print in the distance. In the lower panel of photos, veteran Clarence Mikus practices using a pocket magnifier to read small print on labels and tries out a telephone with extra-large numbers. This page, from top: Mikus uses a pocket magnifier to read a menu as low-vision therapist Steve Rinne looks on, and Dr. Joan Stelmack instructs veteran Gene Trumbo in the use of a video magnifier, or closed circuit TV, to read a magazine.

A matter of function and comfort

Innovative carts make life easier for spinal-cord-injured veterans

It all started with Sammy Schnurr—a veteran with spinal cord injury (SCI) who needed a new way to get around.

Schnurr couldn't sit in a wheelchair, partly because he had undergone numerous skin grafts in the area around the sitting muscles. When he was a patient at the Milwaukee VA back in the 1980s, the only way for him to move about was to lie face down on a plain cart.

"He had to lie on his stomach for hours on end," recalls Pascal Malassigné, a longtime industrial designer with VA and professor at the Milwaukee Institute of Art and Design (MIAD). "The gurneys that were out there were totally flat and this was very uncomfortable for him. To be able to look up, he had to arch himself up and support himself on his elbows."

The French-born Malassigné formed a design team that included VA experts in spinal cord injury, his industrial-design students, and Schnurr himself. Their task was to create an alternative to wheelchairs that would benefit Schnurr as well as the many SCI patients coping with pressure ulcers—a common and risky malady for those forced to spend long periods sitting or lying down.

The group devised a simple but elegant solution: a cart with a padded, elevated front section that would support the chest and allow patients to safely and comfortably move about and interact with the world around them.

That first device, named the Sammy LS in Schnurr's honor and made available to VA patients in the early 1990s, has since evolved: Malassigné and colleagues are now patenting, through VA, the latest in a series of prone carts that promise to improve life for hundreds of spinal-cord-injured patients. The newest version, a folding, motorized version, has a body-support angle that adjusts from 0 to 45 degrees and a centered power base that allows it to turn on a dime. Malassigné's design collaborators included SCI expert Jeffrey Harrow, MD, PhD, of the Tampa VA and Robert Jensen and John Erdman of MIAD.

According to VA's Audrey Nelson, RN, a former spinal cord injury nurse who has collaborated with Malassigné on earlier prone cart designs, the devices deliver wide-reaching benefits to patients. "They provide an alternative that does not interfere with treatment of pressure ulcers or the healing process and allows the person to be active, mobile and socially engaged." Nelson, who

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Then and now—In the bottom photo, from the early 1990s, veteran Sammy Schnurr is seen on the original "Sammy LS" prone cart, a marked improvement over the plain gurney to the right. In the top photo, taken last month, veteran Michael Thomas tries out the newest prone cart model. With him are the cart's lead designer, Pascal Malassigné, and nurse Margaret Amato, SCI program manager at the Milwaukee VA.

Edward Boyko, MD, MPH, an investigator with VA's Seattle Epidemiologic Research and Information Center, was cited in an Aug. 13 *Associated Press* article about a study he coauthored, "Alcohol Use and Alcohol-Related Problems Before and After Military Combat Deployment, which appeared in the Aug. 13 *Journal of the American Medical Association.* The study found that Reserve and National Guard troops who were deployed and exposed to combat were 63 percent more likely than non-deployed personnel to develop drinking problems. Younger service members were most at risk. The results should help guide planning for future prevention and treatment programs, Boyko told the *Associated Press.*

Kristin Nichol, MD, MPH, MBA, chief of medicine at the Minneapolis VA and an investigator with VA's Center for Chronic Disease Outcomes Research, was quoted in a Sept. 2 *New York Times* article about the controversy over the effectiveness of flu vaccines for the elderly. Nichol, also a professor at the University of Minnesota, has authored numerous studies and testified before Congress on the topic.

Douglas Richman, MD, a staff physician and director of the Center for AIDS Research at the San Diego VA Health Care System and the University of California, San Diego, was named second among the world's 10 "highest impact HIV/AIDS authors" in the July 25 issue of the journal and news magazine *Science.* The rankings were based on how often the researchers' work has been cited by other scientists. Most recently, Richman was part of an expert panel convened by the International AIDS Society to author newly updated treatment recommendations for HIV infection. The recommendations appeared in the Aug. 6 *Journal of the American Medical Association.*

Paula Schnurr, PhD, deputy executive director of VA's National Center for PTSD, received a 2008 Health Breakthrough Award from *Ladies' Home Journal* for her leadership of a landmark clinical trial that compared two types of psychotherapy for treating PTSD. The trial included 284 women and was the largest trial to date of PTSD treatment in female veterans and active-duty military personnel. It found that prolonged exposure therapy, in which counselors help patients gradually recall and process their traumatic memories, was more effective than another counseling approach called present-centered therapy. As a result of the study, published last year in the *Journal of the American Medical Association,* VA has undertaken a nationwide training program to expand the use of prolonged exposure therapy for treatment of veterans with PTSD.

Hugh Herr, PhD, a prominent prosthetics researcher and engineer with MIT, VA and Brown University, was featured in a June 19 *Christian Science Monitor* article headlined "Military Inventions Hit the Civilian Market." The story focused on how technologies that are initially developed in response to the needs of military personnel and veterans—such as an innovative foot-ankle prosthesis invented in Herr's lab—often eventually find an important niche in the civilian health-care sector.

Louise Walter, MD, a physician-researcher at the San Francisco VA Medical Center, was quoted in a July 8 *New York Times* article about the pros and cons of recommending breast-cancer screening for elderly women. Walter has published several studies examining the benefits and risks of mammograms, PSA tests, and other cancer screenings for older patients, especially those who are in poor health and have limited life expectancies.

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today heads the Patient Safety Center at the Tampa VA, says patients who would otherwise be bedridden, lying on their stomach or side, are able to "independently propel around the unit or hospital grounds, attend therapy, socialize and participate in recreational activities."

But Malassigné's vision for the carts goes even further. As a designer, he says the product has to be aesthetically pleasing. That translates into a greater likelihood that patients will use it.

"Before our carts, the state of the art was flat gurneys made of stainless steel. The patient would lie on a flat slab that was black, gray or dark green. There were no provisions for user comfort. Psychologically speaking, the patients didn't want to lie on them because they were uncomfortable and unappealing."

Malassigné's first cart won a major design award, and his latest version is also no slouch in the looks department: It has red powder-coated side rails and body supports covered in a black leather-like material. "We wanted it to be as attractive as possible," he says. "You want to be proud of the product you're sitting on."

INVESTIGATOR SNAPSHOT

Boning up on prosthetics—Roy Bloebaum, PhD, an expert on bone healing, joint replacement and biomaterials, is part of a team at the Salt Lake City VA and University of Utah developing a new way to attach prosthetic limbs to the body. The work, supported by VA, the Department of Defense and two private companies, is based on osseointegration, the process by which bone grows around and attaches to porous-coated titanium implants.

Discovered in Sweden in the 1950s, the concept means that an artificial leg can be affixed to a titanium rod anchored directly in the bone. This avoids socket-related problems such as skin sores and pain and gives lower-limb amputees a more natural sensation of what's underfoot. The technique is used on a limited basis in Europe, and Bloebaum and colleagues want to improve it to the point where it can be used widely for U.S. veterans and other amputees. Among other tasks, the scientists are testing ways to further enhance the fusion of bone and titanium and prevent tissue infections around the implant.