

PROGRESS NOTES

MUSC'S MEDICAL MAGAZINE // FALL 2016

Old Drugs, New Tricks

Repurposing older pharmaceuticals to
accelerate next-generation medicine



MUSC again named as state's No. 1 hospital

MUSC was named by *U.S. News & World Report* as the number one hospital in South Carolina and one of the country's top 50 hospitals in the treatment of ear, nose and throat disorders; gynecology; nephrology; urology; and cancer.

MUSC Health CEO **Patrick J. Cawley, M.D.**, said he's proud of the rankings. "These rankings reflect not just reputation, but patient outcomes, teaching the next generation of care providers and developing new innovations to improve health and health care leadership," said Cawley.

Paul R. Lambert, M.D., chair of the MUSC Department of Otolaryngology-Head and Neck Surgery, was pleased his division was again recognized as one of the nation's leading ENT centers. "We set a goal more than a decade ago to reach the top 20, and this year's #14 ranking is a further validation of our excellence in the MUSC tripartite mission of patient care, education and research," Lambert said.

Other top 50 rankings included gynecology at No. 39; nephrology, No. 43; urology, No. 45; and cancer, No. 47.



Dr. Paul R. Lambert, chair of the Department of Otolaryngology-Head and Neck Surgery, examines a patient.

Only 32 of the 6,239 hospitals in the American Hospital Association's Annual Survey Database evaluated nationwide have 11 or more adult and/or children's specialties ranked, placing MUSC among the top 1% of all American hospitals with similar rankings.

Upcoming CME Conferences

The following conferences, sponsored by the Medical University of South Carolina, will be held in Charleston unless otherwise noted. Visit <http://musc.edu/cme> for a complete list of CME conferences.

November 4-5, 2016 2016 Storm Eye Institute Fall Meeting and Alumni Reunion
MUSC Bioengineering Building—Auditorium

November 9-11, 2016 Neonatal Pharmacology 2016: Incorporating Evidence-Based Practice into Clinical Decision Making
Francis Marion Hotel

December 2-4, 2016 19th Annual Frontiers in Pediatrics
Francis Marion Hotel

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Tackling obesity with telenutrition

Mobile telemedicine helps skilled nursing facilities reduce hospital readmissions.



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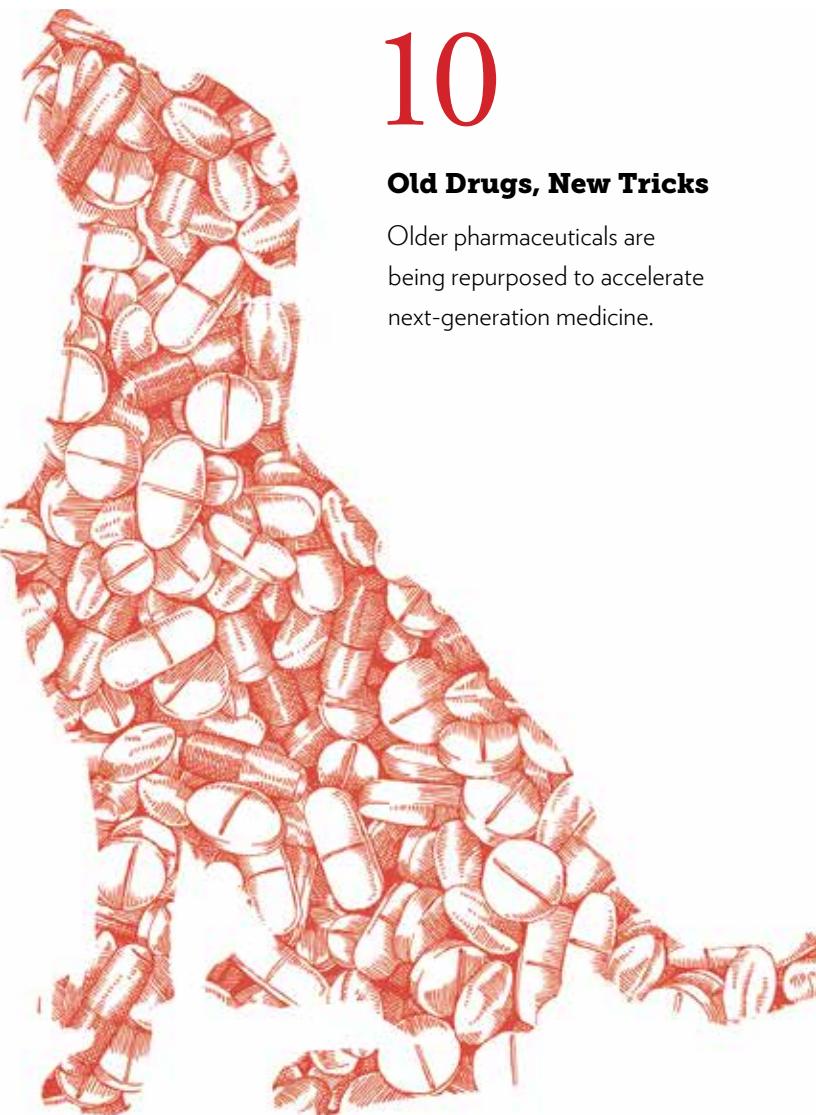
Surgeons at the MUSC Health Spine Center tailor care to the needs of the patient.



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Welcome

New Physicians

On the cover: Old drugs, new tricks. Using new technology, researchers are taking a second look at older pharmaceuticals for new indications.

Illustration by Emma Vought.

LASER WITH A VIEW

Device enables visualization of cardiac tissue during ablation

BY LINDY KEANE CARTER

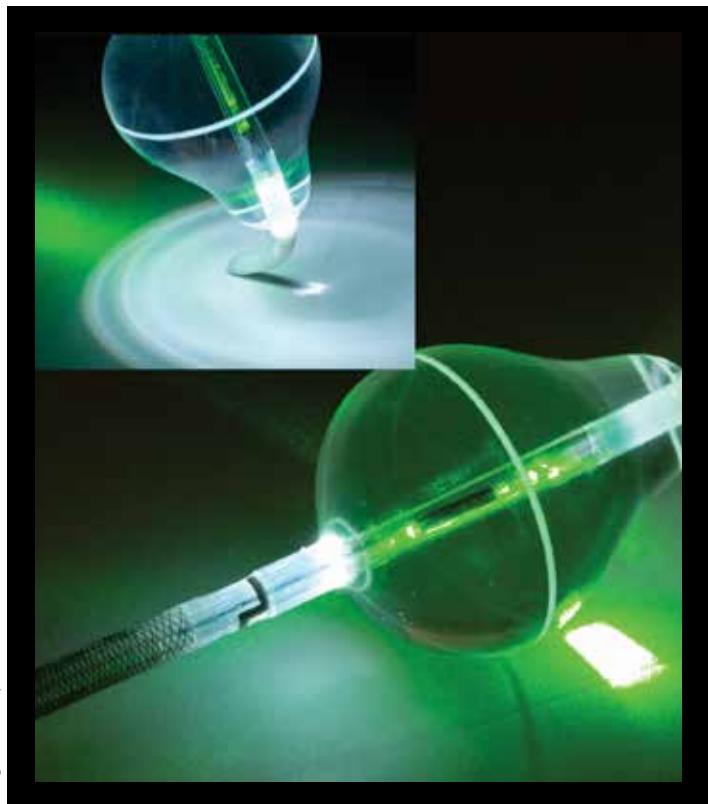


Image courtesy of CardioFocus.

The Heart and Vascular Center (HVC) at MUSC Health played a key role in a 2015 study (NCT01456000) that established the safety and efficacy of an endoscopic ablation system for treatment of paroxysmal atrial fibrillation (AF) that will soon be on the market.

The visually guided laser balloon (VGLB) system (HeartLight®; CardioFocus, Marlborough, MA) recently received premarket approval by the US Food and Drug Administration. The system is expected to be available at MUSC Health in late 2016.

Of the study's 19 sites, the HVC was one of the two highest-enrolling (treating 55 of the 353 patients), and primary investigator **Frank A. Cuoco, M.D.**, director of the HVC's cardiac electrophysiology laboratory, treated the most patients as a single operator.

"This new laser balloon catheter is going to be another great tool in our arsenal for treatment of patients with symptomatic atrial fibrillation," said Cuoco. "We showed that it has a lower injury rate and better long-term outcomes."

The investigators reported their results in the *Journal of the American College of Cardiology*.¹ The study compared the efficacy

and safety of VGLB ablation vs. standard irrigated radiofrequency ablation (RFA) during catheter ablation of AF.

The VGLB system incorporates an endoscopic balloon catheter that uses a laser for the ablation. The physician moves the catheter to each of the four pulmonary veins (PVs) that create the irregular heartbeats that start and maintain AF. The goal is to heat the atrial tissue around the PVs to create a lesion that will block conduction of the erratic electrical signals. The compliant balloon catheter is inflated (creating contact with the atrial tissue), and the endoscope within enables the physician to see for the first time in this kind of procedure where he or she can ablate the heart tissue. The physician then directs the laser energy to ablate around the PV orifice. The endoscope enables him or her to ensure in real time that the lesions overlap for complete ablation around the PVs.

With earlier technologies, the physician worked within an electrical map of the heart and moved the catheter around this "shell" to mark where he or she thought the ablation had occurred. "But with the scope inside the catheter, it's direct visualization," said Cuoco. "This allows for efficient and complete ablation of the target tissue."

In the clinical trial, the safety and efficacy of VGLB ablation proved noninferior to RFA. The mean procedure, ablation, and fluoroscopy times were longer with VGLB compared with RFA, but the primary adverse event rate was lower. Major complication rates were similar between treatment arms.

The patients who will be best served by this procedure will be those with AF who have experienced adverse effects from medication or for whom medications have been ineffective.

Other clinical trials on the horizon at MUSC Health include renal denervation and the use of ligation of the left atrial appendage to improve AF ablation outcomes. For more information, contact Dr. Cuoco at cuoco@musc.edu.

Reference

- ¹ Dukkipati SR, Cuoco F, Kutinsky I; for the HeartLight Study Investigators. *J Am Coll Cardiol*. 2015 Sep 22;66(12):1350-1360.

DAMPING INJURY AFTER STROKE

Innate immune system's navigation can be hacked for stroke protection

BY SVER AUNE

Stroke patients are faced with danger on two fronts. First, when a clot blocks blood flow, brain tissue is starved of oxygen and begins to die. Second, when blood flow is restored, components of the complement system, part of the innate immune system that protects the body against pathogens and other invaders, rush in to remove the dead tissue. Neighboring brain cells are often attacked and removed as well, producing secondary injury that drives more severe stroke.¹

Antibody-based complement inhibitors patented by MUSC immunologist **Stephen Tomlinson, Ph.D.**, and his collaborators at the University of Colorado have protected against secondary injury after stroke in preclinical trials by blocking the part of the complement system that attacks endangered, but salvageable, brain tissue.

Tomlinson hopes that one day these complement inhibitors could be given along with tissue plasminogen inhibitor (tPA), the only currently approved therapeutic agent for stroke, to reduce morbidity. Indeed, Tomlinson has shown in a preclinical model that his targeted complement inhibitors can be safely co-administered with tPA and further can prolong the therapeutic window of safe treatment from three to twelve hours after stroke.

After a stroke, immunoglobulins (i.e., antibodies) move in to remove the dead tissue, honing in on danger-associated molecular patterns (DAMPs) expressed on the surface not only of dead cells but also nearby stressed and endangered cells. The immunoglobulins then recruit complement to trigger the digestion of both.

Inhibiting complement offers a promising strategy for protecting the brain after stroke. However, this kind of immunity cannot be blocked systemically without risking infection, and the immune system must be allowed to continue its job of clearing dead tissue.²

The complement inhibitors patented by Tomlinson and his colleagues get around these problems by transiently targeting a complement inhibitor specifically to the site of brain injury after stroke.

The precision targeting of the complement inhibitors is made possible by their linkage to the recognition domain of antibodies that Tomlinson has shown are responsible for honing in on DAMPs and initiating secondary injury in a mouse model of stroke. He has also verified that the same DAMPs are present in samples of human brain tissue from stroke patients.

Using a bait-and-switch technology, Tomlinson's inhibitors mimic the ability of immunoglobulins to locate DAMPs on endangered

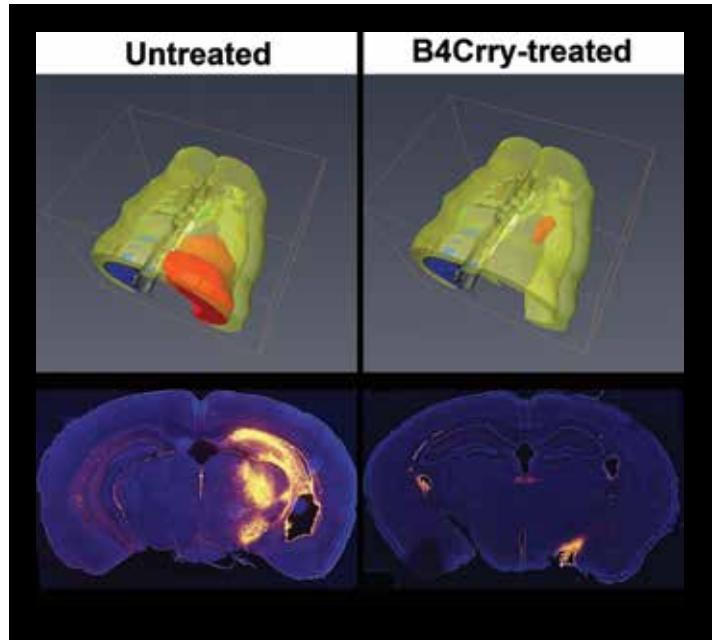


Image courtesy of Dr. Stephen Tomlinson

tissue and to recruit complement, but then block complement once it has arrived instead of activating it.

The inhibitors are removed from the circulation very rapidly but remain bound to the injured brain for a prolonged period, thus preventing local inflammation with minimal effects on the immune system as a whole. Importantly, and unlike many other experimental therapies, Tomlinson's inhibitors also provide effective protection into the subacute and chronic phase after stroke.³

"Our overall goal in the context of stroke is to provide targeted and transient complement inhibition," said Tomlinson. "The complement inhibitor prevents the early inflammatory reaction. Because the inhibitor is targeted, it stays in the affected tissue and doesn't systemically inhibit complement. Because it's transient, we haven't got a continued block on complement activation, and complement is allowed to perform its physiological role in resolving inflammation in the subacute phase after stroke."

Targeted complement inhibitor reduces both lesion size (red in upper panel) and activation of immune cells (lower panel) following stroke.

References

- ¹ Di Napoli M. *Stroke* 2001;32:1443-1448.
- ² Iadecola C, Anrather J. *Nat Med*. 2011;17(7):796-808.
- ³ Alawieh A, et al. *J Neuroinflammation* 2015;12:247.

TACKLING OBESITY WITH TELENUTRITION

Medicaid reimburses nutrition counseling for obese patients. Is telenutrition next?

BY VITRIA ADISETIYO

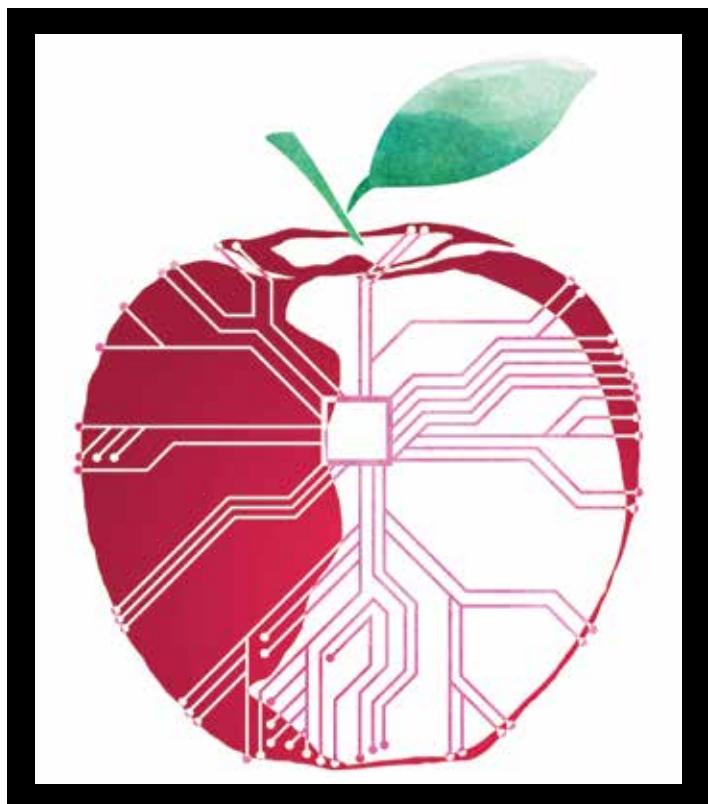


Illustration by Emma Vought

The recently implemented Nutrition Counseling Program for Medicaid beneficiaries with obesity has the potential to help 184,000 South Carolina citizens avoid chronic disease by empowering them to adopt healthier lifestyles. The program is part of the South Carolina Obesity Action Plan, created to address the obesity crisis in South Carolina, where two out of three adults and one out of three children are overweight or obese.

The program promotes collaboration between physicians and dietitians by covering up to six physician visits and six dietitian visits annually. Physicians can refer adult and pediatric Medicaid patients diagnosed with obesity for nutritional counseling with dietitians registered in the program. This is the first time nutrition counseling for obesity has been covered through Medicaid.

Since its launch in August 2015, however, program usage has been unexpectedly low. "A third of people who have Medicaid could qualify for the benefit but we're not having that high of utilization," says **Nina Crowley, Ph.D., RDN, LD**, MUSC Health Metabolic and Bariatric Surgery Program Coordinator. Given that patient

enrollment into the program hinges on physician referrals using the new billing codes, one likely reason for its underutilization is lack of information. "It's been difficult to get support from providers to drop codes," says **Melissa Macher, RDN, LD**, an outpatient and telehealth dietitian at MUSC Health.

To qualify, adults must have a BMI of 30 or greater and a child must have a BMI at or higher than the 95th percentile. For adult face-to-face visits, the code is G0447 (G0447-SC for the first visit). For children, the codes are 99201-99215 and should be accompanied by an appropriate ICD-10 diagnosis code (Z68.54 [preferred] or Z71.3).

Another hindrance is that the Nutrition Counseling Program only covers in-person visits. For patients, particularly those in rural areas, the inconvenience of traveling long distances to receive preventative treatment likely discourages follow-through. Telenutrition could remove this burden and facilitate consistency in follow-up visits.

"We have seen significant improvement in many of our patients' weight, eating habits, and exercise levels," says Timothy Keane, D.O., a pediatrician at Sea Island Pediatrics in Beaufort who regularly refers patients for telenutrition counseling at MUSC Health.

The MUSC Health Center for Telehealth is conducting a Tele-health Nutrition Counseling Initiative wherein all patients referred for nutrition counseling (regardless of insurance type) will be enrolled, all expenses paid. Along with demonstrating feasibility and efficacy, the initiative will document the number of Medicaid patients receiving telenutrition counseling who would not have had access to a dietitian otherwise. The center will present these data to the state, demonstrating the need for Medicaid to include coverage of telehealth.

When physicians and dietitians navigate logistical challenges and collaborate in treating obesity, they can change lives. Jeremy Rhodes, an eleven-year-old boy whose weight was up to 130 pounds, was referred by Dr. Keane for telenutrition counseling with MUSC Health dietitian **Amanda Peterson, RDN, LD**. Not only has the program helped Jeremy lose ten pounds, it has helped his family. "Over the year we have been with the program, Jeremy has adjusted to eating healthy," says Mrs. Rhodes. "It has gotten his father onboard. He has lost over 60 pounds. It has had an impact on our whole family."

To find a registered dietitian, visit MUSCHealth.org/physician-portal/refer-a-patient/obesity.html (Lowcountry) or <http://www1.scdhhs.gov/search4aprovider/> (statewide).

AN ANGEL ON MY SHOULDER

Mobile telemedicine helps skilled nursing facilities reduce hospital readmissions

BY KIMBERLY MCGHEE

In June, Zeriscope™, a technology company based in Charleston, SC, reached an agreement with White Oak Management (WOM) of Spartanburg, SC, to provide its mobile telemedicine platform to more than a dozen of its skilled nursing facilities (SNFs).

Zeriscope is an enterprise-grade, hands-free, mobile-first, multi-sensor SaaS (Software as a Service) platform. Nurses empowered with a Zeriscope-enabled mobile device are able to stream their point-of-view from a tethered camera system in real-time, high-definition video, with advanced sensor streams such as Bluetooth stethoscope audio.

Like hospitals before them, SNFs are looking to telemedicine to help lower rates of readmission, but the costs associated with traditional point-to-point telemedicine may prove a barrier, as profit margins for SNFs can be very narrow. The answer could lie in mobile telemedicine, which carries a much smaller price tag.

"A point-to-point telemedicine system can cost tens of thousands of dollars and requires a lot of infrastructure," said Zeriscope Chief Executive Officer Bill Harley. "Our system is much less expensive, making it a viable option for SNFs."

In 2017, the Centers for Medicare & Medicaid Services will require SNFs to report hospital readmission rates, and the performance by SNFs on this measure will begin to affect their bottom line in 2018.

White Oak Management was quick to see the potential of Zeriscope™ to improve patient care and prevent unnecessary hospital readmissions. "We instantly realized that the Zeriscope platform could be a game changer in lowering the rates of patient rehospitalization and avoidable readmissions," said John Barber, Chief Financial Officer of WOM.

Without telemedicine, the only recourse for nurses at SNFs is to verbally describe the patient's condition over the telephone. Much is lost in the translation—the physician has no way of assessing the patient's appearance and behavior and no way of checking real-time physiologic data. Because a comprehensive assessment is not possible, the physician often opts—out of an excess of caution—to transport the patient to the emergency department or hospital for further evaluation.

Zeriscope™ makes possible a much more comprehensive assessment of SNF patients by off-site physicians, enabling them to "see the patients" in high-definition real-time streaming video, communicate



with SNF staff, and access real-time physiologic sensor data.

"The ability to see, hear, listen to the heart and lungs, see the EKG, and interact with the staff and family is expected to reduce preventable admissions to the emergency department or hospital," said **Robert J. Adams, M.D.**, President and Chief Medical Officer of Zeriscope. Adams, South Carolina SmartState™ Endowed Chair in Stroke at MUSC Health, is one of the inventors of Zeriscope and has an equity interest in the company, as does MUSC's Foundation for Research Development.

Avoiding unnecessary hospital readmissions with mobile telemedicine not only makes good financial sense; it's good medicine. SNF patients, who may be frail and face mobility challenges, are provided the best of medical care in a setting where they are comfortable without having to endure the stress of ambulance transport and the risk of fractures and infections. Nurses are empowered to treat more patients in place with confidence, knowing they have an angel on their shoulder—24/7 access to the expert advice of a physician.

Surgeons at the MUSC Health Spine Center draw on decades of collective experience to tailor care to each patient's needs, offering both tried-and-true techniques and minimally invasive options.

BY KIMBERLY MCGHEE

Experienced Hands

The MUSC Health Spine Center offers patients with back problems a balanced approach to care—treatment that is tailored to their specific needs, grounded in tried-and-true techniques, but also informed by the latest innovation.

What matters is not just having all of the tools of the trade available but having experienced physicians and surgeons who know which tool to use with which patient.

"We don't just hit one nail," said **Charles A. Reitman, M.D.**, co-director of the center. "We approach the patient from a comprehensive point of view. Patients will always get the best treatment they can get, whether they have a simple problem, a complicated problem, or one that benefits from newer technology."

"We're not just using new technology; we're running trials to develop it here," said center co-director **Bruce M. Frankel, M.D.**

For most patients, non-surgical management will resolve their pain, and the center offers these patients a full spectrum of services to meet their needs, including rehabilitation, injections, counseling, and support for weight loss.

But for the ten percent of patients whose pain does not resolve with non-surgical management, a wide variety of open and minimally invasive surgeries are available. The decision as to which surgical procedure is best suited to each patient's needs is informed by the collective wisdom of the Spine Center's many surgeons, representing decades of combined experience.

For many patients, especially those with complex degenerative disease, more traditional open approaches will be the treatment of choice. But in select patients, newer minimally invasive options can result in very good clinical outcomes with minimal surgical trauma, shorter hospital stays, and a faster return to work and other activities.

A more detailed discussion follows of three minimally invasive procedures available at the center—cervical disc arthroplasty, endoscopic discectomy, and sacroiliac joint fusion.

Cervical disc arthroplasty

When a cervical disc ruptures, its contents can leak out and impinge on a nerve root, causing pain to radiate to the upper chest and arms.

For young, active patients who need to return to work or other activity quickly, cervical disc arthroplasty, in which the damaged disc is removed and replaced by an artificial disc, may offer an attractive alternative to traditional fusion.

"If I have a parent with an active family or someone who has to get back to work quickly, this is a phenomenal operation because the recovery time is so fast," said Reitman. "It's really a game changer."

Successes with knee and hip replacements fueled interest in the development of artificial discs, which typically consist of a polyurethane cushion between two end plates that attach to adjacent vertebrae, and several have obtained investigational device exemption approval and been the basis of clinical trials.

Because these artificial discs preserve a good range of motion, proponents argue that they could prevent adjacent segment degeneration, which some believe to be a consequence of spinal fusion. Immobilizing one section of the spine could put additional pressure on adjacent areas, leading to degeneration.

Cervical disc arthroplasty is generally indicated in younger patients with strong bone and mild disease and is not recommended in patients with advanced osteoarthritis because, unlike fusion, it will not stop the degeneration. The durability of the artificial discs is not yet known, and, since they are often implanted in younger patients, it



MUSC Health Spine Center
surgeons Dr. Bruce M. Fran-
kel (top), Dr. John A. Glaser
(middle), and Dr. Charles A.
Reitman (bottom left)

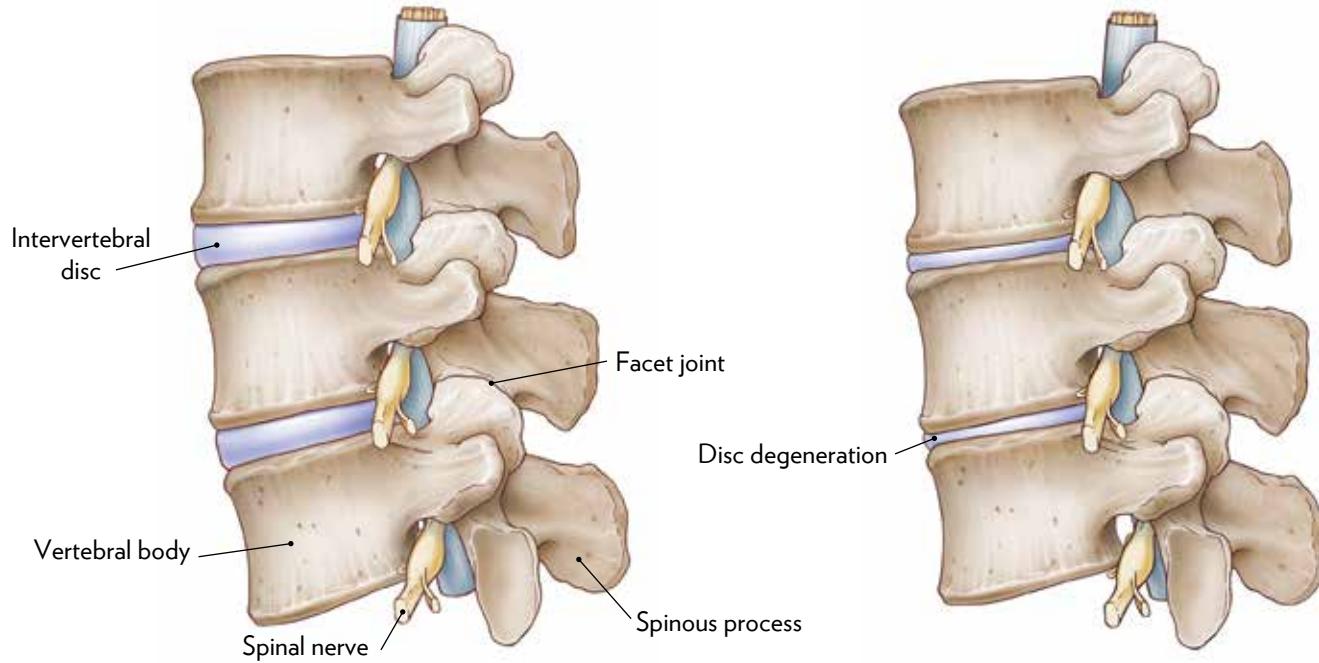


FIGURE. Left lateral view of healthy lumbar vertebrae (left) and lumbar vertebrae showing signs of disc degeneration (right)

is possible that reoperation may be necessary decades later to replace the disc, as is sometimes the case with hip and knee replacements.

Endoscopic discectomy

Herniation of a lumbar disc can compress nerve roots and lead to pain that radiates to the lower back, groin, buttocks, or legs (i.e., sciatica). Substantial pain relief can be attained in many patients by decompressing the nerve root through removal of the ruptured content of the disc and any bony debris. The remainder of the disc remains in place to help maintain the stability of the spinal column.

Open discectomy (OD) and microdiscectomy (MD) are the gold standards for lumbar nerve decompression. Microdiscectomy is a much less invasive but still open procedure that achieves clinical outcomes rivaling OD. A small tube is inserted through a dime-sized incision on the back to serve as the channel through which tiny surgical instruments can be used to extract the disc remnants. A specialized operating microscope is used to enhance the vision of the surgeons as they look down the tube into the site of the affected disc. The tube is advanced into place without cutting the spinal muscles—instead, sequential dilators spread the spinal muscles apart.

Endoscopic discectomy takes things a step further. Surgeons rely not on a microscope for visualization of the disc but on a monitor displaying images captured by an endoscope—a tube with a tiny

attached camera—that has been advanced through a small channel to the disc of interest. To ensure proper positioning of the channel, a wire is introduced under fluoroscopic guidance at the level of the disc herniation and first a dilator and then the tube or channel is advanced over the wire to the affected disc.

"Endoscopic discectomy is an excellent minimally invasive option to treat patients suffering from sciatica," said Frankel.

Endoscopic discectomy can often be done as outpatient surgery, enabling patients to return to work in a matter of weeks, making it ideal for younger, active patients. The ideal candidate has little spinal degeneration and a relatively contained disc herniation (i.e., a single-level herniation that does not span the entire disc). Although endoscopic discectomy has a steep learning curve, in experienced hands, such as those of the surgeons at the center, it has been shown to achieve very good short-term clinical outcomes.¹

Careful patient selection is important to reduce the risk of reoperation due to residual fragments. Patients with broad-based herniation are not good candidates for this procedure because its restricted access compared with OD could make reaching and removing all fragments more difficult and revision surgery more likely. For these patients, the center also offers OD/MD.

In recent meta-analyses,^{2,3} endoscopic discectomy, when performed in appropriate patient populations, was shown to have

shorter hospital stays than MD/OD and similar long-term functional outcomes and rates of complication and reoperation. Clinical trials are needed to definitively evaluate its efficacy relative to MD/OD.

Sacroiliac joint fusion

“Looseness” or movement in the sacroiliac joint (SIJ), which connects the iliac crest of the pelvis with the sacrum, could account for 15 to 23 percent of cases of chronic lower back pain⁴ and 40 percent of cases of chronic lower back pain after lumbar or lumbosacral fusion.⁵ In addition to adjacent segment degeneration secondary to lumbar fusion, other causes of SIJ dysfunction include trauma, pregnancy, inflammatory disease, infection, and tumors.

The capacity of the SIJ to move and generate pain has remained a point of considerable controversy, but evidence is growing that the SIJ can do both.⁶ Indeed, recent clinical trial evidence suggests that SIJ fusion can provide substantial pain relief in select patients.⁴

Several devices have been developed to enable minimally invasive fusion of the SIJ. MUSC Health Spine Center surgeons **John A. Glaser, M.D.**, and **Stephen P. Kalhorn, M.D.**, serve as principal investigators for the MUSC site of the trials of two such devices.

Glaser, who was among the first surgeons in the nation to take an interest in minimally invasive SIJ fusion and who has over a decade of experience performing them, is leading the MUSC site of the ongoing Investigation of Sacroiliac Fusion Treatment (INSITE) trial (NCT01681004). INSITE is randomizing 148 patients with SIJ pain to either fusion with the iFuse Implant System (SI Bone, San Jose, CA) or non-surgical management to compare how many of each group meet the study’s primary endpoint: pain reduction (≥ 20 mm decrease from baseline score on the Visual Analogue Scale [VAS]) by six months without device-related serious adverse events, neurological worsening related to lumbosacral nerve roots, or reintervention.

Early results from the INSITE trial provided for the first time Level 1 evidence that SIJ fusion, in this case using triangular titanium implants, provided superior pain relief and functional outcomes and a better quality of life than did non-surgical management.⁴ At six months, 83 (81.4%) of the 102 patients undergoing SIJ fusion successfully reached the study’s primary end point vs. only 12 (26.1%) of the 46 study patients receiving non-surgical management. After their six-month follow-up visit, patients were allowed to cross over from the non-surgical to the surgical arm of the trial and most (35 of 44) chose to do so. Crossover patients, who had achieved a clinically negligible reduction in VAS pain score after 6 months of non-surgical management, saw a dramatic decrease (from 79.0 to 35.8) six months after minimally invasive SIJ fusion using the study device.

Glaser and the other INSITE investigators recently reported two-year results from the trial.⁷ Greater improvements in pain, disability, and quality of life were seen with SIJ fusion vs. non-surgical management, with a low rate of adverse events and reoperations.⁷

“These findings suggest that SIJ fusion is going to hold out hope for a small subset of patients with chronic lower back pain who until now have been unable to obtain pain relief,” said Glaser.

Kalhorn is leading the MUSC site of the Evolusion study (NCT02074761), a multi-center prospective surgical analysis of patients undergoing minimally invasive SIJ fusion with the Simmetri SIJ Fusion System (Zyga Technology, Minnetonka, MN). The MUSC Health Spine Center was one of only 15 U.S. centers asked to participate. The study will assess pain scores before and after surgery as well as short- and long-term outcomes, including fusion rates. To learn more, contact Aparna Choudhury at choudhur@musc.edu.

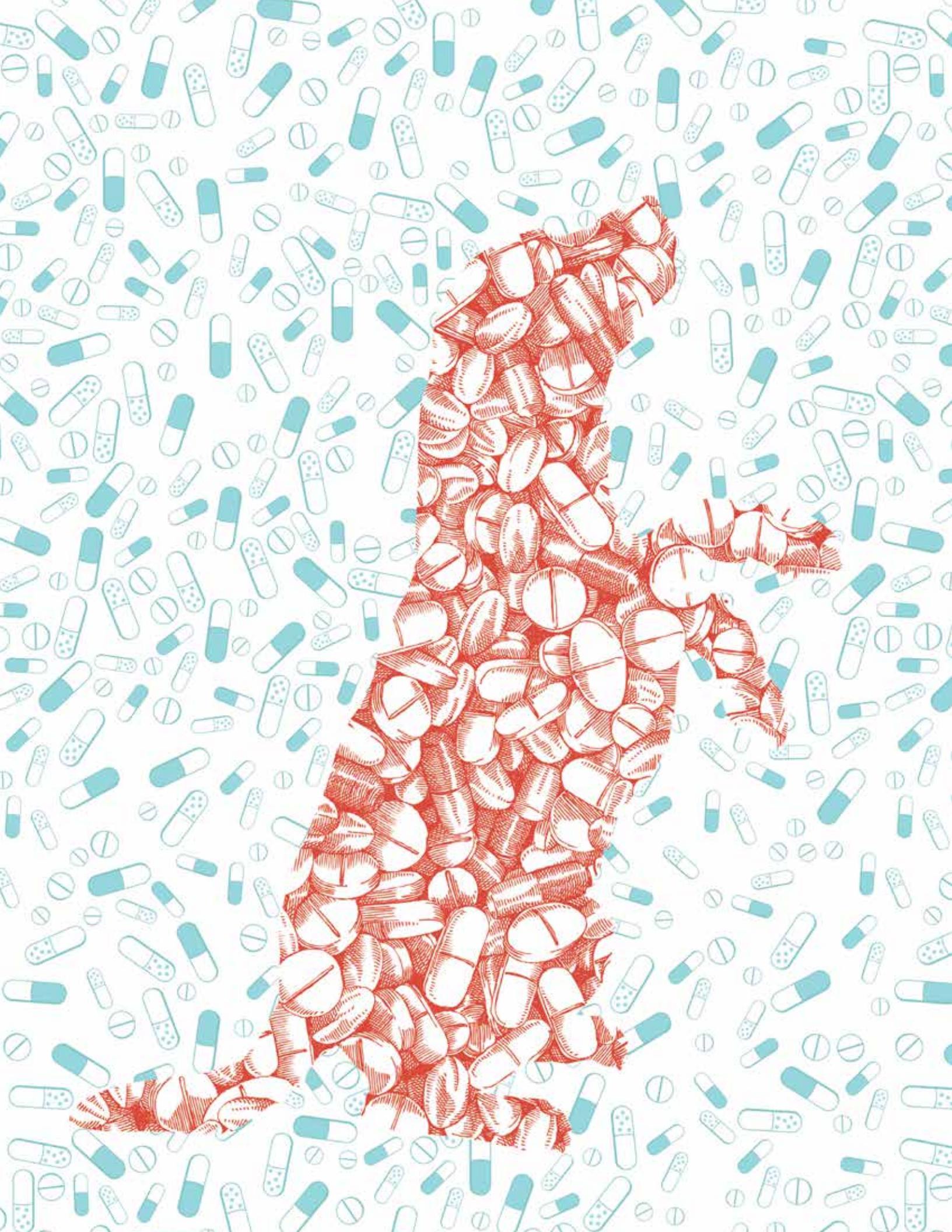
Surgeons at the center offer this minimally invasive SIJ fusion as an outpatient procedure, using biplanar imaging to ensure efficiency, accuracy, and safety. Lateral and anteroposterior views are acquired simultaneously; these 2D images are then transformed into 3D ones that can be used to plan and direct surgery.

Only motivated patients who have not benefitted from conservative (non-surgical) management and in whom SIJ pain has been definitively diagnosed should be considered for SIJ fusion. Asking the patient to perform a series of five physical maneuvers known to provoke SIJ pain can be informative—elicitation of pain by three or more of the maneuvers suggests SIJ dysfunction.^{4,6} For a definitive diagnosis, a 75% reduction must be achieved on at least two separate occasions by injecting the SIJ with anesthetic.^{4,6} SIJ fusion will not ease pain associated with lumbar degeneration. It is not recommended for smokers or patients with osteoporosis or active infection.

Other key members of the MUSC Health Spine Center team include surgeons **Sunil J. Patel, M.D.**, **Barton L. Sachs, M.D.**, **W. Alex Vandergrift III, M.D.**, and **Abhay K. Varma, M.D.**, as well as specialists in neurointervention, neuromodulation, and pain management and rehabilitation.

References

- ¹ Sencer A, et al. *World Neurosurg.* 2014 Nov;82(5):884-890.
- ² Ruan W, et al. *Int J Surg.* 2016 Jul;31:86-92.
- ³ Li X, et al. *J Clin Neurosci.* 2016 Jul 27. S0967-5868(16):30350-30352.
- ⁴ Polly DW, et al. *Neurosurgery.* 2015 Nov;77(5):674-690; discussion 690-691.
- ⁵ Liliang PC, et al. *Pain Med.* 2011 Apr;12(4):565-570.
- ⁶ Rashbaum RF, et al. *Clin Spine Surg.* 2016 Mar;29(2):42-48.
- ⁷ Polly DW, et al. *Intl J Spine Surg.* 2016; Volume 10, Article 28 doi:10.14444/3028



Old Drugs New Tricks

Older pharmaceuticals are being repurposed to accelerate next-generation medicine

BY SVER AUNE

ILLUSTRATION BY EMMA VOUGHT AND BRENNAN WESLEY

The time and expense of failed drug trials have been strong incentives for researchers to give older pharmaceuticals a second look. Many existing drugs—already proven safe in patients—could be rapidly repurposed for other diseases.

Raymond N. DuBois, M.D., Ph.D., Dean of the College of Medicine at the Medical University of South Carolina (MUSC), likens the overall strategy of drug re-evaluation to *kintsugi*, the ancient Japanese art of restoration. Meaning “to repair with gold,” *kintsugi* can describe clinical research at MUSC, where the hidden potential of old drugs is being unlocked in new ways to fill unmet patient needs. (DuBois is also guiding a national collaboration to do the same with new drugs: See Inset on page 13.)

DuBois has illuminated aspirin’s potential to prevent colorectal cancer. A developmental biologist at MUSC is showing how cardiac glycosides—traditionally used as a therapy for heart failure—could treat a sizable portion of people with hypercholesterolemia who do not respond to statins. Scientists at MUSC are guiding an old drug for sleeping sickness toward a clinical trial for patients with acute kidney injury.

Aspirin and colorectal cancer

Aspirin, one of the most widely available non-steroidal anti-inflammatory drugs (NSAIDs) on the planet, has been used for decades to treat pain and fever. Within the past 40 years, research on aspirin’s molecular traits has shown how its particular anti-inflammatory properties can be used to prevent colorectal cancer.¹

For several decades, NSAIDs, which inhibit cyclooxygenase (COX) enzymes, have been known to reduce the risk of colorectal cancer. In 1994, DuBois was part of the research group that first reported how NSAIDs actually work to prevent colorectal cancer.² DuBois and his team members showed that the same enzymes were increased in colorectal cancer and drove its growth and resistance to treatment. They reported that NSAIDs, and aspirin in particular, worked to prevent colorectal cancer by inhibiting COX enzymes. Since then, several large clinical trials and additional research by DuBois and others have affirmed their original results.

Work to deduce the potential hidden in this old drug has paid off. The United States Preventive Services Task force now recommends that adults aged 50-59 should take daily low-dose aspirin (81 mg) to

reduce the risk of colorectal cancer, along with cardiovascular disease.³ Thanks to aspirin, oncologists now have a better understanding of how inflammation drives growth in many other cancers as well.

Treating the Mona Lisa

Using stem cells taken from skin, **Stephen A. Duncan, D. Phil.**, SmartState™ Chair of Regenerative Medicine at MUSC, has found that cardiac glycosides, historically used to treat heart failure, might be repurposed in smaller doses to lower cholesterol.⁴ The discovery was made by studying a rare disease, hypercholesterolemia (FH).

Pharmaceutical company resources are often not available to develop drugs for rare diseases, such as FH; when a rare disease drug does emerge, it is often very expensive. Academic medicine researchers can fill the gap left by the pharmaceutical industry, according to Duncan. “We’re developing platforms for a whole bunch of different diseases that manifest in the liver,” said Duncan. “We felt we should start by focusing on rare diseases.”

Untreated patients with FH, who do not respond to statins, often die in their teens and twenties from cardiovascular disease due to exceedingly high levels of cholesterol. Although FH treatments have been approved, they eventually cause fatty liver disease and cost hundreds of thousands of dollars per dose.⁵

FH, though rare, has been around at least as long as the Mona Lisa, according to Duncan. In fact, Leonardo da Vinci, a master scientist, included the xanthomas characteristic of the disease on the left eyelid and right hand of the subject of his famous painting.⁶

Liver disorders are very difficult to model for drug discovery, however, because hepatocytes rapidly lose their liver-like characteristics when grown in culture. Duncan had two research goals: to generate a stable source of hepatocytes and to reliably model hypercholesterolemia in those cells when grown in the culture dish.

Drawing upon his expertise in stem cell engineering, he pushed skin cells, obtained from a patient with FH, to transform into pluripotent stem cells and then liver-like cells. This provided him the steady supply of hepatocytes he needed. Since the cells were from a patient with FH, the liver cells maintained their hypercholesterolemia phenotype in culture.⁷

Duncan’s research group treated their FH liver cells with a drug library of over 2,000 small molecules that includes nearly every drug that has been or is currently being used in treating human disease. If one of those drugs, already tested for safety and efficacy in humans, were a “hit” in a cell culture screen, that drug could receive a new indication for treating high cholesterol in FH patients.

The results were surprising: it was a set of old drugs, cardiac glycosides, which were most effective at correcting high levels of low-density lipoprotein (LDL) cholesterol in FH hepatocytes. In fact, every cardiac glycoside tested lowered LDL cholesterol not only in those cells but also in mice with humanized livers. Remarkably, most of the glycosides lowered LDL cholesterol when applied in concentrations well below those prescribed for heart failure—the lower the dose, the lower the risk of toxicity.

The group then conducted a retrospective analysis of nearly 600 patients, which revealed similar reductions in cholesterol in patients treated with glycosides as in those treated with statins. A 200-year-old treatment for heart failure might therefore have cholesterol-lowering properties in all hypercholesterolemia patients, not just those with FH.

Duncan is currently working with **Don C. Rockey, M.D.**, Chair of the Department of Medicine, to design clinical trials. Since cardiac glycosides have been approved in patients with heart failure, clinical trials could skip phase 1, saving time and money to provide a non-statin option for patients with hypercholesterolemia.

Filling an unmet need for acute kidney injury

Another MUSC group has made a serendipitous discovery that the African Sleeping Sickness drug suramin works in the kidney in a way that is opposite to what is seen in most other cells. Rather than risking kidney toxicity, suramin might actually protect kidneys from injury.

Acute kidney injury (AKI) occurs in thousands of patients each year as a complication of drug overdose, surgery, or heart attack. As a result of AKI, kidney epithelial cells suffer damage and contribute to renal deterioration. Researchers in MUSC’s Department of Drug Discovery are examining suramin as a possible new treatment for AKI, for which no treatment is currently available.⁸ Had it not been for a fortuitous finding, the drug’s hidden potential for treating AKI could easily have been missed.

The research group, led by **Rick G. Schnellmann, Ph.D.**, then chair of the Department of Drug Discovery and Biomedical Sciences at MUSC and currently dean of the College of Pharmacy at the University of Arizona, was using suramin experimentally in the cell culture dish to block growth factor receptors and prevent cell proliferation. Although the drug is commonly used in this manner in other cell types, the group was having trouble getting it to work in kidney epithelial cells. In fact, suramin was working perfectly, but in the exact opposite way they expected. Instead of blocking proliferation, suramin was causing kidney epithelial cells to proliferate at even higher rates. Suramin might actually help kidneys regenerate after injury.

In new experiments, the laboratory has shown that suramin helps the kidney compensate by stimulating repair and inducing regeneration of damaged cells.⁹ The drug even helps kidneys recover faster when given 24 hours after AKI is induced, at a time when kidney dysfunction is maximal. Since this century-old drug is already safe and effective in humans with sleeping sickness, advancing it toward clinical trials for AKI will be easier. The team is planning for a multi-site clinical trial to begin at MUSC and several other locations by the end of 2016.

"A previously approved drug that's already been in humans that can be repurposed for a disease is a big win for patients as well as the health care system," said Schnellmann. "Since there are no drugs to treat AKI, this will be a great opportunity to fill an unmet need."

The future of medicine relies not just on developing new treatments, but also in understanding how the treatments we already have might be repurposed—repaired with gold—to meet patients' needs.

References

- ¹ Wang D, DuBois RN. *Annu Rev Med*. 2013;64:131-144.
- ² Eberhart CE, et al. *Gastroenterology* 1994;107(4):1183-1188.
- ³ Bibbins-Domingo K, U.S. Preventive Services Task Force. *Ann Intern Med*. 2016;164(12):836-845.
- ⁴ Smith TW. *N Engl J Med* 1988;318:358-365.
- ⁵ Rader DJ, et al. *J Clin Invest* 2003;111(12):1795-1803.
- ⁶ Ose L. *Curr Cardiol Rev* 2008;4(1):60-62.
- ⁷ Cayo MA, et al. *Hepatology* 2012;56:2163-2171.
- ⁸ Chawla LS, et al. *Nat Rev Nephrol* 2011;8:68-70.
- ⁹ Dupre TV, et al. *Am J Physiol Renal Physiol* 2016;310(3):F248-F258

Accessing proprietary drugs for new cancer treatment

Many cancer researchers are convinced that a regimen combining two drugs with distinct targets—for example, the cell cycle and the immune response—is more likely than monotherapy to succeed at fighting certain types of cancer. In order to open up access to investigational drug combinations for cancer patients, **Raymond N. DuBois, M.D., Ph.D.**, Dean of the College of Medicine at the Medical University of South Carolina (MUSC), is guiding a national initiative to change how academia and industry collaborate.

DuBois is a scientific advisor for the Stand Up To Cancer Foundation (SU2C), which partners with industry to raise hundreds of millions of dollars for team-based cancer research. However, because they are competitors, SU2C's industry partners don't readily share research information with one another. A new arrangement was needed to persuade them to participate in clinical trials that included drugs from competitors.

Enter the SU2C Catalyst program, which grew out of a collaboration between SU2C and the American Association for Cancer Research (AACR), the largest organization of the world's leading oncologists and cancer researchers. SU2C and AACR envision the Catalyst initiative as a revolutionary way to combine and strengthen their complementary missions of research and clinical care for cancer patients.

"The hope is that we will accelerate the development of new drugs by deploying novel combinations very early in the process," said DuBois.

As announced on June 21, 2016, Merck is providing initial funding for SU2C Catalyst in collaboration with other industry partners. As part of the funding agreement, research must include Merck's anti-PD-1 therapy Keytruda® (pembrolizumab). The drug can be used as a single agent for a novel cancer. In the first funding initiative of its kind, Merck is also allowing its drug to be combined with other cancer-fighting strategies, including drugs from other companies. Grant review committees consist of three reviewers from industry and three from academia, with DuBois casting the tie-breaking vote on the SU2C Catalyst-Merck Subcommittee.

DuBois believes this novel way to communicate science between academic and industry research partners is essential to helping patients.

"Patients will have access to combinations of drugs that they probably won't get any other way," said DuBois. "They'll be exposed to front-line drugs more quickly and in combinations that they probably won't get anywhere else."





COMING OUT OF THE

shadows

Identifying Eating Disorders in Primary Care

BY RENEE D. RIENECKE, PH.D., ELIZABETH M. WALLIS, M.D., AND KIMBERLY MCGHEE

ILLUSTRATION BY EMMA VOUGHT



On completion of this article, readers should be able to:

- List early signs of eating disorders (EDs) and explain why not all patients with EDs will have experienced recent weight loss.
- Explain why a “wait and see” approach is inappropriate for patients with a suspected ED.
- Recognize that the family is not to blame for an ED and instead is the best resource for successful treatment.

As many as 13 percent of adolescents live in the shadow of an eating disorder (ED), almost three percent of whom have a severe ED.¹

The incidence in younger children appears to be on the rise—three percent of those hospitalized with an ED from 2008 to 2009 were under the age of 12.²

Among the principal EDs are anorexia nervosa (AN), characterized by a restrictive diet and low body weight; bulimia nervosa (BN), in which bouts of binging are followed by compensatory behaviors such as purging; binge eating disorder, in which bouts of binging elicit guilt but are not followed by compensatory behaviors; and Other Specified Feeding or Eating Disorder (OSFED), which can have traits of either AN or BN but do not meet full diagnostic criteria.

Not a lifestyle choice or an adolescent phase, EDs are serious psychiatric disorders. Indeed, AN has the highest death rate for any psychiatric disorder—almost six times that of the general population.³ Patients with BN or OSFED die at almost twice the rate of those without EDs.³

Evidence-based therapy is available to treat early-stage EDs; however, if diagnosis is delayed, EDs can become chronic and much more resistant to treatment. Primary care providers have a seminal role to play in helping those with EDs come out of the shadows and receive the treatment and support they need.

Early detection and assessment

The five-item SCOFF questionnaire is an effective ED screening tool that is easy to implement in primary care. Questions include: Do you make yourself Sick because you feel uncomfortably full? Do you worry that you have lost Control over how much you eat? Have you recently lost more than One stone (14 lb) in a 3-month period? Do you believe yourself to be Fat when others say you are too thin? Would you say that Food dominates your life? Patients who answer “yes” to two or more questions should undergo a comprehensive assessment—ideally performed by an ED specialist—comprising a physical examination, a detailed family and patient history, and laboratory tests. The examination should include measurement of

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Dr. Renee D. Rienecke is a consultant for the Training Institute for Child and Adolescent Eating Disorders. Dr. Elizabeth M. Wallis and Kimberly McGhee have no relevant financial relationships to disclose.

height and weight and both standing and resting heart rate and blood pressure as well as a thorough review of systems. History should cover past problems with EDs, recent weight loss or gain, attitudes toward weight, eating habits, psychiatric disorders such as anxiety or depression that are often comorbid with EDs, any compensatory behaviors (e.g., vomiting, diet pills, or even, in patients with type 1 diabetes, insulin abuse), and any problems with reproductive health (e.g., amenorrhea can be indicative of AN). Complete blood cell counts, urinalysis, and a comprehensive electrolyte panel that includes magnesium, phosphorus, and vitamin D levels as well as hepatic and thyroid function testing should be conducted. Depending on

the severity of illness, additional laboratory studies are sometimes indicated. Because malnutrition or electrolyte imbalances caused by EDs can lead to life-threatening cardiac complications, an EKG is recommended in patients who present with bradycardia, cardiac symptoms, or a history of binging/purging.

Would you recognize these cases of ED?

Three fictional ED cases follow. If Monica, Maria, or Frank walked into your clinic, would you recognize that each had an ED? Would you know the best treatment for each?

Monica, a 12-year-old white female, presents to a pediatrician for her regular wellness visit. She has no history of weight loss; however, despite an increase in height, her weight has plateaued. Her heart rate is 55 bpm. Her mother says that her daughter has been avoiding junk food and counting her calories. Although she once loved team sports, she now prefers solitary exercise such as jogging.

Although AN is typically associated with substantial weight loss, failure to meet an age-appropriate growth target can be a telltale early sign in children and adolescents. In this patient, that failure, especially when considered in the light of her growing social isolation and interest in counting calories, should arouse concern for AN.

After a positive SCOFF screen, Monica is referred for comprehensive evaluation, which reveals signs of starvation, including anemia and thrombocytopenia, as well as a history of anxiety. A “wait and see” approach is not appropriate in children and adolescents with AN and other EDs, because complications can be life-threatening and early-stage disease is the most amenable to treatment.

Monica is referred to an ED clinic for family-based therapy (FBT), an evidence-based treatment for AN. A large 2010 clinical trial in adolescent patients (ages 12-18 years) with AN showed FBT, in which the parents take a central role in refeeding the child with guidance from ED specialists, to be more effective than individual therapy for achieving weight gain and full remission at 6- and 12-months.⁴ Unlike hospitalized patients, who run the risk of relapse when they are released and return to their normal lives, patients receiving FBT, who remain at home and learn to adapt their eating habits in a real-world environment, are less likely to relapse.

The central tenet of FBT is that the family is the best asset for recovery. This is in stark contrast to the prevailing wisdom about EDs a few decades ago, when EDs were attributed to overprotective, controlling, or “enmeshed” families. Relinquishing such outdated notions will be necessary if patients are to fully benefit from the promise of FBT.

Patients with AN often do not recognize the severe health consequences of their obsessive dieting and so are resistant to treatment, frustrating family and care providers who do not know how to reach them. The answer to changing such obsessional mindsets is surprisingly simple. “A lot of it is weight restoration,” says **Renee Rienecke, Ph.D.**, director of the Friedman Center for Eating Disorders at MUSC, which specializes in FBT. “How do you get back over the line? Restoration of physical health goes a long way.”

As refeeding progresses and weight is restored under family surveillance, the patient’s obsessional thoughts begin to resolve. The Minnesota Starvation Experiment, undertaken to determine the best way to renourish the many soldiers returning from World War II who had faced starvation, found that the obsessional patterns of thought that manifested in underfed study participants usually resolved when they were provided high-calorie nutrition.⁵

Maria, a 14-year-old Hispanic female, presents with severe muscle cramps, constipation, and dizziness. At 5 foot 8 inches and 165 pounds, she has a body mass index of 25.1 and is in the 90th percentile for girls her age, which is considered overweight. Anxious about her weight, Maria insists that she eats lots of healthy fruits and vegetables and takes care to avoid “bad” high-fat foods. She confirms her mother’s report that her habit of exercising late at night is interfering with her sleeping.

The stomach cramps and dizziness, especially in the context of Maria’s anxiety about weight and her unusual sleep patterns, are suggestive of an electrolyte imbalance due to BN and mandate a comprehensive electrolyte panel and other blood tests. Many patients with BN purge or engage in other “compensatory” behaviors late at night when their behavior will not be noticed by their families. On further examination, no evidence of the parotid swelling, tooth enamel loss, or knuckle scarring that can be a consequence of frequent vomiting is noted. Not all patients who purge by vomiting, however, present with these symptoms.

Maria’s unusual sleeping patterns could suggest the need to void numerous times during the night due to laxative abuse. Upon further questioning, Maria acknowledges that she has been using laxatives regularly for the past two months. Because purging needs to occur weekly for at least three months for a diagnosis of BN, Maria is diagnosed as having an OSFED. Although OSFEDs do not meet the full criteria for AN or BN, they affect more people and can be just as deadly.

This suspicion of ED-associated laxative abuse is confirmed by results on the electrolyte panel, which show abnormally low sodium, potassium, and magnesium levels. Increased chloride and decreased

bicarbonate levels are also indicative of laxative abuse; in contrast, purging by vomiting leads to decreased chloride and increased bicarbonate levels.⁶

Maria is referred to an ED specialist for cognitive behavioral therapy, in which an effort is made to change behavior by disrupting negative thought patterns. Other evidence-based therapies for BN or an OSFED with BN characteristics include dialectical behavior therapy and FBT, which has shown some efficacy in adolescents with BN.⁷ Maria's diagnosis should not be missed due to the stereotype that only affluent white women develop EDs. Indeed, BN has been found to be most prevalent among Hispanic adolescents.⁸

Frank, a 20-year-old white male who recently dropped out of college after a break-up with his long-time boyfriend, presents with fatigue, dizziness, and depression. At 5 foot 10 inches and 120 pounds, he has a BMI of 17.2, which indicates he is underweight. He has lost 40 pounds since leaving college three months ago. On examination, he has a heart rate of 39 bpm and a blood pressure of 95/52 mm Hg.

Frank's loss of 25 percent or more of his weight in the course of three months and his very low heart rate (<40 bpm) and blood pressure⁶ together with psychological factors such as his depression and recent break-up should alert the physician that this is an emergent situation and that Frank should be hospitalized immediately. Laboratory tests reveal hypophosphatemia and anemia, confirming the need for hospitalization.

Cardiovascular complications are among the deadliest of AN's consequences. Bradycardia is classically associated with AN, perhaps as a natural compensatory reaction to starvation, but long-term AN has also been implicated in a host of other cardiovascular

abnormalities, including mitral valve prolapse, loss of left ventricular mass, myocardial remodeling, and pericardial effusions.

Once Frank has been medically stabilized, he can receive outpatient therapy at either a day treatment center or at home, with his mother or another adult he chooses taking charge of refeeding as part of FBT. Although the large clinical trial showing the efficacy of FBT for AN was conducted with teens, recent studies have shown benefit for those in their early twenties as well. In one recent study, sixty percent of young adults with AN who received FBT were no longer underweight a year later.⁹ However, adherence rates in this age group were not as good as those reported in teens.⁴

Telltale signs of AN should not be ignored because Frank is male. Although EDs are more common in females, five to 20 percent of those with EDs are male, of which 14 to 42 percent are gay or bisexual men.¹⁰ The emotional stress of "coming out" and harassment from peers can lead to high levels of stress in homosexual teens that can increase the risk of developing an ED.

References

- 1 Smink FRE, et al. *Curr Psychiatry Rep* 2012;14:406–414.
- 2 Zhao Y, Encinosa W. An update on hospitalizations for eating disorders, 1999 to 2009: statistical brief #120. Healthcare Cost and Utilization Project (HCUP) Statistical Briefs [Internet]. Rockville (MD): Agency for Healthcare Research and Quality (US).
- 3 Arcelus J, et al. *Arch Gen Psychiatry* 2011;68(7):724–731.
- 4 Lock J, et al. *Archives of General Psychiatry*. 2010; 67:1025–1032.
- 5 Tucker, T. *The great starvation experiment: Ancel Keys and the men who starved for science*. 2007 Minneapolis, MN: University of Minnesota Press.
- 6 Bermudez O, et al. *AED Report* 2016, 3rd Edition. Academy for Eating Disorders, Deerfield, IL. Available at http://www.aedweb.org/images/MCG_06.02.16.pdf
- 7 Le Grange D, et al. *Arch Gen Psychiatry* 2007;64:1049–1056.
- 8 Swanson SA, et al. *Arch Gen Psychiatry*. 2011 Jul;68(7):714–723.
- 9 Chen E, et al. *Int J Eat Disord* 2016 Jul 1;49(7):701–707.
- 10 Feldman MB, et al. *Int J Eat Disord*. 2007 Apr; 40(3):218–226.

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