TMC PULSE

NEWS OF THE TEXAS MEDICAL CENTER — VOL. 6 / NO. 6 — JULY 2019

Snakes!

Everything you need to know about bites and treatment, p. 18

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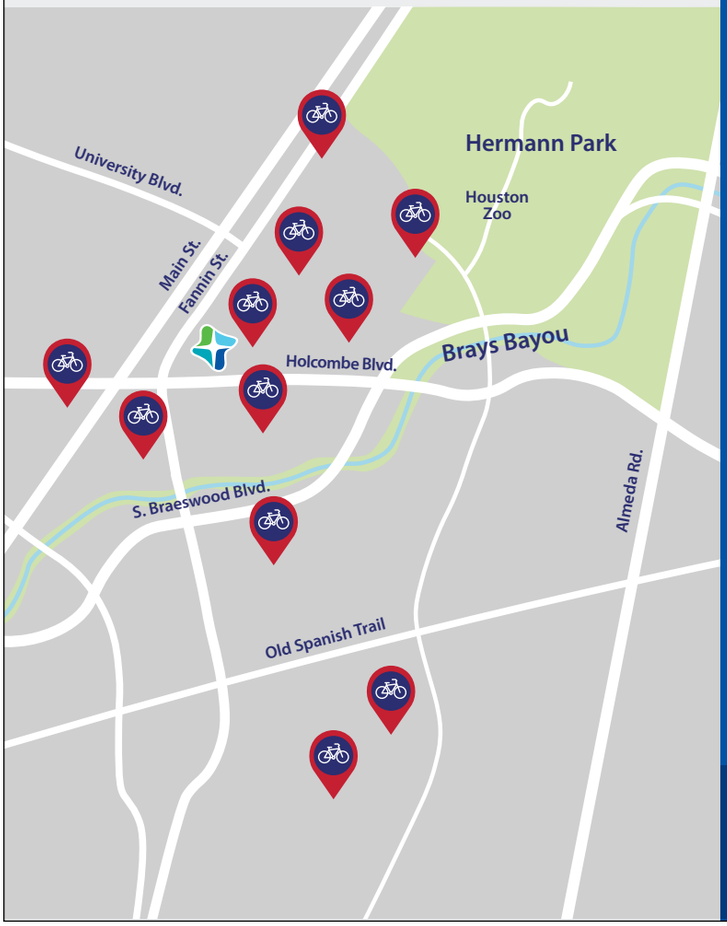

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WILLIAM F. McKEON
President and Chief Executive Officer, Texas Medical Center

For coastal communities like Houston, the start of summer is accompanied by trepidation about hurricane season. But rest assured, if and when the storms arrive, the Texas Medical Center will be prepared. After all, just a few years ago we were tested—and our medical city performed valiantly, operating even in the face of historic rainfall.

That wasn't always the case. Nearly two decades ago, Tropical Storm Allison devastated the Texas Medical Center. Water inundated most of our hospitals and we lost more than $2 billion in research at flooded laboratories.

Importantly, we learned lessons from Allison and quickly recognized the need to fortify. We spent considerable time and resources building walls around our hospitals and research facilities. We raised all of the electrical vaults in our buildings and installed storm doors throughout our medical city. In total, we invested more than $50 million in infrastructure designed to ensure our campus never again experiences the magnitude of devastation that Tropical Storm Allison brought.

Several years later, in 2017, our efforts were put to the ultimate test when Hurricane Harvey hit Houston and dumped more rain than any other storm in American history. Thanks to our advancements in weather forecasting technology, doctors, nurses and administrators had time to get to the medical center before the roads leading to campus became impassable. Thanks to our infrastructure investments, the storm doors held tight and every hospital continued to provide care without interruption.

Today, we constantly monitor storm activities, as flash floods are all too common in Houston. We also continue to invest in physical infrastructure and emergency preparedness planning. As the statesman and philosopher Edmund Burke said, "Those who don't know history are doomed to repeat it." Of course, we don't know what the 2019 hurricane season will bring. But we do know our history—and we've learned from it. If the storms come again this year, we'll be prepared.

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ON THE COVER: A cottonmouth snake yawns at the Houston Museum of Natural Science.

A 3D Model for Global Health

Students are creating a low-cost training tool for cervical cancer screening

By Alexandra Becker

Waheed Mia sits on a bench in Blantyre, Malawi, a tiny paintbrush in his hand. He holds a small cylindrical figure between his fingers, already covered in bright pink paint, and flicks tiny red and white squiggles onto its surface with careful brush strokes. Then he sets it down and starts another. He is satisfied with his work. At the end of the day, the surfaces look just like cancerous and precancerous lesions of the cervix.

Mia hopes they will also save lives.

Nine thousand miles away, undergraduate students at Rice University are busy perfecting another part of that same project, a prototype that they and Mia, along with another student from Malawi Polytechnic, initiated during a summer internship in 2016. Made of 3D-printed material, wood, PVC pipe, water-resistant fabric and foam, as well as easy-to-source hardware, the final product is a low-cost, durable and comprehensive training tool for pelvic examinations.

Credit: Courtesy photo

Above: *Sonia Gomez Parra, left, who earned a Ph.D. in bioengineering from Rice this spring, uses the LUCIA model during a training course in cervical cancer prevention in Beira, Mozambique.* ***Right:*** *Trays hold cervical models designed to depict a range of potential conditions. The models are part of a low-cost, durable and comprehensive training tool for pelvic examinations.*

Known as LUCIA—a loose acronym for "low-cost universal cervical cancer instructional apparatus"—the completed kit includes a standalone "pelvis" and more than 20 3D printed cylindrical cervical models, which allow trainees to examine and detect a range of potential conditions, including cancer. Clinicians-in-training can peer into the model vaginal canal using a speculum, just as they would in clinical practice. Inside, they will encounter one of the cervical models, which fits into a special holder. Eight of the models are designed to change color when swabbed with hot water—mimicking exactly what might happen in an OB-GYN setting during a colposcopy or visual inspection with acetic acid.

"In real life, clinicians put acetic acid onto the cervix and, when you have abnormal areas, they turn white," explained Kathleen Schmeler, M.D., associate professor in the department of gynecologic oncology and reproductive medicine at The University of Texas MD Anderson Cancer Center and the clinical lead on the project. "We actually use hot water instead of vinegar for the models, and they made the models temperature-sensitive, so there are small areas that will turn white when exposed to hot water, and then the other areas will stay pink, simulating what really happens."

The prototype is a tool for both practicing clinical screening and also for recognizing when areas are abnormal—as well as treating some of the most common conditions. The team has created additional components for the kit that include gel-based models for practicing biopsies or performing a LEEP, a procedure in which abnormal cells are removed via a small electrical wire loop. The students are also designing tools to allow for the simulation of cryotherapy and thermocoagulation techniques, which are both procedures for removing precancerous lesions.

Sonia Gomez Parra, who earned a Ph.D. in bioengineering from Rice this spring and returns to medical school in August to complete her training in obstetrics and gynecology, mentored the undergraduate students throughout the project. Multiple clinicians have expressed interest in the model, she said, for training purposes and also for their patients.

"A lot of people have said, 'You know, this would be really helpful for my patients because, when I talk to them, they don't know what a cervix is, they don't know what is happening during a procedure. I can show them with these models exactly what I'm planning to do, what's going on, and just further educate them on why it's

important that we do these procedures," Parra said. "Everywhere we go, I'm impressed that everyone is so receptive to it. And everyone wants to buy it."

Fail early and often

Worldwide, cervical cancer kills about 300,000 women each year, with approximately 85 percent of these deaths occurring in developing countries, according to the World Health Organization. But if detected early through proper screening, nearly 100 percent of these deaths could be prevented. The problem LUCIA addresses is the widespread lack of clinical providers trained to perform pelvic examinations to screen for cervical cancer. In some low-resource settings, this type of training uses models adapted from animals, which aren't as effective or true-to-life as the LUCIA model. Other models are prohibitively expensive.

The LUCIA kit was conceived in the Oshman Engineering Design Kitchen (OEDK) at Rice, a workshop that fosters innovative solutions for real-world problems, and the Rice 360° Institute for Global Health, a program that creates new technologies for health challenges in the developing world. Through collaborations with students and clinicians in low-resource settings, Rice 360° works to design tools that are effective but also low-tech and inexpensive. One of the many challenges in solving global health problems is the fact that existing technology often doesn't work in places with unreliable electricity, scarce resources and sometimes harsh environments. Rice 360° is working to develop alternatives better suited for those conditions.

"This kind of environment is all about reducing barriers for the students to accomplish their design tasks," said Maria Oden, Ph.D., director of the OEDK and co-director of Rice 360°. "We have a facility where it's really easy to laser-cut, 3D print, get into the machine shop—so students can try things out and if they don't work the first time, they are surrounded by tools and people who have ideas, so they can keep improving it over time relatively quickly."

Oden encourages students working in the OEDK to build low-fidelity prototypes early as a way of communicating ideas and determining—quickly—where those ideas break down.

"We strongly espouse the concept of fail early and often so you'll have sooner success," Oden said. "We have so many different kinds of tools and we have a lot of different students working here who have different levels of expertise in these tools, and it opens up a lot of opportunity. LUCIA uses a laser cutter, 3D printer, simple brackets and fasteners and screws and nuts and bolts. All of it was here for the easy taking, so they could try things out. The first few times they made it, the frame wasn't sturdy enough, but then they were able to get advice quickly and try again." ➟

Because students are working on real-world problems, Oden said, they feel more invested in their projects.

"Students of this generation really do want to work on real projects, and when they find something they care about personally, they are more motivated to work much harder than they would normally for just a grade," Oden said.

Karen Vasquez Ruiz, a bioengineering major at Rice who graduated in May, was one of the first students to work on the LUCIA model the summer after her freshman year. She said that the opportunity to focus on pressing global health issues was exactly the kind of experience she had hoped to gain at the university.

"In a lot of classes, we learn so much theoretical stuff and never really know how to apply it outside of class. If you take initiative and join Rice 360° or come to the Oshman Engineering Design Kitchen, you can get involved with projects that are actually making a difference," Ruiz said. "I really wanted to help with low-resources settings and disadvantaged communities who don't have access to health care, and Rice 360° has really been the way that I have been able to get involved with that and give back to those communities and address global health problems around the world."

A global push

In the three years since its inception, LUCIA has evolved based on student ideas and feedback from clinical partners. It has been used in trainings in Africa, Central America and even Texas, including the Rio Grande Valley. Schmeler, who is working with the World Health Organization's initiative to eliminate cervical cancer among other international teaching and training missions with MD Anderson, believes the model could fill a much-needed gap in screening efforts.

"There's a global push to eliminate this disease, and so there's going to be a lot of training and education going on over the next decade and this is a great tool for that," Schmeler said. "The models aren't any good without teachers, but it makes that teaching easier, more fun, more consistent and more effective."

In fact, medical schools in Texas have already expressed interest in using the models as part of their curriculum.

"It's not just limited to low-resource settings," Schmeler said. "The models are innovative enough and easy enough … . The reality is, I think we can use them anywhere."

This summer, the team is working to create 50 kits to distribute to medical partners around the world—all hand-painted by artists and engineers in Malawi. The students hope to get additional feedback about how LUCIA can improve and eventually work with a commercial partner on manufacturing and widespread distribution.

"These problems are big, and to solve them we need a diverse group of people and people who think differently," Schmeler said. "This has really been a collaboration between Rice and Malawi Polytechnic and MD Anderson, and I think that whole idea of bringing together a very diverse team—people from different cultural and educational backgrounds but also their training and professions—has been very valuable."

The innovative teaching model may seem simple, but it is effective.

"We think that sometimes we need to have these elaborate, complicated or highly technical solutions, but really it's about filling a need," Parra said. "I think if we collaborate more, we'll be able to figure out the most important problems and tailor our skills to that."

APOLLO 11
50TH
ANNIVERSARY

HOW RICE TETHERED HOUSTON TO SPACE

By Cindy George

Credit: Courtesy of Woodson Research Center, Fondren Library, Rice University

Rice University's storied and ongoing collaboration with NASA helped Houston become the hub of space exploration, home to research and technology that continue to bolster the nation's other-worldly pursuits.

The most celebrated connection came nearly six decades ago with a historic speech in Rice Stadium. President John F. Kennedy's "We choose to go to the moon" address on Sept. 12, 1962, helped launch the nation's eventual landing on the lunar surface and propelled Houston into space history.

But even before that speech, two esteemed Rice alumni were brokering deals that would allow Houston to house a major federal research facility. ➟

Credit: Courtesy of Woodson Research Center, Fondren Library, Rice University; Facing page: Jeff Fitlow / Rice University

Previous page: *President John F. Kennedy receives applause on Sept. 12, 1962, at Rice Stadium, where he gave his famous "We choose to go to the moon" speech, challenging the United States to become the world's leading space-exploring nation.* ***Above:*** *Kennedy enters Rice Stadium.*

Early 20th-century Rice students and roommates George R. Brown and Albert Thomas played pivotal roles in the location and development of Johnson Space Center, which placed the university and Houston on a global stage. Thomas was the first member of Congress with a Rice degree. Brown became a construction magnate with Brown and Root (now KBR) and a philanthropist for whom Rice's School of Engineering was named.

By the mid-1950s, Brown was chairman of the Rice Board of Governors and arranged for the powerful Humble Oil and Refining Co. (now ExxonMobil) to donate 1,020 acres of land near Clear Lake to the university, which would be offered to the federal government as an incentive to locate in Houston.

> "We choose to go to the moon in this decade and do the other things, not because they are easy, but because they are hard, because that goal will serve to organize and measure the best of our energies and skills ..."
>
> — PRESIDENT JOHN F. KENNEDY *1962*

Senate majority leader Lyndon B. Johnson of Texas was instrumental in founding the National Aeronautics and Space Council in 1958, which he chaired as vice president under Kennedy. Thomas, by then chairman of the powerful House Appropriations Subcommittee on Defense, which controlled NASA's budget, lobbied for Houston to land the Manned Spacecraft Center.

On Sept. 14, 1961, then-NASA Administrator James Webb delivered a memo to President Kennedy that said: "Our decision is that this laboratory should be located in Houston, Texas, in close association with Rice University and the other educational institutions there and in that region."

Then came Kennedy's inspirational 1962 address on campus one year later about the United States accepting the challenge of becoming the Earth's foremost space-faring nation:

There is no strife, no prejudice, no national conflict in outer space as yet. Its hazards are hostile to us all. Its conquest deserves the best of all mankind, and its opportunity for peaceful cooperation many never come again. But why, some say, the moon? Why choose this as our goal? And they may well ask why climb the highest mountain? Why, 35 years ago, fly the Atlantic? Why does Rice play Texas?

We choose to go to the moon. We choose to go to the moon in this decade and do the other things, not because they are easy, but because they are hard, because that goal will serve to organize and measure the best of our energies and skills, because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one which we intend to win, and the others, too.

One month after Kennedy's speech, the federal government acquired the 1,020-acre parcel and another 600 acres from Rice. On that property, NASA's Johnson Space Center was built.

In 1963, Rice became the first university in the world to establish a dedicated space science department.

That same year, in November, Kennedy was assassinated. He didn't live to see Apollo 11 astronauts Neil Armstrong and Buzz Aldrin step out of the lunar module and onto the moon on July 20, 1969. These space pioneers became the first humans to walk on the moon while carrying "a dust detection experiment designed at Rice University," as indicated by a plaque outside Rice Stadium that features a sepia-toned photo of Kennedy's campus speech.

"Apollo 11 came to symbolize America's success in space, but the Apollo program's deepest impact on mankind may well have been the generation of scientists it inspired and the laboratories and educational programs it paid to establish, including those that thrive at Rice today," according to a history of the university's relationship with NASA, prepared in 2009 for the 40th anniversary.

Within 18 months of Kennedy's speech, satellites built at Rice were being launched aboard U.S. rockets. By the time Apollo 11 landed, several dozen graduate students and countless undergraduates had helped to build instruments that made historic breakthroughs—some of which remain on the lunar surface today.

In April 2019, as part of the yearlong 50th anniversary celebration of the Apollo 11 mission, Rice University President David Leebron and NASA Administrator Jim Bridenstine, a 1998 Rice alumnus and former Oklahoma Congressman, participated in a plaque dedication commemorating Kennedy's 1962 speech and a second-generation "moon tree" planting by Rice Stadium. The original moon trees were grown from seeds that orbited the moon on the Apollo 14 mission in 1971.

"President Kennedy's Rice Stadium speech helped plant the seed for our nation's leadership in the exploration of space and also the seed that led, ultimately, to this sycamore moon tree," Leebron said.

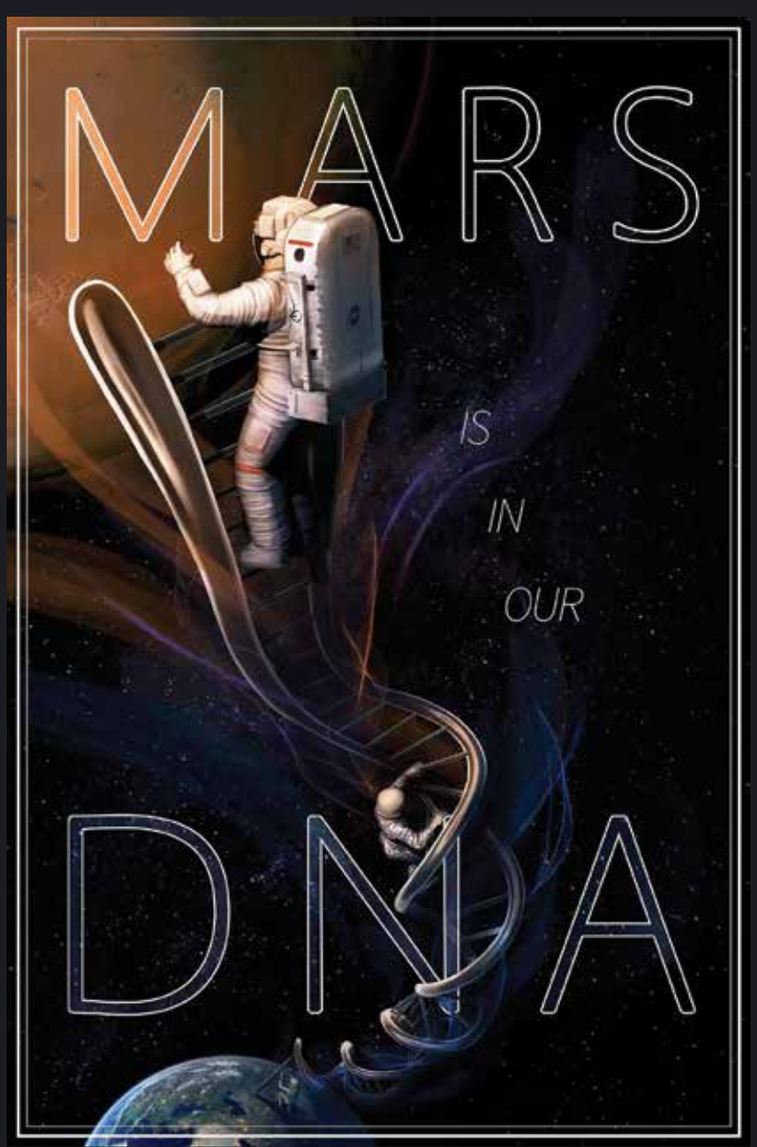
During his speech outside Rice Stadium, Bridenstine articulated a new mission: A return of manned spaceflight to the moon for sustained exploration.

"Now it's time for a new generation to go to the moon. We haven't been to the moon for 50 years; 1972 was the last [manned] moon mission that we had," Bridenstine said. "And so, the president has given me direction to land humans on the moon within the next five years. That is a big challenge, friends, but it's a challenge that NASA is up to. ... This time when we go to the moon, we're going to stay."

NASA Administrator Jim Bridenstine speaks outside Rice University's stadium on April 12, 2019, during the unveiling ceremony of a plaque commemorating Kennedy's 1962 speech and the planting of a tree honoring the 50th anniversary of the Apollo 11 moon landing.

PROJECT MARS
LANDS AT THIRD COAST

By Britni R. McAshan



FIRST PLACE ★ Mars is In Our DNA *by Adrianna Allen from Lapeer, Michigan*

On July 20, the nation celebrates the 50th anniversary of the Apollo 11 mission, which landed astronauts Neil Armstrong and Buzz Aldrin on the moon. To honor this milestone and inspire young people to visualize space exploration, NASA collaborated with IT and engineering firm MORI Associates and nonprofit SciArt Exchange to create the Project Mars International Film and Art Competition. Open to college students and young professionals around the globe, the competition gave entrants an opportunity to imagine NASA's anticipated series of missions to Mars.

Of the 570 entries submitted to the art competition, 34 posters were selected as winners. Some of the winning posters are on display at Third Coast Restaurant, located on the sixth floor of 6550 Bertner Ave., through July 31.

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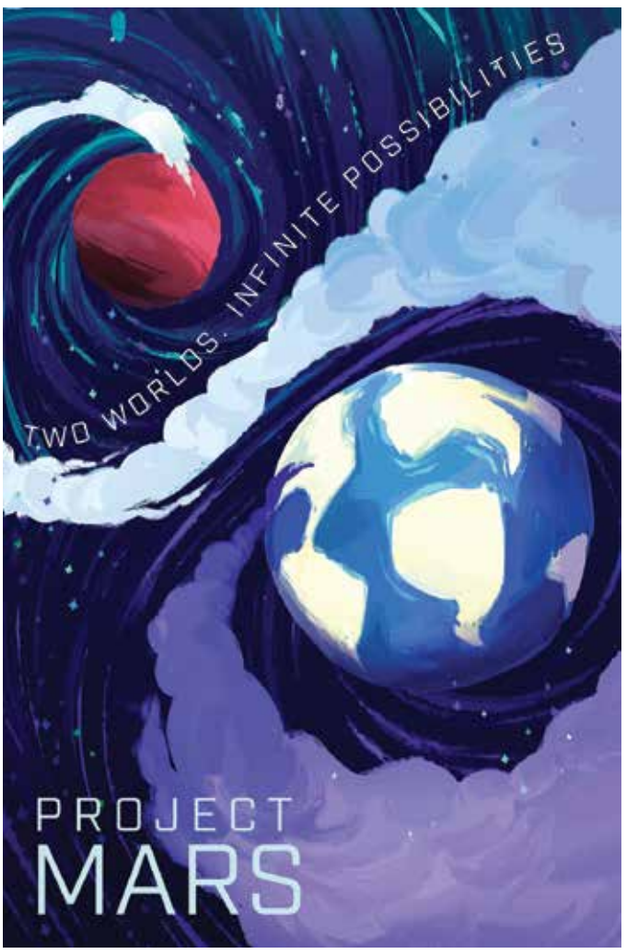
SECOND PLACE ★★ Space Launch System—Toward New Worlds *by Andrew Yan from Boyds, Maryland, was selected as one of two second place posters (top left).* Mars Invasion *by Nada Abdelhaleem from Suez, Egypt, was also a second place winner (bottom left).*



THIRD PLACE ★★★ Two Worlds *by Dominique Evans from Pennsauken, New Jersey, was selected as one of five third place posters (above).*

APOLLO 11 50TH ANNIVERSARY

BERNARD A. HARRIS JR.—physician, astronaut, philanthropist and entrepreneur—credits the historic moon landing with catalyzing his interest in space. As an astronaut, he went to space twice, including a mission that was part of the Shuttle-Mir Program, during which he became the first African American astronaut to perform a spacewalk. Since retiring from NASA, Harris has worked tirelessly to advance STEM education, particularly in underserved communities. He is a member of the TMC Board of Directors and CEO of Vesalius Ventures, a venture capital firm that invests in technology poised to transform health care.

Q | Tell me about watching the moon landing on TV as a kid. I imagine that was one of the most formative experiences of your life.

A | I'd put that up at the top. I grew up the first six years of my life in Houston on the west side. Now they call it the Heights. We grew up poor. My dad had just gotten out of the service. There were three kids. My parents divorced when I was six, and my mother took a job on a Navajo reservation. That was the backdrop I had when I watched Neil Armstrong and Buzz Aldrin on the moon. I don't know where you grew up ...

[I grew up here in Houston.]

... so you probably missed out on the beautiful light show that occurs when the sun goes down and you see the Milky Way and you realize all those stars are just the ones in our galaxy, which is one of billions of galaxies out there. Being an inquisitive kid, being a geek, I followed the space program from first or second grade. By the time July 1969 occurred, I was 13 years old watching the lunar landing. And that was just incredible for me—not only seeing the stars, but seeing human beings land on one of those planetary bodies. I wanted to follow in the footsteps of those guys.

Q | Did you have any teachers growing up who helped cultivate your fascination with science and space?

A | In middle school, on the reservation, my science teacher, Mr. Johnson, helped us create a science club and a rocket club. We were launching rockets, and we even built a flying saucer that really got me into this whole concept of flying. From a mentor standpoint, he was an educator who loved what he was doing and imparted that love for science in me.

Q | In addition to serving on the Texas Medical Center Board of Directors and the TMC Venture Fund investment committee, you're the CEO of the nonprofit National Math and Science Initiative and you lead your own nonprofit, The Harris Foundation. It sounds like a lot of your nonprofit work is about paying it forward because you had some great mentors.

A | It was a combination of things that made me want to pay it forward. One was growing up poor initially. I could see early the importance of education in enabling dreams. Once you become an astronaut, we get asked to visit communities and act as role models. I spent a lot of time in inner-city communities trying to be inspirational to young people. I realized there were a lot of issues with our education system. That got me to thinking about how I can help—not only in supporting them, but inspiring them to become whatever it is they want to be. I think education is the great enabler.

Q | What sort of work does the National Math and Science Initiative do?

A | It's teaching teachers how to teach STEM. Most teachers have general education. Then they go to the districts and are asked to teach chemistry or biology. The courses you loved the most in school were probably because the teacher was most knowledgeable in that space. It's about making teachers feel comfortable about the courses they teach.

Q | This year, the Trump Administration accelerated the U.S. space timeline and pledged to be on the moon again by 2024. Do you think we can do it? Should we do it?

A | I think we can do it, if we have the will, and if they can muster support from Congress to get the dollars. I think it's going to look a little different from 1969. It's going to be more than just the government doing it. I think there's going to be private industry involved. The other difference I see is that instead of going there for just a few days, driving around in a lunar buggy and leaving our footprints, we'll be building habitats and living on the surface.

Q | A lot of your medical research at NASA was about how space affects the body. How does that work apply to a journey to Mars?

A | When I was [completing residency] at the Mayo Clinic, they had an aerospace group. I went to the head of it and said, 'I want to be an astronaut. What advice would you give me?' He picked up the phone and called the head of life sciences at NASA—it's the group in charge of ensuring human survival in space. ➟

> "By the time July 1969 occurred, I was 13 years old watching the lunar landing. And that was just incredible for me—not only seeing the stars but seeing human beings land on one of those planetary bodies. I wanted to follow in the footsteps of those guys."

He said, 'I have a kid who says he wants to be an astronaut. What should he do?' I was told to figure out the biggest issue NASA has to solve about life in space and become an expert in it. That's exactly what I did.

What I found is that bone loss was huge. We lose 1 percent of our bone per month in space. It continues at the same rate, and at some point, we'll reach the fracture threshold—where if you step out onto a planet, and you have less bone, you'll fracture.

NASA asked me to lead what's called the countermeasure effort. It was part of the medical system being developed as we were thinking about spending longer and longer periods in space. In space, your heart shrinks in size. We lose one-fifth our blood volume. We can't fight illnesses like we do on Earth. And we know genetic abnormalities occur from being exposed to zero gravity and probably radiation. The list goes on. That whole thing is called space adaptation syndrome.

Q | Is that still the biggest challenge in getting to Mars?

A | It is. Right now, it takes about a year to get to Mars, maybe three months on the surface, and maybe a year and a half to get back. There are some technologies that can get us there faster, but it's a long trip. If you don't exercise or have some way to stress the bone, you're going to end up landing with weaker bones and nobody really knows what would happen there.

The other big thing with that sort of trip is radiation exposure. Any time during a trip there can be a solar flare, and if there is, then there would be a lot of issues with the crew—possibly even death from the solar flares if we aren't shielded.

Q | I read that you didn't make the cut the first time you applied to be an astronaut. What was it like getting that rejection, after you devoted your entire life to becoming an astronaut?

A | I was working at NASA's Ames Research Center in California at the time. I didn't make the cut, but they offered me a job at Johnson Space Center in the bone lab. They saw something in me, and that was their way of keeping me hooked. But it was a double-edged sword. I could come to JSC, and if I did really well they'd hire me [as an astronaut]. But if I didn't do well ... you're under the microscope. I have to say I worked hard during that period to make a name for myself. In the next astronaut class, I was the first person interviewed and the first person called and hired.

Q | You went to space in 1993 and 1995, for a total of 18 days. Almost 25 years later, how often do you think about those 18 days?

A | Every day. That's in part because when people find out I'm an astronaut, everybody wants to know about it. Our communications group put together what they call a post-flight video. We would play it before going onstage at speaking engagements. They'd open with us walking to the launch pad. When I saw it, it was almost like I didn't believe it was me walking to the launch pad. The experience is overwhelming; your mind cannot take it all in when you're in the moment.

Q | Would you want to go back to space?

A | Yes. It would be fun. I would enjoy it. If we were to go to the moon and NASA said,

'We want some old astronauts,' I'd be up for it. That's where my inspiration was.

Q | Your second mission was part of the Shuttle-Mir Program. You were a kid growing up during the Cold War. In some ways, that mission was a diplomatic effort as well as a technical one. What did it mean for you to be able to participate in something like that?

A | That was historic. We have an interesting relationship with Russia now, but space has been an area where we really do collaborate with the Russians. Out of all the disputes we might have with them, that's hands off. It's a great model for how we should explore space. It shouldn't just be one country exploring space, it should be a collection of space-faring nations coming together to go back to the moon or to Mars. After all, we're all Earthlings.

That experience of being the first shuttle to go to the Russian space station was incredible. It was the first time two large vehicles had ever come together in space. Their space station was probably 1.5 million pounds. Our vehicle was about half a million pounds.

Q | Was it terrifying? Did you wonder what would happen if you bumped into Mir?

A | Yes, that's why we were really careful. Not only did we have help from radar stations on the ground, we had our own radar in the spaceship in order to measure our distance. We had someone in the window of the shuttle basically pinging the space station and calling out numbers—200 feet, 100 feet—calling it out to the pilot as the pilot is also visually checking it.

Q | That was also the mission when you became the first African American astronaut to do a spacewalk. Didn't part of that walk involve testing space suits against extreme cold?

A | Certainly it's an honor for an astronaut to do a spacewalk. But we could have skipped the suit test, as far as I'm concerned. I don't know if I've ever talked about this. What happens in orbit is we get exposed to extreme temperatures, from 200 degrees to minus 165. How do I know it's minus 165? Part of the study—we called it the space suit integrity study—required us to develop the first thermometer for space.

We got on the end of the robotic arm, which extends about 35 feet. Astronaut Michael Foale and I hung out as the commander maneuvered the vehicle from pointing towards the Earth—where we can get radiant heat to keep temperatures from getting too extreme—to flipping the vehicle around to deep space, where we're radiating our heat. Within 10 to 15 minutes, the temperature went from 200 degrees to minus 165 degrees. It was crazy cold. So cold that my feet felt like I was standing on ice cubes. My hands were so cold I could barely keep them in my glove. We turned our temperature control to full heat, but it wasn't enough. The only way we could stand being out there was to move and raise our body temperature. After the experiment, they changed the suit.

Q | How did you make the pivot to venture capitalism once your career with NASA ended?

A | When I was done with my career at NASA, I had an opportunity to work for an aerospace company called Spacehab that was venture funded. My involvement with venture capital came from a chance encounter with one of the founders of the venture capital industry, Jack Gill, who had a company in Palo Alto called Vanguard Ventures. I knew nothing about venture capital and said, 'I want to know about what you do and how you do it.' He suggested I go and get an MBA. After I did, he hired me to work at Vanguard Ventures.

When we do on-board diagnosis in space, that information needs to be sent back down to doctors on the ground. That's telemedicine. I was convinced that telemedicine was the direction that health care was going. I redefined it as the intersection of medical devices, telecommunications and IT. That redefinition allowed me to go to other venture capital firms and let them see that this intersection of technologies would be utilized in health care in a big way. That was probably 2000. By 2002, I convinced enough venture capital firms and one corporation to be the founding partners for my venture capital firm, Vesalius Ventures. For 17 years, we've been doing investments in the telemedicine space.

Q | I've heard some astronauts describe viewing Earth from space as a life-changing, almost religious experience. How did that view shape your perspective?

A | I've always had the perspective that there's something greater than ourselves here. I'm religious. I'm a Christian, so I believe there's a higher power. In space, I'm off the planet and can look back at it. It's a beautiful sight, this blue and white planet. I'm seeing it against this backdrop of stars that I initially saw from Earth and now see in space. It reaffirmed my belief that there's a higher power.

I had an overwhelming sense that this was ordered. Everything had its place. I have a greater sense of belonging, of the connectedness of all of us. One of the things you don't see from space is the differences between us. It reminds us of our uniqueness, in a way, but also our connectedness to each other. If we focus on that, the world will be much better. ■

Bernard A. Harris Jr., M.D., was interviewed by TMC Communications Director Ryan Holeywell. The conversation was edited for clarity and length.

Investing in Health Care Upstream

Increasingly, U.S. hospitals are assuming responsibilities traditionally held by social service agencies

By Ryan Holeywell

Julia Andrieni, M.D., recalled a patient who recently made repeated visits to a Houston Methodist Hospital emergency room. He didn't have any acute medical condition—he was just looking for some food. But the repeat visits cost the hospital money and didn't do much to help the patient, either.

A Houston Methodist caseworker, Andrieni said, did some digging. It turned out the patient was suffering from dementia and living in his car. His son, who lived in another state, was unaware of this until Houston Methodist contacted him. The caseworker was able to work with the family to help the patient move in with his son and reduce the unnecessary hospital visits.

This story illustrates a new approach to care in hospitals in Houston and beyond, said Andrieni, president and CEO of Houston Methodist Coordinated Care. "For this program to work, we have to provide care not just inside our walls, but outside our walls," she said.

Today, many United States hospitals are assuming responsibilities traditionally held by social service agencies. It's a role they weren't necessarily designed to take on, but may be well-suited to, given their access to vast volumes of data, their trusted role in the community and recent policy changes.

In some cases, examples of the new paradigm are relatively straightforward, such as connecting patients with social workers or referring patients to Federally Qualified Health Centers (FQHCs) that can meet their primary care needs. In other cases, they're more complex and creative, and suggest a broader rethinking of what, exactly, it means to provide health care.

A hospital based in Columbus, Ohio, for example, is offering grants for housing repairs to 150 homeowners nearby. In Chicago, a health system sends community workers to asthmatic patients' homes to show how dust and second-hand smoke can exacerbate their conditions. In Boston, a health care provider placed tax preparers in its pediatrics department to help families get proper tax credits and full tax refunds.

This broadening of responsibilities is what health experts call investing in health care "upstream," said Chris Greeley, M.D., chief of public health pediatrics at Texas Children's Hospital and vice chair of community health at Baylor College of Medicine. "You have to pay attention to the context in which people are living," he said.

Julia Andrieni, M.D., is president and CEO of Houston Methodist Coordinated Care, an accountable care organization.

Public health experts agree that, for the most part, about 80 percent of our health is related to things that occur outside of the health care system. Europe and the United Kingdom have long appreciated the link between social investment and health, and have found success funding the former to help achieve savings on the latter. But over the last decade, the U.S. has increasingly come around, too, Greeley said. Health care providers are recognizing that it is ineffective and inefficient to treat patients and then send them right back to the very conditions that contributed to their illnesses or ailments. In recent years, providers have moved beyond studying the links between social conditions and health and are launching programs to address the link.

When U.S. Secretary of Health and Human Services Alex Azar last year spoke about the issue, he teased the idea of moving health care toward "solutions for the whole person." Beginning in 2020, Azar said, Medicare Advantage plans—which pay for managed care based on a monthly fee per enrollee—could start paying for benefits like home modifications, home-delivered meals and more. The idea is to keep seniors out of the hospital if they don't need to be, saving money and improving their health.

"It's not new, and it's not rocket science—social workers have been doing this stuff for 100 years," said Len Nichols, Ph.D., director of the Center for Health Policy Research and Ethics at George Mason University. But several factors are driving hospitals to embrace a broader function, he explained.

First, as a result of the Affordable Care Act (ACA), hospitals can be penalized when patients are readmitted after undergoing medical treatment. That gives health care providers a strong incentive to address upstream issues that can help prevent readmission—or hospitalization in the first place.

"The best way to avoid a hospital readmission is to avoid an unnecessary admission," said Bita Kash, Ph.D., director of the Center for Outcomes Research at Houston Methodist.

Second, the ACA created systems by which hospitals could sometimes keep a portion of the savings if they avoided unnecessary costs. In some cases, hospitals themselves function as the health insurer, so they may have an incentive to avoid unnecessary, expensive care and invest "upstream" if it can help achieve savings.

The reshuffling of duties raises fundamental questions about the role and responsibility of major institutions in society. Who is responsible for ensuring patients have safe living conditions? Who's responsible for making sure they have access to healthy food? Doctors and hospitals, Greeley said, aren't usually the solution to these types of broader societal questions—but almost all of the time, they're part of the solution.

"If [your patient] is talking to you about how their car just got repossessed, and our response is 'good luck with that,' that seems like an opportunity that's been missed," Greeley said.

At Houston Methodist, the health system manages 30,000 Medicare patients in the Houston area through its Houston Methodist Coordinated Care ACO. (Accountable care organizations are groups of health care providers who work together to offer coordinated care.) Historically, Methodist has provided grants to FQHCs and mental health providers as a community benefit. Now, as an ACO, the hospital is also involved in more targeted, value-based care.

This means Houston Methodist is linking patients with social workers and case managers, who can help connect patients with social services. It is training clinicians to embrace a holistic view of health. The system is also using predictive

Carol Paret is CEO of Memorial Hermann Community Benefit Corporation, which works with health care providers, government agencies and business leaders to ensure that all Houston-area residents have access to care.

analytics to identify patients who are most likely to benefit from early interventions so they can be reached "before they fall off the cliff," Andrieni said.

For example, Houston Methodist purchases food through Meals on Wheels for patients who won't be able to shop for or prepare food after a hospital discharge, and it hopes to integrate a software service called "Aunt Bertha" that connects patients to food, housing and transportation providers via its Epic electronic health records system.

In a similar vein, Memorial Hermann Health System officials recently unveiled a new service center at Memorial Hermann Southwest Hospital in Sharpstown, where health navigators can connect patients to legal aid organizations, homeless shelters, FQHCs and other services. Their goal is to work with patients before they're in a crisis, said Carol Paret, CEO of Memorial Hermann Community Benefit Corporation. The resource center is open to anyone, not just patients.

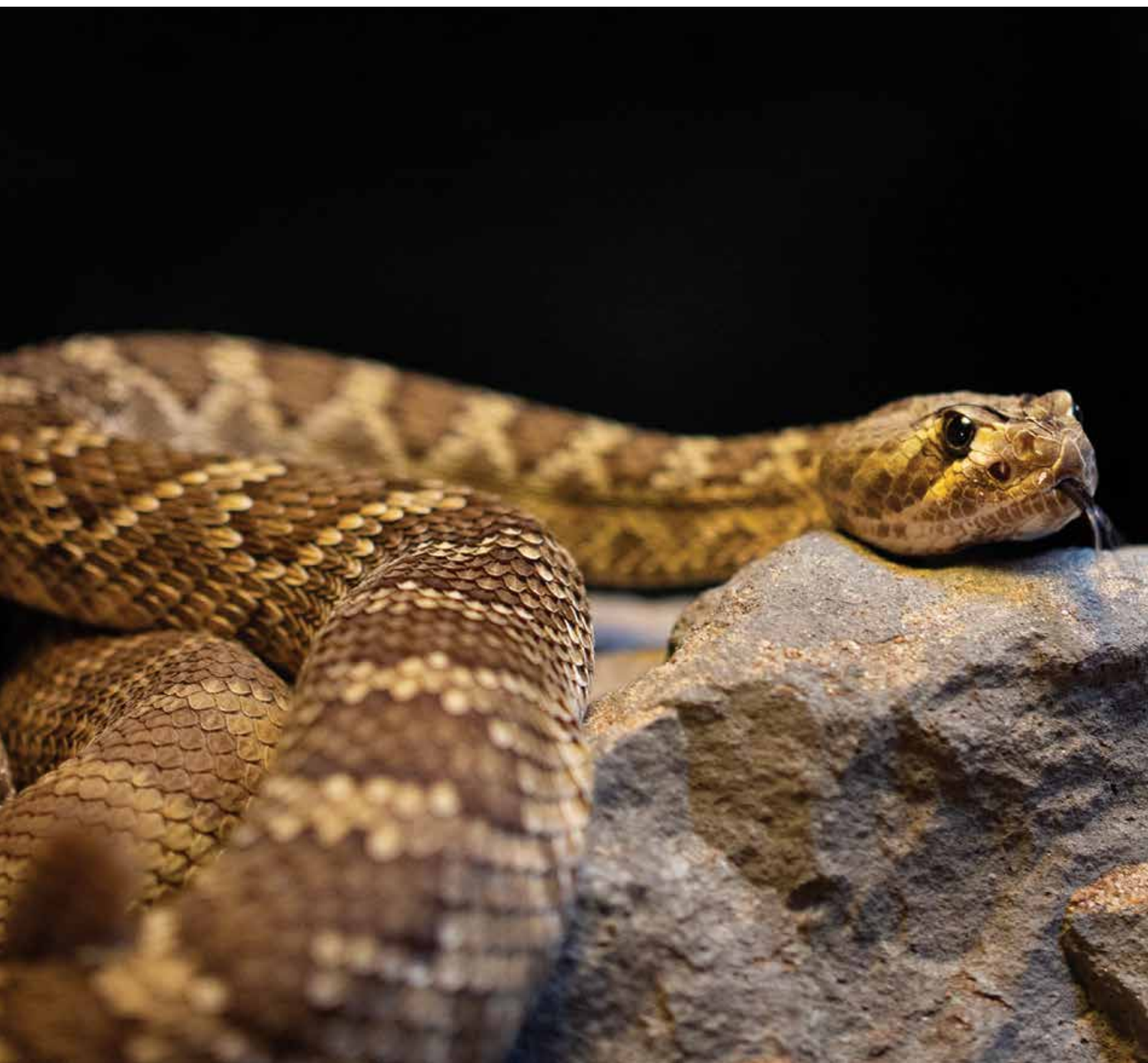
Memorial Hermann has enrolled about 100 patients in its own program that provides six weeks of Meals on Wheels services after hospital discharge. That program, Paret noted, has the added benefit of putting extra eyes on the patient. If drivers see a patient is struggling, they can suggest that a Memorial Hermann caseworker follow up.

This is part of a broader effort to use trained "navigators" to screen Memorial Hermann patients for food insecurity. The system's ultimate goal is to determine whether all patients—regardless of how they've entered the Memorial Hermann system—have reliable access to healthy food. Trained "navigators" started screening patients for food security more than a year ago. Now, the questions are built into patients' electronic health records and physicians are getting training in how to pay attention to the responses.

"What I tell doctors, all the time, is that if your patient is food insecure, they're not going to follow the diet and they're not going to fill the prescription," Paret said.

Hospitals must recognize the importance of conditions beyond their walls. "The reality is, hospitals can't do it all," Paret said. "But hospitals are a piece of the solution."

SNAKES!



EVERYTHING YOU NEED TO KNOW ABOUT BITES AND TREATMENT

By Alexandra Becker

Did you know that snakes can still bite and kill you after they are decapitated? It's the stuff of nightmares, but also potentially life-saving information—and one of the many facts surrounding envenomation that Spencer Greene, M.D., is spending his career setting straight.

And the facts are surprising.

"Aggressive surgical intervention, we now know, is one of the worst things you can do for snakebites," said Greene, director of the medical toxicology consultation services for Baylor College of Medicine.

Why? Because snake venom is often essentially a "soup of antigens"—full of dozens of components that each attack a victim differently.

"They can affect the way your blood clots, they can affect your muscles, they can affect your skin, and they can have neurological effects. The envenomation is best treated by neutralizing the various venomation components with antivenom," he said.

Antibiotics are also unnecessary, unless there is an infection—which Greene said is exceptionally rare. Steroids, too, are only useful when there's an allergic phenomenon—otherwise, they can actually impair wound healing.

Other potentially harmful practices? The use of venom extraction devices, sucking out venom, tourniquets, pressure immobilization, electrical shock therapy, applying ice or heat and positioning the affected extremity below the heart—all first aid treatments that are sometimes recommended by the well-meaning but ill-informed.

"One of the most important things we do when someone arrives at the hospital with a typical snake bite is to elevate," Greene said. "A lot of places keep the extremity flat or, even worse, below heart level, thinking it will decrease systemic absorption. That may or may not be true, but what it does do is result in more damage to the affected extremity."

That, Greene said, is what he worries about the most.

"Here's the thing—people almost never die from snake bites. There are about 5 to 10 deaths a year in the entire country. It's not something you should expect. What you should expect—what you need to worry about and what you need to treat or prevent—is permanent disability."

When snakebites go untreated or undertreated, Greene said, permanent deficits are common and the opportunity to reverse the damage caused by the venom diminishes as time passes.

"I had a patient who was a triathlete who was admitted to another hospital and wasn't treated with antivenom and now, seven months later, she can't walk for long distances because her leg swells up. She certainly can't run and she certainly can't run competitively," Greene said.

A Mojave green snake, also called a Mojave rattlesnake, is part of the Death By Natural Causes *exhibit at the Houston Museum of Natural Science. Venom from the Mojave green snake is considered the world's most potent rattlesnake venom.*

SNAKE BITES: 7 FAST FACTS

1. People rarely die from snake bites. More often, untreated bites leave people permanently disabled.
2. Baby snakes are not more poisonous than adult snakes.
3. Snakes in Southeast Texas are not typically aggressive and generally only attack when threatened.
4. A person can still be envenomated by a dead snake.
5. Snake bites should be elevated.
6. Antivenom is the best treatment for snake bites.
7. Sucking out snake bite venom is not recommended and is a potentially harmful practice, along with applying a tourniquet, using pressure immobilization, electrical shock therapy or applying ice or heat.

Antivenom, Greene reiterated, is the best treatment for snake bites.

"Antivenom is the definitive treatment and it's most effective when started early," Greene said. "Think of envenomation like a fire. If you have a little fire and you take some water and extinguish it, you minimize damage, cost and you use fewer resources. If you wait until that fire gets really big, then it takes a lot more resources to extinguish it, and at that point, you've already allowed damage to occur."

In Southeast Texas, Greene said, clinicians should use CroFab, the only FDA-approved antivenom for North American pit vipers, which include copperheads, rattlesnakes and cottonmouths (a different antivenom exists for coral snake bites). Because CroFab covers all of these pit viper bites, Greene said that clinicians do not need to know exactly what kind of snake bit their patient in order to administer the antivenom.

Patients should not bring live or decapitated snakes to the hospital, mistakenly believing that physicians need to see them, he added.

"You can still be envenomated by a dead snake," Greene said. "There are multiple cases of people being bitten by decapitated snakes … they have such low metabolic rates and they maintain brain activity for minutes to hours. So not only is it cruel to the snake, but it's dangerous."

Specialty service

While snakebites are the most common envenomation Greene sees, he also treats individuals exposed to other venomous creatures, including spiders. Brown recluse bites, which cause tissue damage, are extremely rare.

"For every 100 people who come into the hospital alleging a brown recluse bite, maybe one person actually has a brown recluse bite," Greene said. "I only see two or three a year."

Nevertheless, Greene stressed the importance of knowing how to treat venomous spider bites, since treatment differs widely depending on the type of spider and whether it is a spider bite at all.

"If you have an infectious abscess, you want to cut into it, but if it's actually a spider bite, you don't want to cut into it—that will make it worse," Greene said. "Spider bites—legitimate spider bites—do not need antibiotics, but abscesses require incision, drainage and antibiotics."

As for jellyfish stings? Don't pee on them. The best treatment, Greene said, is to submerge the affected extremity in water as hot as tolerable to neutralize the pain. Becky Futch, who worked for years at the Houston Zoo as their "jellyfish keeper," said that it's also important not to touch the affected area, since the tiny nematocysts will continue to fire and "sting" their victim if any pressure is applied. Instead, she said to use a knife or credit card edge to scrape them off and, if possible, administer oral antihistamine.

Finally, Greene stressed the importance of clinicians learning proper protocols and the general public recognizing when clinical or specialist care is necessary.

"Most hospitals carry antivenom, but most hospitals lack a snakebite expert," Greene said. "You need to go to someone who knows what he or she is doing when it comes to bites."

Greene said he and his two partners, who together serve Ben Taub Hospital and Texas Children's Hospital, make up the only in-hospital medical toxicologists in Southeast Texas.

"If you're far away, go to the closest hospital, get stabilized, then request a transfer," Greene said. "Not all hospitals are created equal—this is a specialty service, an obscure topic, and you want to go where the specialists are." ■

Cultivating a Food **Farm**acy

By Britni R. McAshan

Harris Health System is fighting food insecurity with fresh produce

Rows of tomatoes, peppers, strawberries, green beans and other plants are thriving on a small farm just behind Lyndon B. Johnson Hospital, Harris Health System's Level III trauma center in northeast Houston.

The community farm program, in development for the past year, aims to provide fruits and vegetables to patients and community members with limited access to grocery stores that stock fresh produce. Distribution details are still in the planning stages.

"Sometimes what our patients most need is to be prescribed a plate of healthy food—more than medication and the downstream management of that chronic disease burden," said Karen Tseng, senior vice president of population health transformation at Harris Health System. "If we could get at the root cause, upstream, and help support them earlier in the process, evidence has shown, we can actually improve community health outcomes."

Residents of the Fifth Ward, where the hospital is located, have long struggled with food insecurity. The U.S. Department of Agriculture considers the area a food desert—a place lacking in fresh fruits, vegetables and other healthful whole foods—and Harris Health estimates more than 13,000 residents suffer from hunger daily.

Farmer Rebecca Verm harvests Shungiku chrysanthemum flowers to dehydrate for teas at the LBJ Hospital farm.

"This community doesn't have a lack of knowledge of what they need to do, they have a lack of access," said Michelle Seitzinger, director of nursing and manager of the community farm program at LBJ Hospital. "Diabetes and high blood pressure are the biggest problems our population is facing. These conditions are not uncommon, but the biggest difference in our community is that our patients don't have access to a grocery store."

The lack of accessible fresh food coupled with the fact that many residents rely on public transportation means that many people buy meals at convenience stores, she added. It's also challenging for patients to get from their homes to LBJ Hospital.

"Many of our patients rely on the METRO bus route for transportation," Seitzinger said. "The problem is that there are multiple stops between their home and their destination. They might have to walk a couple of miles to get to the bus stop and then that bus makes four different stops until it comes to LBJ."

Thinking outside the box

To fight food insecurity in the area, Harris Health executives decided to create a farm and hired Rebecca Verm, full-time, to oversee it. Verm is a native Houstonian who graduated from The University of Texas at Austin with a degree in philosophy.

"I began farming over a decade ago because I want to make agriculture real and accessible to everybody," Verm said. "I just never in my life imagined that a county-run hospital in Houston, Texas of all places—oil and gas, hospital central—would think this outside of the box."

Creating a farm within a hospital has been a dream of Verm's since a conversation she had with her brother, a surgical resident at the University of Southern California. When her brother came back from a trip to India a few years ago, he told her they should open a hospital or clinic with a farm attached, because that is the only way people are going to be able to transform health care into a culture of health.

"When I sat down and talked to Alan Vierling [former executive vice president and administrator of LBJ Hospital] about why he created this vision for the farm and had come to the realization that this is what needs to happen in order to take health care to the next step, it brought me right back to that conversation with my brother—and I had to say yes," Verm said.

Rows of zucchini thrive on the community farm outside of LBJ Hospital in Northeast Houston. The farm could yield as much as 500 pounds of produce a week.

But at one acre, the LBJ Hospital farm simply cannot produce enough food to feed the patients and staff at the 207-bed hospital. Instead, leaders are using the farm as a hub to host programming about produce, healthy eating and wellness.

"We would love to be able to grow our farm to serve the LBJ cafeteria and to service more hospital cafeterias," Verm said. "We could feasibly provide enough food for the LBJ hospital cafeteria by utilizing hospital roof spaces and turning them green. If done the right way, that could reduce the hospital's utility costs and you can grow very efficiently in vertical gardens."

Currently, the farm is harvesting 50 to 65 pounds of fresh produce weekly. At full production, Verm estimates the farm will produce about 500 pounds a week.

"All of our produce is going to be donated and the donations are just to get people's feet in the door," Verm said. "Being able to feed and supply people with good, fresh vegetables is not going to be necessarily this farm's responsibility, but we, as stewards, want to help collaborate with other

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organizations to get more farmers and develop more farms so they can actually be the ones who are feeding the community."

Measuring clinical outcomes

Eventually, the produce harvested on the farm will be coupled with fresh food from the Houston Food Bank and distributed to patients with diabetes, hypertension, and possibly expectant mothers through a hospital-based "food farmacy."

Hospital administrators will be measuring certain biomedical markers to ensure patient health outcomes are improving because of the food.

"We are measuring clinical outcomes—A1C levels [which calculate blood sugar], LDL [low-density lipoproteins, also known as "bad" cholesterol] and blood pressure reduction," Tseng said.

According to Tseng, a one-point reduction in a patient's A1C levels translates to a savings of about $8,300 for the hospital by avoiding unnecessary medical services.

"We hope to share results in the next six months to one year to see to what extent those three biomedical markers improve, each point of which directly translates into cost savings," Tseng said. "We are also measuring outcomes related to knowledge and fruit and vegetable consumption, so we are looking over time to see if patients' diets shift to more fruits and vegetables and measuring patient and partner satisfaction."

Hospital administrators also hope to offer "walk-and-learn" sessions with patients, during which dietitians lead participants through the farm and teach them about food selection and its impact on health. Physical therapists are also looking at the farm space to conduct sessions with their patients using benches and a walking path that will soon be completed.

"Access to high-quality clinical care is very important to total health, but it is just one piece of the puzzle," Tseng said. "It is responsible for about 20 percent of health outcomes, another 30 percent is behavioral and a whopping 50 percent is due to the social determinants of health—of which poverty is a huge predictor."

Although in its infancy, the farm to hospital initiative has already received national attention. The program recently won the American College of Physicians 2019 Innovation Challenge grand prize, which came with a $20,000 grant. The Texas Medical Center provided $150,000 in grants to Harris Health and The University of Texas MD Anderson Cancer Center to support development of the farm and its programming.

"It is going to prove to countless other counties and hospitals across the country, hopefully around the world, that this is not a pipe dream, this is not a froufrou, cute and nice thing, but that this can be a real game changer of public health intervention," Verm said.

In addition to growing healthy food for their hospital patients, Verm and Seitzinger have committed themselves to creating change in the Fifth Ward. The two have partnered with neighborhood leaders to bring local children to the farm, educate community members about the importance of fresh food and help solve the problem of access to fresh produce.

"I would love it if all of the students who come out here all wanted to be farmers, but that's not the reality of the situation," Verm said. "More than wanting them to grow up to be farmers, I want them to grow up to be teachers, doctors, politicians, leaders and activists who all have something grounded in respect for agriculture and the need for healthy, nourishing food." ■

VITALS

Trending topics in health, science and medicine

By Shanley Pierce

Is kratom, the popular herbal supplement, dangerous?

Kratom, an herbal supplement derived from the leaves of a tropical tree native to Southeast Asia, has gained widespread popularity as a recreational drug and as a treatment for opioid withdrawal symptoms, but experts are skeptical about these claims.

"It's not the be-all-end-all that some of these [people] would have you believe," said Mike Leath, M.D., chief physician at Memorial Hermann Prevention and Recovery Center. "My recommendation is don't do it. Absolutely don't do it."

The supplement is usually delivered in the form of a capsule or brewed as a tea. In low doses, between 1 to 5 grams, kratom can cause stimulant-like effects to increase alertness and physical energy. In higher doses, between 5 to 15 grams, kratom users experience opiate-like effects, including sedation and euphoria, within five to 10 minutes of consumption.

Users swear by kratom, saying that it improves mood, increases energy and reduces pain. But medical experts are concerned about the two main alkaloids in kratom—mitragynine and 7-α-hydroxymitragynine—that affect the human brain.

"These particular alkaloids work in the system by binding to opioid receptors," said Austin De La Cruz, Pharm.D., clinical assistant professor at the University of Houston College of Pharmacy. "The main opioid receptor that we're primarily concerned with is the mu opioid receptor. This is the opioid receptor that leads to analgesia, which is pain release; it could also potentially lead to euphoria, as well."

Since kratom is currently classified as a supplement, it is not regulated by the U.S. Food and Drug Administration (FDA). However, several cities and counties across the country are pushing to ban the substance due to a lack of evidence to support its safety and efficacy.

Between 2011 and 2018, 11 deaths were associated with kratom exposure, according to a 2019 paper from the National Poison Data System. Of those 11 deaths, nine involved kratom mixed with other drugs.

"We're already in the midst of an opioid epidemic," De La Cruz said. "There are people who are overdosing and deaths that are occurring, so the scary thing from a pharmacological aspect is introducing this herbal plant that people are saying is safe to the public. … We're introducing another opioid without regulation. That may cause individuals who have an opioid use disorder to transition to another drug that works very similarly to it."

Kratom withdrawal symptoms are concerning for doctors detoxing patients, as well.

"When I've taken people off of kratom, the withdrawals aren't as intense as heroin, but they seem to last a lot longer," Leath said. "The half-life of the drug is probably under five hours, so I don't know if there are a lot of active metabolites that we don't know about yet, but the withdrawals tend to go on and on."

In August 2016, the Drug Enforcement Agency announced that it intended to make kratom a Schedule 1 drug—a category that includes substances with no currently accepted medical use and a high potential for abuse. Two months later, the agency withdrew its decision after a public and congressional outcry, with more than 140,000 people signing a petition in support of kratom.

In 2017, the U.S. Department of Health & Human Services recommended a ban on the chemicals in kratom. In April 2019, the FDA issued a warning against the use of kratom, stating that it affects the same opioid receptors as morphine and could expose users to risk of addiction, abuse and dependence.

Yet kratom advocates stand by claims of its safety. The American Kratom Association website emphasizes that kratom is plant-based and neither a drug nor a synthetic substance, but a "safe herbal supplement."

"That's entirely inaccurate, in my opinion," De La Cruz said. "We know it binds strongly with the mu opioid receptors. Look at heroin. No one would say that's safe, but that comes from a plant-based source, too. It comes from the resin of a poppy plant seed, so no one can make the argument that just because it's from a plant, it should be safe to use."

One thing remains certain: More studies need to be done to better understand kratom's long-term effects.

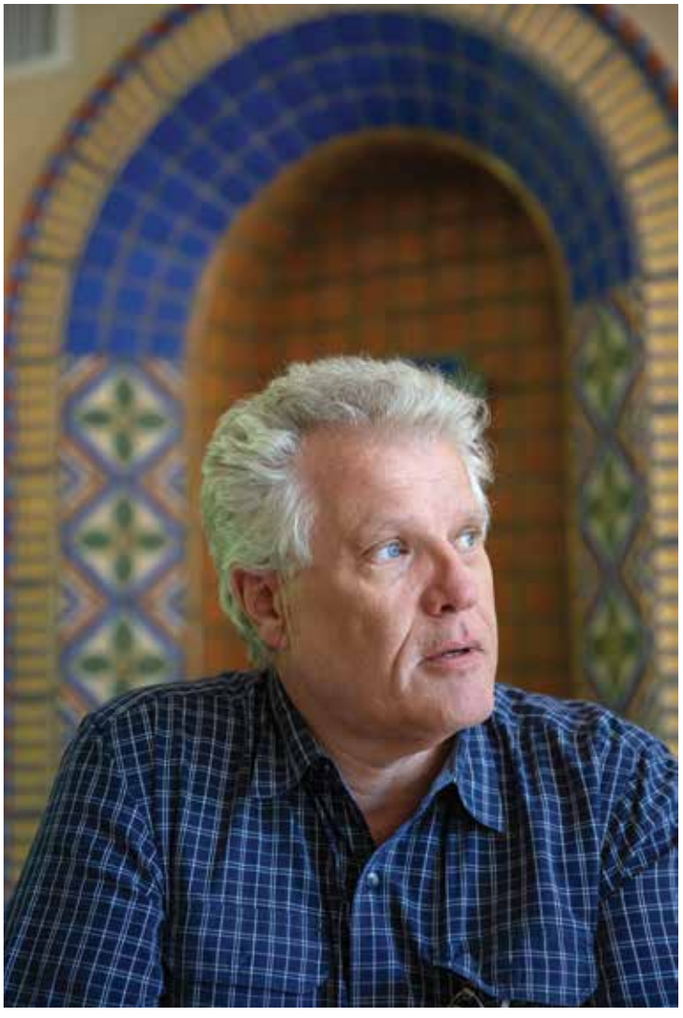
"I would honestly say that the risks right now … outweigh some of the euphoric effects and increase in stamina and energy that people feel while taking this plant," De La Cruz said. ■

Kratom is usually delivered in the form of a capsule or brewed as a tea.

Songs for a Final Journey

Music can soothe patients in their last days and hours

By Alexandra Becker



Dan Danford has been a Houston Hospice chaplain for 25 years.

Dan Danford, a young chaplain-in-training, walked quietly into the hospital room. An elderly woman lay in bed, her two older sisters by her side. They had promised their mother they would always take care of "baby sis," who had been born with mental disabilities and was now in hospice care, only barely responsive.

Danford began with a list of questions, hoping to learn more about his patient. Had she gone to church?

Yes, they said. She loved the music.

Danford asked about songs, then sang a verse of "The Old Rugged Cross."

"Look!" one of the sisters said, pointing to his patient's toe.

It was moving to his voice.

Danford explained that their baby sister could still hear them—that she knew they were there, she just couldn't respond. He encouraged them to sing to her, and together—the young chaplain and the two elderly sisters—finished the rest of the well-known hymn.

Over the next few days, the women remained by their sister's side, humming and harmonizing melodies from their childhood. Later, they told Danford that she passed away peacefully in the middle of a song.

"We sang her on into glory with her last breath, and that toe was tapping, so we know she was on her way to heaven," they said.

Today, Danford—who has now been a chaplain with Houston Hospice for 25 years—knows the power of music, especially for patients and their loved ones at the end of life. Songs can help patients relax and even prompt the release of dopamine—part of the brain's pleasure and reward system—during that transition.

Reducing levels of pain, anxiety, depression and stress associated with end-of-life care for both patients and their families can greatly improve quality of life, according to a 2018 article published in the *American Journal of Hospice and Palliative Medicine*.

"Music is a direct line to emotion. There are areas of our brain that light up when we listen to certain music, and it can cause an emotional response associated with happiness," explained Sarah Folsom, a music therapist with The University of Texas MD Anderson Cancer Center, who spends at least half of her time at work with patients in palliative care. "A lot of patients will describe feeling a connection to themselves, a connection to their spirituality, a sense of peace and a sense of relaxation."

Both Folsom and Danford said that choosing songs or music genres at the end of life should be based strictly on patient preference.

"There really isn't a prescriptive for what kind of music will make you happy or what kind of music will make you feel at peace—it's personally what you find to be happy or uplifting or sad," Folsom said, adding that, typically, those inclinations are formed in a person's teens and early twenties.

"That's the time in your life when you're forging your identity and figuring yourself out," Folsom explained. "It's not necessarily an equation, but it's certainly a starting point."

Anthems

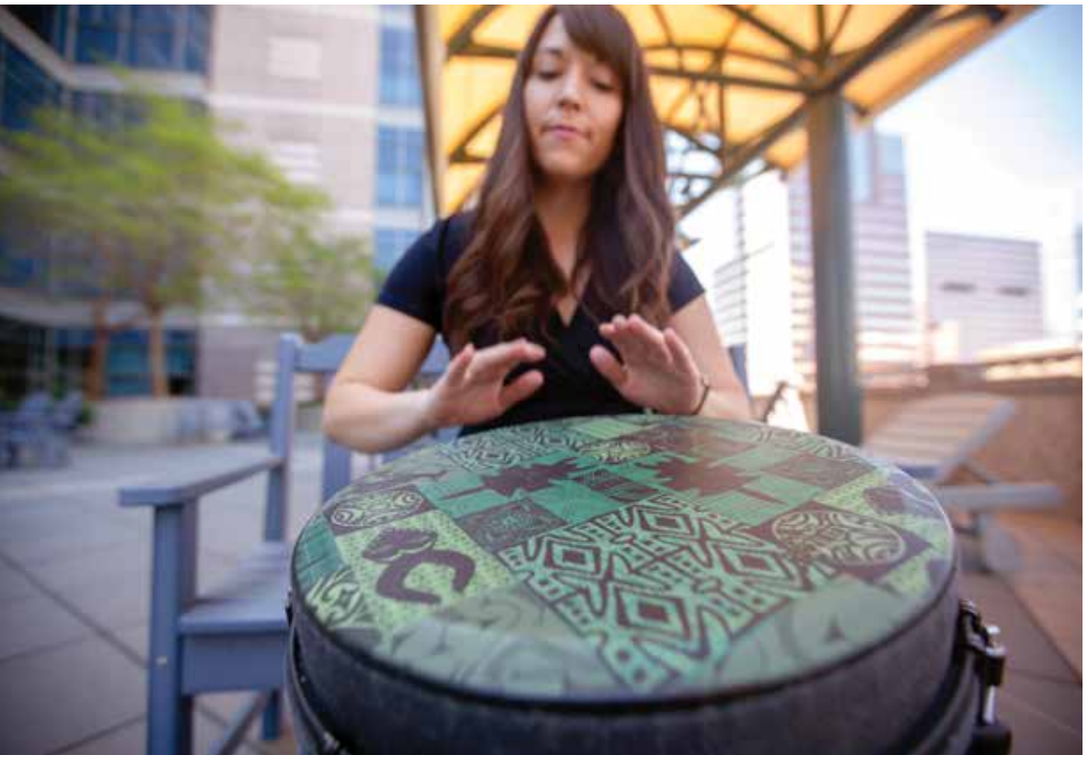
Increasingly, music therapy has been recognized as a valuable tool in hospitals and clinical settings, and more research is being done on its impact on patients.

"Music therapy is a board-certified, credentialed profession, and when we come into a room, we are actually working on clinical goals that a doctor or nurse has referred us for," Folsom said. "It might be that one patient needs to lower their anxiety or another patient doesn't have family and is feeling down and needs something active to make them feel happy and uplifted. So, music is actually the catalyst for that non-musical goal."

Music therapists will sometimes create playlists for clinical interventions. Folsom described a technique known as the iso-principle, in which a music therapist begins the playlist with songs that try to match the patient's current emotional state, and then through the progression of songs, moves toward music that reflects a different state.

"If someone is feeling sad or has low energy and we want them to feel happier, you start with music that validates their feelings. It's their own preferred music—so whatever you listen to when you're sad—and then you slowly have the playlist move towards songs that are more uplifting to you," Folsom said.

Music therapy also engages the patient with the music therapist—conversations and even some counseling can take place.



Sarah Folsom is a music therapist at The University of Texas MD Anderson Cancer Center.

"That's something really powerful about working with patients who are going through these really emotionally turbulent experiences," Folsom said. "It can be hard to verbalize what they're experiencing, and music is a metaphor—they might be able to point to a song lyric and say, 'That's what I'm feeling.' Even if they can't verbalize it, they feel validated and understood."

Rachelle Carrillo, a radio host for KSBJ, a nonprofit contemporary Christian music radio station based in Humble, Texas, receives frequent requests from listeners who are coping with death or a terminal illness. One that is overwhelmingly popular, she said, especially for patients and families affected by cancer, is the 2013 song "Overcomer," by the artist known as Mandisa. Among its uplifting refrains: *You're not going under/ 'Cause God is holding you right now.*

"It has been the anthem for so many," Carrillo said. "Just that encouragement to keep putting one foot in front of the other. ... There are so many people who are here in Houston because of the medical community, and they're here because of our incredible doctors and medical staff that can help them through whatever it is they're going through. ... There is just incredible peace in knowing that God's got you ... even if you're walking through the valley of the shadow of death."

As a chaplain, Danford often finds himself drawing on calming, repetitive music to help comfort his patients through guided meditation. One of his favorite albums to suggest is the soundtrack to the Coen brothers' cult-classic film, "O Brother, Where Art Thou?" It's a popular choice.

"It sometimes depends on the generation and the individual," Danford said. "Maybe they want big band era because the patient and his wife loved to dance, or military music—John Philip Sousa—or string quartet classical music. So much of it is tied to memories."

Danford can always tell when the music resonates with a person.

"I do notice a physical change. Through demeanor—reflected through the eyes or in the smile on their face—you can tell it's connecting with them," he said. "Maybe they're reminiscing or there's a spiritual component of, 'I know that song and I like to sing it.'"

The biggest gift

Music's power—and how it evokes memory—can be especially influential for patients experiencing memory loss due to dementia or Alzheimer's disease. In a study published in 2018 by *The Journal of Prevention of Alzheimer's Disease*, researchers from University of Utah Health found that music can activate regions of the brain that have fallen quiet in patients with dementia.

Danford regularly pulls up songs on his iPhone that are reminiscent of a patient's generation.

"Sometimes songs from old TV shows will register with someone and they would start to converse back," Danford said of his patients with memory loss. "The window of opportunity would remain open for a little while."

He recalled one of his patients with Alzheimer's who was said to love classical music. When Danford met with her, he tried humming Mozart—the opening overture to "The Marriage of Figaro." She studied him carefully, Danford said, as if she was trying to place it. When she finally did, a huge smile spread across her face and she began laughing.

"You hear stories about patients with dementia or Alzheimer's listening to music and they wake up and start crying, but it's really important to know their story so you know why they're crying," Folsom said. "When you're talking end of life especially, there are a lot of really important considerations for how a patient is going to be emotionally responding to the music. You want to make sure that they're comfortable and happy."

Folsom is often present during a patient's final breaths. Sometimes she has pre-arranged for recorded music to play and sometimes she is there just "holding space," playing a soft tune on her guitar to evoke a more peaceful environment. Folsom said she has even tried to play melodies that harmonize with the beeping of hospital monitors or the whooshing sounds of the machines.

For patients who are unresponsive, she watches carefully for nonverbal cues.

"You would follow their breath, follow their movements and just make sure that what you are playing is comforting," Folsom said. "It's humbling and you feel so honored to be a part of that."

Family members benefit from music as much as the patient, Folsom said, as many all but move into the hospital with their loved one and are dealing with stress, anxiety and sadness themselves. She said she will never forget her experience with one patient, who pulled her into his room as soon as he saw her guitar.

"He told me all about his life and he was just so excited about the music and sang all of these songs to me that I didn't even know. I just followed him and sang with him in the moment—he took the session the way he needed to take it, and I just supported him because that was his moment," Folsom recalled. "It was this really beautiful connection and session and I remember when I left his room he said, 'Never stop doing this. You do this forever; I need you to just keep on singing.'"

A day later, Folsom's supervisor told her she had received an email from the patient's daughter. Apparently, his family had come to visit him later that day.

"I didn't know this because I was pulled into his room unexpectedly, but he had been really disoriented and hadn't been remembering who people were, but that day he recognized everyone in the family," Folsom said. "His daughter wrote that it was so special because music had always been such a big part of his life, but that he had stopped singing when he got sick."

The patient passed away that very same night.

"You gave him music on his last day," his daughter's email to Folsom read. "That's the biggest gift you could have ever given us."

Freezing for the Future

Why one doctor joined a growing number of women who are freezing their eggs

By Shanley Pierce

Around the time Kriti Mohan, M.D., turned 32 in 2018, the mounting societal pressure of starting a family began to weigh on her. She knew her biological clock was ticking, but she was still single and driven by her career as the chief resident of plastic surgery at Baylor College of Medicine.

"There are some women who know 100 percent that they're going to have children and all of this. For me, it was kind of one of those things that's always been on the back burner because I was taking care of other things," Mohan said.

She had looked into freezing her eggs a couple of years earlier, but she was in the midst of her surgical residency and spent every single day in the operating room. Logistically, it was impossible for her to leave in the middle of surgery to attend to her own medical procedure.

At 32, Mohan was headed toward "advanced maternal age," the section of the reproductive timeline that starts at age 35, when the risk of birth defects and infertility increases. So she decided to hedge her bets and freeze her eggs.

The decision, she said, was liberating.

"I don't have to feel that pressure of having a kid that a lot of people do," said Mohan, now 33. "Nowadays, women and men are very equal, and we really are made to feel that way, but in terms of biology that's just not true. This equalizes the playing field, to a degree. … You get to be like a man. There's no biologic clock for you. Maybe you'll have to have IVF [in vitro fertilization]. Maybe you'll have to have a surrogate. Maybe you'll have to do all those things, but in terms of people telling you that your eggs are old or that you can't use them, that's just not the case anymore."

Hitting pause

The first reported human birth from a frozen egg occurred in 1986. The American Society of Reproductive Medicine initially classified egg freezing as experimental; however, in 2012, the ASRM removed the experimental label.

Since then, the technology behind preserving fertility has improved and given women more control over their reproductive futures. More recently, employers including Apple, Yahoo, Uber and others have started to offer some insurance coverage for egg freezing as an incentive to retain employees.

Kriti Mohan, M.D., underwent an egg retrieval procedure in 2018, during which her doctor retrieved and preserved eight of her eggs.

The Society of Assisted Reproductive Technology reported an increase in egg freezing technology to preserve fertility. In 2016, there were 8,825 cycles of fertility preservation; that number increased to 10,936 the following year.

"It gives the woman the choice of, 'I can freeze my own eggs and I have a choice in the future,'" said Mazen Abdallah, M.D., a reproductive endocrinologist and OB-GYN at Memorial Hermann Hospital. "It keeps the doorway open for her to have a child or children with her future partner and makes the dynamics of her relationship easier."

Prior to treatment, doctors run a series of blood tests to check the quantity and quality of eggs in the ovarian reserve. The egg freezing process consists of three main steps: ovarian stimulation, egg retrieval and freezing.

During the first two weeks, patients take follicular stimulating hormone (FSH) injections to stimulate the ovaries to produce eggs. In some cases, the brain may read these unusual hormone levels as a signal to ovulate early. In order to prevent premature ovulation, doctors prescribe a hormone antagonist to counteract the body's response.

Doctors monitor the progress of the follicles—fluid-filled sacs inside the ovaries that harbor the eggs—under ultrasounds. Once the eggs have matured and are ready for retrieval, the patient is placed under sedation while doctors pass an ultrasound probe through the vagina to the follicles and use a suction needle to draw out the eggs.

On average, 12 to 13 eggs are retrieved, with a maximum of 15 eggs.

"If we looked not too long ago, 10 or 15 years ago, the only credible option for women would be to freeze embryos," Abdallah said. "We have been good at freezing embryos for years, since the '80s, but to freeze an embryo when you're not partnered means you have to select the sperm now and then deal with it later."

> "When you freeze [the eggs], you stop all metabolic activity in the cell. Whether you stop it for a day or a week or a month or a year or 10 years or 100 years, it's as if you hit the pause button."
>
> **MAZEN ABDALLAH, M.D.**
> *Reproductive endocrinologist and OB-GYN At Memorial Hermann Hospital*

Egg freezing was not as successful until the early 2000s, Abdallah added, when a new technique called vitrification was introduced. Instead of the old-fashioned method of slowly freezing the eggs from 37 degrees to minus 196 degrees Celsius, vitrification is a flash-freezing technique in which the eggs are immersed in liquid nitrogen and frozen almost instantaneously. This process prevents ice crystals from forming, which damages the eggs and renders them unusable.

Vitrification has become the gold standard for egg freezing, with a 92 percent survival rate of eggs after thawing compared to the 61 percent survival rate of the traditional slow freezing process, according to an ASRM study.

Once the eggs are frozen, they can be stored for "a month, a year, 10 years. Time doesn't matter anymore because they're frozen," Abdallah explained.

With eggs frozen in time, a woman can hit the pause button on her biological clock.

"When you freeze [the eggs], you stop all metabolic activity in the cell," Abdallah said. "Whether you stop it for a day or a week or a month or a year or 10 years or 100 years, it's as if you hit the pause button. When you un-pause it … it's going to pick up from where it was. The trick is knowing how to hit the pause and un-pause buttons efficiently."

The process is expensive. Harvesting eggs costs approximately $10,000, plus $500 annually for egg freezing and storage, and another $5,000 for IVF.

Bad news

Successfully freezing eggs is, ultimately, a numbers game. In order to harvest eggs and freeze them for future use, a woman must start with a large number of eggs.

"Each woman is a bit different and her body is programmed physiologically to lose eggs all the time. As she advances in life, she's losing eggs," Abdallah explained. "She'll get to a point where the egg content in the ovaries is going to be lower and this reflects on the chance of getting pregnant, because the remaining eggs are typically a lesser quality and would make pregnancy harder to achieve. That would make miscarriage more common."

Some women's biological clocks tick much faster than others.

After Kriti Mohan's egg viability and production test results came back, her doctor called and asked to speak to her in his office.

"The doctor … said, 'I'm sorry, this is the worst news I'm going to give today. I actually don't think that we can freeze your eggs. In fact, I don't actually think you can get pregnant,'" Mohan recalled. "To this day, he doesn't really know why."

Her doctor tested her anti-Müllerian hormone (AMH) levels, which measure a woman's ovarian reserve—the quantity but not the quality of the follicles. The doctor's report indicated that, on average, a woman between the ages of 30 and 39 would have an AMH level less than 9.24 ng/mL (nanograms per milliliter). Mohan's initial test put her AMH level at just .35 ng/ml—essentially the ovarian reserve of a woman over 50. She had her doctor run a second test, which came back at 1.08 ng/ml.

Her doctor could not explain why her AMH levels were so low.

"They tested other labs and did more ultrasounds, but [there was] no explanation, was what I was told," Mohan said.

The news, she said, threw her for a loop. She wasn't married—in fact, she had just started dating somebody. And she was about to finish her residency.

"My mom pressured me to have a child right then," Mohan said. "For a second, to be honest, I actually did think about it. That's when I realized this whole thing was insane. It makes you kind of crazy. … It forces you to really grapple with, 'Yes, I want a career, but do I want a child? Do I want a family? When do I want that?'"

Mohan's doctor told her she would have to undergo the egg freezing process all over again and, even then, he did not know if she could even have one pregnancy. But Mohan remains hopeful and has even chronicled her fertility journey on Instagram.

Even after the emotional rigmarole, she said freezing her eggs still provides an "enormous sense of relief" and feels like "there's this burden of a clock that's ticking that doesn't exist anymore."

Mohan has recently started her practice as a plastic and reconstructive surgeon at Memorial Plastic Surgery and is engaged to Edward Chamata, M.D., a fellow plastic surgeon. She plans to try freezing her eggs again later this year.

"At the end of the day, the whole reason I decided to do this was because I didn't want to feel pressured," Mohan said. "I didn't want somebody to tell me when my time was right. When [the bad news] happened, I felt like somebody was doing exactly that—somebody was telling me and making the decision for me that I needed to have a child right now. To me, after I actually went through the whole emotional process of it, it allowed me to still decide to do it. I wanted for it to be empowering and for me to make my own decision." ■

CURATED

The Intersection of ARTS and MEDICINE

By Britni R. McAshan

In the age of heavily-filtered selfies and alternate realities, an exhibit at Rice University's Moody Center for the Arts challenges viewers to consider digitally enhanced self-portraiture through a new lens.

In her eponymous exhibition, *Gillian Wearing: Rock 'n' Roll 70*, Wearing asked several digital technology experts to imagine what she might look like at age 70.

Collaborators manipulated Wearing's self-portraits using artificial intelligence and age-processing technology. The result: a wallpaper installation of digitally-enhanced photographs that covers 51 feet of Moody's Central Gallery and hazards several guesses at how Wearing, now in her mid-50s, might look in 15 years.

"Portraiture is the oldest art historical genre," said Alison Weaver, executive director of Moody Center for the Arts. "It has been around since cave paintings, but it has taken on this new relevance because we all have phones in our pockets and we are all putting ourselves out there in the world. We are all taking portraits of ourselves almost daily and putting up selfies of ourselves in Facebook posts and on Instagram."

To counteract selfie culture and question why youth is held in such high regard, Wearing chose not to enhance her beauty, but to embrace and explore the aging process. She also renounced control of her own self-portraits and allowed others to manipulate them, adding fine lines, wrinkles, sun spots, gray hair and even curvature from osteoporosis. The exhibit is as much a meditation on different attitudes toward aging as it is a projection of possibilities for Wearing's future self.

"We are living in a time where youth is what we admire," Weaver said. "But as we age, and as we are putting ourselves out there as we age, what does that mean for our presentation to the world and how we face that?"

In the center of the exhibit, Wearing placed a photographic triptych. On the left is a self-portrait at age 50, in the middle is a digitally enhanced photo of what she thinks she will look like at age 70, and the space on the right is blank. Wearing plans to photograph and add the final self-portrait when she turns 70.

"It's a lot about the identity and the nuances of how we present ourselves to the world, but also about how technology mediates that presentation," Weaver said. "We are reliant on these technological formats." ■

Gillian Wearing: Rock 'n' Roll 70 is on display at Rice University's Moody Center for the Arts, 6100 Main St, MS-480, through August 31. Information: 713-348-2787.

HEALTH TIPS FOR TRAV

Jason High, an insurance agent from Newton, Kansas, has spent his career assessing risk, but nothing could have prepared him for the medical journey he started in April 2017.

During a seven-day cruise in the Caribbean that he won for being a top agent at his company, High and his wife, Racquel, decided to rent a moped when the ship docked on the island of Antigua. He drove and she sat behind him.

"We were driving to the beach and we went from being on smaller streets to kind of a highway," High recalled. "When we got on the main road, we swerved to miss another car and we hit a curb and flew and hit a light pole that came down and hit my knee and then my femur bone went through my pelvis."

Travelers from the United States may be accustomed to certain standards of safety that other countries do not meet.

"Whatever safety systems exist in the U.S. are not going to be there in other countries," said Herbert L. DuPont, M.D., director of the Center for Infectious Diseases at The University of Texas Health Science Center at Houston (UTHealth) School of Public Health. "There are no railings in dangerous areas where you may fall, there are breaks in the sidewalks, wires that hang at eye level. ... There are hazards all the time. We have to exercise care in a way we don't in this country and be careful and go slow—and that is preventive medicine."

• • Buy travel insurance • •

Between 18 and 24 percent of deaths among travelers in foreign countries are caused by injuries, compared to only 2 percent of deaths caused by infectious diseases, according to estimates from the Centers for Disease Control and Prevention (CDC). Experts hypothesize that the increased injury toll for travelers can be attributed to multiple factors—unfamiliar and risky environments, differences in language and communications, less stringent product safety and vehicle standards, unfamiliar rules and regulations, as well as a carefree holiday or vacation spirit leading to more risk-taking behavior.

"A lot of times people travel abroad in order to do certain activities, such as mountain climbing or base-jumping or parasailing," said Richina Bicette, M.D., assistant professor of emergency medicine at Baylor College of Medicine. "Those are all very dangerous activities. They look fun, but we aren't really sure what the regulations are

ELERS

By Britni R. McAshan

overseas. Usually they are not regulated by a government. They are locals who have created a business, so there is no way to make sure you will be as safe as you are in the U.S."

High's injuries were severe. After the accident, he was taken to one of the largest hospitals on the island.

"The hospital wanted $1,000 before they would let me see a doctor," High said. "A surgeon who traveled between the islands was at [the hospital] that day. Immediately, he could see my knee was about six inches offset from the other one and he said, 'We have to get this reset right now because your leg or any of your joints can only be out for two hours before the blood vessels die and the bone ends up dying.'"

After resetting High's leg, the surgeon delivered a stern warning.

"The doctor that set my leg told me that I needed to do everything I could to get out of this hospital to have the surgery," High said. "He told me that if I had the surgery there, I would die."

But the price to get home was a staggering $47,000.

Fortunately, when High's company booked the trip, they also bought travel insurance.

"To be evacuated back to the U.S. is extremely expensive," DuPont said. "If you have one of these $40, $50, $100 travel insurance plans, all of that will be covered. It feels like insurance should be a requirement for all U.S. travelers."

About 30 hours after the crash, High and his wife were picked up by an air ambulance and flown back to the U. S., where High had surgery.

"The trip insurance reimbursed us for everything," High said. "I think at one time, I estimated the total cost was $315,000 for the surgery—flight and everything. Your trip insurance pays for everything out of the country and then once I was back here, my insurance took over for the rest. For the flight and everything in Antigua, it was about $70,000."

Travel insurance is the No. 1 recommendation DuPont and Bicette make for travelers.

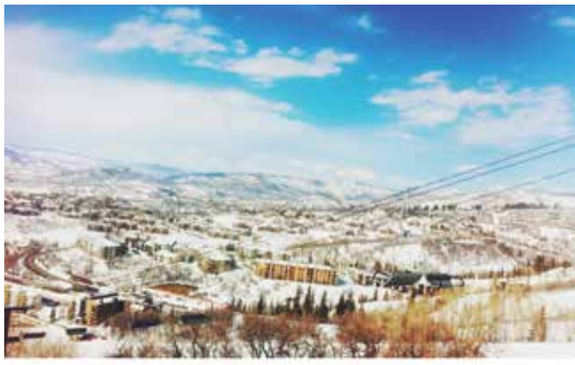
"It is usually pennies on the dollar for whatever you are paying for the trip and it can save you a ton of money and headache in the long run," Bicette said. "When you are in the states, and you live in Texas but are traveling to New York and you get hurt and you have to seek medical care, your insurance will cover the cost even if you're not in your home state of residence. If you're abroad, that is usually not so much of a guarantee and people don't oftentimes know that."

Travelers can purchase travel insurance when booking flights, or separately, through a provider.

"The cost varies depending on the trip you take, but that cost includes all medical costs and evacuation insurance to get you back to the U.S. once you're stabilized," DuPont said. "It sounds expensive to a traveler, but to a traveler who uses it, it's an amazing cost savings."

• • Get informed, get vaccinated • •

Travel experts warn that for certain destinations, accessing care can be challenging. DuPont recommends joining the International Association for Medical Assistance to Travellers (www.iamat.org), a Canadian nonprofit that provides travel health information and access to a network of English-speaking doctors around the world. ➟



"If you're in a hotel, they usually have people that work with the hotels that you can summon to you," DuPont said. "You can also call the U.S. consulate in the city you are in and they have a list of doctors who take care of U.S. people living there. If all else fails, go to a university hospital. Everywhere you go in the world, people are required, by law, to see you."

In addition to the risk of injury, travelers might encounter other health-related situations, including contracting a disease or succumbing to food poisoning.

"Measles is highly, highly contagious—so contagious that you don't actually need to come in contact with someone that has measles to get it," Bicette said. "For example, say someone that has measles was in a hotel room before you got there and they were coughing and sneezing. Those respiratory droplets will still be there even if the person is gone and you may still be at risk."

The best way to protect oneself from measles is by getting vaccinated with the measles-mumps-rubella vaccine. The CDC recommends getting vaccinated at least two weeks before departing on a trip. Even if travelers are within two weeks of a trip, they should still get vaccinated.

• • Eat food dry, peeled or hot • •

To mitigate the risk of food poisoning, Bicette suggests avoiding street food and DuPont swears by a "dry, peeled, hot" rule.

"We have done research on this over the years and the foods that are safe are very simple," DuPont said. "They are dry foods—the bacteria that cause disease need moisture, so anything dry is safe. That is bread, toast—safe. Anything that is steaming hot—if you see steam coming from food, it is safe. If you peel something, it is safe. For example, a melon at a breakfast buffet, that is safe because the contamination is on the surface. If you stick with dry, hot, peeled, you'll never get sick."

The UT Physicians International Travel Medicine Center, a once-a-week clinic offered at McGovern School of Medicine at UTHealth, prepares travelers by offering pre-travel exams, vaccinations, contact information for U.S. embassies and consulates, and follow-up care.

"Our patients come in because they want to stay healthy while they travel," said Maria Reyes, RN, a travel medicine nurse with UT Physicians. "We check vital signs, make sure their blood pressure is OK, their heart rate is OK and they're not running a temperature, and check their weight. We go through their medications, provide vaccinations if they are needed."

DuPont said in regard to preventive medicines, the most important is malaria prophylaxis if you're going to a malaria endemic area, which includes parts of Africa, South Asia and Central and South America.

Anti-diarrheal medicine is also a must for many travelers.

"Malaria kills people; diarrhea makes them feel like they're going to die," DuPont said. "Arming yourself with medication for diarrhea is important if you're going to an area in Latin America, Asia or Africa. If you're going to Europe, Australia, Japan, New Zealand, no problem. But if you're going to these other areas, you need to bring something to protect you from illness."

Being prepared is the key to a safe and healthy trip.

"You can't live in a perpetual state of fear or you will never be able to experience life," Bicette said. "Always consider your safety when traveling, always have bail out plans, make sure someone knows where you are every step of the way, make sure you have a way to contact people at home and that they can contact you." ■

MEASLES ADVISORY

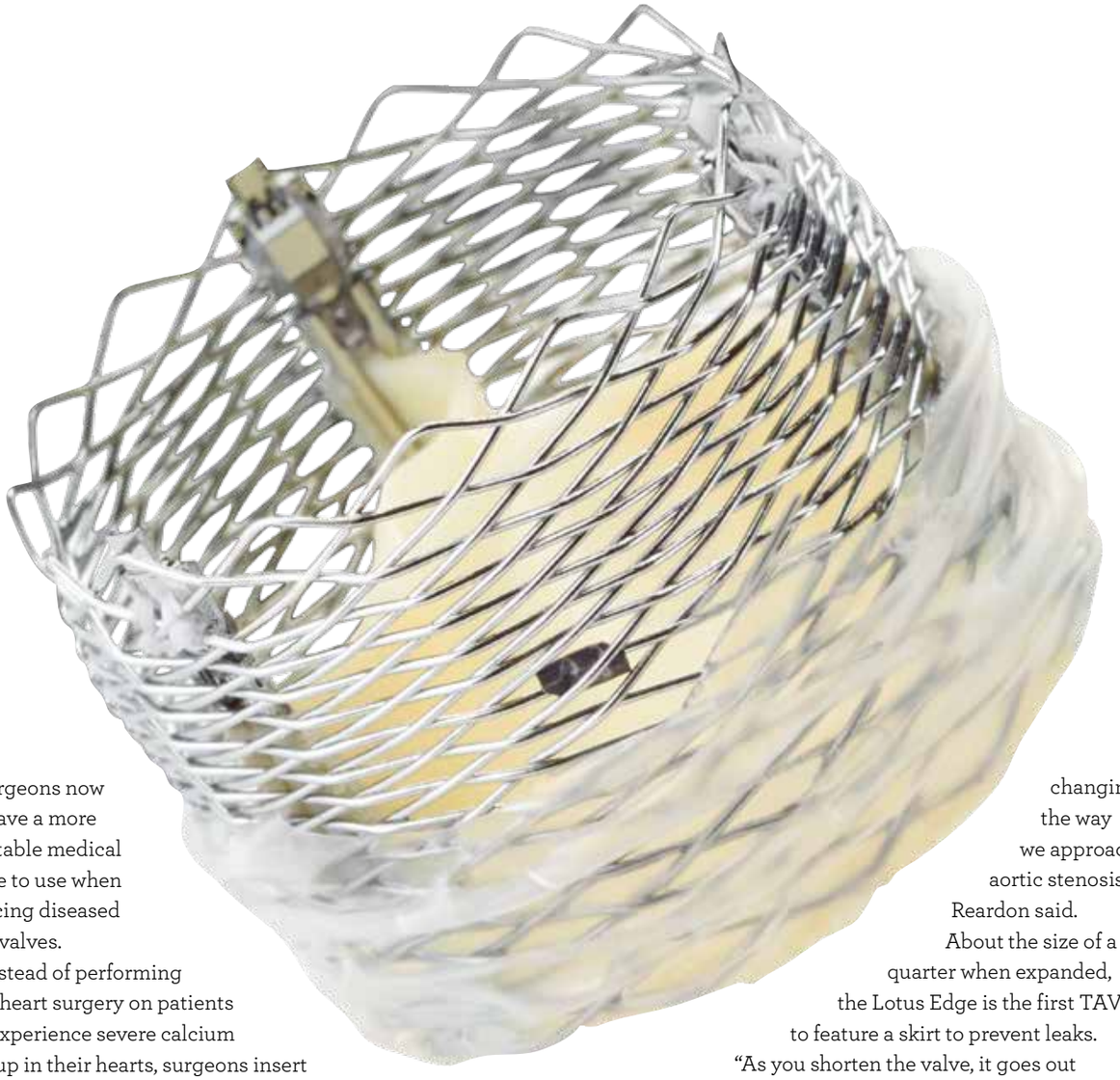
The Centers for Disease Control and Prevention (CDC) recommends protecting against measles before international travel. Plan to be vaccinated at least two weeks before departure with the measles-mumps-rubella (MMR) vaccine. The CDC does not recommend measles vaccine for infants younger than 6 months of age.

NEXT MED

New technology and techniques

By Cindy George

Heart valve offers expansion and adjustability



Surgeons now have a more adjustable medical device to use when replacing diseased heart valves.

Instead of performing open-heart surgery on patients who experience severe calcium buildup in their hearts, surgeons insert a transcatheter aortic valve replacement, or TAVR. The device is pushed through a small hole in a patient's groin and threaded to the heart, where it replaces a narrowed aortic valve that no longer opens properly.

In April, the Lotus Edge Aortic Valve System became the third TAVR system approved by the U.S. Food and Drug Administration.

It's the first device approved for use in the United States that can be fully repositioned and retrieved, said Houston Methodist Hospital cardiovascular surgeon Michael Reardon, M.D., one of two principal investigators for the clinical trials of the Lotus Edge, made by Boston Scientific Corp.

"It's very fascinating technology and it's certainly changing the way we approach aortic stenosis," Reardon said.

About the size of a quarter when expanded, the Lotus Edge is the first TAVR to feature a skirt to prevent leaks.

"As you shorten the valve, it goes out and fills up all the nooks and crannies in the calcium so there won't be any leak around the valve," Reardon said.

TAVRs now deploy in three ways, he said. In some devices, a balloon-expandable valve is inserted and blown up in place. In others, a self-expanding valve is spring-launched with some versatility. The Lotus Edge offers a third option: mechanical expansion with complete adjustability.

"It's never obstructive to blood flow, so you can take all the time you want and you can deploy it until it's 100 percent implanted … and if you like it, you let it go. If you don't like it, you can completely recapture it and move it to a new position," Reardon said. ■

Credit: Boston Scientific Corp.

1 | **EMMA A. OMORUYI, M.D., MPH,** assistant professor of pediatrics at McGovern Medical School at The University of Texas Health Science Center at Houston (UTHealth), was selected as a member of The University of Texas Kenneth I. Shine, M.D., Academy of Health Science Education.

2 | **PAUL AUSTIN, M.D.,** was named chief of urology at Texas Children's Hospital.

3 | **DONNA WARREN MORRIS, M.ED.,** program director and professor in the department of periodontics and dental hygiene at UTHealth School of Dentistry, was selected as a member of The University of Texas Kenneth I. Shine, M.D., Academy of Health Science Education.

4 | **DAVUT PEHLIVAN, M.D.,** an instructor of pediatrics and neurology at Baylor College of Medicine, was recently awarded a Mentored Clinical Fellowship from Rettsyndrome.org.

5 | **MARC L. BOOM, M.D.,** president and CEO of Houston Methodist Hospital, and **SUSAN AND DENIS DeBAKEY,** son of Michael E. DeBakey, M.D., and a member of Houston Methodist's DeBakey Heart & Vascular Center Council, hosted the screening of a new documentary, "Houston Methodist: The Hospital with a Soul, Celebrating 100 Years of Leading Medicine," at the iPic Theater in River Oaks in June.

6 | Her Majesty Queen Elizabeth II appointed **V. CRAIG JORDAN, M.D., OBE,** professor of breast medical oncology at The University of Texas MD Anderson Cancer Center, as Companion of the Most Distinguished Order of St. Michael and St. George for services to women's health. This award is offered to men and women who render exceptional service outside of the United Kingdom.

7 | University of Texas at Austin student cyclists participating in the Texas 4000 ride to Alaska stopped in Houston to present checks to **TEXAS CHILDREN'S HOSPITAL** and **MD ANDERSON CHILDREN'S CANCER HOSPITAL** to support cancer-related programs and research.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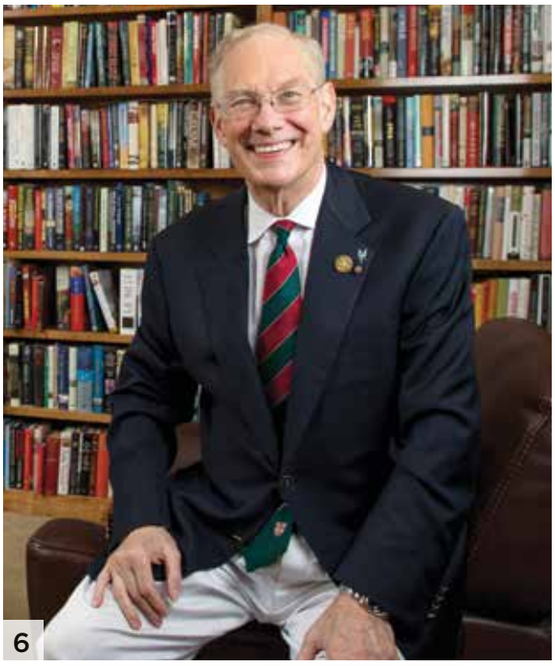
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Credit: Nos. 2, 4, 5, 7, 8, 10, 11, 12 courtesy photos; No. 1, 9, Dwight C. Andrews; No. 3, University of Texas Dental Branch; No. 6, Robert Seale; No. 10, JHPhotographyOnline

8 | Friends, family and members of the Baylor community gathered at Jesse H. Jones Hall for the Performing Arts on May 28 to celebrate this year's graduates. **BAYLOR COLLEGE OF MEDICINE** had 158 graduates and the **GRADUATE SCHOOL OF BIOMEDICAL SCIENCES** had 103 graduates.

9 | **MICHAEL BAGG,** a third-year medical student at McGovern Medical School at UTHealth, received the Texas Medical Association Medical Student Section Student of the Year Award.

10 | **BELINDA REININGER, DR.PH., MPH,** professor in the department of health promotion and behavioral sciences at UTHealth School of Public Health, was selected as a member of The University of Texas Kenneth I. Shine, M.D., Academy of Health Science Education.

11 | **LARRY H. HOLLIER JR., M.D.,** surgeon-in-chief and S. Baron Hardy Chair in Plastic Surgery at Texas Children's Hospital, was honored at Smile Train's 20th Anniversary Gala in New York City.

12 | **SUSAN D. RUPPERT, PH.D., RN,** associate dean and department of graduate studies chair at the Cizik School of Nursing at UTHealth, was selected as a member of The University of Texas Kenneth I. Shine, M.D., Academy of Health Science Education.

13 | TMCx Demo Day drew a standing-room-only crowd to the **TEXAS MEDICAL CENTER INNOVATION INSTITUTE** on June 6 to hear presentations from the 19 companies in the TMCx08 cohort. The eighth Demo Day featured companies focused on creating digital solutions to some of the world's most complex health problems.

Do you have TMC photos you would like to share with *Pulse*?
Submit high-resolution images to: news@tmc.edu

July 2019

7/8

Nursing Information Session
Monday, noon – 1 p.m.
Prairie View A&M University
College of Nursing
6436 Fannin St., Room 135
fdsmith@pvamu.edu
713-798-6590

7/9

Rice University Farmers Market
Tuesdays, 3:30 – 6:30 p.m.
Rice University
Parking lot entrance 13B
5600 Greenbriar Dr.
ricefm@rice.edu

7/12

Shining a Light on LVN Practice
Annual Licensed Vocational Nurses Conference, hosted by Harris Health System
Friday, 8 a.m. – 4 p.m.
United Way
50 Waugh Dr.
$10–$25
rita.mack@harrishealth.org
713-566-9255

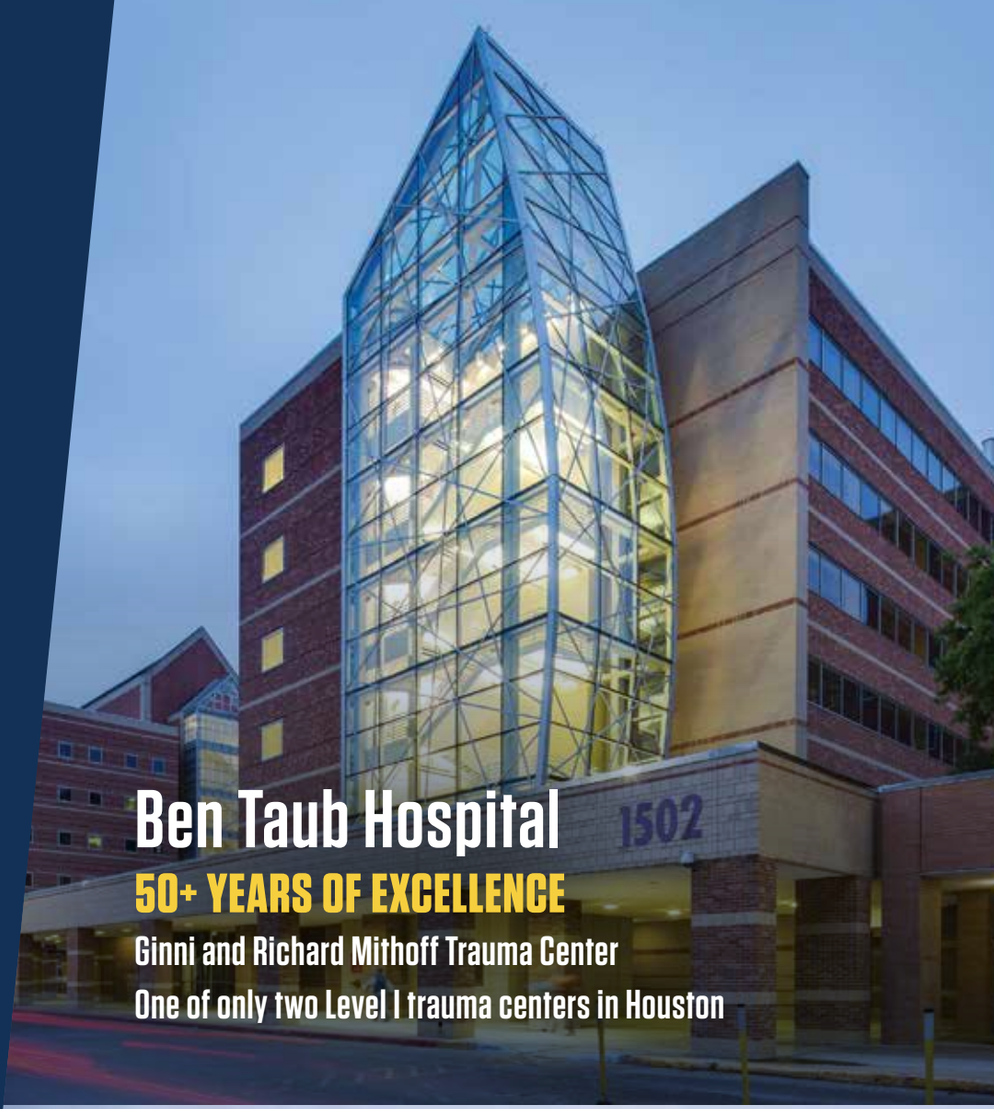
7/28

PeaceXCulture Fest
Fashion show and performance in collaboration with the UH Wellness Center
Sunday, 4 – 8 p.m.
University of Houston "Ballroom"
Student Center South
4455 University Dr.
$12–$30
eventbrite.com

Here's to your health.

For more than 50 years, Harris Health System has served as a vital resource for Harris County. Our hospitals provide the highest levels of care and serve as the ultimate training grounds for tomorrow's best medical professionals.

You can count on us to remain innovative champions of health for those who need us most for decades to come.

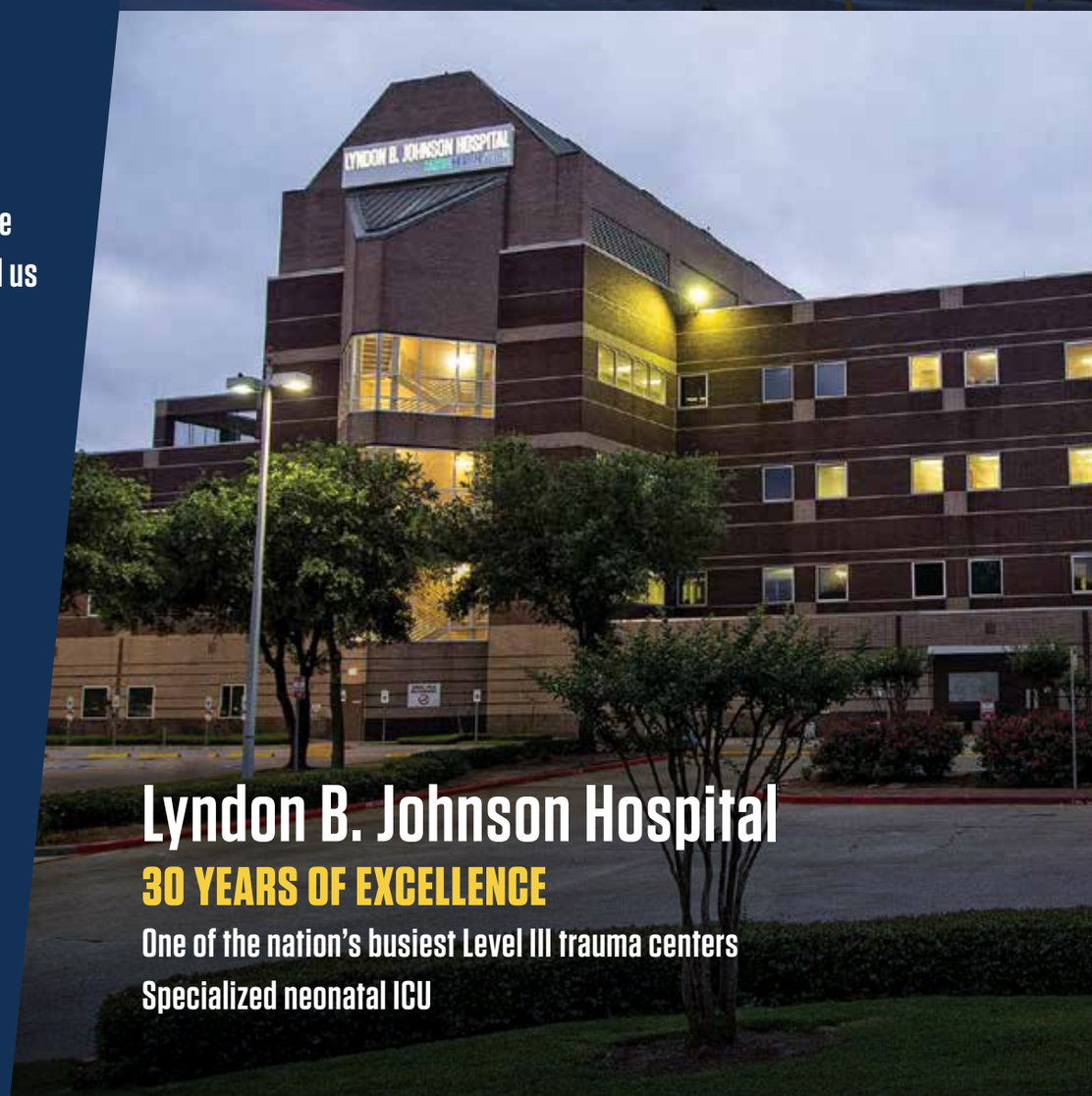


Ben Taub Hospital

50+ YEARS OF EXCELLENCE

Ginni and Richard Mithoff Trauma Center

One of only two Level I trauma centers in Houston



Lyndon B. Johnson Hospital

30 YEARS OF EXCELLENCE

One of the nation's busiest Level III trauma centers

Specialized neonatal ICU

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ONEFORALL harrishealth.org

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Pine Valley
River Oaks, $2.8+ mil.
Colleen Sherlock, 713.858.6699

Rice Blvd.
Southampton Place, $2.7+ mil.
Cathy Blum, 713.320.9050

Rice Blvd.
Southampton Place, $2.3+ mil.
Tim Surratt, 713.942.6830

Summerhill
Piney Point, $2+ mil.
Sharon Ballas, 713.822.3895

Holt
Bellaire, $1.6+ mil.
Cheryl Cooper, 713.254.4984

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Southwestern
West University, $1.1+ mil.
Bonnie Laughlin, 713.805.6422

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Bobbie Fisher, 832.721.3313

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River Oaks Shopping Area, $580s
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Midtown, $470s
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