

# MEDICAL BREAKTHROUGHS 2020

NEW HOPE FOR: **DIABETES + BREAST CANCER + PROSTATE CANCER  
VISION LOSS + HEART DISEASE + LUNG DISEASE**

# Saving Their Health AND OURS

*Meet some of the courageous patients who have found promise in the latest medical breakthroughs* **By Sarah Mahoney**

**+** YES, 2020 HAS been a dark time. The coronavirus crisis exposed plenty of cracks in our national health care system, and we lost far too many of our peers and loved ones to an out-of-control pandemic. But as we mourn the losses of this past year, there's reason for optimism, not just for an end to the current crisis, but for all of the innovations that have arrived in its wake. The growth in telemedicine and health apps has improved health care access for the most

vulnerable among us, while manufacturers such as Ford and GM have shown that they can quickly retool to create medical equipment, exposing an opportunity for all companies to explore. So let's take a moment to recognize many of the recent breakthroughs in medical care—advances that may pave the way for a healthier, happier tomorrow for all of us—and to celebrate the heroic men and women who have helped to make these futuristic treatments a modern reality.



DIABETES  
BREAKTHROUGH

## Treating Diabetes With Islet-Cell Transplants

**S**OME MEDICAL breakthroughs come as lightning bolts, but Randi Fibus-Caster has been riding the slow-moving train of islet-cell transplants for an astonishing 15 years. For most of her life, Fibus-Caster was called a “brittle diabetic,” which meant that her type 1 diabetes caused such severe swings in blood sugar levels that passing out was a frequent occurrence. “I used to wear a lot of silver bangles on my arm, so they could hear me when I fainted at work,” she says.

But since she had her islet-cell transplant in 2005, followed by a bone-marrow transplant 10 days later and an additional islet-cell transplant in 2010, that has all changed. She's been free from insulin injections for 10 years, with a blood sugar score on the low side of normal. And she takes just two anti-rejection medications per day—very low for a transplant patient. That has made her a success story of the experimental procedure, which continues to be a major focus at the University of Miami's Diabetes Research Institute.

Such transplants are used in other countries, and researchers are await-



**Bariatric surgery can prevent diabetes in very obese people (BMI of 40-plus). Now data shows it may cause remission in type 2 diabetics with a BMI as low as 30, especially for those with early onset.**

Rose Marie Cromwell



“I never have to worry about insulin reactions.”  
—Randi Fibus-Caster, 63  
Florida

ing approval from the Food and Drug Administration (FDA), which is evaluating trial results. “This is an area where the U.S. lags,” says Jay Skyler, M.D., deputy director of clinical research at the institute.

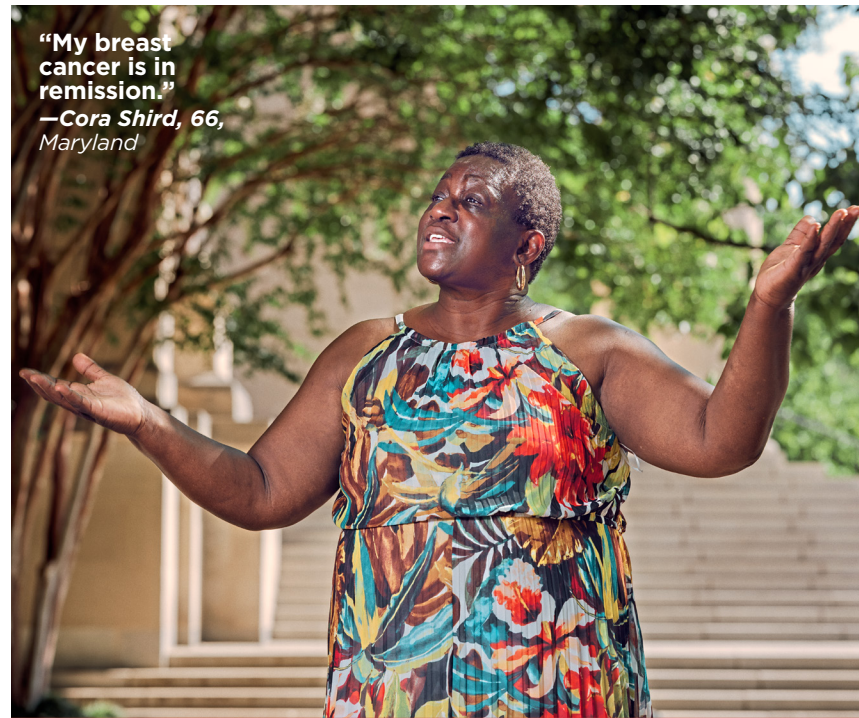
One hurdle for these transplants is finding more sources of insulin-producing cells. Currently, they come from cadavers and are in short supply. “We're still limited by only 1,200 cadavers per year,” he says. Researchers hope that embryonic or induced pluripotent stem cells will one day be

a source of insulin-producing cells, making the treatment available to both type 1 and type 2 diabetics.

Both of Fibus-Caster's 2005 transplants came from the same cadaver donor, and the 2010 procedure from another. Doctors attribute her exceptional recovery to a high tolerance of the required antirejection drugs, which can be an obstacle for many.

She can't wait for the day the procedure is cleared for widespread use. “I'm so happy this transplant has given me a second chance.” →





**“My breast cancer is in remission.”**  
—Cora Shird, 66, Maryland

**BREAST CANCER**  
BREAKTHROUGH

## Aggressive multidisciplinary therapy to attack an especially dangerous early-stage tumor

**A**FTER 24 YEARS of perfect mammograms, Cora Shird, 66, got the call that women dread: She should come in for a retest. The retest, in March 2018, led first to a sonogram, then a biopsy, then a diagnosis, then tears. Two of her five sisters had already had breast cancer, and she knew how scary it could be. “After I got the call, I went into my manager’s office, and we went down in the chapel, and I prayed,” she says. Adding to the fear, Shird discovered she had a type of cancer known as HER2+/ER+. About a quarter of all breast cancers are HER2+; these tumors have higher levels of a protein

called human epidermal growth factor receptor 2, which tends to make them grow and spread faster than other breast cancers. Researchers had been studying this cancer subtype and had developed new treatment approaches, including an aggressive multidisciplinary therapy that was first proven beneficial in later stages of breast cancer. “Several treatments are now available to women with advanced breast cancer, and some are expected to also be incorporated in the early setting, including new treatments that target HER2,” explains Vered Stearns, M.D., director of the women’s malignancies program at the Kimmel Cancer Cen-

ter at Johns Hopkins University in Baltimore, which is where Shird was being treated.

First, Shird got a lumpectomy, with doctors removing three lymph nodes as well as the tumor. Next came 20 sessions of chemotherapy, followed by 15 rounds of radiation. “The first session



There are several breast cancer treatments that are generating optimism.

> New studies find that aromatase inhibitors (which reduce estrogen), currently used to prevent recurrence, may prevent breast cancer from developing in the first place.

> An immunotherapy drug, atezolizumab, is being tested in combination with the chemotherapy drug nab paclitaxel, potentially creating a new line of treatment for difficult-to-treat “triple negative” cancers.

was the worst, and I was determined that chemo wasn’t taking me down like that,” Shird says. So she began taking better care of herself, looking for ways to build up her immune system, including meditation classes—even something called “sound meditation”—along with tai chi and walking. Today her cancer is in remission. Shird continues to take one medication daily, anastrozole, which reduces the risk of her breast cancer coming back. Her doctors expect her to be on this drug for between five and 10 years. Shird, who has since retired from her job as a clinical technician, couldn’t be more grateful, despite ongoing struggles with lymphedema, a common but painful complication of lymph node removal that required physical therapy. “I just leaned into my faith,” she says. “My three daughters gave me such strength and support. I even did a mission trip down to Jamaica. And when I lost my hair, I decided to be the baddest chick with a bald head.”

From left: Jared Soares; John Clark

**PROSTATE CANCER**  
BREAKTHROUGH

## An experimental drug combo that controls hormones linked to prostate cancer progression

**I**N 2016, John Hammel developed intense back pain, and an MRI revealed tragic news. He had late-stage prostate cancer that had already begun to spread through his body. “Because I’m a physician, I knew how devastating the diagnosis was. I was despondent—I didn’t think I’d live a year.” When his

oncologist told him real treatment was available—“treatment, not just palliative care”—he was skeptical. Then he met someone who had a similar case but was symptom-free for three years. He allowed himself to be hopeful.

At his oncologist’s urging, Hammel joined a clinical trial led by Christopher Sweeney, M.D., at Dana-Farber

Cancer Institute in Boston. Because testosterone and other male hormones can fuel the growth of cancer cells, much research focuses on ways to either suppress the production of hormones or stop cells from receiving them. Sweeney’s study did both, combining enzalutamide, an oral drug that blocks hormone reception, with testosterone-suppressing medication. The FDA-approved treatment may raise three-year survival rates by as much as 80 percent.

Hammel, a psychiatrist, was living in Vermont and continued working throughout the trial, making regular trips to Boston for treatment. “I watched my PSA [a protein created by the prostate that goes up when the organ is diseased] drop from 2,000 to 450 to four and then to undetectable for six months—that’s where it is now.”

For Hammel, who says there is now no progression of his cancer, the trial has helped him start living, instead of focusing on his prognosis. When he and his wife found out one of their daughters was pregnant with their first grandchild, “that changed everything. We knew we wanted to be a part of the baby’s life and part of my daughter’s life more than we were.” So he found a new job in Seattle, and the couple moved west. Besides spending time with their grandchild, they bought a sailboat, reigniting an old love of cruising. “We had put our lives on hold and kept working in three-month intervals,” he says. “But we are so fortunate that I’ve had this sustained response that we just decided to do what we want. If the tumor starts to win out again, we’ll deal with it.” →



By fusing a molecule that binds to a prostate-specific protein, scientists can spot tiny clusters of cancer in PET scans—leading to earlier detection of recurrences than were possible with conventional imaging.



**“I have virtually no symptoms of disease.”**  
—John Hammel, M.D., 65, Washington





"I can see faces again."  
—Anna Kuehl, 80,  
California

 VISION LOSS  
BREAKTHROUGH

## Retinal implants to restore sight impaired by age-related macular degeneration (AMD)

**ANNA KUEHL** was scared. Ever since a diagnosis of dry macular degeneration in her late 40s—younger than most patients—she had been monitoring her sight, using a special tool known as an Amsler grid. One day a large black area appeared in her left eye, and she went back to her doctors at the University of Southern California for help. There she discovered that a team of researchers were working on a promising treatment for her condition that involved stem cell-based implants. Even as she began taking the required immune-suppressant medication leading up to the surgery, she says, "I wasn't scared anymore. I was looking forward to it."

Surgeons implanted the tiny device—about the size of a human red blood cell—into the retinas of 15 patients, including Kuehl. Now that

some participants have passed the key one-year mark with improving vision, the procedure has cleared the way for a larger clinical trial.

The treatment uses an ultrathin layer of specialized retinal cells to slow the progress of dry AMD. In some cases the procedure actually improves vision. That's what happened to Kuehl. She can now read her watch and see her entire face in the mirror. "Shortly after the surgery, I turned to my husband while we were watching TV and said, 'I can see all their faces!'" Doctors say FDA approval is about five years away.



A refillable eye implant can deliver the AMD drug ranibizumab, eliminating the need for monthly injections.

 HEART DISEASE  
BREAKTHROUGH

## Radiation therapy to reprogram deadly heart arrhythmias

**WHEN BOB** Bartlett collapsed during an exercise class in 2007, fast-acting paramedics saved his life. But the event led him down a complicated road of heart procedures and surgeries, an implanted defibrillator and debilitating medication. And he was burdened by the constant knowledge that he could drop dead at any moment from his fast and abnormal heart rate, a condition called ventricular tachycardia (VT).

"Once you know the feeling," Bartlett says, "you know that if it continues, you'll fall like a tree. And you know you might die."

The attacks—which trigger the defibrillator to begin shocking the heart back into proper rhythm—can occur multiple times a year. "It feels kind of like a locker-room punch to the chest," he says of his VT attacks. Like Bartlett, many patients develop post-traumatic stress disorder from repeatedly having their heart shocked back into rhythm. And when his arrhythmia drug caused intensely painful neuropathy in his feet, he was ready to give up. "I realized that if this became the new normal, I wasn't sure I could live with it."

Then Bartlett learned about experimental work happening at Barnes-Jewish Hospital in St. Louis, where Washington University School of Medicine physicians were using radiation to ablate damaged heart tis-

sue. The procedure remains investigational, so insurance may not cover it.

Diagnostics took a week as doctors mapped out the faulty areas of Bartlett's heart, but the actual procedure

"took less time than the Chopin sonata he had on his earphones," says Clifford Robinson, M.D., professor of radiation oncology at Washington University, a co-pioneer of the technique. Unlike a typical ablation, which can take six hours or more, the procedure is noninvasive.

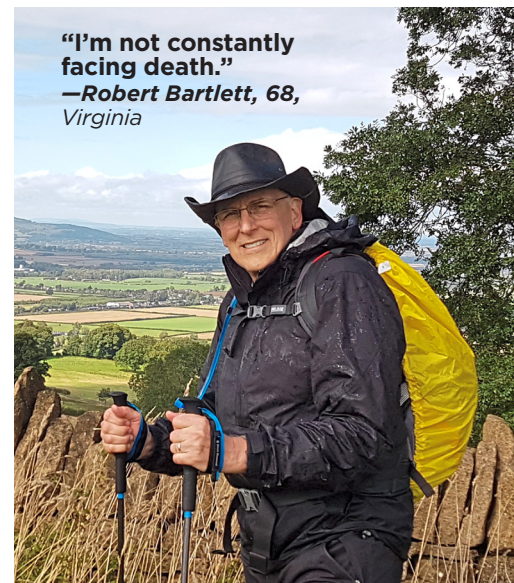
Doctors have now performed it on a number of people. One, a patient in

her 80s, died within one month, from causes that may have been unrelated to the surgery. The other patients, who had experienced numerous VT episodes in the weeks before the procedure, have found that their incidents have decreased measurably, and in some cases have stopped altogether. Bartlett's are virtually nonexistent—and so is his sense of dread.

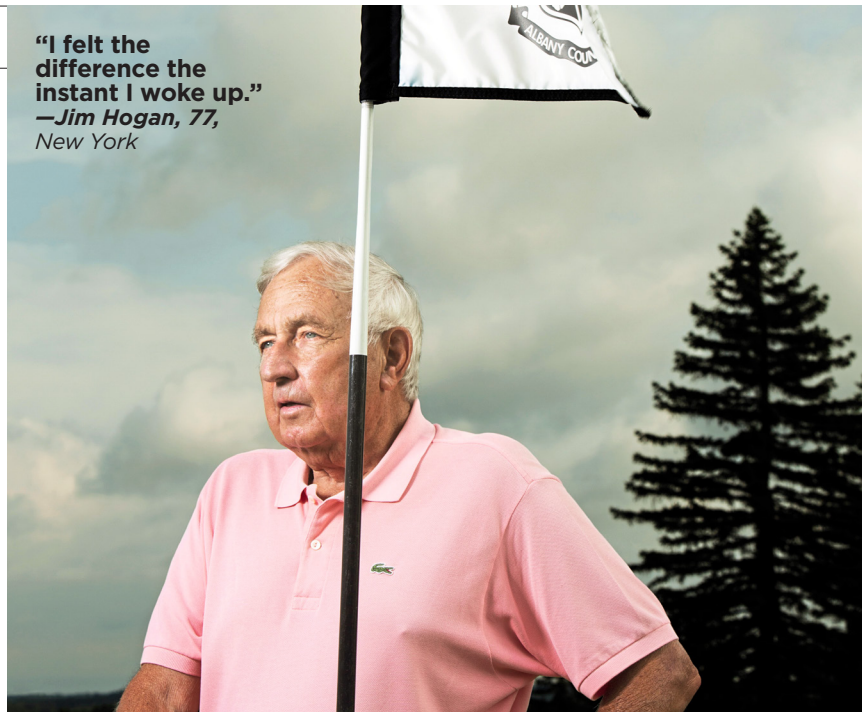


In a study of 420,000 Apple Watch users who wore an electrocardiogram patch, the smartwatch accurately warned about atrial fibrillation in more than one-third of the participants.

Clockwise from left: Tracy + David Stills and Motion; Ethan Hill; Courtesy Robert Bartlett



"I'm not constantly facing death."  
—Robert Bartlett, 68,  
Virginia



"I felt the difference the instant I woke up."  
—Jim Hogan, 77,  
New York

 LUNG DISEASE  
BREAKTHROUGH

## A tiny valve implant that boosts breathing by helping damaged lungs work more efficiently

**JIM HOGAN'S** chronic obstructive pulmonary disease (COPD) was getting worse, making it hard to finish his weekly golf games—or even walk down the driveway. Lucky for him, his golf partner, a doctor, came across a journal article about Zephyr, a lung valve that was generating medical buzz in Europe.

When the FDA cleared Zephyr for use in the U.S. in 2018, Hogan lobbied to get insurance coverage for the procedure, traveling to Temple University Hospital in Philadelphia, the first U.S. center to use

the valve to treat severe emphysema. After a few hurdles—his insurance company considered it investigational, and he had to appeal—he had the valve implanted in April 2019.

It's a serious procedure, with a device the size of a pencil eraser inserted via a bronchoscope. The one-way valve blocks air from invading the damaged part of the lungs, where it can get trapped and hinder breathing.

"The instant I woke up from anesthesia, I felt the difference," he says.

"It took 20 years to develop and gain approval for a treatment," says Gerard J. Criner, M.D., director of the Temple Lung Center, where Hogan had his procedure. "It's less invasive than other treatments. It costs less. And it improves exercise function and quality of life." ■



Nuvaira is a radio-frequency ablation that disrupts nerve signals and dilates the airways. In trials it reduced COPD flare-ups in patients.