REVIVING A HEART

By Stephanie Perry

A MAN, A BOAT AND THE FUTURE OF CARDIAC CARE

“They say that blood is seawater,” says Jim Briggs, standing at the wheel of his boat.

While his wife, Cindy, secures the lines, Briggs assesses the craft’s readiness before heading out on the waters of Puget Sound. Are the pumps running? Are they pumping enough water, but not too much? Which way will the tide take the boat?

As the engine warms up, it smooths out audibly, with water pumping through and out the exhaust from both sides. As Briggs knows, the process is not unlike the function of the heart. Sometimes, hearts work well. And sometimes, as in Briggs’ case, they don’t.

A DECLINING HEART

“It never once occurred to me that maybe I should slow down and take another course in life,” says Briggs. “Not once.” He was used to an active life: diving, skiing and boating with Cindy and working long days distributing wholesale plumbing supplies.

When Briggs began having trouble breathing in 2001, he attributed it to allergies or a recurring bout of asthma. But his primary-care provider wasn’t so sure. And when chest X-rays showed signs of heart failure, it struck a chord — both Briggs’ father and sister had died young from congestive heart failure.

As he became sicker and tired more easily, Briggs was forced to cut back his schedule, working from home when he could. He had also received a defibrillator.

In 2002, Briggs came to UW Medical Center. Wayne Levy, M.D., UW professor of medicine in the Division of Cardiology, and Jeanne Poole, M.D. ’80, professor and director of the arrhythmia service and electrophysiology laboratory, treated Briggs with a combination of medical and electrical therapy to interrupt electrical impulses that create abnormal heart rhythms. Later, they gave Briggs a pacemaker-defibrillator, capable not only of restarting the heart but also of supporting a declining heart rate. In 2008, Briggs was upgraded again, this time to a cardiac resynchronization pacemaker-defibrillator.

Despite these state-of-the-art technologies, Briggs’ heart failure was getting worse. Even taking the trash can from their doorstep to the road would leave him winded and struggling for air. In April 2009, his heart was pumping so poorly that he was hospitalized with kidney problems.

“His heart failure continued to worsen, which is the problem with heart failure in general: it is a progressive disorder. For most people, ultimately, it’s going to get worse and require more aggressive therapy,” says Poole.

It was time to talk about a heart transplant.

WAITING FOR A TRANSPLANT

Although Briggs was placed on a waiting list for a transplant, no one knew how long it might take. At any given time, UW Medicine has 40 to 50 patients waiting for a donor heart. Depending on their blood type and organ availability, patients can wait months, even years.

While Briggs waited, his doctors prescribed a heart stimulant to maintain cardiac function until the transplant. But when his health continued to deteriorate, he was scheduled to receive a high-tech left ventricular assist device (LVAD). While they're awkward to manage, and not without risks of their own — infection, bleeding and increased stroke risk — LVADs can extend patients' lives by years while they're waiting for a transplant, allowing them to live with markedly improved quality of life at home while they wait. They're also given to patients who may not be good candidates for transplant.

Daniel Fishbein, M.D., UW professor of medicine in the Division of Cardiology and the medical director of the UW Medicine Heart Transplant Program, was the one to deliver the good news: after just seven weeks, before they'd even had time to implant an LVAD, they had found Briggs a heart. The transplant took place on June 4, 2009.

"It was a whole new life," says Briggs. "I didn't realize how sick I was, and how lucky I had been, until I came home. My life started again right then and there." Briggs retired, and he and Cindy gradually returned to an active life.

GETTING ANOTHER CHANCE: JIM BRIGGS' LIFELINE		
2001 Trouble breathing **2001** Diagnosed with congestive heart failure	**2002** Implanted a defibrillator (a monitor capable of providing a life-saving shock)	**2008** Upgraded to a cardiac resynchronization pacemaker (aligns the rhythms of the two sides of the heart)

2002 Cardiac arrest in ER; referred to UW Medical Center	**2002–09** Treated with medications and ablation (a cauterization procedure) to reduce rhythm abnormalities **2008** Implanted a pacemaker-defibrillator	**2009** Progressive heart failure with trouble breathing and kidney problems **Spring 2009** Placed on heart transplant waiting list **June 4, 2009** Heart transplant; a new life begins

WHEN TRANSPLANT IS NOT AN OPTION

Eight years after his transplant, Briggs' doctors are pleased with his recovery. "He's done extraordinarily well," says Levy. "He's doing what needs to be done: taking his medicine and obtaining follow-up care."

For those fortunate enough to receive a transplanted heart, the prognosis is good: patients can survive up to 30 years with a new heart. Still, only about 3,000 heart transplants are performed each year in the U.S. In contrast, millions of people in the U.S. suffer from congestive heart failure.

"Transplant is a wonderful therapy for people who get it," says Fishbein, "but there is a clear need for improved therapies, particularly in older patients or patients who have medical conditions that preclude the possibility of transplant."

At UW Medicine, investigators are working to create new therapies — and improve current ones — for people who need care. One of the most promising areas of investigation is stem cell medicine.

USING STEM CELLS TO REPAIR THE HEART

“We think the only way we’re going to make the problem better is to create new heart muscle, and we believe pluripotent stem cells are the best way to do that,” says W. Robb MacLellan, M.D., head of UW Medicine’s Division of Cardiology and the Robert A. Bruce Endowed Chair in Cardiovascular Research. Pluripotent stem cells can produce any cell or tissue needed to repair the body.

MacLellan and his team are developing a universally compatible stem cell line to help rebuild heart muscle tissue. During a heart attack, a portion of the heart dies from blood vessel blockage and a lack of oxygen; within 3–4 weeks, the dead muscle will turn into non-functioning scar tissue. Injecting stem cells before that happens could allow the heart to form healthy new muscle tissue. Phase I clinical trials, focusing on the highest-risk patients, are tentatively scheduled for 2019.

The director of the Institute for Stem Cell and Regenerative Medicine and the Arra and Eva Woods Endowed Professor, Charles E. Murry, M.D., Ph.D., is also making major progress in stem cell medicine and cardiac repair. His lab recently demonstrated that damaged heart muscle in animal models could be repaired with human stem cells. Their first clinical trials are planned for 2019.

If successful, stem cell therapies could have broader applications to other types of disease.

“There’s scar tissue fibrosis formation in lung disease, kidney disease and liver disease,” says April S. Stempien-Otero, M.D., FACC, UW associate professor of medicine in the Division of Cardiology and the Craig Tall Family Endowed Professor in Heart Failure Research. “I think anything we learn from implanting heart muscle cells that are made from stem cells is going to help those other tissues.”

ACCELERATING HEART CARE

In addition to stem cell medicine approaches, UW researchers are working on a number of creative methods to address heart disease in new ways — and to improve existing treatments.

Gene therapy

Murry and UW bioengineer Michael Regnier, Ph.D., are working on a novel gene therapy called BB-R12 that may address the underlying cause of heart failure — a weakened heart — by activating the heart's pumping protein to strengthen contractions.

Destroying scar tissue

Stempien-Otero is collaborating with bioengineer Marta Scatena, Ph.D., to modify a macrophage, a cell that produces enzymes to break down scar tissue, to potentially "eat" dead scar tissue in the heart.

Better medications

"We now have medications that improve heart function, stabilization and heart failure,"

Fishbein says. “We’re going to develop more targeted drugs that treat specific aspects of heart failure and change the natural history of the disease.”

Smaller, improved LVADs and other devices.
Mechanical and electrical engineering teams at the UW are attempting to create fully implantable LVADs that pose less risk of infection. Other small devices are likely to come online, too, including tiny implantable pacemakers.

“WE CAN BEAT HEART DISEASE.”

Today, Jim and Cindy Briggs are advocates for conquering heart disease. Jim offers emotional support to patients waiting for a heart transplant, and Cindy serves on the executive board of the American Heart Association in Seattle and the South Sound. She says they’re inspired by the innovation and creativity they’ve seen firsthand at UW Medicine.

“I am so grateful that we had the opportunity to take that journey with all the nurses, doctors and everybody who knew our story and greeted us in the hallways and asked how we were doing,” says Cindy. “It was incredible.”

Whether it’s through advances to current treatments or a breakthrough from a new therapy, the Briggses are confident about the future of cardiac research and care at UW Medicine.

“I feel ever more committed that we can beat heart disease,” Cindy says. “I hope it’s in my lifetime, because I want to see it, but I know it’s going to be done.”