The science of meditation

U of M study seeks evidence that mindfulness-based stress reduction can help improve recovery for people who have heart disease

Can meditation help prevent or ameliorate heart disease? For years, many patients and physicians have believed the answer is yes—though ironclad evidence has been hard to come by, in part because it’s difficult to design workable controls for clinical studies.

Now a University of Minnesota team is exploring whether—and precisely how—meditation affects heart health. The study is also suggesting that meditation, specifically mindfulness-based stress reduction (MBSR), may help heart patients follow through with cardiac rehabilitation.

“I’ve been interested in meditation, and the mind-body connection, on a personal level for a long time,” says University of Minnesota Health cardiologist Prabhjot S. Nijjar, M.D., an assistant professor in the Medical School. Coleading the study, Nijjar says he began meditating while he was in medical school and noticed that it seemed to help significantly with stress-induced back pain.

“Nobody doubts that meditation makes you feel good,” Nijjar says, and many people have felt it makes a difference in easing various physical ailments. “But what is it doing toward the actual disease process?”

As a cardiologist, he was eager to find out. “It’s clear that stress plays a big part in cardiac disease,” he says.

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Not only does stress contribute to heart disease to begin with; the added stress of experiencing a cardiac event can exacerbate it. “I wanted to really [establish] whether meditation has beneficial effects for cardiac patients—and understand how it works,” he says. “It became apparent to me that [meditation] has to interact through the autonomic nervous system.” That’s the part of the nervous system responsible for controlling basic, unconscious bodily functions like breathing, heartbeat, and digestion.

A mentor pointed Nijjar toward heart rate variability as one key way to examine the autonomic nervous system. Counterintuitively, variability here is a good thing.

“If your sympathetic nervous system is revved up—which is bad—your heart rate stays steady. When you’re nervous or stressed out, your heart rate doesn’t change,” explains Nijjar, who is also a faculty member of the U’s Center for Spirituality and Healing. Conversely, “when you’re relaxed or sleeping and your parasympathetic system is active, that’s when your heart rate has these fine changes from beat to beat.”

A few years ago, Nijjar completed a study showing that MBSR helps improve heart rate variability in healthy subjects. “What we found was that during meditation, the heart rate variability was even better than just controlled breathing,” he says. “So it’s not just about controlled breathing; there’s something else that’s happening.”

What, exactly? And could it have a place in the treatment of cardiac patients?

In 2014 he began working with Susan Everson-Rose, Ph.D., M.P.H., an associate professor in the Medical School with a long-standing interest in the relationship between stress and cardiovascular risk, to design a randomized study of MBSR’s effect on heart patients.

The interdisciplinary study began last summer. It includes 47 participants who were referred for cardiac rehab; nearly two-thirds have undergone MBSR training. Nijjar and Everson-Rose are examining data on participants’ sleep activity, inflammation markers, quality of life, and heart rate variability to see whether there are differences between the control group and the subjects who practiced MBSR.

Their strikingly successful recruitment and retention rate—95 percent, for a commitment that includes nine three-hour sessions over eight weeks—may help. “It’s a big time commitment for patients,” Everson-Rose says. And given that cardiac rehab completion rates are only about 50 percent nationally, the study could say something about MBSR’s ability to help keep patients engaged in their recovery.

If their proposition holds up, Nijjar says, meditation could become another part of standard cardiac rehabilitation therapy.

“We need rigorous scientific research showing that it works,” he says. “And if we have that, I see [meditation] being a part of all of therapies that we have. A tool in the toolbox.”
It’s the ever-present challenge of heart transplantation—too few donor hearts and too many people who need them.

Last year, 3,191 suitable hearts were transplanted in the United States. But more than 100,000 patients could benefit from a new heart, according to University of Minnesota Health cardiologist Cindy Martin, M.D.

The result of this mismatch: highly selective waiting lists and many people who never get the new heart they need.

Today a clinical trial at the University of Minnesota and seven other heart transplant centers across the country may help make use of good hearts that don’t meet today’s stringent guidelines for transplantation. The potential result: more hearts for more patients.

If successful, the clinical trial involving a portable device known as the TransMedics Organ Care System (OCS)—or more colloquially, the “heart in a box”—could have a “huge impact on the donor organ allocation system,” says Kenneth Liao, M.D., Ph.D., surgical director of the University’s heart transplant program and principal investigator in the University’s portion of the trial.

Inside of the OCS, the donor heart continues to beat and circulate warm, oxygenated, nutrient-laden blood until the heart is disconnected and implanted into the recipient. The goal is to allow more time for the donor heart to be transported to the recipient. Under today’s standards, transplantation within four hours is best; within six is acceptable in the right situation.

The EXPAND Heart clinical trial, as its name suggests, expands the criteria for what is an acceptable donor heart in a long-term effort to increase the number of organs available. Physicians use the OCS to evaluate “marginal” hearts that might be rejected under traditional criteria. The device gives a surgeon such as Liao an opportunity to continuously monitor the heart during transport and to examine its function, even at an enzymatic and cellular level. That information translates into more confidence in using a heart that might have come from an older-than-optimal donor, for example, or a heart that has been in transit for more than four hours.

“[We] assess the heart until about 10 minutes before we put it into the recipient,” Liao says. “We’ll watch the heart work, pumping, until we’re totally satisfied that this heart is usable.”

The alternative might be no heart at all for that patient.

“The last thing you want to do is let a good heart not be used because of incomplete information,” Martin says.

Cardiovascular surgeon Kenneth Liao, M.D., Ph.D., has evaluated four donor hearts using the TransMedics Organ Care System so far. Two have been used for transplant.
Specialized care, no matter the distance

People who need specialized heart care but live far from specialty heart centers face a higher risk of adverse events, simply because of the distance from their care teams.

But with the right technology, University of Minnesota Health nurses and physicians will be able to assess patients’ health from afar and help to better manage their disease. In a pilot program, M Health Heart Care evaluated a virtual care model with the help of patients living in outstate Minnesota who have advanced heart failure.

24/7 symptom monitoring by heart failure nurses and cardiologists at M Health Heart Care in the Twin Cities

11 patients participated

59 miles on average from the Twin Cities

36% reduction in hospital admissions

$30% reduction in per-patient health care costs

Quality of care
Communication between patients and providers
Ownership of disease management
Trust between patients and providers

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