JEFFREY WINTERFIELD: When you go to public spaces, like stadiums or airports or train stations, you'll see boxes with glass-- almost like a break glass in case of emergency-- which contain portable defibrillators. And that's meant to resuscitate those folks who, for whatever reason, experience a cardiac arrhythmia that results in them losing consciousness, collapsing. And in many circumstances they are easily resuscitated with prompt defibrillator shocks delivered by those devices.

What we try to do is prevent them, though, and try to identify those folks who are at risk of dying suddenly. And to do that, we largely look at things like their overall cardiac health and other co-morbid illnesses to get a sense of what their risk might be. And in folks that we deem particularly high risk, we implant them with an implantable defibrillator.

My role, generally, is-- although I do implant defibrillators-- it comes in after the fact, after the defibrillator's been implanted, and they begin to experience electrical storm with those defibrillators already in place. What we really refer to as electrical storm are those folks who have implantable defibrillators, which are implanted to prevent sudden death. And when people have appropriate therapies, meaning defibrillator shocks or defibrillator therapies which total number of three or more in 24 hours, we define that as electrical storm.

And in that setting, when people experience multiple defibrillator shocks or therapies which can, in and of themselves, be predictive of worsening cardiac condition, worsened outcomes, meaning higher morbidity and mortality from a cardiovascular standpoint, we intervene with things like catheter ablation to reduce the risk of sudden death.

So DT ablation is firstly not a cure. In folks who have idiopathic ventricular arrhythmias, the procedure can be curative. It can eliminate the focus or the hot spot where those arrhythmias emanate from. And that's very different from people who have advanced structural heart disease, where the heart is diseased for other reasons, and the electrical problems-- the arrhythmias- are a manifestation of the underlying cardiac disease.

When we ablate arrhythmias in the setting of structural heart disease, we're not curing or reversing the underlying cardiac disease or what we call cardiomyopathy. OK? What we are doing is essentially suppressing or containing. We're managing the electrical manifestations. It's not unlike trying to treat cancer in which we're not necessarily trying to cure, but we're trying to contain or control the disease. When we ablate ventricular arrhythmias and the

setting of structural heart disease, we are containing or we are controlling.

Now the success rates are better than doing nothing. It depends on what kind of substrate we're talking about. But, let's say, in the setting of people who've had prior myocardial infarction or prior heart attack where they've had in occlusion, acutely, of a coronary artery and part of the heart muscle dies as a consequence, and that over time, the heart muscle heals and forms scar in the area that was damaged.

And ablating ventricular arrhythmias that result from that where the scar itself is interdigitated with surviving bundles of cardiac myocytes, those surviving bundles become the nidus, or the source of circuits for those electrical arrhythmias, or those ventricular arrhythmias. And a catheter ablation simply goes in and finds those surviving bundles of myocytes and begins to burn or cauterize them to eliminate them. And in doing that, the success rates can approach 70% with improved morbidity and mortality.

In the late 1990s, a company called Biosense Webster, which is an Israeli company, first developed magnetic navigation, where systems were created to basically create a GPS system for the heart where catheters were fitted with magnetic sensors, and patches were placed on the body. And it's kind of like having a GPS in your car. You can drive around, and the satellites above you will give you your precise location on Earth. And those patches on the body serve as those satellites orbiting the Earth. And the catheter itself is like the car driving in your heart.

And St. Jude Medical then developed a similar system-- a little bit different technology. But very soon, there will be a newer system that comes out called Precision the first week of January. We will be one of 12 sites in the United States that will have it. And what these three-dimensional mapping systems have done have enabled us to eliminate the need-- or significantly reduce the need-- for x-ray equipment to image catheters in the body.

And coupled with that, what it's done is it has enabled us to look at things like voltages inside the heart muscle, which can be a surrogate for tissue health and help us navigate to the diseased areas of heart muscle to focus our attention and to focus our ablation efforts. Additionally, it allows us to see electrical signals in the heart themselves, to get a sense of how the heart is activating itself, how the electrical conduction system of the heart-- the specialized conduction system of the heart-- is working and transmitting signals through the heart muscle. And it allows us to map arrhythmias in real time to get a sense of how those wave fronts of

activation are traveling through the heart muscle.

And there are some new concepts emerging that will better enable us to map these arrhythmias in real time while limiting the exposure to those rapid arrhythmias, which in many cases, are not mappable, because when they happen, they're fast. The patient's blood pressure drops, and they are electrically and hemodynamically unstable. And we are really at a point where we are beginning to be able to map, in a high resolution, three dimensions and reduce the need for mapping in the arrhythmia to make the procedure safer.

And so we've really-- from the advent of these mapping systems to now-- are beginning to create workflows that maximize patient safety, reduce risk, enhance outcomes, and improve long-term survival from these arrhythmias. And so it's really a very exciting time for us to be in this field. And I think I came to MUSC at the right time.

I joined an already very mature group and a very busy center for managing arrhythmias And, I think, all the credit goes to the folks that have been here already. Dr. Gold is-- the former now-- chief of cardiology at MUSC. But is now currently the president of the Heart Rhythm Society, which is a national and global society for heart rhythm professionals, not just physicians but support staff and allied professionals. And he is right here at MUSC and is the president of the Heart Rhythm Society.

Marcus Wharton is a very well-regarded and one of the senior members of the Heart Rhythm Society who was one of the pioneers of AFib ablation in the United States, and he's here. Frank Cuoco is my partner and has really grown the ablation practice around the state of South Carolina, has made MUSC his center of excellence a referral center for complex atrial arrhythmia management.

And then Lacy Sturdivant, who's been here as well, and is a really very talented electrophysiologist, and is one of our lead extractionists. For me, managing ventricular arrhythmias requires a multi-disciplinary team. It's not just a physician operator, but it's-- first and foremost, it's the lab staff that we have that are very experienced and very dedicated and are among the most capable people I've worked with anywhere between Boston and Chicago and now, here. They are tremendous.

We have to have world-class cardiac anesthesia, which we have hemodynamic support in the form of heart failure and interventional cardiologists, which we have. We've been able to do some fairly advanced and sophisticated cases with advanced hemodynamic support because

we have the expertise already in place here.

And then the advanced heart failure group here-- the signal to me that this place is moving in a direction where it was serious about managing ventricular arrhythmias is when they brought in Tom Di Salvo to be the chief of cardiology, who is an advanced heart failure cardiologist, recruited from Vanderbilt, familiar in the heart failure and transplant arena, knows about ventricular assist devices and other forms of advanced hemodynamic support in cardiac transplantation.

We need that, because that is really an extension of what we do. And, really, I would say it's the other way around. It's not just managing ventricular arrhythmias. It's really-- a VT ablation program is a part of an overall program in advanced heart disease, which includes VT ablation, surgeons to implant ventricular assist devices, to perform cardiac transplantations, heart transplant cardiologists, imaging cardiologists, cardiac anesthesiologists-- all of it. It's a team approach, and we cannot do what we do without all those pieces in place. And we have that here.