

# Mayo Clinic Q & A - Dr. John Stulak - Captions

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## SUMMARY KEYWORDS

patients, pump, lvad, implanted, therapy, heart failure, called, device, heart, blood, intensive therapy, absolutely, mayo clinic, symptoms, transplant, ventricular assist device, centers, impeller, medical therapy, risks

## SPEAKERS

Dr. John Stulak, Dr. Halena Gazelka, Narrator

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- N** Narrator 00:01  
Coming up on Mayo Clinic Q&A,
  - D** Dr. John Stulak 00:04  
We have a surgical option for your heart failure. So, it's really when patients get to that point of advanced heart failure when the medications are failing, and they have significant, significant symptoms with very little activity.
  - N** Narrator 00:16  
It's called a ventricular assist device, or VAD, and it helps to pump blood through the heart. The VAD can be implanted as a long-term treatment for heart failure, or if the patient is not a good candidate for transplant.
  - D** Dr. John Stulak 00:29  
Patients are living with these. And so, now you could be older than a transplant candidate. Typically, around the age of 65 is where we consider patients not to be

transplant candidates due to their age, and they live with this device for the rest of their lives. They get back to living life.

**D** Dr. Halena Gazelka 00:46

Welcome, everyone to Mayo Clinic Q&A. I'm Dr. Halena Gazelka. Did you ever watch some of the futuristic cartoons or TV shows decades ago? Our topic today may sound like something from science of the future. But amazingly, it is a reality today. A ventricular assist device, also known as a VAD, is an implantable mechanical pump that helps pump blood from the lower chambers of your heart or the ventricles to the rest of your body. A VAD is used in people who have weakened hearts or heart failure. A VAD may be implanted while the patient waits for a heart transplant or is working to get their own heart strong enough to effectively pump blood on its own. Well, we have an expert with us to discuss this today. Dr. John Stulak is a cardiovascular surgeon at Mayo Clinic, and he's going to help us understand ventricular assist devices. Thanks for being here today John.

**D** Dr. John Stulak 01:39

My pleasure. Dr. Gazelka. Thank you for the invitation.

**D** Dr. Halena Gazelka 01:42

I'm so excited to talk about this topic, because I find this just to be fascinating. And I think our listeners are really going to be intrigued by it as well.

**D** Dr. John Stulak 01:50

Fantastic. Yeah. You kind of mentioned it, the futuristic, and it's a little bit like science fiction. So, I'll do my best to kind of talk through the intricacies of this therapy.

**D** Dr. Halena Gazelka 02:01

It is. John, what in the world does this device look like?

**D** Dr. John Stulak 02:05

Yeah, it's about the size of a hockey puck. So, it's kind of a maybe three inches in diameter. And it has a canula, which is kind of a pipe that gets implanted into the failing ventricle as you indicated. And then it's fastened to the heart. And then we hook it up to the main blood vessel of the heart called the aorta. And patients do have a power cord

that exits the body, and they get hooked up to a power source, and it's implantable. They live with this device, like you said, either as a bridge to transplant or as what we call destination therapy. I think we'll talk a little bit about both of those in a little bit. But it's a pump that stays in there. The heart stays inside the body, and just as the name denotes a ventricular assist device. It assists the heart in delivering blood flow to the rest of the body in patients with heart failure. So, like you said, a little science fiction, but certainly a reality for about 20 years now.

**D** Dr. Halena Gazelka 03:06

But basically, it augments what the heart can do, so it makes it pump harder? Would that be correct?

**D** Dr. John Stulak 03:12

Well, the native heart stays present. And it could either pump, it can either improve or pump poorly. But you know, the ventricular assist device really doesn't depend on the left side of the heart for pumping at all. However, you make a very good point in that the patient still has a right ventricle, we all have four chambers of the heart. So, we do need a lot of the medical therapy in these patients is geared at maintaining that right ventricular function so that blood can be delivered to the LVAD on the left side of the heart, and then it gets pumped to the body. So, it does assist the left side of the heart.

**D** Dr. Halena Gazelka 03:53

John, how many institutions or places in the United States implant these devices?

**D** Dr. John Stulak 03:58

Yeah, it's a growing number. Initially, when the therapy was beginning to be adopted, you had to be, and CMS required for implanting centers to be tied to a transplant program. Now, since the growing population really in whom we implant these are what we call destination therapy, it's for patients who will live with this device for the rest of their lives. institutions that implant these do not need to be a transplant center. So, we're seeing more and more centers offer this therapy. And so, the number is growing toward 200, 250.

**D** Dr. Halena Gazelka 04:36

Oh wow.



Dr. John Stulak 04:36

And new centers are being added all the time across this country, certainly around the world.



Dr. Halena Gazelka 04:42

So, you mentioned intriguing words there, destination therapy versus patients waiting for transplant. Tell us a little about that.



Dr. John Stulak 04:50

Oh absolutely. So, the initial use of this therapy was for patients with very bad heart failure to implant the pump. And this was in earlier generations where it may not have been as durable etc., and to get the patient, a very sick patient, as a bridge to a transplant. So, like I said, we implant the LVAD. It helps deliver blood flow to the body. So, you know, it keeps the liver and the kidneys and the lungs alive. And the patient can get up and live with it, go home while they wait for a heart transplant because there's a limitation of donor organs. And sometimes patients are waiting for a year to three for heart transplant, a donor organ. And so, at that point, we implanted the pump with the expectation that they were going to get bridged and have it removed, you know, at the time of heart transplantation. More recently, with the advances in in how good the pump is, and we can talk about that a little bit too. There's been major technological advances. These pumps are now very compatible with the blood in the body such that patients are living with these. And so, now you could be older than a transplant candidate, typically around the age of 65 is where we consider patients not to be transplant candidates because of their age. And they live with this device for the rest of their lives. And we wholly expect, and we follow about 100 patients here at Mayo Clinic, in whom patients have these as destination therapy. So, they go to the market, they get back to farming, they, you know, they get back to living life, you know, with the device. So pretty amazing.



Dr. Halena Gazelka 06:00

How long can you live with one, John?



Dr. John Stulak 06:34

Well, the program here started in earnest in 2007. And we have a couple patients, from those early days 2008, we have someone 13 years living on the device. So, we're now in the third generation, what we call the third generation of pumps. And what all that really

means is there's been just several technological advances through time such that really device failure and mechanical durability are really at a point where we do not see device failure anymore. We can talk about some of the medical management and what patients need to, you know, kind of be maintained on, but from a mechanical perspective, we are just not seeing pumps wear out these days. So, from a medical standpoint, if we can optimize everything patients can live a very, very long time. I know some institutions are having people that are approaching 17 to 18 years on a device.

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Dr. Halena Gazelka 07:28

Wow, that is amazing. I want to get back later to what type of pumps there are, and a little bit more about that. But could you tell us first, how do you know if someone needs a ventricular assist device? And how are they assessed for that?

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Dr. John Stulak 07:44

Oh, this is a great question. And I think this really gets at the crux of, you know, when do we really consider a patient for this therapy and heart failure can be, you know, a very ongoing chronic disease that patients live with and can be maintained on medications for a very long time. However, the natural history of this is that patients live for years and years with heart failure, but with a slow decline in heart function and condition. So, it's really when patients get to this point where we call it advanced heart failure. This is where the patients have very limiting symptoms with very little activity. And it's really to the point where they're having a failure of medical management. And so, once medicines fail, it's very exciting to say like, wow, we have an option, you know, a surgical option for your heart failure, whether it's destination therapy for the majority of these patients as they age. So, it's really when patients get to that point of advanced heart failure when medications are failing, and they have significant, significant symptoms with very little activity.

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Dr. Halena Gazelka 08:53

Out of curiosity, can you take these pumps out later?

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Dr. John Stulak 08:57

We can. Yeah, these pumps, there is a very small percentage of patients and certain diagnoses like myocarditis, which is inflammation of the heart muscle, or several other entities where we put the pump in, it allows the heart muscle, since the pump is pumping the blood, it allows the heart muscle to rest. And we do see recovery in patients. However,

it's a very low percentage of patients, about one to 2% of all the implants in the country, really show signs of recovery. But we have recovered patients and then remove the device.

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Dr. Halena Gazelka 09:36

Fascinating. So, tell me a little bit more about the different types of pumps that there are.

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Dr. John Stulak 09:42

Sure. I alluded to this, we've gone through several kind of technological advances, and it really kind of gets down into the weeds of the engineering. The first generation were what we called a pulsatile pump, so it had a pumping mechanism, and the patient still had a pulse. However, there's a lot of moving parts, and the durability of those pumps, you can imagine if you had to have a machine kind of beating against itself constantly, it kind of wore out. And so, those pumps were only lasting about nine to 12 months. Then we got into the second-generation pumps, and that was more that had sort of like an impeller like a boat, kind of a boat impeller if you will, which spun the blood through the pump. And that was a good pump and, and that served us for about 10 to 15 years or so. But the problem with that is you can imagine a boat engine with the impeller is it generated a lot of heat. And so, that was very rough on the blood products and caused a lot of blood clotting. Now we're at a point which is called centrifugal flow, but we're able to magnetically levitate these impellers. So, there's no touching parts. The blood comes in, and a motor shoots the blood out to the aorta, like I described without any parts or metal or anything touching each other. So, it's very, very gentle on the blood itself, it causes very few blood clots, or strokes or bleeding problems like the older pumps did. So, that's where we are now, the third-generation pumps.

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Dr. Halena Gazelka 11:13

How interesting. Now you mentioned that people go back home after having these put in or back to other activities. What would one see outside of their body? And what sort of a power source is connected?

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Dr. John Stulak 11:26

Yeah, absolutely. So, like I said, the pump and everything is on the inside, however, patients do have an electrical cord looking device that does exit the body, and they have to wear a vest and some patients accessorize, they'll get a fishing jacket. And actually, there's several companies that actually make clothing and accessories, you know, for

LVAD patients. You know, they have certain pockets for their batteries, kind of like a Batman belt or something. And some patients, you know, they accessorize, and they have fun with it. You know, they kind of embrace the technology, and they embrace the fact that these pumps are helping them live years and years beyond what they otherwise would have, you know, if they wouldn't have had the pump. But to look at a patient, quite honestly, you know, from the outside with the certain, you know, clothing and jackets, you may not even see a mention of it. And so, you may not even know, but to look at a patient, you know, in the office setting, you can see that they have a power cord coming out. And they're hooked up to either batteries or kind of a wall power unit.

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Dr. Halena Gazelka 12:31

Oh, very interesting. So, what are the risks of having this implanted and of living with it?

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Dr. John Stulak 12:37

Yeah, this is very intensive therapy. It's a great question. Because patients really do need to know it's very intensive therapy. But the outcomes, you know, for us from a surgical standpoint, the risks of having the pump implanted, really are getting very, very less to the point where, you know, the surgical risk of having this implanted really is mirroring that of a valve replacement or coronary bypass operation in appropriate patients. So, we're really, you know, with advances in anesthesia care, intensive care, etc., we're really getting the initial risks down, you know, almost to that of regular heart surgery. Now, in the ongoing phase, there is an ongoing risk as patients need to take blood thinners while they're on it. So, a lot of the risk that patients have really depends on you know, them taking a blood thinner. So, if their bloods get if their blood gets too thin, with the blood thinner, they could have bleeding. And we see GI bleeding with patients mainly, or if we have to stop the blood thinner for some reason, etc. Patients can develop clots in the pump, and then you can have things called thrombosis or getting a clot in the pump. So, it's not working very well, or you can have things like a stroke. And so, you know, those are risks. And probably what I would say is the Achille's heel of that therapy really is that power cord. That is the interface between the outside dirty world and the inside sterile world. So, we do see about 1/3 of patients have an infection at that drive line. But really anything you put in your body like an artificial hip, artificial knee, a mesh for hernia repair, etc. Whenever you have something foreign interacting with the body, there's a chance of infection, but these patients are maintained on antibiotics. And they do go they do undergo very, very strict follow-up after implant.

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Dr. Halena Gazelka 14:29

And John, you mentioned that there are older pumps now and then newer pumps being developed. Can you go in and change out the type of VAD that someone has as new technology becomes available? And do you ever have to change the battery packs?

D Dr. John Stulak 14:43

Yeah, and we've had to do that. Let's just say a patient has had the older second-generation pump, and it's either gotten infected or clotted. We have changed pump styles because if we have to go in and change the pump, we'll say hey, let's upgrade them to a newer technology. However, you know, with all the patients that were following out there, those second-generation pumps were still very good pumps. So, if the pump is working, then you know, sometimes you don't want to poke a skunk, so to speak, and you know, the patients just get maintained on their therapy. And like I said, some of those that are living since 2008 have those second-generation pumps. So, those are still very durable pumps. But we have done the change from second to third generation pumps as needed.

D Dr. Halena Gazelka 15:27

And the batteries are all external, correct?

D Dr. John Stulak 15:30

They are, those are all the external. And then, so if we were to change pump style, we would just change the controllers that they have, which you know, kind of measures the flow and everything. And we would change all the externals, like the batteries in the power hookup.

D Dr. Halena Gazelka 15:46

How often do patients have to follow-up after they have a pump?

D Dr. John Stulak 15:50

Yeah, great question. It's, you know, it's ongoing therapy and here for the first six to 12 months, we have them come back every two months. We do partner with a lot of institutions out there in the community. And so, we do what's called shared care. So, we do try to save patients travel back to Rochester, because sometimes patients travel quite a distance. So, we have this very big kind of collaborative network out there. And more and more hospitals are becoming comfortable with treating these patients. You know, 10 years ago, they were these complex patients, you know, no one, you know, I think you're,



you know, we're afraid of the uncertainty of things in life, I think. But people have embraced it, and they realize that there's a lot of patients living in their communities with these LVADs. And so, it's very exciting. We partner with upwards of 20 institutions around kind of the upper Midwest area, to save the patient, you know, that travel back and forth. So, it's things like echocardiograms, to get a picture, make sure the heart is looking good, laboratory values, and then just office visits to see you know, are their symptoms better, do we need to change the speed of the pump, and ongoing issues. We'll look at the drive line site, make sure there's no infection, etc. So, it's really a pretty detailed assessment that we do at those office visits.

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Dr. Halena Gazelka 17:09

Are you using any virtual visits? We're using so many more virtual visits in some areas of Mayo. Now, I'm wondering if you are able to do that.

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Dr. John Stulak 17:16

Yeah, we do that a lot. Our LVAD coordinators and LVAD program, you know, we have an emergency line, which is a cell phone, and they can call 24/7, but if we need to, you know, if need be, then yeah, we can hop on Skype, or, you know, the telemedicine really has improved our reach to really almost see patients at the drop of a hat if they need it. So, yeah, I think we're embracing all aspects of technology to kind of help this other technology, you know, be better ongoing for the patients.

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Dr. Halena Gazelka 17:49

This sounds just incredible to me, John. And I think one of the things that I have noted the most practicing palliative medicine is how profoundly symptomatic and how miserable people really can be when they have significant heart failure. And I'm wondering, what do you see in terms of symptom improvement? it? Can it be fairly profound in individuals who have a ventricular assist device placed?

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Dr. John Stulak 18:13

Oh, absolutely. I mean, you're talking about a patient with end-stage heart failure, who may be out of breath brushing their teeth, they're out of breath sitting, you know, in the recliner watching TV. You know, when a patient really ends up having symptoms at rest, that's the telltale sign that this is end-stage heart failure. And really, in many instances, the patient will hardly live six to 12 months, when they get that, you know, dense degree of heart failure symptoms. And then what the LVAD does is it helps that left side of the heart

pump and kind of decongest the heart and gets all the blood moving forward again. And then we get patients that get back to basically doing everything they want to do. They may still have some symptoms, you know, just because they've been so sick and deconditioned for some time, but we've had some patients I mean, literally, you know, some of the farmers here in the upper Midwest, you know, they'll be very symptomatic, get an LVAD, and they will literally be back to farming in a couple of months. And so, it's really neat to see patients get back to doing what they want to do.

**D** Dr. Halena Gazelka 19:17  
That's farmers for you isn't it, John?

**D** Dr. John Stulak 19:19  
Absolutely. If you have a stoic farmer telling you that they don't feel well then, you know, book the LVAD or book the operating room because you know that the patient's quite sick.

**D** Dr. Halena Gazelka 19:30  
And I think one of the things that our listeners may not recognize is that how profoundly your other organs suffer when your heart can't. I mean, we think of heart failure as being a heart problem, but really, it's a whole-body problem.

**D** Dr. John Stulak 19:43  
Oh, absolutely. I mean, blood is what carries the nutrients, the oxygen and you know, patients with chronic heart failure, they can see dysfunction in a lot of different areas. They may become cognitively, you know, cloudy, so to speak. If the brain is not getting blood flow, we see that cognitive dysfunction. We see certainly the kidneys start to fail. We've even had some patients progress to needing dialysis because the, you know, because the heart is not providing enough oxygen and blood flow. Then other things like the liver, the intestines, you know, patients may have, you know, stomach cramps or you know, have trouble with digestion, etc. But certainly, you know, muscle cramps, they just, yeah, if the blood is not getting to the tissues, it's like you said it's a whole-body problem.

**D** Dr. Halena Gazelka 20:26  
This is really a fascinating topic. What advice would you give individuals who may have heart failure or know those who suffer from it, have friends or family and wonder whether

this is the type of therapy they should be talking to their physician about?

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Dr. John Stulak 20:40

Absolutely, I think that one of the biggest things is that this therapy is really underutilized therapy. It's really underused, when if you look at the hundreds of 1000s of people suffering from advanced heart failure and heart disease, a very large percentage of these patients are candidates for LVAD. And I think that there's either hesitancy, or really a lack of awareness, like you say about when should patients be referred. So, I think the general, the kind of the general framework is that if you're having significant symptoms with medical therapy, and you feel like that the medical therapy is failing, you are a candidate for this. Your patients are now extending into that, from chronic heart failure to advanced heart failure. And it's very exciting that we have a surgical treatment for this now.

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Dr. Halena Gazelka 21:31

That is really exciting. And obviously, this is a therapy that is offered in centers where these are performed regularly. It's obviously something highly specialized that people would want to go to a center where they were done frequently, I imagine.

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Dr. John Stulak 21:45

Yeah, that's right. I think just like whether it's congenital heart surgery, certain types of valve operations, etc. Really, the outcomes of this procedure is very closely tied to the volume of patients. So, certainly I think patients want to get to a well-connected, and a high-volume center that really has the infrastructure to offer really not only round the clock care, but really complete care in terms of, you know, other organ systems, or like I said, it's very intensive therapy with potential complications. So, you really want to think about a center that can offer one stop shopping so to speak.

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Dr. Halena Gazelka 22:21

Well, this is exciting, bringing hope to patients with significant congestive heart failure.

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Dr. John Stulak 22:27

Absolutely. I think what you know, if there's a takeaway, also it's that, you know, if a patient or a referring provider is thinking about referring the patients, we would rather see the patients earlier rather than later, because we've certainly been in a situation where we get patients who are a little bit too far progressed, so the kidneys have shut down, or now

they're in liver failure, etc. So, there is a there is a sweet spot to when we get a referral to this. So, we would rather establish the relationship and see a patient far earlier, follow them along until the appropriate time. It is not that we're just going to push an LVAD on everybody, but we'd rather know about the patients and establish that, you know, care pathway early on, rather than get the patient too late. Because we have had that happen as well, where patients are not a candidate when they're too sick.

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Dr. Halena Gazelka 23:19

And so helpful to be able to weigh the options as patients are moving through this disease trajectory too.

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Dr. John Stulak 23:25

Oh, absolutely. And you hit the nail on the head, we really look at this from a holistic, you know, viewpoint. We do have the meet with our colleagues from palliative care medicine, you know, to discuss, you know, what are your goals? You know, what do you still want, you know, what would you kind of take on in terms of how intensive therapy is, and some patients say, you know, I'm just going to go along with medical therapy, and this isn't a therapy for me. And so, we do help patients navigate those very complex issues. You know, and the other thing, too, is the psychosocial landscape, too. We've had some patients that are not fortunate enough to have a designated caregiver or may not have the financial means etc. So, we do a lot of work with our social work colleagues who are just simply amazing. And we either, you know, create financial assistance through helping them get different, you know, state assistance or things like that, or we get different caregiver options, etc. So, there's really, it's not just a medical appropriateness for therapies, there's also a psychosocial and the personal desire from a palliative care standpoint too. So, we look at all these things. All of these things contribute to a successful outcome after LVAD.

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Dr. Halena Gazelka 24:39

Whole person care.

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Dr. John Stulak 24:41

Absolutely. Absolutely.

**D** Dr. Halena Gazelka 24:43  
Thanks so much for being here today, John.

**D** Dr. John Stulak 24:45  
This is absolutely my pleasure Dr. Gazelka. Thank you again for the invitation.

**D** Dr. Halena Gazelka 24:50  
Our thanks to Dr. John Stulak, cardiovascular surgeon at Mayo Clinic, for helping us to understand ventricular assist devices for heart failure. I hope that you learned something today. I know that I did. And we wish each of you a very wonderful day.

**N** Narrator 25:05  
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