

[MUSIC PLAYING]

ABHINAV HUMAR:

Now, this one will be on live donor liver transplant. So for those of you who are not from Pittsburgh, welcome to Pittsburgh. But I think most of you are from Pittsburgh. But the University of Pittsburgh is well known for liver transplantation. In fact, many say that the liver transplantation started here. It's gone from essentially over a period of 35, 40 years from an experimental therapy to what is now really the only therapy we have for treatment of someone with end stage liver disease. It really is the gold standard of treatment with very, very good results in all aspects.

And a lot of the credit, in fact, the bulk of the credit for this goes to this gentleman right here, Dr. Thomas Starzl who really was the visionary who started this and who is the namesake for our program. And if you're interested in medical history, or you're just interested in a good story, I encourage you to read about the story of liver transplantation and maybe see a movie that was just recently released called *The Burden of Genius*, which highlights Dr. Starzl's endeavors in taking this program.

When he came first, here, in 1981 and started, and within about four or five years this program was doing roughly about 600 liver transplants a year. It's a feat that's never been duplicated at any other center in the world ever after that. So it was a remarkable thing that he achieved and was able to do.

So fast forward to the current status of liver transplantation in the United States, and this is where we're at. There are roughly about 14,000 people that are waiting for a liver transplant. We do roughly about 8,000 liver transplants a year. So not as many as the people that are waiting. And the numbers have gone up and down. Though the waiting list has gone down a little bit, the number of transplants has increased a little bit. Though some of this is real, some of this is artificial. But nonetheless, there is a discrepancy between the number of people that are being transplanted and the number of people that are actually waiting for a transplant.

So that creates three very unique consequences as a result of this not having enough resource. And this type of situation exists in just about any type of thing where you have allocation of a scarce resource. So one is that there's about a 15% to 25% chance in this country, depending on what part of the country you live in, that you're never going to get your liver transplant. That means that you will succumb from your liver disease, you will die from your liver disease, before you get to the top of the list.

For those who are lucky enough to get a liver transplant, it means a waiting time because livers are allocated based on priority. You get priority by being the sickest. And therefore, you have to wait until you get that. And over the period of time, especially over the last 15, 20 years, the waiting times for liver transplantation have increased all across the country.

And the third thing-- and this is something that people don't talk about as much really-- is that not all the people that benefit-- that could potentially benefit from a liver transplant actually qualify for a liver transplant. Because it's a scarce resource, you have to decide who is going to get that. And you can't put everyone on the list.

So I liken the situation to where you have 1,000 people on a ship that's sinking, but you only have 500 lifeboats. So all 1,000 of those people could benefit from the life jacket, but you got to decide who are those 500 that are going to really benefit and that you're going to give it to. And that's the same situation with liver transplantation. We've set artificial lines as to what is an acceptable outcome, and that's how you qualify for a transplant based on that artificial line that was set by a group of surgeons that sat down in a room about 30, 35 years ago and decided this is what should be acceptable for a liver transplant.

And this is our own data from our own center.

You can see that on the left is the mean waiting time, how that's increased over the last five years, and how our mean MELD scores-- and we're transplanting at a MELD score of roughly about 30 now. So that means people are waiting longer, people are sicker by the time they get to a transplant, and that's a graphical description of that based just on our own data.

So one possible solution to this is a live donor liver transplantation. What is a live donor liver transplant? Live donor liver transplant essentially involves removal of part of a liver of an otherwise healthy individual and transplant that into the recipient. The reason we can do that with the liver because of two unique things.

One, you have a lot of extra capacity built into your liver. And two, the liver is one of the unique organs that we have that will actually regenerate. There's a lot of advantages to a living donor transplant over a deceased donor transplant. So let's say, well, if you were one of the 25% that was going to die from you're waiting for a liver and you have a living donor, the advantage is obvious. It's a lifesaving procedure immediately.

But even for those who would have potentially gotten a deceased donor transplant, there's several advantages to having a living donor. The biggest is that you can now do that transplant in a much more timely fashion. You don't have to wait till that patient gets to the top of the list and has all of the consequences and problems associated with chronic liver disease-- muscle wasting, renal failure, et cetera, et cetera. You can transplant that individual when you know that they're going to benefit from a liver transplant, but before they've had all of those possible problems.

And you turn now what is an emergent operation into an elective operation, and that makes a big difference. Makes a big difference for us, because we can do it during the daytime, we don't have to do it at night. That's nice. But the main difference is that you can optimize your patient. You can optimize them. You can treat any infections that need to be treated. You can address cardiac issues, et cetera, et cetera. And do that when you optimize the patient, as opposed to with a deceased donor transplant, you have to call the patient in, and the way they are is the way they are. And unless they're really bad, you have to proceed and deal with the issues as they come up.

There are some immunologic advantages of getting it. We do have some data that rejection issues are less. And one important thing to remember is that it adds to the overall pool of livers that we have. So for every one individual that we transplant with a living donor, that's an individual that doesn't need a liver from the deceased donor pool, and therefore, that frees up an organ for someone who doesn't have a living donor.

You obviously have to balance that with the disadvantage. The disadvantages for the recipient really are that you're receiving half of a liver as opposed to a whole liver. And there are some issues with that, but I'll talk in more detail about that.

But really the main disadvantage are to the donor, because remember, this is a unique situation in medicine. We're operating on an individual that doesn't need an operation, that we're not going to help in any way from that operation, that we can only potentially make worse. So you have to very carefully balance the risks to the donor, both in the short term-- short term, meaning immediately after the operation. But also the long term, because remember, these are healthy individuals. You're going to expect that they're going to be around 30, 40, 50 years down the road, and what are the consequences of donating your liver down the road associated with that.

So those are the advantages and disadvantages. But we clearly feel that the advantages outweigh the disadvantages. There are lots of advantages, as I said. And this is just a brief overview of our own data, and I'll go through this in more detail a little bit later. But it just shows-- the red represents our living donor outcomes, and the blue is our deceased donor outcomes. And you can see that these patients do better in terms of overall survival, they're shorter length of time in hospital, and less other secondary problems, as I'll go through in more detail.

So if it's so good, then why is everyone not doing it? And everyone is not doing it, because if you look at the current status of live donor liver transplant in the United States, you can see that the numbers are relatively small. So in 2018 there were a total of 401 live donor liver transplants done in the entire United States, and that's seen a recent increase.

You can see over here on the right that over the last four or five years we've had a slow, steady increase in the number. But still, last year there were only 401 live donor liver transplants done. So let me put that in perspective for you.

On the left is the volume curves of a single center in South Korea-- that's the Assam Medical College. And you can see that on average, they do about 400 live donor liver transplants a year. That's one single center in South Korea doing more than the entire volume of the United States put together. So you can see that we're very underutilized when it comes to live donor liver transplant. And if you contrast us in transplants per million compared to other areas of the world, especially places such as the Far East, Asia, India, the Middle East, all of those places have a much greater adoption of live donor liver transplant compared to the United States.

And this is the United States volume, and you can see that there are very few centers that have a lot of experience with live donor liver transplant. But there are only 15 centers in the United States that have done more than 100 in their entire history of doing this procedure. And on the right you see the live donor liver transplant volume for 2018. So you can see that in 2018, there were only 12 centers in the United States that did more than 10 a year.

So think about it. Ten a year is not even one a month. And you can imagine that a procedure that's very technically complex and challenging, that you want to maintain a certain degree of technical competence and expertise to be able to do it, that just means you have to do it, and you have to do it regularly to have a comfort level, not only with the people doing it, but of the team that's looking after these patients. And so most centers don't really have that degree of experience and ability to maintain it.

Why? So why has live donor liver transplant not taken off in the United States? There's certainly a need for it. As I showed you, there's not enough transplants. There are lots of people who could benefit from it. So why has it not?

So yes, there's several reasons. It's a complex procedure. It requires some degree of technical expertise. You have to invest in having the dedicated team that can do this.

Transplant is very heavily regulated in the United States, much more so than any other field. You can see anyone's results at any time by going online, and we're regulated by CMS, UNOS, state. Everyone wants a piece of transplant and wants to make sure that you're doing everything to the strictest code and regulations, which is good in some ways, but it can be a bit stifling for others.

Because if you have complications, and unfortunately, when you're doing big procedures like that, it's not unexpected that at some point you may have complications. And what I'm talking about are donor complications, and especially the ultimate complication of a death in a donor. Those can take a heavy toll, and heavy toll in terms of impact on the program. It can affect not only your liver transplant program, but it can impact your entire program, because once something like that happens, a, not only is the press on it, but also all of your regulatory agencies are going to be on it.

And it can be very risky to the careers of specific individuals. That's certainly been the example in the United States where programs that have had bad outcomes, it's impacted significantly the careers of the main surgeons that were involved in those programs. So those are all reasons why live donor liver transplant hasn't taken off in the United States.

But the main reason in my mind why live donor liver transplant has not taken off is down at the bottom, which is that people don't know about this procedure or are misinformed about this procedure. And who do I mean by people? So by people I mean the patients who need the transplants. The families who are looking after those patients who are looking at the transplant.

The providers. The providers meaning the family physicians who see those patients. The gastroenterologists who they're referred to. The hepatologist who then subsequently manage them. To the point where even the transplant programs that these patients are referred to, if they're not doing live donor transplants, don't either know about it, or are misinformed, or have a lot of false information about this. And finally, the payers who are ultimately controlling the purse strings of this all have it.

And these are just some of the quotes that I've heard over the last several years from patients that come to us from other places as to why they came here. "My doctor told me this was a last resort only." "My doctor told me I wasn't a candidate." "My transplant told me that this was just for pediatric patients, because of the amount of liver needed for adult patients wasn't there." "This was an experimental procedure." "I was told this could only be done for kidney transplant." So these are all direct quotes, and they're all false. And in fact, some of them are the opposite of really what we should be telling patients.

So we've strongly believed in live donor liver transplant for many years, not only for our pediatric patients, but also for our adult patients, and have had invested strongly in developing both strong live donor programs for adults, as well as our pediatric. This is the volume of transplants that we're doing on a yearly basis. And you can see over the last two years especially, we've increased. Last year we did almost about 70 transplants total-- 60 on the adult side and 10 on the pediatric side.

And how does that contrast to the rest of the US? It is much more than the rest of the US. You can see that the next highest volume program is roughly about half of what we're doing. But as you can see from the previous programs that I've shown you, it still is a fraction of what's being done at some of the other programs around the country. And still it's a significantly untapped potential as to the total number of transplants that can be done.

So if we're going to push live donor liver transplant, you have to know about the outcomes. That's really your currency as to how you're going to present it to those people who are misinformed. You have to have good tracking of your outcomes. And remember, when you're talking about outcomes for this procedure, you have to talk about outcomes in not only your donors, but also your recipients, or not only your recipients, but also your donors. Both are equally important. In some ways, one is even more important than the other.

So let's start right off the bat talking about donor outcomes. And this is the worst possible outcome for a donor, and that's a donor death. So let's attack that head on. This was a very heavily publicized case in 2001. This was a donor, a brother who donated to his brother in Mt. Sinai, New York. The recipient did fine. The donor, unfortunately, died of complications at one week post donation.

And that had a huge rippling effect on the transplant community, especially on the live donor transplant community, because you can see that in 2001 was when we reached our peak of the number of transplants that were being done. And the year subsequent to that, there was a huge drop off, and every year after that there was a drop off for the next 10 years. It took 10 years for the field and the community to really recover from the fact that, yes, sometimes donor deaths can happen as a result of this.

But what exactly is the data? So if you look at the national data as of the end of January 2019, there were 6,800 live donor liver transplants that had been done in the United States. There've been six donor deaths reported to date, so roughly about a 0.1% mortality risk. And three donors that themselves received a transplant.

Various surveys have been done across the country looking at what are the complications, and the overall complication rate reported is roughly about 30%. That includes all complications-- urinary tract infection, et cetera, et cetera. But the major complication rate is roughly about 10% with this operative procedure.

What's our own data like? We've had, knock on wood, no donor deaths, no cases of liver failure, and our overall complication rate is roughly about 20%, with a major complication rate of roughly about 8%. Our mean length of stay for donors is about 5.8 days.

This is a more detailed breakdown of the complications that we've had. Our reoperative rate in the donors is roughly about 6%, half of those being early, meaning within the first couple of months after donation. The rest being late, meaning more than three months out after, and those are the various causes that we've seen. We've only had three bioleaks to date associated with liver donation, all that have been managed with either percutaneous drainage with or without ERCP, and then we've had a smattering of medical complications, including pneumonia, C. diff, some wound infections, et cetera-- everything that you would expect from a major abdominal operation.

But remember, you want to know not only about the mortality and morbidity for donors, what their baseline was, that they were completely normal and healthy coming in. So that's one of the key outcomes is how many of them are getting back to that. And the vast majority do. Our length of stay, as I said, is roughly between five to seven days in hospital. It's about four to six weeks before they're back to a desk job, about 10, 12 weeks before they're back to a more physical job. And most are 90% back to their normal level of health within about three months post donation.

So I had given this presentation once before and someone got up and said to me, you know, this is not acceptable. One donor death is not an acceptable outcome. And my argument to that is, yes, we don't want any donor deaths, obviously. But I think if our default position is going to be that no donor deaths are acceptable, then this procedure can never take off. And I put the example of live donor kidney transplant to contrast this with.

So live donor kidney transplant everyone accepts is the gold standard for treatment of end stage renal disease. In fact, CMS accepts it. Dialysis centers accept it. Your actually metriced for speaking to patients about live donor kidney transplants. If you talk to a nephrologist, they all encourage live donor kidney transplant. So it's the gold standard.

But there have been deaths that have occurred after live donor kidney, they just haven't been publicized. Between 1999 and 2011, so about a period of about 12 years, there were 25 kidney donor deaths that occurred from kidney donation. Now it's a much bigger denominator and the risk is less, so you're talking about numbers, the risk as to the numbers, the risk of liver donation may be 0.1% to 0.2%. The risk of mortality with kidney donation is about 0.01%, so almost a factor of 10.

But nonetheless, it's not zero, and yet, it's something that we clearly accept. So I think it's just a matter of sorting out in your mind as to what you think is an acceptable risk or not. Certainly the patients feel that it's an acceptable risk. There've been various surveys that have been done asking patients or families of patients what would be an acceptable risk for you to proceed with living donation. The average acceptable risk for most donors is about 20%.

So they would accept a mortality risk of 20%. We wouldn't even do a surgery that was a benefit to someone if we thought it had a 20% mortality risk, much less a living donor procedure. So you can see that there's a wide disconnect between what patients and their families accept and what the medical community accepts.

So let's go to the flipped coin, which is the outcomes in the recipients, so you have to look at outcomes in the recipients. And this was an analysis that we had done recently comparing our deceased donor to our live donors over the last 10 years. And you can see that both in terms of patient survival and graft survival, the live donor patients, which are shown in red, have roughly about a 5% to 10% survival advantage.

Now, you have to put that in perspective. So this is the demographics of those two populations. And you can see that it's a little bit apples and oranges what you're comparing, because the deceased donor patients, which are these patients right here, are sicker right away to begin with. This is the mean calculated MELD that's taking out all the exception points.

But you can see that the calculated MELD for these patients is roughly about 22, whereas for the live donor patients is about 16. And that's a big difference someone who's got a MELD score of 16 versus as someone who's 22. That's a big difference in terms of how sick they are.

And again, when I present this people say, well, you're just comparing two different things. The outcomes is not better. And my point to this is, yes, that's true. They're two different populations. But that's a real world comparison in my mind. Real world in the sense because that's what the patients have to deal with.

So when I see a patient in the clinic who's got a MELD score of 16 and has all of the complications of liver disease, their options are not living donor transplant versus deceased donor transplant. Their options are a living donor transplant now versus going on a waiting list waiting for a deceased donor transplant, accepting a 25% [INAUDIBLE] list mortality, and then potentially getting a transplant two years down the road when their MELD score is closer to 30. So I mean, that's what the patient is feeling, and so that's the comparison that you have to make for them.

And again, these are some of the outcomes when you look at it. You can see that the live donor patients have shorter lengths of stay, less use of resources, such as interopt transfusions. Half of our patients at this present time, when they get a living donor transplant, get no blood transfusion-- interop, which is remarkable.

When I first started doing liver transplants, I mean, every patient got a blood transfusion. Not a blood transfusion, multiple blood transfusions. And you talked about the days of early days when this procedure was being done, rivers of blood flowing out from under the operating room door, and that's not a myth. That was the reality. And now you're talking about doing half of your transplants without any blood transfusions. It's remarkable that you can do that.

What about complications? Are they any different? I had mentioned that it's a more technical procedure, and that's one of the reasons why it hasn't. But one thing that we've learned is that it's a technical procedure. So the more you do it, the better you get. And as we've done more and more over time, our results have improved over time, and this is our complication rates.

The main things that you worry about with live donor procedures are technical complications, such as thrombosis of your major vessels, or leaks of bile, and these are those complications. And you can see that our reoperation rate, again, no different between the live donor versus deceased donor. Hepatic artery thrombosis rate for our live donor patients, about 3%. It's about 2% for our deceased donors.

Our late hepatic artery thrombosis rate is actually lower for our living donors versus our deceased donor. Portal vein complication no different. Our overall incidence of biliary complications is the same between the living donor and the deceased donor patients. And in fact, the early leaks are a little bit more common with the living donor patients, which is what you would expect, because you've got a large surface area of the cut surface area where you can get a leak of bile, which you don't have with a deceased donor when you transplant the whole liver. But our incidence of late strictures is less with our living donor patients versus our deceased donors.

And these are some of the other outcomes that are important. This is a comparison looking at cost data and utilization of resources. And this is all of the transplants that we did in 2017. So there were 60 living donors versus 52 deceased donors.

And what we did was looked at all of their resource utilization six months before the transplant, and a year after their transplant. And if you looked at it then, you can see that the average number of radiology scans, less. Post transplant number of radiology scans, less. Post transplant number of emergency room visits, less. Average number of invasive procedures for the patients, less. Because these are healthier patients, and so they're going to utilize less resources before the transplant, they're going to utilize less resources during the transplant, and they're going to utilize less resources after the transplant because you're able to get them home, back to work, et cetera, as opposed to having to send them to a rehab facility and wait until they improve.

And so you can see in terms of the cost data, that the bottom line is right here. If you combine all of the inpatient and outpatient pre and post transplant costs-- this is hospital costs, not charges, this is cost data-- it's roughly about 30% lower for the live donor patients versus the deceased donor patients.

How does this compare to the rest of the country? So if you're interested in looking at any center's programs outcome, you can go online to this website right here, OPTN.org, and look at any program that you want. This is how data is reported on that site. Every circle here represents a program in this country. The x-axis here represents your volume, and the y-axis represents your outcomes as expressed as a hazard ratio.

So the lower you are below that curve, the better your outcomes are. The farther along you are on that curve, that means the higher your volumes are. So that means you want to be somewhere way down here to have the best outcome in the country with the largest volume. That's what you should be striving for. You can see we're working towards that and working to try to get to that point.

This is another important metric for patients. This is called the transplant rate, and it essentially represents the-- if you want to think of it in crude terms-- the likelihood that they're going to get a transplant at your program. And you can see, this is our transplant rate back in 2015, and you can see that we were well below the national average for our patients. Our transplant rate was 44.8. And flash forward to 2018-- this is the most recent reporting-- and you can see that our transplant rate has now gone up to 87, which is above the national average. And that, in part anyways, is due to our significant utilization of live donor transplants.

And the other important metric is your wait list mortality, and you can see that we're slowly starting to decrease our wait list mortality. It's not a huge decrease, but again, over the past two years, our wait list mortality has decreased from about 25 and 1/2 to about 24 and 1/2 in that period of time.

So this is how live donor liver transplant evolved at our center over that period, over the last 10 years. We started first thinking that, OK, this is a good procedure. We should start using it for the patients that are low down on the waiting list, that are not likely to get a transplant. Patients who have tumors that are outside of criteria that wouldn't qualify for a transplant. And for international patients, because we certainly don't want to use a scarce resource for people that are coming from outside. We would exclusively offer them a living donor transplant, not a deceased donor transplant.

So these were the three main groups that we were transplanting initially. And as we started to do these transplants, we saw that we could get good results in these patients, and so we started to expand our indications for living donor transplants. We moved on to doing patients with higher MELD scores. We saw that you could do patients that were sicker. You had to adjust your technical procedure a little bit, use right lobes, so bigger livers. You had to use younger donors because they could regenerate their liver better.

But if you did that, and again, this is not something that we invented, or learned, or were smart enough to do. This is something that the Asians have been doing for a long time because they have no option of a deceased donor transplant. They have to use living donors for whatever type of patients that they get. And so MELD no longer represents a contraindication for us. We've done patients with MELD scores of greater than 40 with a living donor, if they have a suitable living donor.

Patients with carcinomas and various types of tumors that wouldn't qualify for a deceased donor transplant but nonetheless, we know could benefit. And that's what I was hinting to that artificial line. Somewhere about 35 years ago, a bunch of surgeons sat down in a room and said, well, to qualify for a liver transplant you have to have an outcome of about 75% at five years. That's about what the outcome should be. And that's how you qualify. And that's what all the qualifying criteria are based on.

But those patients, while they may not have a 75% survival at five years, nonetheless could benefit significantly. So if your options are 5% versus 50%, which would you choose? You'd choose the 50%. And so we have protocols now for highly cholangiocarcinomas, patients with metastatic colorectal cancers, tumors that are beyond the acceptable criteria by Milan, metastatic tumors that otherwise wouldn't qualify.

We now do patients with ABO-incompatible. That no longer is a contraindication. This is the protocol that we utilize for ABO-incompatible transplants. And this now represents our expanded indication. So just about any type of patient we think is a good one. So whether they have chronic liver failure or acute liver failure, we can work up a donor within 24 hours if we need to and do a live donor liver transplant on them, because we know that those patients really only have hours of survival, and the sooner you can get them transplanted, the better.

Patients with various tumors that I said that [INAUDIBLE], redo's are very good to do with a live donor, because you can do them in a timed and controlled fashion when they're relatively healthier. It's very difficult to get a redo through when they have a MELD score of 30. That's a very tough operation, and a very tough recovery for the patient.

Same thing with an older patient. A patient who's 75 is generally not going to survive till they get to a MELD score of 30. And if they're lucky enough to survive when they get to a MELD score of 30, they have to be doubly lucky to get through a transplant with a MELD score of 30. So it's better not to transplant them with a MELD of 30, but you can certainly get them through when they have a MELD score of between 15 to 20 the vast majority of times.

And so our thinking now is that for all patients, a living donor liver transplant-- a suitable living donor liver transplant, you have to have a suitable donor, that's the key to it-- is really the first option for all of our patients if they have liver disease and they could benefit. And this is some of what we call the higher risk categories, and at most centers these would be contraindications for living donor transplants. And these include our retransplants, patients that are older than 70, your higher MELD scores. And you can see, we're just starting to do them. That's why the numbers are relatively low.

But we've done several of these with living donors, and you can see that the outcomes are really not a whole lot different when you contrast living donor versus deceased donor. And as I was pointing out to you, in some situations, it's actually much better if you can do a living donor on them. And these older patients, again, they just can't get through a transplant when they have a MELD score of 30.

So what are the keys to success on this? So you have to invest in this. As anything, you have to invest in it. You have to have a strong team dedicated to this. It's not the surgical team that only can do this. It's the surgeons, the hepatologist, the coordinators, the social workers, the financial people, the independent living donor advocate, the nurses looking after the patients on the floor, the critical care team all have to be attuned to looking after these patients and thinking about living donor liver transplants.

And so the key to this is education, as I pointed. Education. Education for the patients, education for the physicians, education for the payers. And Dr. [INAUDIBLE] is going to talk a little bit more about this, but we have programs and educational campaigns on each of these. So we've had brochures that we send to our referring physicians, we have brochures that we give to our patients, educational classes, videos, something called the Champion program, that, again, Dr. [INAUDIBLE] is going to talk to.

And we've had-- people call this an ad campaign, and I always correct them. This is not an ad campaign that we have. This is an educational campaign that we have, because most people don't know about this, and this is what this campaign was meant to do. It was meant to educate the public about living donor transplant. And you've probably seen this ad, which is the waiting in line ad.

[VIDEO PLAYBACK]

- If you're waiting patiently for a liver transplant, it could cost you your life. It's time to get out of line with UPMC. At UPMC, living donor transplants put you first, so you don't die waiting. UPMC does more living donor liver transplants than any other center in the nation. Find out more and get out of line today.

[END PLAYBACK]

ABHINAV HUMAR:

So as I said, it's not an ad, it's an educational campaign. And the educational program is successful, because this is some data that we got from Google Analytics. It just looks at the number of hits on Google based on the search term of LDLT. And you can see before this campaign came out, there were roughly about 2,000 hits across the country on live donor liver transplant on a monthly basis. After this campaign, roughly about 15,000 hits on a monthly basis. So if you educate people, they become aware of it and are there.

So we think and strongly believe that it's time to change the paradigm about how we think about liver disease in the setting of a live donor liver transplant program. And remember, all of the rules for allocation that we have at the present time, MELD score, all are very good. They do their accomplished task. But remember, they were designed specifically for the situation where you have 8,000 livers, 14,000 patients, and you have to figure out who's going to get it.

So that equation is not applicable to a live donor transplant situation, because the equation there is one donor, one recipient. One equals one. And so none of those rules really have to apply, and we feel that the criteria for live donor liver transplant really should be based on the ability of the procedure to provide a survival advantage. It's how we judge everything in medicine, isn't it?

If you had a new medication that was for treatment of pancreatic cancer, for example, how would it get FDA approval? Well, it would have to show that it's better than the best standard of treatment that you have at the present time for it. So if a live donor liver transplant is the best therapy that you have for a patient, compared to every existing therapy, then it should be at least applied or at least made available to that. And so live donor liver transplant for us is not the last resort, but rather the first resort.

And so our criteria for selection of patients has actually become very simple over this period of time. There are only two things that really matter to us. A, do they have a significant survival benefit with a liver transplant versus best other therapy? It's as simple as that.

So if they have metastatic colorectal cancer, for example, it used to be an absolute contraindication. But we know that in select situations, if they're unresponsive to chemotherapy, they have a five year survival of about 5%. But with a liver transplant, they have a survival advantage of about 60%. So it's a vast difference. And maybe, then, those are suitable candidates, as long as you choose them appropriately.

So a significant survival benefit over best other therapy. And the second part of this that's key, a suitable, willing living donor. Willing, because that's obviously the key to all living donor transplant. And suitable. Suitable. Not all donors can be suitable for every type of situation. If you have a very sick patient with a high MELD, then you can't use a borderline liver in that type of situation. You have to have a young donor with a good liver mass, as I had pointed out, too. So that really is our criteria for a live donor transplant.

So what's the future for us? So I think it's possible that we can, at one time, eliminate the wait list. If you know of your patients that are on a wait list, it's a terrible way to live. They never know when they're going to get that call. They're sitting waiting for that call at any time. Never know if they're going to get that call, if they may die before they get that call. So it's a terrible wait.

So we think that it's possible to potentially eliminate the wait list using a combination of live donor liver transplant, as well as various other things-- and some of which you'll hear about a little later in this-- to expand our pool of the number of transplants that we're doing. But the key to all of this is that we have to educate. We have educate the patients, their family members, the doctors, and the payers. All of them have to be educated and thinking about this as a possible option for the patients. And that's it. I'll stop there and take any questions.

[APPLAUSE]