RANDALL S. SUNG: I'm going to talk about what happens to kidney transplant recipients and donors, and also talk a little bit about the surgery itself, which isn't exactly their experience because they're under anesthesia, but probably would be of interest. So just a brief mention-- [INAUDIBLE] talked a lot about recipient selection, and I don't want to be too redundant. What surgeons care about-- we care about the whole patient, but we are specifically tasked with determining issues related to obesity, vascular disease, and urologic disease. The obesity, I think, Trish touched upon.

The vascular disease, there kind of two components of that. One is flow into the kidney, which usually can be determined pretty easily on clinical grounds and then reinforced with additional studies. Calcific disease is not extremely common to the extent that it would preclude doing it a transplant, but it does happen.

And so we, over the past several years-- and I think most centers are doing this now-- do non-contract CT scans, which are very good at detecting this type of calcific disease that might prevent the situation where we explore our patient and decide intra-operatively that we can't do a transplant. So it doesn't happen that often, but it's valuable in preventing those really unfortunate episodes. And then where there are circumstances where there is kidney infection related to reflux, whether there's a bladder substitute or bladder dysfunction, or there are polycystic kidney that may or may not be getting in the way of a transplant or a patient's lifestyle, then we get involved in determining that.

For people who are on the list, candidates have to be reachable 24/7, because they could called at any time. While some, the odds are somewhat predictable in terms of how long they've been on dialysis or how long they've been waiting, there are many circumstances by which someone can get transplanted potentially earlier and so they should be available. Most of the time we identify that a recipient is going to get a transplant before the kidney is recovered, so they don't have to go in an ambulance, lights and sirens. They don't have to contract the helicopter unless they're way up north, but even then, maybe not. So you have some time.

A lot of times we will give a heads up, in other words, somebody is potentially what we call primary or up for a kidney, has been identified as such. But certain things may have to happen for them to do it, or maybe they're a backup, but we want to check on them to make sure there are no issues that might prevent them from getting a transplant or things that we have to address. So a lot of times it'll be a how you doing?

Did you do this? Did you do that? Have you been sick? OK, stay by the phone, we'll let you know one way or the other.

Sometimes we get the opportunity to transplant after the recovery happens. So there are a couple of scenarios where this could be the case. Sometimes a donor, after cardiac death, occurs-- the process moves forward very rapidly for a variety of reasons. And so there may be a situation where the donor has gone to the OR even before or while what's called the match run, where the potential candidates are identified in order is happening.

It may be that the organ procurement organization doesn't want to make offers until they get some labs back, and some of these labs may not be back until the recovery's already started. Kidneys can go for a long time, so that's not bad or a disaster or anything like that. It just-- the sequence gets to be a little bit out of order.

So sometimes what will happen is the organ will be out, or there may be somebody else up for the kidney. So we're not the primary recipient, we're the backup, but the organ's been turned down for the recipients ahead of us for a variety of reasons. The transplant center doesn't like the anatomy, something happened with the recipient that wasn't identified until now, those sorts of things. So in those circumstances, we may call the recipient and say how fast can you get here?

And again, you know, we're not talking a heart transplant or a liver transplant, where every second counts, but obviously we like to have them there as soon as possible. And a lot of times we'll bring somebody in and we'll send them right to the operating room, and they'll get their labs done and their x-ray work up and then they'll go get their transplant. So that's exciting for them, I guess. Most of the time it doesn't turn out that way. But either way, it's all good.

At the time we call them, we may talk about different types of donors in the context of just informing them because we feel we need to, or we are obligated to, or maybe to set their expectations about what's going to happen with the transplant. For example, a high KDPI organ I mentioned, people already consent for that, so they've already agreed to do it. But nevertheless we tell them and reinforce that that's something that they're interested in.

The PHS increased risk-- we do not preconsent people, but we discuss it and educate people about it, and then we talk to them about it at the time of offer. So that may be part of the phone call if it applies, which it does 20% of the time. And the discussion basically goes as far as the recipient wants it to in terms of being able to make a decision.

So some people say yeah, I remember this, let's go. Some people say, yeah, I remember this, I'm spooked, I don't want it. And other people will say, OK, what was it in the donor that made them high risk, and we're allowed to disclose that because it helps them make an informed decision. So those conversations can go a number of different ways. And remember, if somebody declines, they're not penalized, we don't question their motivation or anything like that.

And then there are kidneys like donor after cardiac death. Now, there's no preconsent process, and we don't think that that distinction is meaningful enough in terms of what's going to happen with the transplant to get specific consent or permission or anything like that. But we do talk to the patients about it, because the risk of delayed graph function, in other words, the kidney not recovering right away is much higher for donors after cardiac death.

So we try to tell them about it in order to manage their expectations, because people who have delayed graph function, you know, they can get a little bit down. Because they want their kidney to work, and even that we know that it's all going to be fine and the kidney's going to recover, it's a stressor for them. So we kind of set those expectations up front.

So I talked a little bit about the donor after cardiac death, just to kind-- through the statistics, 90% of donors are brain dead, and if you're brain dead, you're legally dead and your organs can be recovered while the heart is still beating. So that minimizes ischemia on a donor after cardiac death. The heart has to stop.

So people have the same neurologic injuries for the most part, poor prognosis, family decides to withdraw support. Support has to be withdrawn, and the heart has to stop before organs can be recovered. That means there's ischemia and injury, so in general the time from withdraw support to declaration of death has to be within a certain time frame.

For kidneys, it's somewhere between 30 and 60 minutes. I'm actually right in the process of having to not use a liver transplant because it took too long for the donor to expire. So there's lots of things that go into that.

Donors don't need to be in good health, so that's another kind of misperception that can happen. If a donor has hypertension or diabetes or something like that, then it's not a good kidney, that there's a lot of variability in to the extent of chronic kidney disease that occurs in people with these conditions, and there are plenty of great kidneys from people with longstanding diabetes and hypertension that can be used. We're talking deceased donors, of course, not living donors, but that's part of the education.

And very importantly, and I don't know if this comes up to you all very often, but donation is anonymous. There's a trust that's been placed by the donor family that their identity will be not disclosed for a variety of reasons, not the least of which is just respect of privacy. And it's very easy-- there are some people who try to find out who their donor is, and with information these days, you can do a lot of things just on your computer with a couple of bits of information and identify people who really didn't want to be identified.

So we try to hammer that home around here, that it may seem innocuous that you said that the donor was from Flint, and that was it, so how could they possibly figure it out, but then somebody else said, oh, you know, they were a teenager, and somebody else said oh, they got hit by a car. And all of a sudden, you know exactly who it is. So that's very, very important.

I already talked about PHS increased risk donors in this context. This is what we discuss with them. I won't go through that again, just another slide showing the increase in PHS risk donors. Now, in part, the definition was modified over here, which it expanded it a bit, but you can see-- you probably, if you look at-- opioid deaths in the US. The curve is probably pretty similar, and so that's unfortunate.

But again, these are perfectly good organs. So the KDPI I also talked about. In this context it's important to know that it's not the only determinant of quality. There are many other things that aren't collected using national data.

Anatomy, I talked about biopsies, I talked about pump, none of that goes into it. So KDPI is really only the start of the donor evaluation process. And again, reiterating as I mentioned before, these high KDPI organs, we don't like to refer to them as high risk, because high risk implies that somebody is taking a chance that they shouldn't be taking. You know, these are perfectly reasonable organs to use in the right patients. And I already talked about that, these are all the variables we look at.

It's actually of interest that-- there was a study that looked at utilization and discard practices based on the KDPI of kidneys before this information was available to surgeons, and after it was available to surgeons, because you could apply that sort of retroactively. And it turned out the utilization by different strata of KDPI was really no different. So the KDPI helps to make that evaluation process simpler, but surgeons were actually pretty good at judging quality even without that number. So it hasn't necessarily hurt or helped utilization very much.

These are kidneys. They're put on a perfusion pump and we actually perfuse preservation solution into the artery of the kidney, which is attached to this cannula. And then the pump fluid comes out of the vein and gets collected passively, and then it gets recirculated.

So we can use this as a selection tool; if the kidney pumps well, then we think that's better. If the kidney doesn't pump well, they might be too injured or they might have chronic kidney disease. But the other thing that actually happens is by pumping into the vasculature, it actually opens up the vasculature of the kidney. There are some vasoconstriction that happens as a result of injury. Question?

AUDIENCE: [INAUDIBLE]

RANDALL S. SUNG: Oh, the size of the box?

AUDIENCE: Yeah.

RANDALL S. SUNG: Well, the kidney's about the size of your fist, right, so it's kind of like that. And actually it's kind of like eggs-- there's a number of different types, it's kind of egg shaped, very portable. About a shoe-- a little bit bigger, because of the engine or the pump or things like that. But this canister, right, is very much like the size of a shoe box that contains the kidneys.

So it can actually help reverse a little bit of the injury that occurs. And so kidneys that are pumped have dramatically lower rates of delayed graph functions than a graph function compared to kidneys that are not pumped. So any kidney from a marginal donor or a DCD or that might have a long, cold ischemic time-- in other words, out of the body-- we pump in Michigan. It's an OPO policy, and the centers all agree that that's a good thing to do. And we'll look at this resistance, which is a calculated number that basically takes into consideration the flow that we're able to get through the kidney, but also the pressure required to get that flow.

And so there are kind of loose criteria by which we can use to make a decision about a kidney that's maybe borderline. But there's no absolutes with anything, we take into consideration all different factors, and there are technical issues that could potentially come up. The biopsy I kind of alluded to in my last talk.

People realize it's very important to be consistent, so that's one thing Gift of Life is trying to be very focused on, is being consistent about the way the biopsies are processed and read. And there is a suggestion that arteriosclerosis, interstitial fibrosis, glomerulosclerosis, there's some evidence to suggest that that's associated with inferior graft outcomes. But again maybe not to the degree to with which we use it.

So here's the incision. It can go on either side, it's low down, most recipients find it's not as painful as they thought it was going to be, which we think is a combination of the lower location of the incision and also steroids, and also the fact that they're really happy that they're getting a transplant. I think all these things help make the pain more manageable. So you can put any kidney on any side. There are surgeons that have little preferences based on the anatomy of the donor or the recipient, but it's pretty much anything goes.

However you get it in, if you find a spot to sew the artery and a spot to sew the vein, you're good. Basically, it's a retroperitoneal dissection, and so we get to it by going through the abdominal muscles. If you remember your anatomy or if you use it in any way, it's sort of the rectus muscle and then the oblique muscles. We actually try to preserve the rectus muscle over the past few years by sort of peeling it away, and I don't know for sure that that helps recovery but it certainly can't hurt.

We expose the iliac vessels, and we preserve the peritoneal integrity, so we're really peeling the peritoneum away. This accomplishes a couple of things. One, if we make a hole in the peritoneum, we can get bowel going through it and get an internal hernia.

Secondly, there's always a little bit of oozing around afterwards, and if you have peritoneal integrity, then you get tamponades. So the peritoneum knee and basically sort of presses on it and limits the expansion of a potential hematoma. Whereas if you have a hole in the peritoneum, it can just bleed into the free peritoneal cavity. The other thing is if bowel gets out from the peritoneum over the kidney, it can drape over the kidney and make it hard to biopsy. So for all these reasons, it's good for the kidney to be in the retroperitoneum.

And we're mostly attaching it to the extra iliac artery and vein. So most patients-- I should have said this from the outset, most you probably know, we don't remove the native kidneys. There isn't a single person that comes to evaluation that hasn't had a transplant before that isn't surprised or curious about what, you don't remove my kidneys? Do you disconnect them? No. What?

But it's not necessary, right, it's basically adding risk without adding any benefit. You There's also good reason to have the kidney here, because most people are going to wind up getting a biopsy and native nephrectomies are really no fun-- not native nephrectomies, sorry, native kidney biopsies are really no fun. Transplant biopsies are not bad. Not having had one, it's easy for me to say, but it's not that bad.

So as I said, we prepare the external iliac artery and vein. There's a little bit of stuff we do on the back table, not really that much cleaning extra fat off of the kidney and off of the vessels. Occasionally if we have multiple vessels we may splice them together or do other additional prep.

When we do the surgery, we give lots of volume. The principle is the more perfusion the kidney gets early on is critical for early graph function. So unless they have a cardiomyopathy, we'll give them a ton of volume and load them up. We'll give diuretics and then we start the immunosuppression right in the OR before we perfuse, with the thought that some of these immunosuppressants may help to minimize ischemia reperfusion injury, which can lead to delay graph function and is also felt to amplify rejection.

So just briefly, for those of you aren't familiar with this type of surgery, we occlude-- this is the vein-- we occlude on both sides. We sew the end of the vein to the side of the iliac vein. In the end, that looks like this, so this is a kidney, nice and pink. This is vein, which is sort of bluish. That's the renal vein, this is the iliac vein.

For the artery it's quite similar, the only difference is the artery is a little bit thicker, so we actually punch a hole in it to make sure that we don't get any sort of narrowing at the slit. So this is what we do for a living donor transplant, which is basically there's no patch. For a deceased donor transplant, you can use a patch of deceased donor aorta to make it a little bit bigger.

This is the end result, so the vein's already done. This is the artery, which arteries are pink. This is the iliac artery, and then the kidney's up here.

So here is a picture of how we attach the ureter. There are several different ways to do it, but this is the easiest and by far the most common. This is essentially-- the end of the ureter is sewn to the mucosa of the bladder, which is exposed by dividing the muscle. And then we will show the muscle back over it after the anastomosis is done to try to prevent creating an anti-reflux valve, which often works.

There are other options as well. If you have a short ureter, you can sew to the native ureter. You can even sew to the collecting system of the kidney.

Our basic principle on retransplants is we want the cleanest operation possible. Kidneys that fail are actually really scarred in, and so to do a transplant nephrectomy is a very inelegant operation and often is associated with-- I wouldn't call it torrential or life threatening bleeding, or even bleeding that requires transfusion, but enough bleeding you know to potentially create disturbances and intravascular volume which might affect the early function of the kidney transplant. Remember, I went back to we want a volume load, we want a lot of flow, and there's lots of other reasons to leave the original kidney transplant. Especially if it has residual function, as an insurance policy in case something goes wrong with the new transplants.

So we'll just go on the other side, because that's clean, it's easy, it has less of a chance of having complications. For a third transplant, we might have to take a kidney out, we might not. Sometimes you can fit two on the right side.

There are some programs that will actually do orthotopoic kidney transplants for fourth and fifth kidneys. In other words, take out the native kidneys and sew up in there. We would probably take out one of the kidney transplants, but there's lots of ways to skin a cat.

For pediatric transplants, small kids will often get adult kidneys, which means it fills up the entire abdomen, so we have to sew to the aorta or the vena cava. You can do two for one transplants for very young, small kidneys, you can do double transplants for old kidneys. Any organ that is transplanted that is not called the kidney can be transplanted with a kidney, and often is.

So afterwards, we pay close attention to urine output. If it's a living donor transplant, it should be super normal, hundreds of cc's per hour. If it's a deceased donor, it may be very minimal, it may be vigorous, there's much more variability there. And we also have to pay attention to whether the recipient actually makes urine, because many people do. Preemptive people make normal amounts of urine.

The longer people have been on dialysis, the less likely they are to make urine, but we have to know what that baseline is in order to evaluate what the kidney is doing. I talked about delayed graph function and when it happens. It's really rare in living donor kidneys, the rate is about 3% to 5%.

Going along with what I said before, if a kidney transplant's not-- living donor kidney transplant is not functioning, it's incumbent on us to figure out why, whereas with a deceased donor, DGF is expected in a certain percentage of patients. And then in order to keep the kidney perfusing, all the urine output that comes out, we do one to one replacement in the first 12 hours, and then one half to one in the second 12 hours, in order to keep people hydrated. So it's a little bit of a balance.

If the kidney is not working that great, there's a temptation to push fluid to try to get it going, but then there's also the potential for volume overload. So we do it to a point, and we also take into consideration what the cardiac risk is. People have a foley times two days. If there may be some difficulties in the OR with a fragile bladder or something like that, we may keep it in longer.

Everybody now in our program-- and, you know, there's lots of different programs, some of which may use stents, some which may not-- we use internal nephrouretral stents, so these are double J stents. One J is in the collecting system, the other J is in the bladder. All I could-- without trying to be too much of a zealot about it, all I can tell you is our leak rate was about 5% to 6% before we started using them routinely, and now it's about 2% to 3%, which could be from a number of different things. Because it's basically over time, but we think the stents have helped.

The diet basically goes as people tolerate it. Most people are able to eat solid food the day after the surgery. It's rare to have an ileus, and we tried not to hold people back from resuming their diet. That's sort of just a principle of surgical recovery.

After surgery, early ambulation. Some people, the day of surgery, we try to get everybody up post-op day one. I mean, part of what our evaluation process is so focused on is functional status, because we need people to walk after surgery. Because if they can't walk, they have complications, and if they can't walk and they have a complication, then they're even worse off and they wind up having this terrible spiral.

By the second day, everyone ambulates and ambulates a lot. Obviously, there are challenges, people who are old, obese, who have amputees, functional disabilities, all these things. Obviously matter is part of the transplant evaluation. So our target length of stay is two to four days, and most people wind up being three to four days, unless they have specific issues, and everyone's pretty aware of that.

Jamie's going to talk about the medications. About 60% of our patients get thymolglobulin for induction. So this is basically to prevent rejection. These are the categories of people that could be at risk for rejection, and if people have delayed graph function, they'll also get Thymolglobulin.

Oh that's a mistake, we actually give it the first three days, and it's usually pretty well tolerated. We use three immunosuppressive drugs tacrolimus, CellCept, or mycophenolate, and steroids. And there are a lot of different side effects that can happen, and I think Jamie's probably going to touch on some of them. But the more common ones, tremor, headache, hypertension, diabetes or worsening thereof, GI side effects, prednisone can make people euphoric or irritable. I never tire of warning people about that because it's something that I think is underappreciated, and there can be a lot of family conflict after transplant that people ascribe to many different things other than the steroids which would be the easiest thing to do.

There's lots of clinical studies, we give lots of anti infectives. Everybody gets DVT prophylaxis. There are a decent number of patients with thrombophilia or who are on anti-coagulants for some reason or another, and we'll manage them according to the risk. If people are at very high risk, we may have to give full anticoagulation throughout the transplant, and then there's a 50% chance of bleeding.

That's pretty well documented. But people that don't require that can require a little more gentle perioperative anti-coagulation, and they generally do pretty well. In general, bleeding is better than clotting, but only up to a point.

AUDIENCE: What about those who don't tolerate [INAUDIBLE] but take something like [INAUDIBLE]?

RANDALL S. SUNG: So, yeah, we've struggled with this. Because you're talking about like sort of the newer ones, like eliquis.

AUDIENCE: Yeah. [INAUDIBLE]

RANDALL S. SUNG: Right. So part of the problem is there are no reversal agents for these drugs. So if there is an anti-coagulant that does not have a reversal agent, then we try to tell people to go back to Coumadin or go back to one that is if they're getting to a point where they could be transplant-- if they're on the list, if they could be transplanted within a year or so. Because for most circumstances, we can't call them in and wait that long to transplant them.

Now we're getting more tolerant of how long we can put kidneys on a pump, so that may be changing, but I suspect also some of these will be able to be reversed down the road. For living donor transplants, it's not a problem, because we can stop it in advance and it's a planned operation. But those agents are tricky.

So for blood pressure, we basically start everyone from scratch but add according to their prior regimen. Almost everyone requires blood pressure medications. Some may be higher, some may be lower, depending upon the degree of essential hypertension. And typically we'll accept higher blood pressures than usual, because as the doses of immunosuppressive medications go down, the need will decrease.

Similarly, with diabetes, many people are diabetic already. Some people will delap develop the novo diabetes. The control will generally be better as time goes on, but it is a big shift because people with the SRD, they're used to having pretty good control or at least low insulin requirements. And there's a lot of teaching that goes on, and there's a lot of social support that is needed and is reinforced, and I think we've touched upon that a couple times.

After discharge, the first visit is very comprehensive. They see every member of the team, and then after that, generally the nephrologist and the post-transplant coordinator. Frequent visits early on, and then it kind of tapers off, but labs are still very, very frequent. Once again, they need support, because there's lots of unscheduled stuff that could come up, especially early on, so that's very important.

They get surveillance biopsies and monitoring for things like donor specific antibody MBK, and a lot of times we'll try to get people to go back to their referring nephrologist if they're doing pretty well within three to six months. We try to set those expectations. Some patients welcome that, some people are more resistant, but again, that's kind of the goal at least, and so we've been moderately successful in that.

In general, about 10% of people will have a blood transfusion afterwards. It's a little more common if they're on anti-coagulation. I talked about delayed graph function. Rejection can happen.

Most patients think that rejection means their kidneys failed and they go back on dialysis, but in reality, most rejection episodes can be treated. Probably, in our experience, about 20% of people will get a rejection in the first year, and the vast majority of those are either completely or at least partially reversed. Vascular complications are very rare, less than 1% of the time. If we suspect-- we do a lot of ultrasounds, though, because if we get one, we need to act on it right away and de-clot.

And then I talked about urine leaks. Fluid collections aren't necessarily a reason for intervention unless they're causing symptoms, which would be aspiration or sometimes even an operation to improve the drainage into the peritoneum. Like I said, we do a lot of ultrasounds.

We pay a lot of attention to the wave forms, because it can tell us flow without going into great detail in the interest of time. This is a normal wave form, if it gets really, really sharp that suspects things like renal vein thrombosis or other kind of severe outflow problems. If the wave contour is kind of rounded, that's more suggestive of renal artery stenosis.

This is a urine leak-- I was going to ask questions, but I'm running short of time. So this is a nephrostogram. This is collecting system, this is transplant ureter, this is extravasation. This is the same person, and most of these we treat non-operatively when they are having their nephro-uretral stent out six weeks later. This is the bladder, that's the ureter, that's all normal.

So our living donor selection, the most important thing is they have to be willing and not coerced. Their overall health has to be good. They have to be able to have very low risk for perioperative complications. They have to be at relatively low risk for end stage renal disease. The timeline is variable, but really the most important things are they have to declare that they're interested and then we take care of the rest. We can't call them just because their relative said, oh, yeah, this person wants to donate.

So we'll try to do a phone screening within a week, we'll do tissue typing, which doesn't necessarily have to be completed before they come in for an evaluation. Because of paired donation, their in-person evaluation is very similar to the recipient evaluation. Long, detailed, they have a lot of things done. And they have both a CT scan and a nuclear medicine test that specifically looks at their GFR. For most people, the decision's made within a week or two, but if they're more complex, it could take longer.

If the recipient is ready, usually the lead time is about three to six weeks, depending on schedule and availability and things like that. And both donor and recipient get a history and physical two to three weeks before the surgery to teach, reassess, make sure everything's ready to go, and then they donate.

This is a CT scan. 90% of the time we remove the left kidney, because the left renal vein is longer than the right renal vein. So it's a little safer in the donor and a little bit easier to transplant in the recipient.

In this scenario, there's one right renal artery and two left renal arteries. You might think well, we ought to take the right kidney, because it's simpler, or at least that's what a lot of surgeons would think. But the vena cava actually runs right along the side here, so it's actually hard to get back there. So because of the left renal vein thing, we'll usually take the left kidney and then splice those two arteries together.

Chad is going to talk about paired donation, but there's lots of different schemes. Simple swaps. Even if you're compatible, you can enter paired donation and help somebody else get a transplant, or maybe get a better transplant for yourself. There are chains that can be initiated by a non-directed donor, so there's lots of different ways that paired donation can help people get transplanted.

We do it laparoscopically. There's lots of different ways to do it, almost nobody in the country does open nephrectomy anymore. It's all laparoscopic.

This is roughly the incisions that we use. This one we do hand assisted nephrectomy, which means that this is the incision that the kidney has to come out of any way, so we put a hand inside and we use it to basically create retract, create exposure. If we have bleeding, we have good control, it's a very safe way to do it. This one is for a camera port, this is right under the costal margin. This is off to the edge, where the dissecting instrument goes through, and then the stapler at the end.

So typically with a left nephrectomy, we'll mobilize the descending colon, we'll tease the kidney off of the spleen and the pancreas, isolate the renal artery and vein and ureter, staple, staple, cut, take out. Typically about 2 and 1/2 hours. That's a kidney that's been taken out. Renal artery is here, renal vein is there, ureter is here. A surprising number of patients who do this want pictures of their kidney.

AUDIENCE: [LAUGHTER]

RANDALL S. SUNG: I don't know why, at least they don't want to take their old kidneys home or anything like that. And it's to the point now, where it's-- most people who were involved in this, if they're asked, they're like, oh, yeah, let's do it. I sometimes get so focused that I forget, but I'm getting much better. It probably happens about 10% of the time.

So donor recovery can be pretty quick, and in general, principles of surgical recovery are trending towards everything happening faster. The faster you get back to normal, the faster you recover, the fewer complications you have. So we do a bunch of different things that are part of those trends, like carbohydrate loading beforehand. A TAP block is basically a block of the abdominal wall around that main incision that the anesthesiologist put it after induction, before the surgery started. Low IV fluids, enough to perfuse the kidney, but not enough to develop an ileus afterwards.

The foley comes out pretty much the night of surgery. Soon as somebody sits up and says, hey, I don't need this, we take it out and we try to ambulate them. We don't hold them back on diet, and some people are eating normally the night of surgery. Everybody's different, and so we try not to hold them back. And we do allow nonsteroidals in the perioperative period, even though they have one kidney for a small period amount of time, and we try to minimize narcotics.

All of these are pretty much sort of consistent with other principles. And then just briefly, we did a retrospective review, and we found a decreased length of stay, decreased narcotic use, and really no difference in pain scores or operative times with the TAP block. So I kind of described our pathway already, it's basically the pain medication is parenteral the first night and then oral the next time. They get a post-op visit, 10 to 14 days, and we're actually working on doing some telehealth visits at six weeks to follow up.

One of the things that donors experience is kind of this sense of letdown afterwards, and so they don't necessarily want to come back and take the time for a visit. But just some sort of attention and thank you and are you OK would go a long way. And we do required follow up at six months, one years, and two years.

So the complications are basically complications of general surgery, and the risk of any complication that requires interventions about 6% to 7%. There's about a 1% or less chance of conversion to open procedure to prevent a life threatening complication. The risk of death is one in 3,000. So nobody really flinches when we tell them that.

So just the impressions that-- and these are only my impressions from the years I've been doing this-- by the time people come to evaluate and you tell them all the bad things that can happen, which you're obligated to, they don't care. They're already want to donate. It doesn't faze them, they don't fear the surgery. They do have concerns about how much it's going to cost and when they can go back to work, and that can be a challenge.

Early on, the incision can hurt even though it's laparoscopic, and so they're kind of like oh, I didn't realize. But that doesn't last very long. And by the time they get their post-operative phone call, they're usually not on pain medication.

So it is really fairly quick, and most are very motivated. So to add, saying that the norm is to go home post-operative day one they're like, yeah, great. Could I go home earlier? And the overall satisfaction has more to do with how the recipient does, because remember, this is why they're doing it, than with anything else.

And again, because the complication rates are low. Very high satisfaction, and we always try to tell recipients that donors are-- they're doing it for the recipients, but they're also doing it for themselves. They get something out of it that's very important and profound.

And so some recipients, when they think about it in that light, are more inclined to be receptive to an offer of donation. And most wind up being more motivated to develop a healthy lifestyle. So it really is a good thing.

Just a word about-- we care a lot about the risk of kidney failure in living donors. In general, living donors have a higher risk of kidney failure compared to comparable healthy donors that don't donate. We don't think that donation creates kidney disease, what we do think is we are not capable of predicting with 100% certainty which healthy people are going to develop kidney disease later, after donation. And for those people, kidney failure occurs earlier because they have one kidney.

Mortality is no different from comparable healthy individuals, and both ESRD risk of mortality are much lower than the general population. So we're not even getting them to normal. They're still healthy. So these are data that we consider to be acceptable, but we also have to be very careful of the types of the people that we allow to donate, and we're constantly refining those criteria.

AUDIENCE: Actually, I was just curious. You know, recipients can't have a blood transfusion before the transplant takes place, but you were mentioning how it's very common that you might have a transfusion during the procedure. What's the difference?

RANDALL S. SUNG: The difference is that transfusion pre transplant is a potentially sensitizing event. So people develop antibodies against HLA. So typically, if somebody's transfused, then they get placed on hold for 90 days, because 90 days is the time period we think that is sufficient for any antibodies that are going to develop, that they will develop. Post-transplant-- you know, the literature on post-transplant blood transfusions is very interesting, because some believe that it can also be immunosuppressive, which can also help reduce the risk of rejection. That's kind of all over the place, but the bottom line is we think that under immunosuppression those antibodies don't get generated to the same degree, which is why it's not an issue to transfuse after the surgery.

AUDIENCE: What's your thought on doing both pancreas and kidney for diabetics?

RANDALL S. SUNG: I'm all for it. I love doing pancreas transplants. I'm like one of the strange people, because most surgeons don't like doing pancreas transplants because we don't do enough of them to understand why they fail, and so it's very frustrating for people who like to be in control. But it's really very, very rewarding for the people that get it.

Now, they self-select, so-- the general approach in 30 seconds-- it's typically only for type 1 diabetics, because the type 2 diabetics won't be helped because they have insulin resistance. Although if you're kind of in that gray area where it's hard to know which you are, it's worth considering. It generally is agreed that it won't increase life expectancy, or if it does it's only by a little.

So the kidney, from our perspective, is the much more important organ. The kidney you want to have. The pancreas you could if you wanted to.

The complication rates are higher. It's not a dangerous operation, but the risk of dying is extremely low after a kidney transplant, it's a little bit higher after a pancreas transplant. The complications are more serious. People can be in the hospital for a month after a complication of the pancreas transplant. About 5% of the time it's thromboses, and that's unfortunate, too.

But, having said all of that, for somebody who's been on insulin their whole life to not be on insulin is like an albatross being lifted for them, and it's very meaningful. Now, other people, they hear the complications and they go, you know, I've been diabetic my whole life. I'm used to it, it's not that bad, or it's bad but I can live with it, I don't want to take the chance.

Our approach is-- and this is usually in the context of kidney transplant, and the difference is that if you are getting a kidney transplant, or you have a kidney transplant, whether or not you got a pancreas transplant, you're going to be on immunosuppression. That's not going to change, so that long term risk is the same and the immunosuppression isn't that much different. If you don't have kidney failure and you just have diabetes-- brittle diabetes-- and you're getting a pancreas transplant, now you're taking the risk of the surgery plus all the long term risk of immunosuppression. So we're very, very selective about pancreas transplant alone. Only very, very brittle diabetics who are at the end of their rope, have hypoglycemic events that are short term risks to their life, those are the people we'll do pancreas alone.

For people who are kidney candidates or have a kidney, it's a totally different approach. We determine whether we think they're robust enough to handle the additional surgery and the complications. And if they are, we tell them the pros and cons and it's totally up to them. And some people decide and some people don't. But the people that decide, and again, they're motivated, but when they get it and it works, it's a life changer for them.

AUDIENCE: If they don't get it, will they end up-- doesn't diabetes eventually get to this--

RANDALL S. SUNG: Yeah, that's a really good question, and most people who are thinking about it ask that. The answer to that is yes, but not to the degree that it compels somebody to get a pancreas transplant. So you can get recurrent diabetic nephropathy and a kidney transplant, but it's extraordinarily rare for a transplant to fail because of it.

Most transplants and diabetics fail of chronic rejection, or basically short of long term wear and tear over a period of time. So it's really no different. So it could shorten it, but that in and of itself isn't a reason to recommend it to somebody. OK.

AUDIENCE: [APPLAUSE]