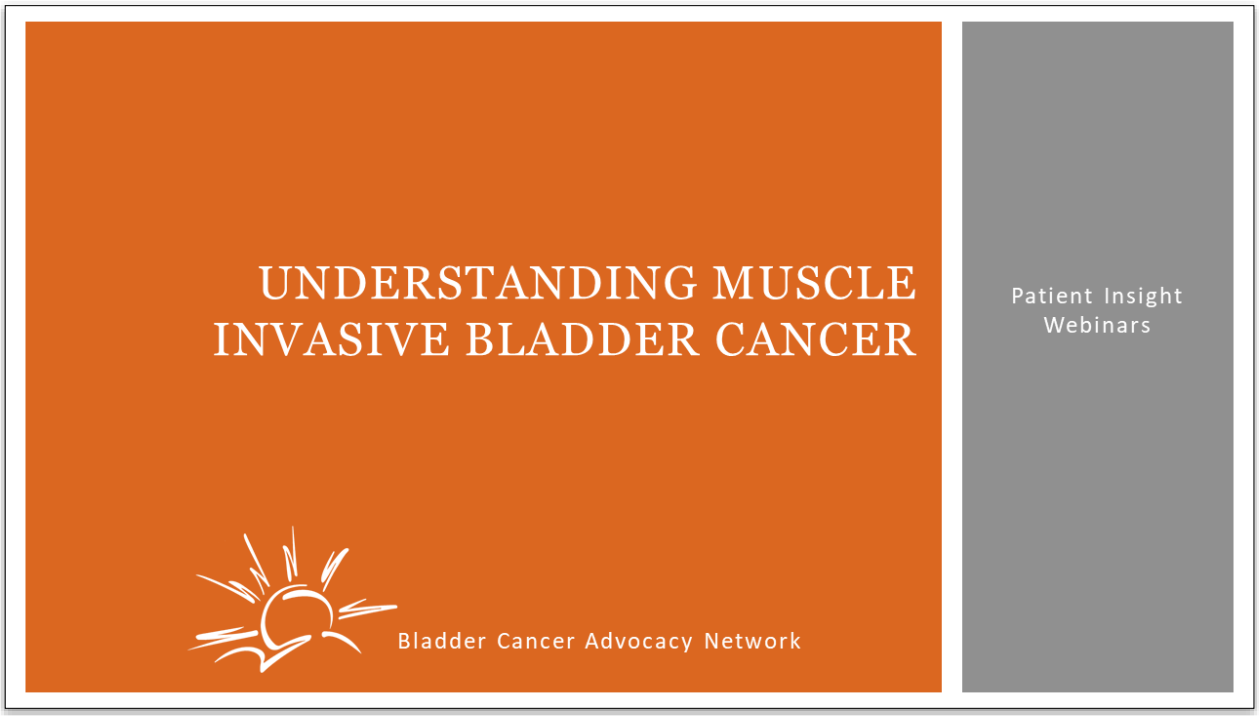
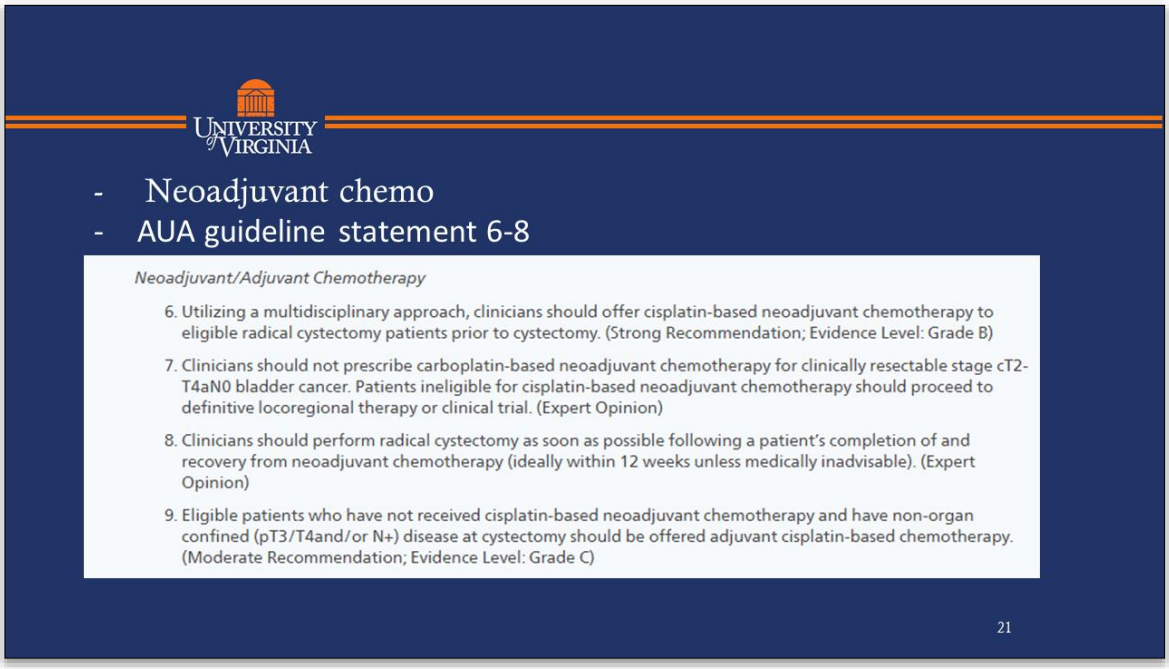


Dr. Tracey Krupski:

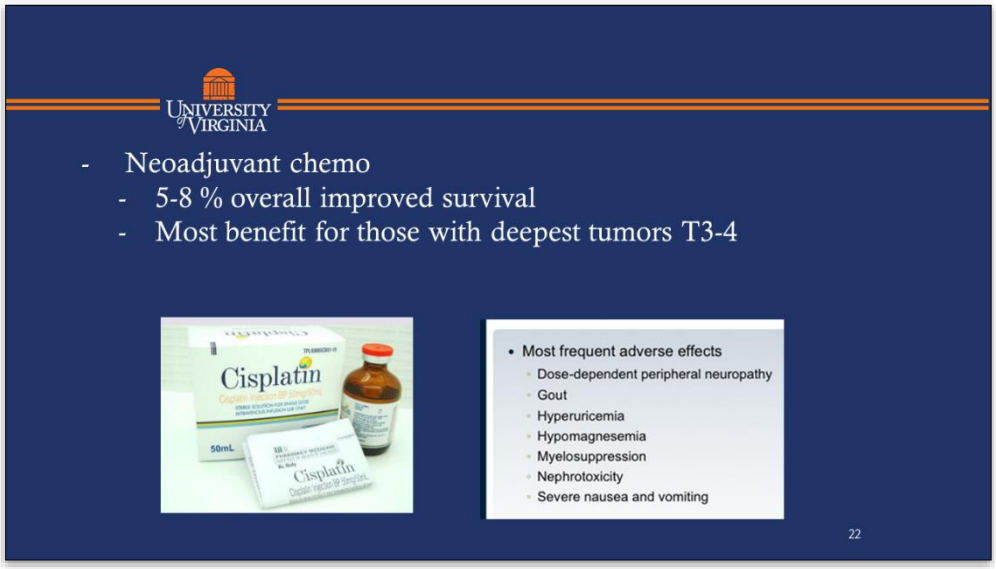
What about the bladder? So if we talk about doing a cystectomy, so you say, "I'm not going to do that chemo radiation thing. I don't want to do that, I want to just surgically have my bladder out."

Well, we've kind of had a shift in our philosophy. Originally, we thought only the people who had the really bad tumors, like it went all the way through the bladder wall would we recommend they take chemotherapy before the surgery. But more recently we're recommending neoadjuvant chemo to anyone with muscle invasive disease if they can have it. So



anyone who comes in with a muscle invasive bladder cancer, it's pretty standard of care to recommend they discuss chemotherapy with an oncologist.

It doesn't mean that you have to take it, there may be medical reasons why you can't get the chemotherapy and you really need to get cisplatin chemotherapy. That's a certain kind of drug. If you substitute carboplatin for it, it's not very effective and you should just go ahead and do surgery without chemotherapy if you cannot get a cisplatin based chemotherapy. So ideally, that makes this a very long journey because this chemotherapy usually is given for three or four cycles, which means you get it every three weeks three times. So anywhere from 9 to 12 weeks, it's going to take to finish chemotherapy.



You need to have a little time to get stronger so that you can head into this big surgery feeling like you have a good appetite, good strength, good performance, you can do things. Those are the most important criteria. So we would recommend that you discuss it anytime you have muscle invasive bladder cancer. Now who might not get it? So the cisplatin, this is the drug that I was talking about. It's given intravenously. It can be combined either with one other drug called gemcitabine or with three other drugs and we call that MVAC.

Dr. Tracey Krupski:

They have neuropathy. So this is the kind of chemotherapy where people are trying to do the buttons on their shirt and their fingers don't work as well, they get stiff. It can cause a flare in your gout. But one of the bigger things, the two biggest things we worry about is myelosuppression, meaning during those nine weeks of getting chemotherapy, you're at risk to get an infection because your body is not making its fighter cells so you may be more likely to it get a pneumonia or a kidney infection or colitis or something like that.

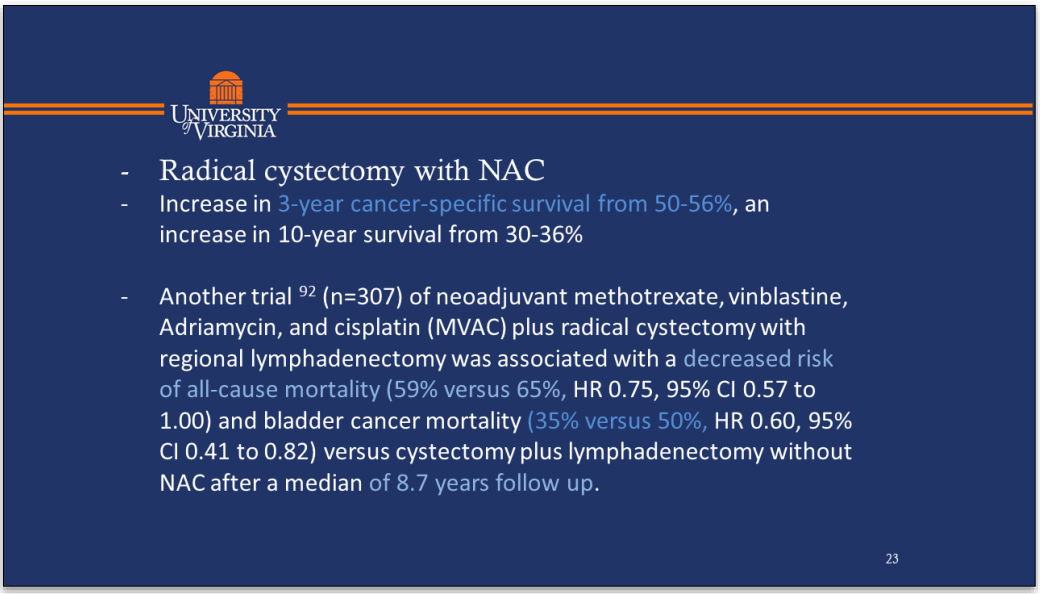
And if your counts are too low, meaning when they check your blood counts for your leukocytes, your natural killer cells, all your immune cells, if they're low, they may have to postpone giving you the chemotherapy. And the chemotherapy is not good for kidneys. So when you have impaired kidney function, maybe you've had bad diabetes for a long time, maybe you've had kidney stones, maybe you've had bad high blood pressure, heart disease. If your kidneys aren't in fairly tip top shape, they're not going to tolerate getting this drug that is very hard for the kidneys to metabolize. So you have to be fit again for chemotherapy also.

If your kidney function's not good, if you keep trying to get the drug and your blood counts are so low that you're not going to be able to resist any infections, then sometimes you can't get the chemotherapy. But it's always worth discussing these things and talking to the oncologist. And usually I personally would recommend starting it and seeing if you have any of those bad side effects.

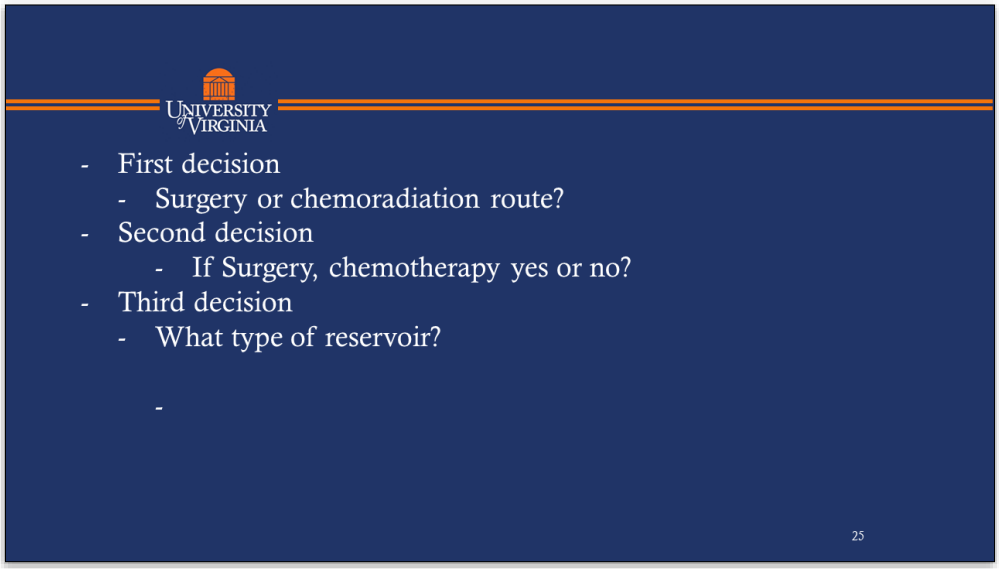
The vast majority of patients actually get through this kind of chemo quite well. It's much better tolerated than some for like chemos for breast or colon cancer or some of the more common ones. There's some data we would generally tell people that you have increased your overall survival by about 5% if you take chemotherapy first, and your bladder cancer survival also goes up. So this is over three years, it's also over 10 years. And in this other trial, same thing.

Dr. Tracey Krupski:

If you took the chemotherapy first, the chance of dying was 59% with no chemotherapy versus 65% with chemotherapy. And then for bladder cancer specific, 35 versus 50%. So generally it is improving overall survival to get the chemotherapy first. So we are going to talk a little bit specifically about surgery and preparing for the surgery. So if you were to walk in my office, we would sort of have gone through those things that we just touched on.

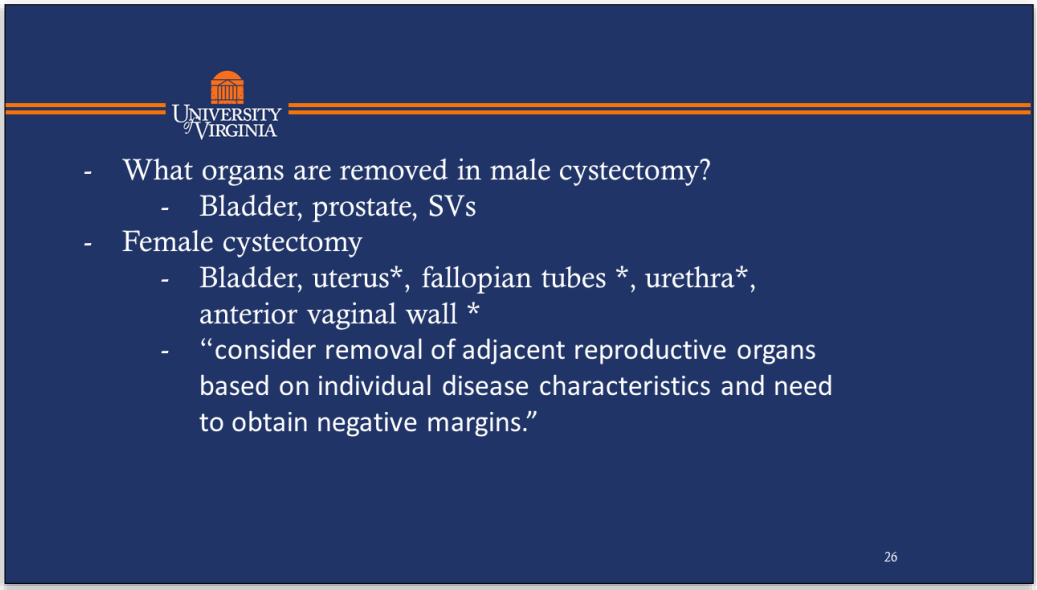


First decision you would have to make is, do we think you should do surgery or do we think you should go that chemo radiation route. If you do chemo radiation, urologist is still involved because we have to do that maximal endoscopic resection and then we're going to keep looking in your bladder every three months. So you still see your urologist, but you will go see these other doctors. If you say, "Nope, I'm going to get it out. I want that bladder out. I want to do surgery," then your second decision is, should we do chemotherapy or not?



I just gave you groundwork that I would strongly recommend chemotherapy before doing the surgery but again, you have a personal choice. You can say, "The data doesn't support it for me, I don't want to get chemotherapy first. I want to just do the surgery." Or maybe we look at your kidney function and we say, "It's really probably not a good idea, it's just going to delay things and it'll probably hurt your kidneys too much to proceed." So there could be reasons to do chemotherapy or not do chemotherapy.

And then the third decision we have to talk out is you're going to have your bladder removed, we've decided on chemotherapy, what are we going to do with your urine once your bladder's gone? So what type of reservoir are we going to put your urine in? And it's a big surgery. So the things you have to sort of talk about, I've alluded to, but when you remove the bladder, it's going to do the bladder, prostate, seminal vesicles for a man, for a woman, you might remove part of the uterus, fallopian tubes, vaginal wall.

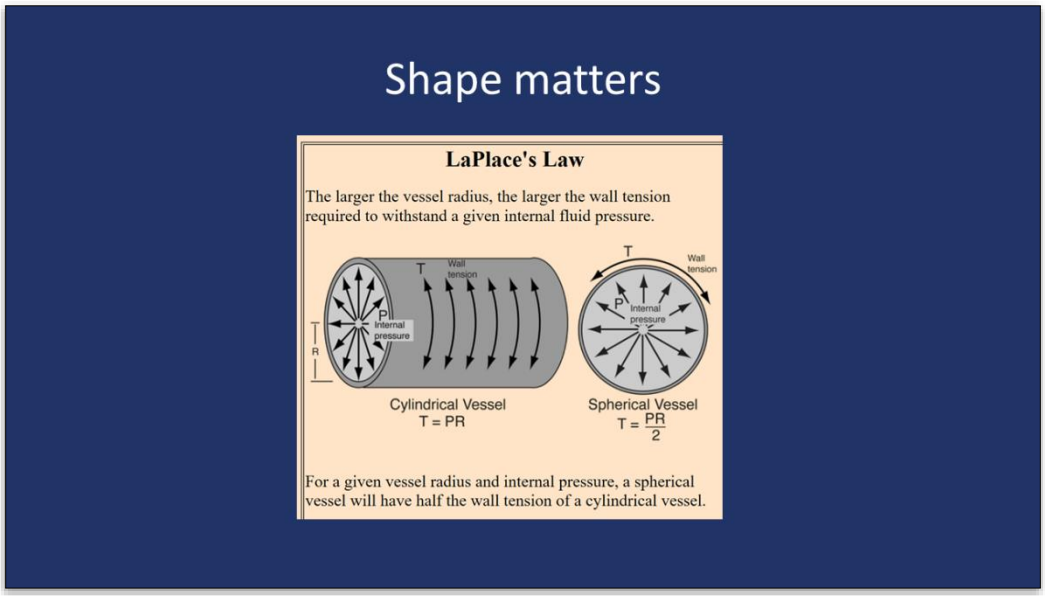


Dr. Tracey Krupski:

This is depending on what your cancer's like, how stuck those organs are together. But the goal is that you have to remove anything that might have cancer in it, so that's a consideration. And then for the reservoir, we need to be thinking about what kind of bowel we're going to use and what kind of reservoir for you you're going to have. So large bowel is going to use your colon, that's going to change a little bit about your postop life long term.

Small bowel, you probably won't notice it as much from a colon or a defecation standpoint, but it'll have different electrolyte abnormalities and different things you'll have to watch for. For you on your day to day basis, what matters for incontinent or continent means is the urine just continuously pouring out into some kind of bag or receptacle, or are you continent, meaning you have to access the bladder through some kind of tube, either naturally urinating or potentially putting a tube in you.

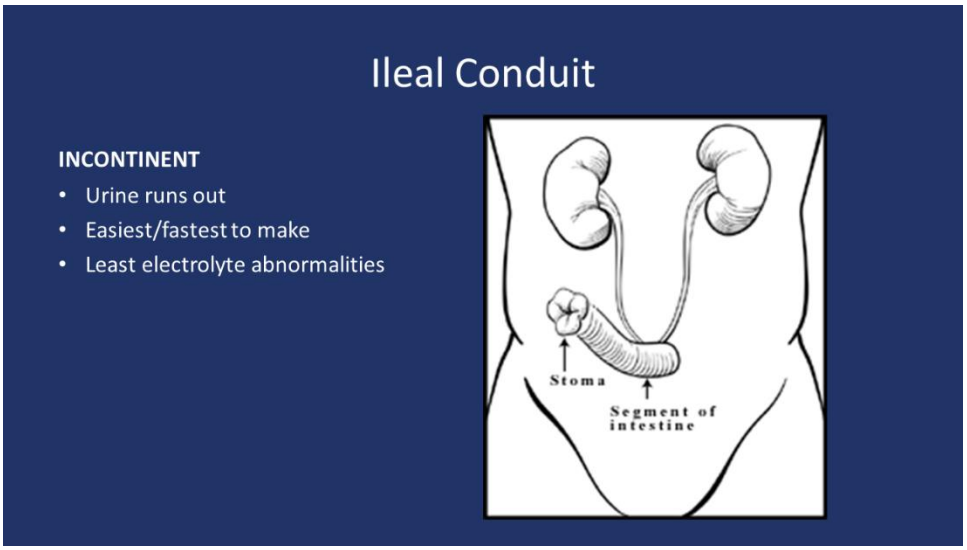
So those is what we mean by continent or incontinent. This is the one time I'm the one doctor that gets to tell my kids that geometry actually matters, that I use geometry in my day to day life. And what that has to do with is LaPlace's Law. If you have a tube, a long narrow tube like a sausage, that does not store anything. Urine is just going to run straight through there and that's going to be an incontinent type of reservoir because there's no... The wall tension is so high it's just going to squirt the urine straight out.



Dr. Tracey Krupski:

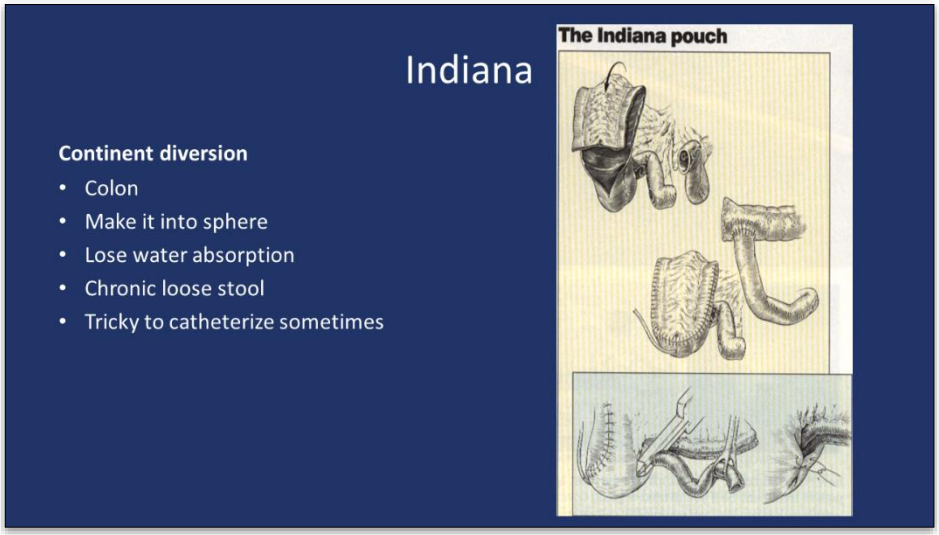
What has to happen if you're going to store urine is you have to create a sphere. So our bladder was made into a sphere for a reason. It's not so that the urine comes out better, it's so the urine gets stored better. If you have a circular shape, you have a very low pressure wall so that lets the urine accommodate without constantly having a spasm and squirting out the urine. So anything that we make has to be made into a sphere if you're going to try to have some kind of continent reservoir.

So here's just a cartoony type picture of the easiest thing for us to make, the easiest thing for you to take care of but it's this tube, right? The urine just comes down from the right kidney, from the left kidney, just gets peristalsis, pushed right out into the skin and drains into a bag on your skin. So this is called an ileal conduit or urostomy, very similar to colostomies that people get that just continuously drain stool into a bag.



This is small intestine so it has the least electrolyte abnormalities and it has the smallest amount of time that the urine is in contact with the bowel. And that's important for these electrolyte abnormalities because urine is not supposed to be in contact with the bowel, that's what the urothelial cells were for. So this is an incontinent reservoir called an ileal conduit. And in general, in the United States, this is the vast majority, 60 to 70% of people will have a conduit after this surgery.

Now in Indiana is a continent diversion. So these are continent pouches. I just picked Indiana, it's the one I make. It's fairly common but you can hear about a UCLA pouch and a Florida pouch and a Kock pouch and a Studer pouch. There's lots of different names, but essentially these are continent diversions that use colon. And we capitalize on the natural valve between your small intestine and your large intestine, and that's what keeps you dry.

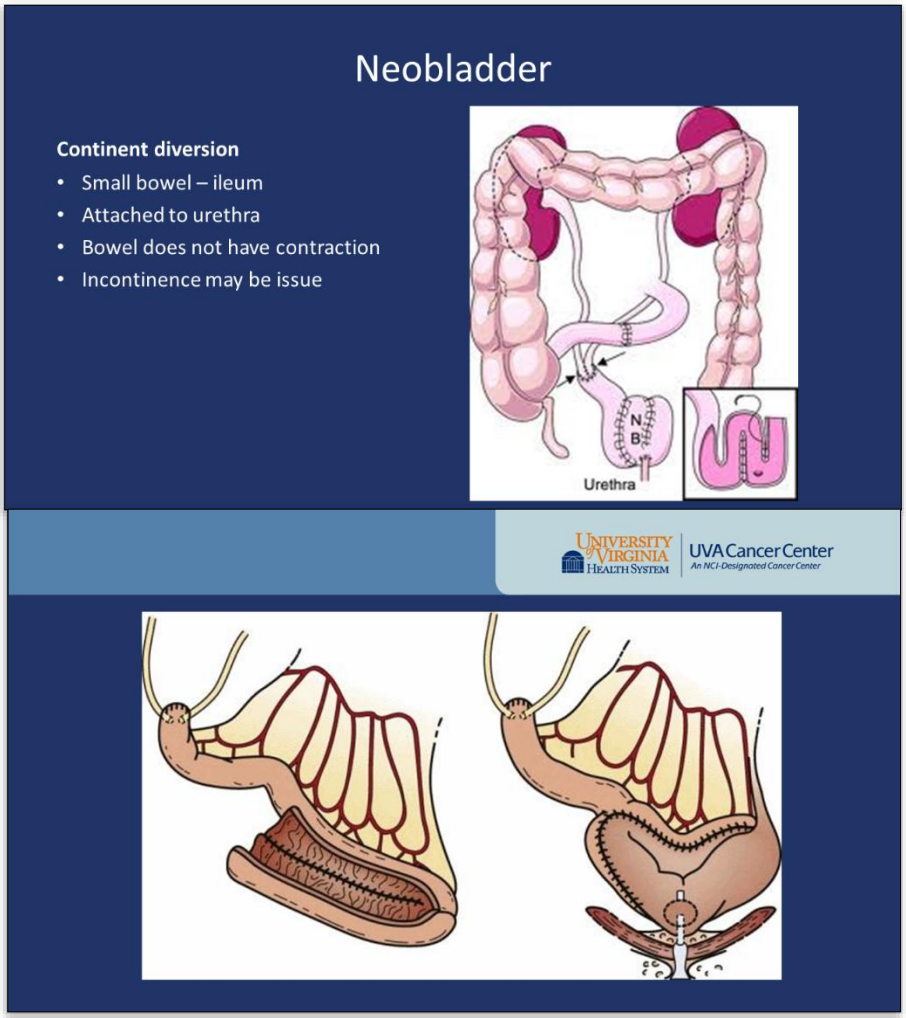


Dr. Tracey Krupski:

So it's a little bit hard to imagine and I don't know that you guys can see my piece of paper. But if you imagine that you have a tube, that's a colon. So this is your colon. We open the colon up away from its blood supply and then sew it into a bigger circle like that. So again, that's for the storage part. So it becomes almost kind of like a clam shell. It's somewhat spherical so it will store urine and then you would put a tube in the one way valve through your skin to empty your urine every four to six hours and that would be forever.

So you have a little medical alert bracelet often. It says I don't have a bladder, my urine comes out through my belly button. And that's what this is depicting, what I just tried to do with the piece of paper. You fold this intestine over, you reconnect the regular bowel with all of these. The stool part gets reconnected so you still eat and drink normally, but then you have this valve mechanism that you use to put in through the skin and drain your bladder. So it's a little bit more work for the surgeon, it's a little bit more work for you.

And I put on here chronic loose stools. So what the colon is meant to do is reabsorb water. So it reabsorbs water that you eat and drink on a daily basis. So you're more prone to chronic loose stools if you have to use colon to make your continent pouch because now there's no... the whole right colon is used for urine, it's no longer used for stool.



Neobladder is probably much more common these days. People will try to build you a new bladder. We mostly use small intestines, so we use ileum also. But you again, have to open up that tube and sew it by hand into a circle. And that circle is what's going to allow the urine to be stored and then you have to relearn how to urinate because there's no muscle in this intestine. So you relearn how to urinate. Usually it's by relaxing your pelvic floor. And then occasionally you'll have to irrigate yourself with the mucus from the bowel or if you can't void successful, you may have to empty it through your natural urethra, either your penis or the urethra for a female.

So again, now in this case, it will have a little different electrolyte abnormalities because the urine is going to be sitting in contact with the intestine and there's going to be transfer of electrolytes, potassium, sodium, phosphorus,

magnesium because of this new setup where urine is going to be sitting there dwelling between you either voiding or catheterizing, cetera.

Dr. Tracey Krupski:

Anytime you have to do more work, there's a few more risks of things not totally healing correctly because there's a lot more sewing and a little bit more for the patient to learn how to deal with afterwards. But it is a continent and in this case it's attached to your natural orifice that you currently urinate through. So just a couple other pictures in case these make more sense. Again, you kind of sew the back wall together, then you fold it on itself to make a circle, then there's the ureters coming down, they drain into this reservoir and then this goes out through the natural pelvic floor.

Bowel, as I just sort of alluded to, is not meant to be in contact with urine. Postop, one month after any of these surgeries, 30% of neobladder patients were quite acidotic meaning their body pH was less than 7.4. It can be in the 7.3, 7.4s and we sometimes have to supplement that. Much less common in a conduit because that urine is just sort of traversing through. That's a long term problem at a year, still up to 25%, the neobladder and 10% of the conduit.

So again, you might need extra vitamins, you might need to take some bicarb or citrate. There might be things we have to do to adjust that body pH. If your bicarb in your blood is less than 15, you do need supplementation. And these are... if your filtration rate is not good before surgery, meaning you don't have good kidneys before doing

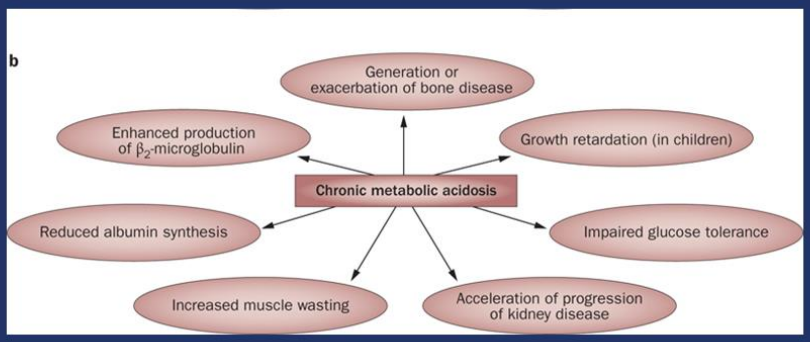
Bowel not meant to be in contact Urine.

- Metabolic acidosis:
  - 1 month 31% of neobladder, 15% conduit
  - 1 year 23% neobladder and 10% conduit
- Bicarbonate less than 15 treated
- Significant predictors at 1 year
  - Age (fell out on multivariate)
  - eGFR
  - Evidence: Ren Fail. 2017; 39(1): 379–384

Evidence: Ren Fail. 2017; 39(1): 379–384.

- Study 27% developed AKI one month after diversion
  - Obstruction, uti, medication
- Generally renal function falls by 15-25% after diversion
- Preop GFR is consideration for diversion

Metabolic Acidosis

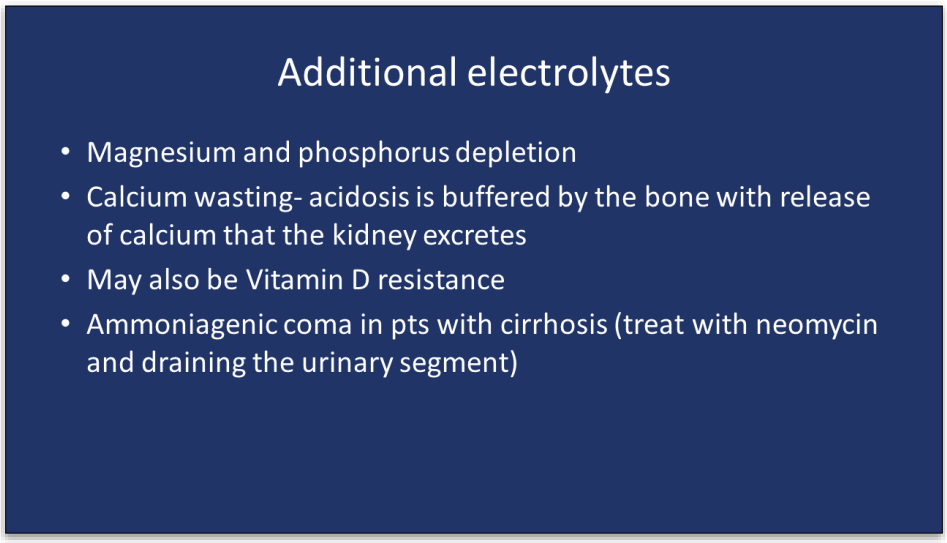


that, we classically are taught that that's not a good person to do this continent bowel reservoir because the electrolyte abnormalities are going to be very difficult to manage because the kidneys are what's trying to keep up with those electrolytes, so something to think about.

Dr. Tracey Krupski:

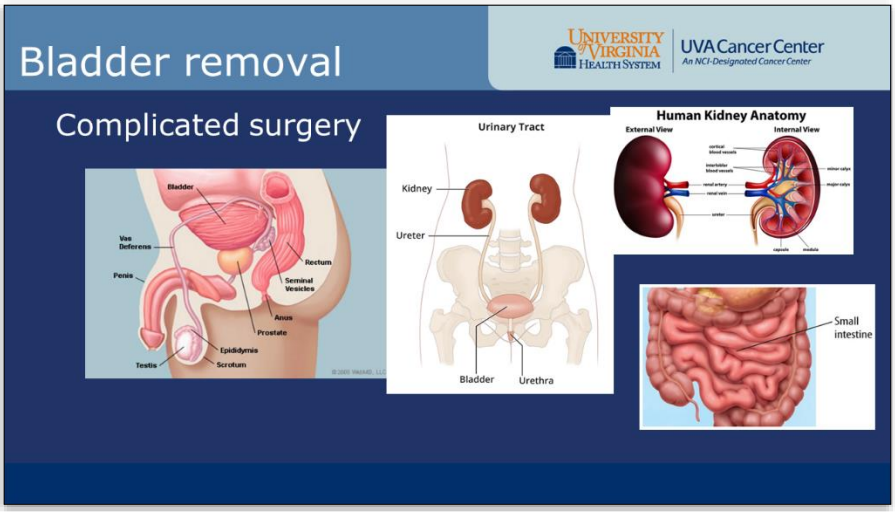
Even kidney failure can happen in up to a third of patients right after these surgeries and your kidney function will continue to decline for years afterwards again, because we're putting some stress on the kidneys by having this urine be in contact with bowel. Metabolic acidosis, the reason you don't just want to run around with a chronic acidosis that I'm talking about is it can start to chew up your bones.

It tries to offset that bicarb loss by taking bicarb out of your bones. It'll make any kind of diabetes or endocrine problems with sugar worse. It will accelerate kidney disease. It will cause muscle wasting. You'll lose the albumin in your bloodstream. So gain, not great to stay in an acidotic state so we do need to treat that, you can't stay like that. And magnesium phosphate, I just sort of alluded to calcium wasting due to the bone. So again, this is serious, we do have to follow all these things postop.



You don't want to do any kind of neobladder in anybody with cirrhosis, that's sort of just an extra tidbit, not the focus of this. So... Ooh, that was already a lot but this is where you should really be meeting with your urologic oncologist two or three times before undertaking the surgery because this is not the kind of information that you can go into one visit and have everybody tell you, well, let's talk about removing your bladder, doing chemo radiation, and do you want chemotherapy?

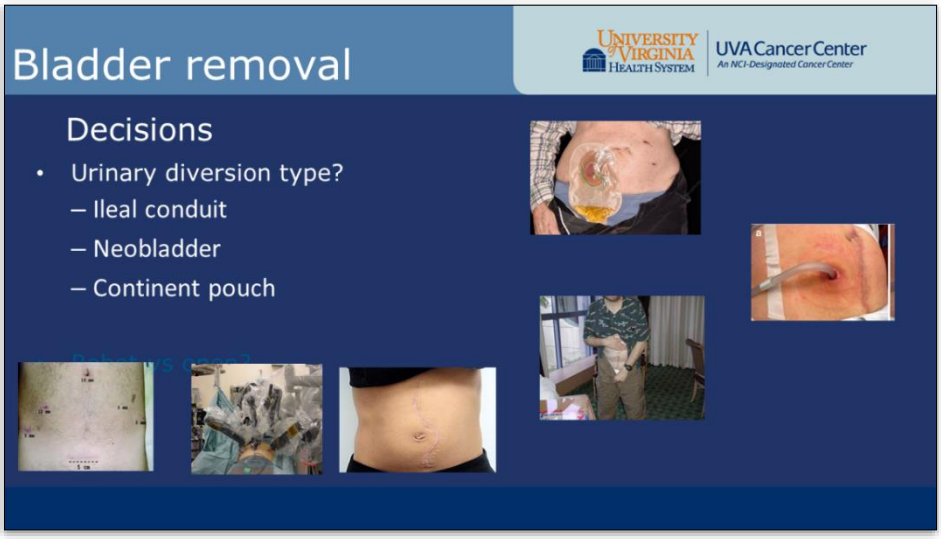
And oh, by the way, the surgery's really complicated and this is all that's going to happen. This has to be done in stages and given time to process it and come back, ask your questions, think it through because it is a major life changer and a major surgery. So this is just a person, a man from the side and just showing you that the bladder gets removed, the prostate gets removed and the seminal vesicles. If you're going to do a neobladder, you would sew to this urethra and they would still be able to urinate here.



It's showing how close it is to the rectum. That's another area we worry about and how your vas deferens will be clipped to do the

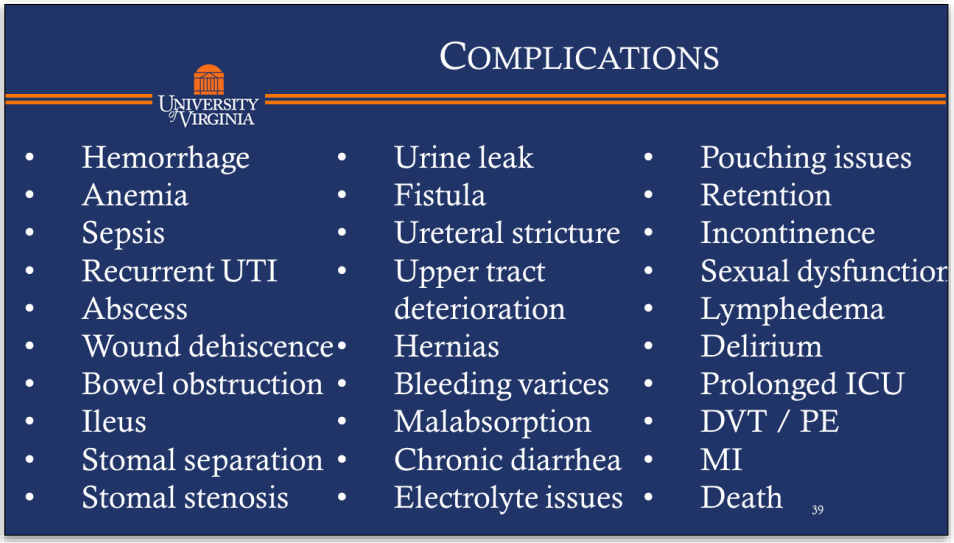
surgery. Then the bladder's removed, it's hiding behind the pubic bone, so that's what this is showing. Again, these are all areas where the surgery is complicated. The kidneys have to be rerouted into this piece of intestine. These are some actual photos of things.

Dr. Tracey Krupski:



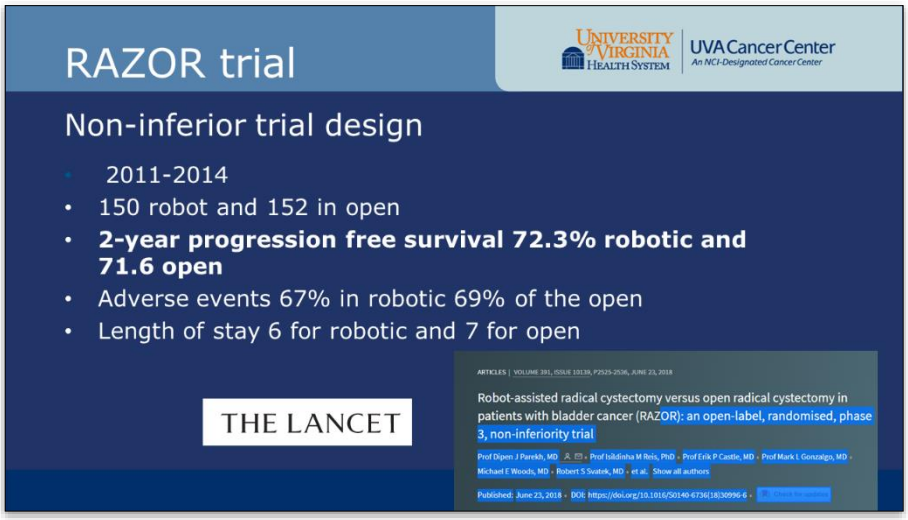
I don't want to dwell on how we would do the surgery, but it could be done robotically through some small ports but the bladder has to be removed somewhere. So there is an incision to get everything out. This is just a little shot of the robot. The old fashioned way I haven't seen... I've never made one above the belly button. Mostly it's a incision from the side of the belly button down that does the same thing that the robot does.

This is a person showing their incision. This is more like it where they have some kind of continent diversion. This is the incontinent conduit so you can see the urine's just draining straight into a bag on their skin. And this is the second belly button I was talking about where you will put a tube in through the skin forever more with a continent diversion. So ileal conduit, urostomy is this one. That's the same thing, it's just two words for the same thing. Neobladder, this one, he must be hooked up to his natural orifice. Continent pouch is this one where you can see the second belly button at the skin and you're putting that tube in through that bowel, and that's what will drain the urine. So just to give you a little bit of a thing. The complications are extreme, the list as long as my arm. All kinds of stuff happens after this surgery because of what I just talked about. We're working on a lot of different areas, we're working on a lot of things and you have to be aware of these complications and what to look for in the postop period.



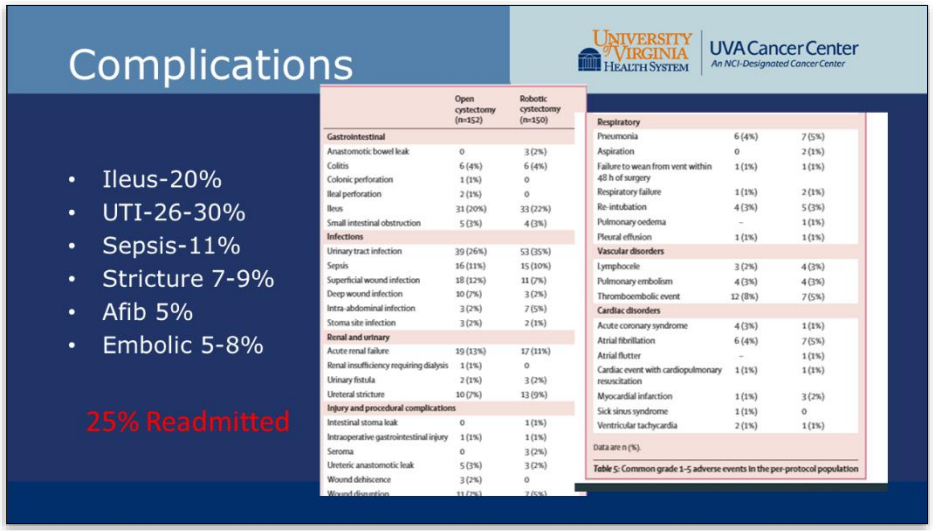
So I just wanted to touch on this was a study that we were part of. It was a United States study and they looked at complications after surgery. We did 15 centers in the country. The patients, we let a coin, it was a computer decide if they were going to have it done with the robot or have it done the old fashioned way. And what I wanted to tell you was the complications, whether you were at Mayo Clinic,

Vanderbilt, UVA, UCSF, Harvard, Scottsdale, Cleveland Clinic, it's a big surgery and they had adverse events, meaning some complication in 67% of the robotic cases and 69% of the open cases, so very high.



Dr. Tracey Krupski:

The length of stay, how many days we're in the hospital. It was six for the robot and seven for the open cases and the cancer survival or the cure was the same, essentially 72.3 versus 71.6. So the robot doesn't make it better, the robot doesn't really change your complications. It doesn't change your length of stay that much. It's fine to use it, I'm not against it, but you still have complications regardless of how you do the surgery. The surgeon is still doing the surgery and has to do all the appropriate steps.



	Open cystectomy (n=152)	Robotic cystectomy (n=150)
Gastrointestinal		
Anastomotic bowel leak	0	3 (2%)
Colitis	6 (4%)	6 (4%)
Colonic perforation	1 (1%)	0
Ileal perforation	2 (1%)	0
Ileus	31 (20%)	33 (22%)
Small intestinal obstruction	5 (3%)	4 (3%)
Infections		
Urinary tract infection	39 (26%)	53 (35%)
Sepsis	16 (11%)	15 (10%)
Superficial wound infection	18 (12%)	11 (7%)
Deep wound infection	10 (7%)	3 (2%)
Intra-abdominal infection	3 (2%)	7 (5%)
Stoma site infection	3 (2%)	2 (1%)
Renal and urinary		
Acute renal failure	19 (13%)	17 (11%)
Renal insufficiency requiring dialysis	1 (1%)	0
Urinary fistula	2 (1%)	3 (2%)
Ureteral stricture	10 (7%)	13 (9%)
Injury and procedural complications		
Intestinal stoma leak	0	1 (1%)
Intraoperative gastrointestinal injury	1 (1%)	1 (1%)
Seroma	0	3 (2%)
Ureteric anastomotic leak	5 (3%)	3 (2%)
Wound dehiscence	3 (2%)	0
Wound disruption	11 (7%)	7 (5%)

Respiratory		
Pneumonia	6 (4%)	7 (5%)
Aspiration	0	2 (1%)
Failure to wean from vent within 48 h of surgery	1 (1%)	1 (1%)
Respiratory failure	1 (1%)	2 (1%)
Re-intubation	4 (3%)	5 (3%)
Pulmonary oedema	–	1 (1%)
Pleural effusion	1 (1%)	1 (1%)
Vascular disorders		
Lymphocele	3 (2%)	4 (3%)
Pulmonary embolism	4 (3%)	4 (3%)
Thromboembolic event	12 (8%)	7 (5%)
Cardiac disorders		
Acute coronary syndrome	4 (3%)	1 (1%)
Atrial fibrillation	6 (4%)	7 (5%)
Atrial flutter	–	1 (1%)
Cardiac event with cardiopulmonary resuscitation	1 (1%)	1 (1%)
Myocardial infarction	1 (1%)	3 (2%)
Sick sinus syndrome	1 (1%)	0
Ventricular tachycardia	2 (1%)	1 (1%)

Data are n (%).

Table 5: Common grade 1–5 adverse events in the per-protocol population

This is that long list of things I just told you about. What I wanted to pull out of that is that ileus means your bowels slow down. Bowels don't like being taken apart and put back together. So you're in the hospital those five or six days while we wait for your bowels to wake up so you can start eating again. Infections were really common in this group. Again, this is data from 15 centers across the country, all the best places, it's just a complicated surgery.

Infections of the urinary system, infections of the bloodstream, scar tissue between the kidney and the intestines where we sewed that ureter together, atrial fibrillation or heartbeat irregularities, blood clots that go to your lungs or your legs, so these were all fairly substantial and 25% of people got readmitted at all these good places. So I am not trying to tell you not to do the surgery. What I am telling you or what I tell my patients is that we need open lines of communication and you need to be prepared to let us know if these things are happening.

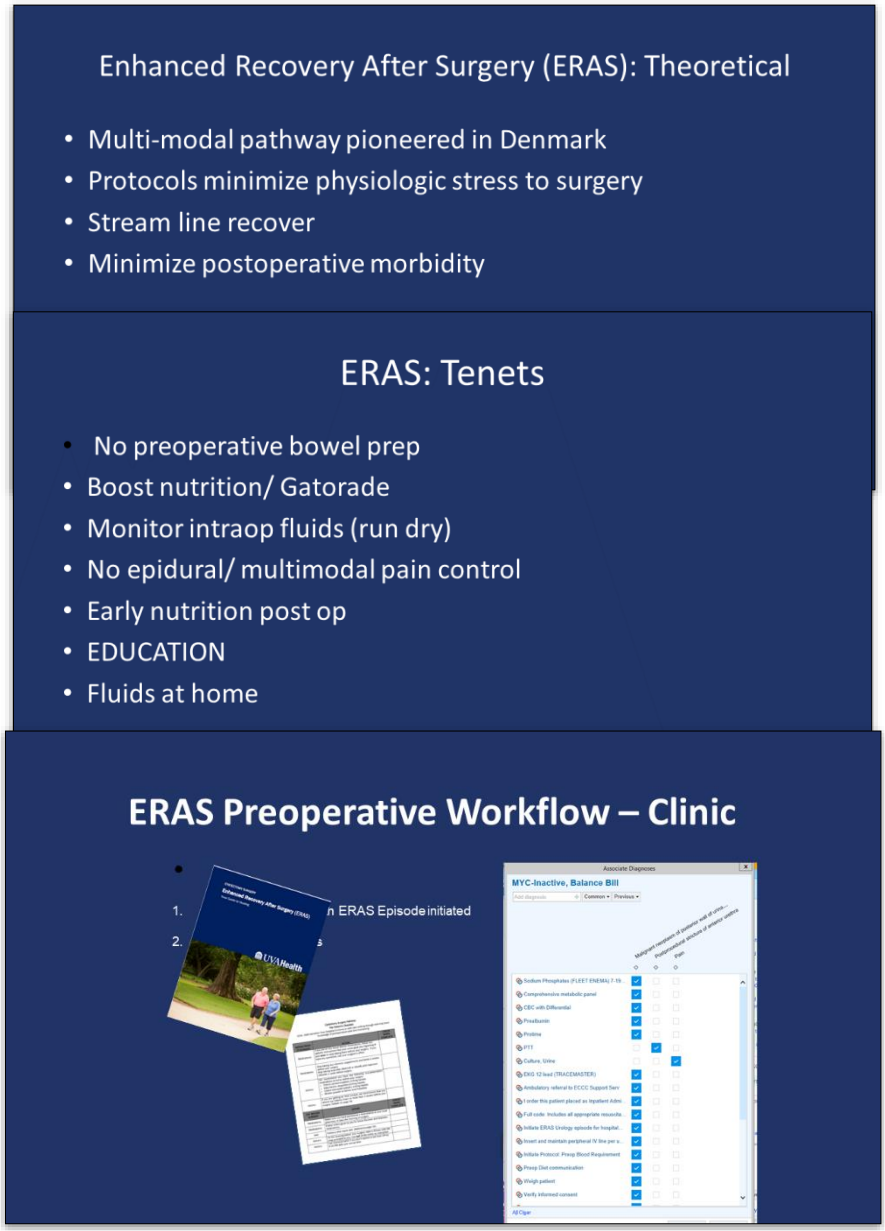
They are all fixable. We can fix them, but the sooner we know about them, the sooner we can fix it. And if you need to come into the hospital to just get through it, let's come into the hospital, get through it to get you back on your journey and get you back to normal life. You'll read a little bit about enhanced recovery after surgery. It's a multimodal pathway. We're getting rid of opioids, we don't leave tubes down your nose anymore. We let you drink Gatorade before surgery. We don't wash out your entire intestine and make you start out dehydrated.

Dr. Tracey Krupski:

So it really has streamlined recovery and it has minimized the very severe complications after surgery and most people will do an ERAS type pathway. These are sort of the highlights that you may have heard something about. We don't do a bowel prep. It's not like a colonoscopy, you don't have to drink all that stuff and make yourself... have defecate clear liquid. You usually use boosts, nutrition, Gatorade right up to two hours before surgery. We don't use epidurals in your spine anymore.

We'll give you multiple pain medications that are not opioids so that we can try to get your bowels working sooner, eat more quickly. And you get educated about all the steps that are to be expected. And most of these will give you fluids at home. So when you go home, we will set you up to have fluids two or three times a week to keep that hydration, keep those electrolyte problems at bay while you're getting stronger and getting back to your normal self.

You'll get these workbooks, worksheets. Again, it's all about what we expect and what you should expect so that you know when to contact us.



Dr. Tracey Krupski:

You may have a diversion plan that you want the neobladder, but you sometimes have to change during the operation. We may say that there's cancer going into the urethra or the intestine doesn't reach so we can't do a neobladder. If there's a cancer at the margin, those will be reasons not to do it. Again, if you don't want to potentially catheterize yourself or at least be willing to learn just in case, that's going to be a questionable person to do a neobladder on.

If you already have inflammatory bowel disease or problems with digestion and nutrition, we may not want to use two or three feet of your intestine to sew in to this circle to be your reservoir. We always do a node dissection. This is kind of to be just quickly, but we will take all the nodes next to the ilea and artery and vein going down to this obturator nerve all the way up towards the iliac bifurcation. So that's what we're showing here. At least these lymph nodes on the right pelvis and the left pelvis, some people even do an extended node dissection all the way up to the cava. That's more surgical than you probably need to know.

During the Operation

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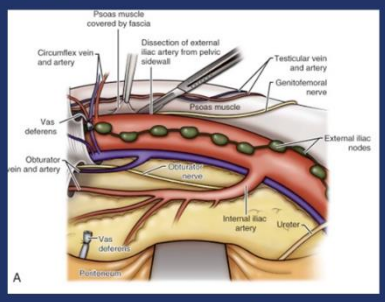
- May have plan for one diversion but have to change
- Absolute contra-indications for neobladder
  - Positive urethral margin
  - Inability or unwillingness to intermittent catheterize
- Other considerations:
  - GFR, IBD, short gut, urethral strictures

Node Dissection

University of Virginia

- Node dissection could be reason to abort surgery. Controversial but if not going to cure patient should take on all the risks?
-



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Node Dissection

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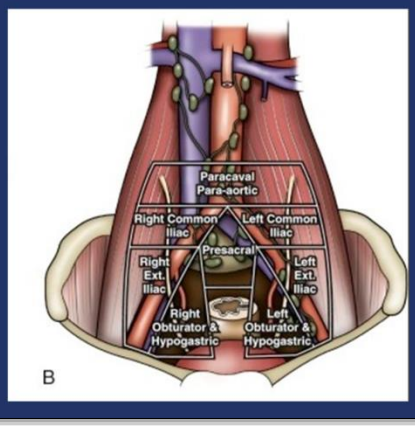
- "Standard template"
  - Obturator
  - Internal iliac
  - External iliac
  - Presacral
- "Extended"
  - Common iliac
- "Super extended"
  - Para-caval / para-aortic



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