[MUSIC PLAYING]

ROY SEMAAN: All right, thank you so much, Dr. McNeill. It's an honor to be here. Thanks to all the course directors for inviting me. So my name is Roy. Thank you for that very kind introduction.

So interventional pulmonology is kind of a new blossoming field, and we actually just started our program about a year ago when I came on to faculty. And it's kind of a procedural pulmonary specialty that brings in some aspects of thoracic surgery as well as ENT surgery with a little bit of a medicine perspective. So I don't have any disclosures that are relevant to this talk.

So just a quick overview of what I'm going to be talking to you guys about. So I want to-- just for our primary care providers that don't know much about IP-- let you know what I do, talk a little bit about the main focus of IP, which is very focused on lung cancer. Not only lung cancer, screening lung cancer diagnoses, as well as care of patients that develop long term complications from lung cancer central airway obstruction, as well as malignant pleural effusions, and things like that, and the scope of procedures that I can offer that we're currently doing at Presby Montefiore, and at the VA, and hopefully shortly at Shadyside as well, and then talk a little bit about my interests of subcentral airway obstruction and the treatment of malignant and nonmalignant central airway obstruction.

So this is actually a still from a movie called *The Doctor.* I don't know if you guys ever watched this. It's an early '90s movie about a thoracic surgeon who is not the nicest guy and actually develops cancer himself and then has to become a patient.

So we were watching this at MTV in med school. And I remember watching this scene where they're doing a rigid bronchoscopy. And I'm like, what is this, like, a sword they're sticking down this patient's throat? So little did I know I'd actually be starting to do that when I got there.

So a little bit about the NLSA. I think most of you guys are aware of it. It's a study that came out in the *New England Journal* in 2011 that looked at low-dose CT scanning for lung cancer screening versus routine radiography, which actually wasn't recommended. But that was the control arm. And it showed a pretty significant 20% relative reduction in mortality.

So, at that time, pretty quickly, the US Preventive Services Task Force approved screening. And we'll go over, kind of, just to refresh everybody, who qualifies on the next screen. And then Medicare/Medicaid started paying for once yearly screening with low-dose CT for patients that are smokers, or former smokers over 15 years ago, that qualify.

And then the American College of Chest Physicians, in their latest guidelines, do recommend a lot of the procedures that we do, including navigational bronchoscopy and EBUS, for the diagnosis of these nodules that we find. So who qualifies?

So generally, it's people ages 55 to 80. The study, actually, was up to 74, 75 years of age, but because of the AARP, they actually extended it to 80. And it's patients that have a 30 pack a year smoking history and either actively smoke or quit within the last 15 years. There is actually good data that patients that quit over 15 years ago actually return to the baseline risk for lung cancer. So that's why they chose that number.

But then the big thing-- those are pretty easy screens-- the big thing that you guys have to check off when you order these scans is is the patient, A, willing to undergo the testing that they're going to need once they get these scans? Because probably about 95% of the things, the nodules, we find are going to end up being stable benign granulomas, nodules that we don't really need to do anything for.

But this really takes you down a path of diagnoses, and further scans, et cetera. So it's good to counsel your patients that you're probably either going to-- if something is found-- A, that it's probably not cancer, but B, that it's something that we're going to either have to watch or do a procedure for. So if they're not willing to do that, then there's really no point in doing the screening.

And then the other thing is that they're fairly functional patients. Obviously, if your patient already has widely metastatic colon cancer, there's no point to screen for this. They have to have, generally, a life expectancy of about six months.

So if we find out just what are the ways-- I think most people know this-- but these are the three basic ways that we biopsy lung nodules. We can either do CT-guided transthoracic needle aspirations, which is generally done by our IR friends, which generally have the highest diagnostic yield of the minimally invasive biopsies, anywhere around 90% to 92% for multiple studies.

But they do provide a higher pneumothorax rate of about 15% to 20%. And they don't really allow you to stage the mediastinum, in terms of lymph node metastases, for your TNM staging. You can get PET scans, but there is a lot of data that we actually are missing. A lot of patients that have N2 plus disease that are not going to be surgical candidates that end up having surgery-- we're actually probably doing them a disservice by doing the wrong type of therapy.

So the other way we do things is kind of what I do, is bronchoscopic diagnoses through either EBUS, navigational bronchoscopy, traditional bronchoscopy, et cetera. Now that does have a somewhat lower yield, especially for these smaller peripheral nodules that are tougher to get out to.

But we can simultaneously stage the mediastinum in terms of lymph nodes with endobronchial ultrasound, as well as provide a pretty lower complication rate. And skilled hands, generally, the complication is 1% to 2%, 3% pneumothorax. All comers is about 5% to 6%. And then, obviously, the definitive treatment, if you can't get it either way, is having us send it to our thoracic colleagues for VATS or thoracotomies.

So the three major tools that I've started using at Pitt are EBUS, which comes in two forms-- and I'll tell you guys about each one and how we use them-- as well as navigational bronchoscopy, and then a new tool that we actually just got the system for that we're going to actually start doing our own transthoracic biopsies, all as part of one trimodal diagnostic procedure.

So endobronchial ultrasound, for those that are not very familiar, is basically a bronchoscope that literally just has an ultrasound at the tip of it as well as a video camera. So it allows us to look outside of the trachea, as well as the main stem bronchi, to look at tumors, lymph nodes, et cetera, to do transbronchial needle aspiration biopsies. And there's actually two types, radial and linear.

And this is our linear probe. This is the workhorse of the bronch lab. It's really revolutionized thoracic surgery and pulmonary medicine. So it's basically a little probe tip at the very bottom that gives you a view-- we'll show you the ultrasound view we get-- and allows us to see almost all lymph node stations throughout the chest, a couple that we cannot see.

So if you actually look at this scanner, this is a patient with a left upper lobe nodule. And you can see it's kind of in a tough position. This is a patient we did a couple of years back. It's way too deep to do a transthoracic biopsy, kind of too central and apical to really get to it with a bronchoscope. There's too many structures in the way-- the aortic arch, the left main pulmonary artery.

So normally this patient would have had to go for a surgery-- either a VATS, et cetera, or a mediastinoscopy. But he does have an enlarged right lower paratracheal lymph node, kind of where my line there is. And then if you actually see, in the next image, is our endobronchial ultrasound image.

So at the top, the little outline circle is actually that lymph node, the right lower paratracheal lymph node. Behind that is the superior vena cava, which you can actually see highlighted through the red line. And then that's actually our biopsy needle.

So this patient actually ended up having N3 disease, so would have not been a surgical candidate. We don't even have to touch the primary lesion. We then stage them, diagnose them, and we generally can collect enough tissue for a molecular marker testing to send off for immunotherapy checkpoint inhibitors, all our targeted therapies.

So this is a lymph node, not really for you guys, obviously, to study. But this just shows that we can access almost every lymph node on this station except, generally, our station 6 and 5, which are our AP window nodes, although while, as it happens, we did start doing transpulmonary biopsies of station 5.

We did about 20 cases while we were there, without really any mediastinal hematomas, no bleeding, or anything. So that's actually-- might be in the future-- become standard of care, although a lot of people are still kind of leery to do that.

Station 6, we don't do. You'd have to go through the aorta for that. That requires a VATS or a Chamberlain procedure.

And then our lower station, 8 and 9, we generally ask our GI colleagues to do an EUS for those. But everything else on there, we can access very easily. And these used to take either VATS, mediastinoscopy, or Chamberlain procedures, so pretty useful tools.

So indications-- people who you send to us or anybody that you need a lymph node biopsy for, whether it's for lung cancer, to stage, to diagnose, whether you have a patient with colon cancer, renal cell carcinoma, a lot of cancers that go to the thorax-- we can biopsy all those.

Anybody that has a suspicion for sarcoid, the yield with EBUS is actually somewhat higher than transbronchial biopsies in the right setting, as long as, obviously, they have lymph node involvement. It doesn't put them at the risk for transbronchial biopsies and pneumothoraces, so a very safe procedure.

And then lymphoma, we're actually getting better at. Initially, obviously, for lymphomas, a lot of times you need to do an excisional biopsy to actually get architecture. But we're actually doing 18 and 19 gauge core needles now, which gets us a lot of material. We can send flow cytometry off of it. And we've actually gotten very good at diagnosing lymphomas as well.

If your suspicion is very high and you still don't get it, you still might have to go to a mediastinoscopy or some other excisional biopsy. But we're getting much better.

And then just central tumors-- that picture on the bottom right there-- that's a tumor that is sitting in the right main symbronchus, easily accessible. So just a great tool all around.

So contraindications is almost none. But obviously, anybody with a difficult airway, unstable airway-- tracheostomy, we can do it. But it is a little bit difficult. Or anybody with active mediastinus or an infection, you're obviously not going to go in and do something. Everything else is fairly relative.

Generally, my cutoff is six to eight liters. Anybody on higher oxygen than that is generally A, probably should not have an elective procedure theoretically, and then B, is running about a 50% chance of getting intubated after the procedure. But anybody lower than that, we generally can get through safely.

Coagulopathy, kind of the standard cutoffs there, 50 and 1.7 for your INR. We don't do them on full dose anticoagulation, obviously. Aspirin and Plavix, a lot of centers won't do. We did do them in certain patients.

The classic one is somebody comes in with chest pains, having an MI. They get their stents. They have a CT scan done while they're in the hospital. They're usually smokers. They have some new lung lesion.

At this point, they've already gotten stented. They're already on dual antiplatelet therapy. We will do it in those scenarios. It's generally fairly safe. But obviously, the patient and the physician have to understand there is a slightly higher risk of bleeding.

So complications. I'll say this is probably the safest procedure I do. I'd rather do this than almost anything else in sick patients because it just-- patients tolerate it very well for whatever reason. It's just a very small needle. I've probably done almost 1,000 at this point. I've never had an infection, although, theoretically, you can develop a mediastinitis or a pneumomediastinum.

Pneumothorax is almost case reportable, as long as you obviously stay within your hila and your central airways. We just never get them. Once in a while, we get a little bit of pneumomediastinum treated conservatively.

The other things-- if you're not doing this with general anesthesia, you can't avulse cords. That's a picture of one right there. And you can actually-- there's a balloon on the end of the scope that can pop up, which we can usually go back and get. But we try to avoid that as well. But overall, I can't stress how much of a safe procedure this is.

So the other type of EBUS we've started doing is what's called radial probe EBUS. This is actually stolen from our cardiology colleagues, with a endovascular ultrasound. It's basically a small 2 millimeter probe that rotates, that we can pass out, basically, anywhere-- almost out to the pleura-- anywhere into the lung. And it really lets us localize these small nodules peripherally.

And I'll show you guys a picture here. So this is a case I did recently at Presby. This is kind of an apical right upper lobe nodule. You can kind of see a shadow there.

But really, using fluoro for these is tough because you can obviously be anterior or posterior to lesions, so uniplanar fluoro is kind of worthless. But passing the probe out with a sheath on top of it actually got to the lesion. You can see the little arrow where the probe is, a nice circular lesion.

But the bottom screen is what we see with normal lung. If we localize it, then we pass a sheath out over the probe, take the probe out, and then actually pass tools up to the lesion to do our biopsy. So it really is the only real time guidance for these small peripheral nodules that have classically been tough to get bronchoscopically.

So the last thing which I include under bronchoscopy, although it's not technically a bronchoscopy, is our-- oh, I'm sorry, I'm talking about the lecture on magnetic navigational bronchoscopy next. So I think a lot of people have heard about this or seen it. It's basically a GPS system to help us get out to the periphery of the lung.

So most times, when you get out to these one centimeter from the periphery lesions, you're going to have to take five, six, seven turns. And it's just tough to get out there. There's really no scopes that get out there that are that small that you can actually see.

So the system that we use actually creates a 3D magnetic field around the patient. And then a tool is passed through the bronchoscope, out past where we can see. And then it's actually, literally, kind of a GPS system that tells you which airways to turn into. And then the tip is actually tracked in that 3D field.

And once we get to that spot, again, we take out that sensor, and we pass our tools through that working channel that we've created. Now I actually pass our radial probe through that sheath. I actually get confirmation that I'm actually there because this is technically not a real time guidance.

So this allows us a little bit more accuracy peripherally. It's used in conjunction with fluoro as well as radial EBUS. It does have to be done with general anesthesia because the patient does have to be pretty still. We try, though, not to paralyze them or anything, but they have to sit in a pretty sedate stage.

And these catheters that pass out generally can irritate them. There are some people that still do them with conscious sedation, David Wilson being one of them, maybe the only one left in the country. But it does make it a little bit tougher.

So contraindications, the same as EBUS-- unstable airways, coagulopathy, hemodynamic instability. There used to be a contraindication, actually, that AICDs were considered a contradiction. But there's actually now good data that actually the machine doesn't interfere with the AICD, and the AICD does not interfere with our magnetic field. So we do do them now in patients with pacers and other boxes.

So the last thing is this virtual CT-guided TTNA. So the kind of workflow that I see when I get a patient with a lung nodule that has either questionable lymph node metastases, plus or minus on their PET scan. We bring them into the lab. They go to sleep. We do our EBUS. We biopsy any lymph node that's bigger than 5 millimeters to make sure that there is no mediastinal spread.

That's looked at by our pathologist in the room. If we have a positive outcome, then we're actually done with the procedure because then we have staged them and we've diagnosed them. Then we just collect enough tissue from molecular markers, wake the patient up, and they're done.

Now the mediastinum is clean. Then we move onto the actual nodule. And we generally, then, go on to bronchoscopic navigation because A, the safety profile, lower risk of pneumothorax, et cetera. So we take our biopsies peripherally if we can get there. If we got the diagnosis, great, we're done.

If not, normally at this point, most people wake the patient up, and then they'll have to wait for the final results. If they're negative, then they have to send them off to IR or thoracic surgery for another procedure or more sedation. But with this new system, actually, it allows us to actually, then, convert to a transthoracic approach.

So then we sterilize the chest. We use this needle that is actually tracked by that 3D magnetic field. And then it gives us coronal, sagittals, and axial views in our CT there. And actually we do the transthoracic biopsy right there in the lab with one procedure. They don't have to wake up. They get all three right there.

So we did a study while I was at Hopkins. And we had about a 94% yield using all three modalities, which is better, if not equivalent, to IR and all the other modalities. You get staged, you get a diagnosis, and you go on to your treatment quicker. And we're actually starting a multi-center trial, where we're going to be one of the sites as well, to see if this yield is true. Because that was a smaller 30 patient study.

So my other big interest besides diagnostic bronchoscopy is therapeutic bronchoscopy. So rigid bronchoscopy kind of fell out of favor once we got all our flexible scopes. Although recently, with lung cancer patients living longer with all our new therapies, a lot developed central airway obstruction. We've been getting more and more referrals for a section of central airway tumors, et cetera.

So that can be done flexibly but is actually, a lot of times, safer and more effective done with the rigid bronchoscope. As you can see here, this is us doing one in the operating room. It's just a much larger bore tube, up to 20 centimeters.

We can pass multiple tubules down through it, large section if there's bleeding, multiple simultaneous lasers-- argon, plasma. And we can deploy much larger stents as well as silicone stents.

So just to review for you guys the different causes and a lot of things that we see in terms of central airway obstruction, we see, by far, the most common being malignant, although post intubation and post tracheostomy, tracheal stenosis, is a large benign disease that we see all the time as well.

So symptoms-- a lot of times patients get mistaken for having asthma. They're wheezy, they're just not getting better with bronchodilators, et cetera. People don't look at the flow volumes on their PFTs, and this can be missed pretty frequently. And patients can actually get pretty small before you guys will even get symptoms.

So if you have an otherwise healthy patient from a cardiopulmonary standpoint, they usually have to get down to below 8 millimeters to start having symptoms at, even with exertion. And then to start having stridor or arrest symptoms, they actually have to get lower than five millimeters, trachea wise.

So, and just to put it in perspective, most male tracheas are about 18 to 20 millimeters, and most female are about 16 to 18. So they have to get pretty significantly small. Sometimes we'll put people under, and they'll have, literally, one to two millimeter stenoses that they're still walking, talking, but pretty dangerous.

So just a few examples here for you guys. Again, malignant being the most common thing I see. These are the three examples with the one on your far left, number A, being the optimal tumor for us to remove. So it's a polyploid stock tumor. We can usually resect the whole thing, we ablate the base, and they actually do the best.

The ones that do the worst are actually the one in the middle, where they have more of an extrinsic compression of their airway. Because you can't really do anything to open the lumen. You just either have to dilate or put a stent. Usually simple dilation doesn't do the trick because that external pressure is still there.

So we generally just have to stent those patients. And stents come with a lot of problems. And I actually, even though I like deploying stents, I almost always try not to put a stent in because generally those patients have a lot of side effects.

And then there's your mixed lesions where they're both extrinsic and intrinsic. And they actually do OK because even if you can recannulate the airway and place a stent, the stent actually has a little something to hang onto, rather than just a pure extrinsic compression.

So lymphadenopathy can cause bad central airway obstruction. This is a patient with actually tuberculous adenopathy that we saw that had pretty significant severe obstruction of their mid trachea there. We've had-- obviously we're a transplant center.

This is a patient that was a tough case with actually endobronchial left main stem aspergilloma. They had invasive aspergillus disease, and then they started getting progressively more short of breath on therapy, were sent to us. So these are notorious for bleeding horribly.

So what we actually did is actually used our EBUS scope and examined the tumor to make sure there wasn't big feeding blood vessels, then lasered the whole thing, and actually resected it without much significant bleeding. But this is one I would never do without a rigid scope because if there is significant bleeding, a rigid scope allows you to pass much bigger tools to control that bleeding than with a small bronchoscope.

Sarcoid, we see all the time. This is one of those airways. This is a patient we put to sleep. We went down with our scope, and that's what we saw in the trachea, which is something you never want to see. So we rapidly dilated. They did OK. But these are obviously things that you need to be prepared for with, and rigid bronchoscopy is usually a lot safer for, because you can deploy instruments much faster.

And then the biggest cause of airways is stents, actually. So back when airway stents started being used in the '90s, they were all uncovered metal stents. And they actually got great results, initially. They opened the airway up.

But these patients actually started developing horrible granular reactions. So their whole mucosa would infiltrate the stent, and then the ends would start getting obstructed because of a basically inflammatory granulation reaction. These are just big granulomas they're forming. And then the stent gets so built into the airway that you can't actually take it out.

So these bare metal stents actually now have a black box warning. I personally never put them in. And we do have now covered metal stents that do not granulate nearly as much, and then even safer silicone stents that are much more easily removed.

And then one of the bigger things I also deal with as well is post-intubation tracheal stenosis or post-tracheostomy tracheal stenosis. Now, with critical care patients living much longer, surviving longer, this is one of the classic a-frame stenoses that we see with these patients. They actually respond pretty well as well.

We usually make two incisions in each a-frame, dilate them up, and they sometimes never have to come back. Sometimes they'll come back for serial dilations. We can place silicone stents, but we really try not to put stents in patients with non-malignant disease to try to avoid all the granulation.

So really, the classic treatment for tracheal stenosis, especially benign tracheal stenosis, is a procedure that was developed by Dr. Grillo up at MGH. He's an Italian-born surgeon who's thought to be the father of airway surgery. And this is the surgery he developed, where basically they do a resection of up to four centimeters of trachea, and then do an intricate suture, and put everything back together.

But, even in his hands, probably the most skilled person at doing this, there's still some significant mortality and morbidity, so about a 1% rate of death-- it's a pretty high risk procedure-- as well as patients go through this huge surgery, and then up to 5% of them actually still have issues with their stenosis. They either end up retrached, they have to have another surgery, or they still ended up having all these endoscopic procedures. So a lot of people don't opt to do that.

So these are kind of the management options that I have to offer, and we have to offer, as interventionalists for patients. So things that we can do, rigid and flexibly, we do a lot of balloon dilations, laser resections, with Nd:YAG laser mostly, argon plasma resection, electrocautery. Newer probe is a cryoprobe. We actually do cryotherapy for these. And then, like I talked about, covered metal sensor silicone stents.

And then a newer tool that we've actually started using, along with our ENT colleagues, is something called a micro debrider, which is a long, solid, rigid, basically, cutting knife with suction involved in it, that actually lets you shave, microscopically, each stenotic region as you go along with wall suctioning, all the secretions of bleeding. So it's a good tool that we felt-- so started using.

And then, finally, like I said, I really try to avoid stents. But these are some examples of silicone stents. They're better in the sense of they're almost always removable. They do not granulate into the tissue. And they allow you to deploy what's called Y stents, that big Y shaped one, if you have carinal disease.

So obviously you cannot put just tubular stents at the carina. You'd have to put a full Y stent. And these have to be deployed via a rigid bronchoscope due to their size. Patients tend to do well with them because they don't migrate, because they're actually stuck in the carina.

But we don't usually leave them in for more than six months. So our hope is that we place them for whatever pathology they have. The airway kind of models around it. And then we're were able to remove it with their airway hopefully staying in that same shape.

This is just a quick example for you guys of a metal stent we placed. So this is actually a patient that had thyroid surgery that did not go well with an infection, and then basically dehiscence of their anterior trachea, which you can see on the picture on the left, as well as some electrocautery burn injury there.

They actually perfed through their trachea, developed bilateral pneumothoraces, had to have chest tubes placed in, and then had some mediastinitis. So the thoracics team didn't want to do a repair right then because they thought their whole repair would just get infected.

So we placed a covered metal stent that sealed everything off, stopped the air leak. We got the chest tubes out. They got six weeks of antibiotics, and then they did a muscle flap repair, actually, and we got our stent out. And she's actually doing great now, a year and a half later, walking around, doing well.

This is actually another fairly interesting stent case. Unfortunately, a young lady that we saw that had esophageal stenosis after radiation for lymphoma-- her lymphoma was actually in remission, theoretically cured at that point. And she had serial dilations of her esophagus, and then eventually had a esophageal stent placed by GI because her symptoms were so bad.

Unfortunately, she didn't follow up. Who knows exactly what happened, but her stent, actually, basically eroded through her whole posterior tracheal wall at that point, when she came to see us. Kind of same scenario-- developed mediastinitis, pneumothoraces-- and basically thoracics didn't know what to do at this point because she basically had no trachea left.

So this is actually a video, just to tell you where we-- this is the esophageal stent. This is her, actually, trachea right here, what's left of it. So the stent is taking up that whole area. And then her whole left main stem is obstructed. And where we end up there is actually her right lung and her right main stem.

So you know, this girl was only about 25 years old. So unfortunately, what we did was actually placed probably the largest stent we've placed. This was about a nine centimeter basically complete Y airway stent.

So you can see her carina all the way at the bottom down here. This is kind of an anchoring suture that we sutured through the anterior trachea. Because it's such a big stent, we don't want it to migrate. And she had a lot of her mediastinum destructed.

And then this is actually further down. This is her now new carina. This is her left main stem, her right main stem. And this is a CT reconstruction of our stent, basically. You can see her whole mediastinum is just destructed. This is the ET tube post-operatively, and this still has a little bit of a pneumo.

She actually got six weeks of antibiotics. Her air leak healed as well. Her chest tubes came out. And then she had a full basically tracheal reconstruction using strap muscle reconstruction as well as a pectoral muscle reconstruction, and actually got her stent out, eventually. So we do have some success stories. I really don't like to use stents, but they do have their purpose in younger patients that we really need to help.

And then my last area of interest is topical or injectable agents to try to avoid having to put stents for these benign diseases. So we have started using this new catheter that we actually-- I feel like we steal all our devices from other people. But this is actually a vascular device that they were using to inject into peripheral vascular disease.

So this device actually passes down our scope. It has basically a 25 gauge tiny microneedle that, once it's inflated, basically can submucosically circumferentially inject whatever agent we want to inject into the airway.

So we actually-- this is actually just a little pilot study that showed that we have basically full extravasation of our agent, just with one injection into half of the airway. So we generally do four injections and get full circumferential injection.

And this was a study where we started doing this into patients with central air obstruction from non-small cell lung cancer. This is the third patient that we did injecting endoscopic paclitaxel, with the help of our oncology colleagues. And this was a pretty bad-off patient when we first met her in 2014.

She had full right main stem obstruction, stage 4 at diagnosis. She did get chemo and radiation. And then we went in-- this is her carina here. This had, basically, recanterated her whole right-- it was kind of a hot mess-- injected everything. And then this is actually her six months pleurosis. We didn't even expect it to be this good. But you can see that she had basically full reexpansion of her whole right lung.

And I keep checking on her. And she is still go, and so almost three years out from stage 4 lung cancer, almost unheard of. So hopefully, we're actually doing a larger trial on that soon. We only did about 12 pilot patients with that first study.

And then, finally, the last triad of what I like to do is management of pleural disease. So we do do medical thoracoscopy as well as tunnel pleural catheters, pigtail chest tubes, thoras, et cetera-- a lot of intrapleural thrombolysis, pleuradesis through catheters, et cetera. We do have a pleural service at Presby and Montefiore that we generally run with our fellows.

We're not doing thoracoscopy yet, except at the VA. But that is a fairly narrow patient population that we do it for. We generally do it for recurrent exudative profusions of unknown etiology, which this is a quick example of actually a young patient with HIV that came in with a recurrent bloody effusion.

They was tapped three times. Cytology, cultures-- everything negative. We put a scope in and actually found these little violaceous lesions. And they actually turned out to have pleural Kaposi's, with no other Kaposi's anywhere else in their body. So he went on heart and actually felt a lot better.

And that's it. So I think I just wanted to give you guys a little bit of an overview of our new field-- what options we have to offer. I see patients at the Comprehensive Lung Center every Monday. I'm at the VA as well, and hopefully Shadyside soon. Happy to see anybody, talk over the phone, about a difficult case or anything like that, if anybody has questions.