

Kendal Williams, MD: Welcome everyone to the Penn Primary Care Podcast. I'm your host, Dr. Kendal Williams. So when I came back to primary care two years ago, I expected to be managing hypertension, diabetes and the occasional back pain patient. But what I found is that one of the most common issues I faced were pulmonary nodules. They were either seen incidentally on CT scan done for other reasons, usually coronary calcium score or now as part of the lung cancer screening paradigm. I had a lot of questions. And I would imagine that some of you have questions. So we decided to invite two guests on with experience in this area to talk to us.

Dr. Anil Vachani is a pulmonologist and an Associate Professor of Medicine at Penn and at the Philadelphia VA Medical Center. He did his medical school at UCSF, and he holds an MS in clinical Epidemiology from the University of Pennsylvania. Anil is widely published on screening for lung cancer and pulmonary nodules. Anil, thanks for coming.

Dr. Anil Vachani: Great to be here.

Kendal Williams, MD: Dr. Corey Rhodes is the co-host today, but she will also be speaking to the population health efforts on the primary care service line. She's the primary care physician and an Assistant Professor of Medicine at Penn. She is the Associate Medical Director of Quality for the primary care service line. She did her MD at the University of Pittsburgh and an MPH at Harvard School of Public Health. Corey, thanks for coming.

Dr. Corrine Rhodes: Glad to be here.

Kendal Williams, MD: So I thought we'd start actually with just having the two of you talk about your experience with this issue. I know, Anil, you have extensive experience studying pulmonary nodules. Can you tell us what you do now?

Dr. Anil Vachani: Sure. I spend, you know, most of my time running a lung nodule program, and that essentially means taking referrals from primary care doctors for lung nodules and helping evaluate and guide patients through that diagnostic journey as they need. And I serve as the co-director of lung cancer screening both at Penn and at the Philadelphia VA. So my life is almost entirely overtaken by my finding and evaluating pulmonary nodules and hopefully doing the right thing most of the time.

Kendal Williams, MD: This is going to be a great discussion. My life was more about pulmonary nodules than I expected in primary care. So we can learn a lot here. Corey, you do a lot of work in the service line in the population

health space. Can you tell us a little bit about the effort in the primary care service line on pulmonary nodules?

Dr. Corrine Rhodes: Happy to. Just for listeners who aren't familiar, primary care service line at Penn is just a way that we align the different groups who give primary care, family medicine, internal medicine, geriatrics, et cetera. And we really try to scale solutions and try not to solve the same problems over and over in different ways. And so I became familiar with this work. First, I think my lens was similar to you, Kendal, as a primary care doctor. I practice with residents as well as with an attending faculty-blended practice. And we identified pulmonary nodules as an opportunity for a risk reduction initiative where once a year, they choose a topic where we can focus and improve systems, and that's how I first became engaged with the pulmonary nodules.

Kendal Williams, MD: So let's just jump into the clinical aspects here, Anil, and I'm going to ask you a bunch of questions up front here. Let's first start by just pulmonary nodules, generally. What causes them? This is a question that by the way, patients often ask us, "Well, if it's not cancer, what is it?" So what are the answers that we can give to patients?

Dr. Anil Vachani: Yeah. Great question. And the reality is that it's oftentimes difficult to know what an individual nodule is due to for an individual patient. But we know from population-based studies that most lung nodules are in fact scars from old granulomatous infections. So, while that represents an old fungal infection from cocci or histo or some other fungal organism, an old bacterial infection, an old mycobacterial infection, in most cases, the nodules we see are scars and will remain stable over a person's lifetime. The less frequent cause is active infections. So acute inflammatory reactions to, again, a virus or bacteria, just some local inflammation from aspiration are probably common causes, mucus plugging that all mimic a lung nodule and appear to be cancer.

Dr. Corrine Rhodes: And fortunately, the least common cause perhaps is cancer itself. So, you know, we think that if we take all lung nodules together, those that measure anywhere from two millimeters up to 30, that only about 4% to 5% approximately will be lung cancer, and that's a pretty uncommon reason to actually have a lung nodule.

Kendal Williams, MD: So, you know what, we see a lot more of these than I would have expected based on granulomatous disease alone, you know, we're not in a histoplasmosis area. So, it just was always interesting to me that I know that was what we see from the epidemiologic studies, but they just seem to be very common in the general population as well.

Dr. Anil Vachani: Yeah, it's a good question. You know, I think that we classically think of as, you know, the histo and the cocci belt as being more Ohio River Valley going south or the Southwest, but even in the Northeast, we see old granulomatous nodules in people probably 20% to 25% of all the CAT scans that we do. And that is much lower than the rate of 55% to 60% that we think of for Ohio River Valley or the Southwest. So it is less common, but still very common, even in our area.

Kendal Williams, MD: So let's talk about the types of malignant nodules, which you said were a small percentage. How do you classify them generally? Obviously, lung cancer is classified in various ways, but maybe you could just go over that quickly.

Dr. Anil Vachani: Sure. The most common malignant cause of a pulmonary nodule will be non-small cell lung cancer. So a standard bronchogenic carcinoma or what we call adenocarcinoma or squamous cell will be the most common histological subtypes. In rare circumstances, you'll see more aggressive cancer showing up as small nodules. That would be something like small cell. I guess that's perhaps the most common one. And then there are a few more indolent types of cancers. Approximately 5% of all malignant nodules will be carcinoid tumors, which are very slow-growing but still need treatment usually with surgical resection. And then there's a whole host of much smaller and slower growing tumors. And I guess we shouldn't forget metastatic disease. So in certain circumstances, metastasis can present as a single or a small number of nodules, though more frequently they present with multiple nodules and it's a little bit sort of easier to delineate on clinical presentation.

Kendal Williams, MD: I had a patient or two come back to me who had been diagnosed or had been seen with what's was described as an adenocarcinoma spectrum lesion. And, you know, some of these, they were watching and so forth. Can you go into that and educate us about what that means?

Dr. Anil Vachani: Sure. That is unfortunately a new favorite term in the field. And it's often confusing when patients see these in their reports, for sure. We believe that at least a small subset of adenocarcinoma tumors go through a spectrum of pre-malignant to malignant phase.

This is sort of very similar to the sort of adenomatous polyp to colon carcinoma story where some ground-glass nodules are going to represent adenomatous hyperplasia, which is thought to be the pre-malignant lesion to adenomatous carcinoma. And then as it grows and becomes more solid, that nodule, it is theoretically going through the stages of becoming an adenocarcinoma in situ to a minimally invasive tumor and ultimately to an invasive tumor. So when

radiologists now see anything that looks like it could be a ground-glass or a part-solid nodule, which has both ground-glass and solid features. It's very common for them to just take an umbrella term and call them adenocarcinoma spectrum lesions now. And so I think it's essentially a bit of a hedge that they don't want to necessarily make a call on whether it's still pre-malignant or malignant or somewhere in that phase. And it's an easy way to convey that potential concept. But of course, that leaves all the hard work of figuring out what to do next to people like you and me.

Kendal Williams, MD: You know, I know you're not a radiologist, Anil, but you look at these films yourself and so forth. And, you know, what are some of the features that lead you to be more concerned when you see a lesion?

Dr. Anil Vachani: Sure. Still the basic principles of many tumors and nodules and other organs, which is size matters. So, you know, the bigger a nodule is, the more likely it is to be cancer. Fortunately, we can say based on population studies that if the nodule is eight millimeters, the solid nodule is eight millimeters or smaller, the likelihood of it being malignant is probably 1% or less. So that should be quite reassuring to both provider and patient that, you know, with that likelihood of malignancy, that nodules of that size can be usually managed with pretty conservative measures like surveillance. But as nodules get larger, you know, beyond a centimeter up to two, or even up to three centimeters, now the likelihood of malignancy is rising pretty rapidly. So that by the time you get to a nodule that's two to three centimeters in size, you know, it is likely to represent a malignancy in upwards of 40%, 50%, 60% of those nodules. There's still a relatively high benign rate at that stage, right? There's still likely to be inflammation, all granulomas that get large, but we do start to worry about nodules that are in that size range. And those are the kinds of nodules that are going to need, you know, more early evaluation. So that will involve things like PET scans and perhaps biopsy.

Kendal Williams, MD: You know, we all rely on the radiologist to tell us when we should do our followup CT scans, because, even, if something is small, you want to make sure it's not growing. Is there sort of an algorithm they're following?

Dr. Anil Vachani: You know, it's funny when you look at what happens out in sort of national data with pulmonary nodules, it actually sort of falls into three big camps either we're not doing scans at all because people fall through the cracks; we're doing scans quite more frequently than they're necessary, that is we're just being a little more aggressive than it needs to be, that patients are getting scanned at two or three months when in fact we can wait longer. And then there's the bucket where we're doing it right, where we're really sort of

following existing guidelines. And the guidelines we think that our best, although we think they're evidence-based, they're actually based on somewhat weak evidence, are the Fleischner Society guidelines, and these have come out a few years ago now and really very nicely lay out what the sequence of subsequent imaging should be based on nodule size. They are mostly expert opinion-based again with a little bit of evidence behind them, but we think that they balance sort of the risks and harms of doing too much versus too little scanning at sort of a relatively reasonable rate and those are the guidelines I recommend that we follow.

And I think the bigger challenges are to make sure we can catch the ones that we're missing and maybe not do too aggressive in the people who are quite worried, but their likelihood of malignancy is still quite low.

Dr. Corrine Rhodes: Anil, you mentioned that terms like adenocarcinoma spectrum lesion cause worry in patients. Now that our patients are seeing more and more of their results, do you anticipate there's going to be a drive to more overtesting given patient concern?

Dr. Anil Vachani: I certainly in my practice have observed that more of my patients are obviously getting their reports and they're reading their reports. And in fact, they do come in with many more questions around the findings than I've ever experienced before. So it really doesn't allow me to frame the risk before they get to me, because I've already read their report, they're already quite concerned and have some expectations of what should happen next. And I find that I am talking to a lot of patients down from thinking they need a biopsy or more aggressive evaluation when in fact all they need is surveillance. It is definitely something we see. And I think that's just something that we're going to have to manage differently than what we're used to from previous experience.

Kendal Williams, MD: So when we see a nodule that has grown in subsequent CTs or has concerning features, we generally refer them to you from that point on, Anil. And I think that, you know, from the reading I've done, the nodules themselves fall into basically three categories: low probability of cancer, which is usually defined as less than 5% chance; high probability of cancer, which is over the 60%; and then intermediate probability, which is that 5% to 60% range. Is that how you think about these nodules just generally?

Dr. Anil Vachani: Yeah, I do. I think that gestalt you just laid out is actually a very commonly used approach by pulmonologists. You know, I think that there's two ways to think about how to estimate that risk. The 5% to 65% being the intermediate risk, over 65% being high risk and below 5% being low risk. You can do that sort of at a gestalt, like you can look at a nodule or if you have

enough experience and say, "Yeah, this is six millimeters in a 45-year-old with no smoking history" and probably know pretty easily that that is a low risk nodule, right? But just based on the statistics I quoted earlier, below eight millimeters, the entire population of eight millimeter or smaller nodules has a malignancy risk of under 1%. So that's a low-risk nodule and it's pretty easy to say that's okay to go forward with surveillance.

As nodules get larger and their age gets higher and the tobacco history becomes a little bit more prominent, it can be hard to estimate risk, and there are sort of a number of nodule calculators out there that are sort of freely available and I think should be used if we want to get a better estimate of risk and then that can help guide then what the next step could be. I use them in my practice, though I will admit that frequently I can just estimate, I think, with reasonable certainty. And then, I use that knowledge that is low risk for surveillance, intermediate risk to think about a PET scan or a biopsy and higher risk to think about an urgent biopsy as sort of my general sort of philosophy on how I approach an individual case.

Dr. Corrine Rhodes: Anil, can I ask in your specialized clinic, what is the balance of patients that you've seen between these three different categories, low, intermediate, and high probability? And who do you think should really be referred to a clinic like where you work?

Dr. Anil Vachani: I think that, you know, our philosophy is that we'd of course prefer to be able to focus on the intermediate and high risk patient, because I think that those are the patients that need my expertise that is trying to sort of distinguish between what the level of risk is, what the right biopsy approach should be. Should they have a PET scan? Should they not? Can we wait? So in general, as nodules get above eight millimeters in size, particularly in older individuals with a smoking history, their risk is now sort of crossing over from low-risk to that intermediate risk threshold. And we certainly are happy to see any patients in that risk range and guide the next steps.

As you know, Corey, because there are so many nodules now that we identify on CT scans that are small and that are in that lower risk category, under 5%, we prefer if our colleagues in primary care are increasingly more comfortable with managing those. We're also happy to see them, but because of our somewhat limited availability, it does get harder to bring all of those patients in to see us. And so we're obviously working with you and all of our colleagues here at Penn and our colleagues at other institutions to try and gain the experience we all need to be able to manage the low-risk sort of with their primary care and bring the higher risk patients to us.

Dr. Corrine Rhodes: As a followup, right now, how much of your practice is made up of these lower risk patients?

Dr. Anil Vachani: I think my practice, probably under 10% is the low risk nodule and the majority of patients that we'll see at least for a new referral are nodules that are in the intermediate or high risk category. That is a little bit by design and that we will to some degree triage our referrals and suggest, you know, strategies for our referring physicians to use for surveillance, as opposed to bringing them in for a formal referral with us. So we do influence that a little bit.

Kendal Williams, MD: And from my perspective as a primary care physician, if a nodule is less than eight millimeters, and particularly if it's a low risk patient, I'll be simply following whatever the CT radiologist recommends in terms of followup, right?

Dr. Anil Vachani: Yeah. Fortunately, our radiologists at Penn do dictate the Fleischner guidelines into the body of the report. So we hope that makes the guidelines and the appropriate next step a little bit more accessible to all of our providers. And so I think that's a reasonable strategy. I think that the other part of this, Kendal, was that if there's a question on any specific nodule, even if it's a small nodule, it is perfectly appropriate to reach out to us and we're happy to do either, you know, a quick referral or a phone consultation, or just a quick email chat with any of our providers to just review a case and make sure we're all agreeing that the risk is low and that the appropriate strategy is to use surveillance.

Kendal Williams, MD: Are you part of the e-consult paradigm?

Dr. Anil Vachani: That's a good question. I have had several discussions on how to get that launched for lung nodules at Penn. And, you know, for a variety of reasons, mostly bandwidth, we haven't necessarily made that into a formal process, but one I'd like to see happen in the near future, because I think this is a perfect clinical problem for that paradigm.

Kendal Williams, MD: Other than a nodule over eight millimeters, is there any other features of the nodule that you would suggest early referral, for a nodule that is less than eight millimeters, that is small?

Dr. Corrine Rhodes: I think that in the other sort of small nodule that probably deserves referral is the small part-solid nodule. So that is the six or seven millimeter part-solid nodule. So it's partly ground-glass, but it's partly solid. And so those nodules, we know are potentially as we discussed,

adenomacarcinoma spectrum lesions. So I hate that term. That is they are evolving somewhere between pre-malignant to malignant. And while the short-term strategy is likely going to still be surveillance, it may be appropriate to have a pulmonologist do that so that we can think a little bit more about sort of the timing of what those scans should be and, more importantly, as the nodule changes over time, which many of these do, when the appropriate time comes to pull the trigger on doing a biopsy or surgery.

Dr. Anil Vachani: Is it fair to say that anytime we get a read of an adenomacarcinoma spectrum lesion that we should refer it to pulmonary?

Dr. Corrine Rhodes: I think that's perfectly fine by us. I mean, I think fortunately, you know, we do know that many of these patients will do fine on the short run, but many of these will sort of progress over time and they may wish to sort of have the expertise of understanding that this is a pre-malignant lesion, what the strategies are to follow it, what treatment strategies look like. So I would say in general, that's fine. We would be happy to see anyone who has that as a component of their report and as a component of their CT findings.

Dr. Anil Vachani: So, you know, before we get to the workup of a pulmonary nodule, I just want to ask a question because, of course, you know, we have IPULM now, interventional pulmonology, we have thoracic surgery, we have general pulmonologists who all I assume are working in the pulmonary nodule space. Can you tell us when it's most appropriate to refer to one? Or who should we be referring to first is the question.

Kendal, I suppose that answer probably varies from institution to institution. It's my guess though, or at least my estimation that many institutions have started to develop localized lung nodule sort of clinics, where a few of the providers take on the management of the majority of patients that get referred for this problem. With all due respect, I don't think this is a very common problem to manage. You know, I think that what I do is certainly not rocket science. And I think that a lot of this is, you know, following various algorithms. But a lot of pulmonologists don't want to have to do this, and they don't want to necessarily be the ones making the decisions on biopsies and PET scans and the next step.

So at least at Penn, we have an interventional pulmonary group that sort of doubles as a lung cancer pulmonary group as well. So our group accepts all of these consults and it's eight providers that are located between sort of Penn and the VA who will see you lung nodule patients. But the rest of our a hundred pulmonologists at Penn actually don't manage this problem. But I think at smaller institutions that distribution of work around who accepts and takes the responsibility for lung nodules may vary, but that's sort of our setup locally.

Kendal Williams, MD: That's great. That's actually very helpful. It comes up. I once referred to somebody and I got to think back that said, "No, you want to send it to somebody else." And so knowing the map, but part of that is because I'm relatively new and practicing in a newer location, but I think figuring out who you should be referring to is an important part of the management here.

Dr. Anil Vachani: And one of the nice things now is that even though we don't have pulmonary providers who were, quote unquote, you know, the part of our lung nodule group at all the sites, we now have discovered the beauty of telemedicine, of course. That's one of the, I guess, silver linings of the pandemic. And so, we're happy to see many of these patients through telemedicine consults. Mostly these patients don't need a physical examination or vital signs to manage their nodules. So we could accept a patient from anywhere at any practice within our system and see them, you know, down at Penn through a telemedicine visit, so happy to do that.

Kendal Williams, MD: That's great. So let's talk about the workup a little bit moving forward. So you mentioned before that an intermediate probability, you might go to a PET scan. Could you speak to the role of PET scans now?

Dr. Anil Vachani: That is perhaps I think one of the most controversial areas of managing pulmonary nodules. I think I would sort of take away sort of two or three basic principles. One is that PET scans are most useful when the nodule is larger. I think most people sort of know that principle now, that PET scans are going to be able to show FDG uptake when the nodule is above eight millimeters, frankly, really above 10 is better. PET scans have both a reasonable false positive and false negative rates, so that there are going to be some slow-growing cancers that will show up as being negative and there are going to be other some true cancers that will be negative and there's going to be some benign lesions that are going to be positive. And so, I mean, I do use PET scans some, but I tend to try and minimize my PET scan use. I still think that their rate of false positives and false negatives makes it such that it's only helpful to me in some cases. And oftentimes I'm blessed with not great information from a PET scan.

I prefer as much as possible, Kendal, in patients who are at low risk, and my risk threshold is really closer to 10%, maybe 15%, to try and use surveillance as the right strategy. I'm trying to minimize doing sort of biopsies on people who don't need them. As the risk gets up into the higher ranges above 15, I sometimes will do a PET scan if I think it's going to help me sort of figure out whether the nodule is truly positive and will then really lead me to doing a biopsy, but if I'm going to do a biopsy anyway, I sometimes don't do a PET scan

upfront.

I wish I could give you the sort of more scientific sort of basis for why my strategy is that way, but that's the way it's evolved. And I don't necessarily have, beyond showing you data that shows sensitivity and specificity, that it becomes a little bit more of a gestalt on sort of being able to look at a case and know whether I think a PET scan will help or not. So, I generally use it less, but you will find that there are pulmonary practices that will take any eight millimeter or larger nodule, and the first thing they'll do is a PET scan. And that is of course, you know how it's labeled and it is paid for that way. And some physicians find it more appropriate to do it that way. I just think that the false positive, false negative rate gets to me a little bit, so I tend to try and minimize its use.

Again, I think that this is not an easy decision and we're again happy to see a patient to try and think through the issues around whether a PET scan is appropriate in their individual case.

Kendal Williams, MD: It does make sense what you're saying though, because if you simply follow it and you're comfortable with your relationship with the patient, they'll come back for followup up. They'll get the followup studies, that you can do it in a few months and, based on that, you put somebody into a higher risk category and go forward with that without losing anything, right?

Dr. Anil Vachani: That's exactly it. So, you know, I always say to my patients that, and even to my colleagues, that growth over a short period of time is a much better test than a PET scan.

Kendal Williams, MD: So what's the actual practical aspect of a biopsy now from a patient perspective? What happens?

Dr. Anil Vachani: Well, there's still really only two ways to biopsy the lung, you know, outside of surgery and that is to do a bronchoscopy or to do a CT-guided transthoracic needle biopsy. Those technologies have been around a while and they haven't changed all that much. Although admittedly, we have gotten much better at bronchoscopy for nodules.

You know, the technology really has advanced over the last 20 years to where 20 years ago, trying to do a biopsy of a three centimeter or smaller nodule with a bronchoscope, you would be successful less than 30% of the time. Whereas if you do it with a CT-guided needle biopsy, at least for a lesion that's midline to periphery of the lung, it's successful 90% of the time.

So, you know, in fact, the preferred test is a transthoracic needle biopsy in most

cases. But because bronchoscopy has gotten so much and because we can sample lymph nodes at the same time that we do a bronchoscopy, you know, the choice now has gotten a little bit more complicated. And again, it's one of those things that sort of has a little bit to do with local expertise, has a little bit to do with size of nodule, location of nodule, our lymph nodes needing to be sampled because they look maybe a little large on a CAT scan. So those are the considerations that go into our decisions around doing one versus the other. And, you know, I would say that we probably do an equal amount of one or the other, but it's very patient specific that decision on whether to do a CT guided versus a bronchoscopy now.

Kendal Williams, MD: And who does CT-guided biopsy?

Dr. Anil Vachani: At least at our institution, those are mostly done by our CT radiologists. So we have a group of really eight terrific thoracic radiologists at our institution. Actually, now I think that number is closer to 15 if I heard that correctly. And I believe that four or five of them do the majority of our transthoracic biopsies. That includes people like Ana Kolansky and Eduardo Barbosa, some others. In some rare cases, if it's a more difficult case, you might go to one of the interventional radiologists, so that's our group.

Kendal Williams, MD: So I want to step back and start asking questions to Corey because I want to give Anil a break. But Corey, can you tell us about the program at Penn now that we've had that sort of large overview of pulmonary nodules about how we're trying to keep track of these when we see them on CAT scans?

Dr. Corrine Rhodes: Absolutely. And I think that this is something that many of us can identify with. We all have our own different ways as primary care doctors of keeping track of things. You and I happen to work within Epic, but every EHR has its own kind of tips and tricks to follow things. And we found when we were first starting this work within pulmonary nodules, that there was at least a half dozen ways that each individual provider was reminding themselves. Maybe put a reminder in the chart, maybe put like a little sticky note within the patient's chart. You send yourself a message. You write it within the patient's note. But all of those depended on a couple of different factors, either provider factors or patient factors. And we found that there's lots of ways that patients would fall through the cracks. And so when we started to look at this work, we were trying to find a system solution that would work whether or not a provider goes on a maternity leave, leaves the institution, works well for our resident colleagues, and people could really pick up the pieces and carry this ball forward.

We found that the real work of the provider is deciding what is the next step. So when I see a patient with a pulmonary nodule, is this a patient who I need to refer to Anil and his group, or is this a patient where I need to do a CAT scan and at what time do I need to do that CAT scan? Once I've made that decision, we actually wanted to hand that off to a different team, which we call our population health team so that they could execute the care plan that we've put forward. And so I got to work with great people like Dr. Vachani as well as other population health specialists within our institution. And we found a way to standardize the approach within our division of general internal medicine of tracking lung nodules.

So the way that it looks is kind of step one, within every radiology report that we get, try to find those patients who've had a lung nodule identified. That is helpful because as early in our conversation, we talked about patients who fall through the cracks. And so by proactively identifying all of those patients, we can make sure that we're tracking them through the whole process.

The second step in the process is then creating a care plan. And so, we have a population health associate, so a nonclinical person who will prompt you or I with a telephone encounter saying, "Your patient had a lung nodule. Please document in this very standardized fashion about what you want to happen next." In that documentation, they pull in appropriate information, like, is this patient a smoker? Does this patient have a history of cancer? What is on their problem list? So if there's something like breast cancer in their problem list, obviously you're going to look at that in a different way. But it really is the provider who needs to look at that, take the Fleischner criteria and recommendations that are within the report and put it together into those next steps.

Once those next steps are identified, it gets handed back off to the population health team. And so if I say this patient needs a CAT scan in six months, in six months, they're going to show up on a list for our population health associate to work. And at that point, they're going to send a CAT scan order to me. I will sign it and they will communicate with the patient to make sure that it is scheduled and follow up with them if they don't show up or if they don't schedule that CAT scan.

Kendal Williams, MD: So through that process, you are basically handing off to somebody else to ensure that they get followup outside of the sort of miscellaneous meandrous systems that we had, and they take it from there.

Dr. Corrine Rhodes: You got it.

Kendal Williams, MD: And it's only the Division of General Medicine practices currently, or to what extent is it extended out to the service line generally?

Dr. Corrine Rhodes: Right now, that is the process within the division of general internal medicine. But we're piloting different ways to spread this. Without getting into too many details, we are benefiting from Dr. Vachani's great work in his research arm of his job. And so we're using a number of resources that are really hard to scale across the system. And so we're working with other colleagues, with Dr. Tessa Cook within radiology and within the innovation center to try to find other solutions that don't depend on research tools. And so right now, there's a couple of different pilots that are going on to take these same principles, but to try to operationalize them in a way that can be scaled more broadly. We're hopeful that this is going to be piloted in the spring time of 2022. So it really is around the corner.

I will also say, Kendal, just for people who might work at different institutions, like there are different solutions that you can buy for this. There's a lot of different packages that you can get for people to track lung nodules. Very few of them are integrated within the electronic health record, but they do similar work. What we heard from our providers when we did some Voice of the Customer and heard about their experiences is they want this integrated with the electronic health record, within Epic, because that's where they're doing their work day to day, and so they don't want to utilize another system to keep track of these nodules.

Kendal Williams, MD: Yeah, that's great. I got some of those emails earlier in my time back in primary care, and I wasn't actually sure what to do with them. So I'm glad you really clarified exactly what's happening there.

Dr. Corrine Rhodes: And I think that's helpful to know, right? Any kind of new system, you really do need to get out to docs and explain what's going on and get out to the different providers who are doing this. And this might be something that providers only see a few times a year. And so I know the system that we worked on really went through a number of iterations to make it as self-explanatory as possible. But still, you know, I work with residents and there's a resident who's going to see it for the first time quite frequently. And so a lot of this is also being able to reach out and understand and learn from your colleagues about what is this system. It's not the only way, you know, that we could track these, but it is a systematic and consistent way that we have shown when we've done analyses has improved overall the number of patients who follow through on nodules based on prior to the implementation of the system. And it actually decreases the amount of time that it takes patients to get that

CAT scan that was recommended.

I will also note Kendall that shortening of the timing, if I said this patient should follow up in six months, the patient whose followup is in six months, instead of 12 months, we saw that improvement in the time to CAT scan, despite the fact that we rolled this out throughout COVID.

Kendal Williams, MD: That's great information, Corey. And that's a terrific program. You know, for those practicing broadly, you just have to figure out what local system you have in place to try and keep track of these nodules. So we started the discussion about nodules that find us, if you will, you know, nodules that we incidentally noted on CAT scans. But now, obviously, we're going through a process of actively looking for nodules in patients that are at high risk. And I want to turn the discussion over to this topic of screening for lung cancer. So, Anil, for years, there was efforts to validate chest x-rays as a way for screening for lung cancer. And it really never reached a level where it was recommended. But now, with low radiation dose CAT scans, we seem to have reached that threshold. Can you just quickly bring us through the evidence that has changed that paradigm, that now we're actively screening for lung cancer in smokers?

Dr. Anil Vachani: Actually, as you know, we've just seen the United States Preventive Services Task Force update the lung cancer screening guidelines recently to those who are 50 to 80 years of age and have a 20-pack-year or greater history and at least for previous smokers, those who've quit within 15 years. The original trial was actually now over 10 years ago when the National Lung Screening Trial was published, I believe in 2011, if I'm remembering correctly. That showed a 20% reduction in lung cancer-specific mortality at the time. And at that time, the criteria were a little more stringent. And since that time, we've had one other major international trial published, which was something called the NELSON Trial published in Europe last year, which also showed a similar improvement in mortality with annual lung cancer screening. And so I think we've now hit that point where we've had two very large trials, pretty well conducted, that show a mortality benefit. And I think the evidence is quite strong now.

The USPSTF guidelines still have it as a grade B as opposed to a grade A recommendation. And I think that the grade B recommendation is a little bit more still because of the concerns around harms from screening, that is, you know, we find a lot of nodules as we just talked about and many nodules are benign. Are we going to end up doing too many biopsies and procedures on people who don't need them? Are people who are going to get screened in the community going to be more sick and perhaps less likely to benefit. I think

there are still some lingering issues around that. But I think the mortality benefit is actually quite robust. And I do think that we are making strides to get lung cancer screening up and running, though obviously, given that it's relatively new, still lags far behind things like breast cancer and colon cancer screening.

Kendal Williams, MD: And so it's 50 to 80 years of age, right?

Dr. Anil Vachani: Yep. Fifty to eighty years of age, 20-pack-year tobacco history. And if you're a previous smoker, you must have quit within 15 years.

Kendal Williams, MD: And I found that if you don't meet the criteria, it's actually kind of challenging to get people to scan. Sometimes people are on the borderline or especially with pack years, people tend to minimize their pack years, and then you go back and talk to them and you say, "You know, you don't really want to minimize. I really need to know actually how much you've smoked." And that several patients say, "Well, actually, it was much higher than I have recorded."

Dr. Anil Vachani: Yeah. Kendall, it's a problem. I mean, I think that accurate tobacco history is a major issue and one that we certainly haven't solved yet. I do worry about that. And as you know, in Epic, if someone begins or changes their tobacco to smoking less, it actually inadvertently changes their pack years in Epic to making it look like they've smoked less over their whole lifetime. And, you know, it seems like such a simple problem, but it's actually been much harder to fix than I would like. And so I think that we don't do a great job right now of having a way to really accurately measure and capture tobacco history. So I'm hoping we can do better. But I do agree with you. This becomes essentially, you know, a problem for all of us, right? At our individual practice level, accurately documenting and getting people to screening if they qualify.

Dr. Corrine Rhodes: Neil, you mentioned that you think that lung cancer screening isn't done as well as breast cancer, et cetera. Do you think that a lot of that has to do with the role of shared decision-making with patients?

Dr. Anil Vachani: I mean, I do understand that the requirement for shared decision-making, you know, was felt to be an important one. And that, you know, I, of course fully believe in the concept that many decisions that patients make or that we make with our patients should be done with shared decision-making and understanding and education of the problem. But I think that by requiring it for payment as what CMS has done, certainly many people believe that it's a barrier to screening and that it should just go away, that we should assume that doctors are going to do the right thing and they're going to, of course, speak to their patients about screening, whether it's breast, colon, or

lung. And do it for those in whom it's appropriate and not necessarily require the documentation or the billing of shared decision-making to move forward. It's a bit of a controversial area. And I know that people will fall on both sides of that equation.

At least at many institutions and now including our own, we are at least now standing up a lung cancer screening clinic for providers who refer to us and we will have an APP meet with the patient often in person or by telemedicine to have that conversation in whatever detail is appropriate. And take care of the ordering and the followup of the scan. So we're trying to decrease the burden because I do believe that it is a bit of a burden at the primary care level given all the other things that our primary care providers are responsible for. So we're actively searching for strategies to make it easier.

Kendal Williams, MD: And just a simple clinical question when we actually order the CT, we're ordering a specific test, that is not the typical non-contrast CT of the chest, right?

Dr. Corrine Rhodes: Yes, you are. Yes. Even I have now forgotten what the new CPT code is. But in our version of Epic, if you work to insert lung cancer screening, you should get the appropriate order set up. And it actually makes it go through a series of questions, including completing the tobacco history, as you've mentioned to confirm that the patient is eligible and we are then looking to order a specific low-dose CT, because it is actually done with the lowest radiation dose technique possible. So it actually does not give us the best images of a lung parenchyma possible, but enough that we can identify lung nodules.

Kendal Williams, MD: Yeah. I think if you just put in CT of the chest and try to find it that way, you can't find it. I think you have to go back and do some sort of screening for lung cancer or some other thing that you put in.

Dr. Anil Vachani: We'll have to make sure it's as easily findable as possible. But yes, there is a definitely a different order and a different CPT code for it.

Kendal Williams, MD: Great. So this has been a terrific discussion, both of you extremely helpful. Are there any thoughts that you wanted to share with the primary care community before we log off?

Dr. Anil Vachani: Well, I'll just say I've really enjoyed, you know, I talk about lung nodules a lot in my life, but I always talking this audience and conveying what we can do and what we should do together. And, you know, my parting words are simply that we hope to have this not be something that we dread seeing in our practices, but we want to make sure we're facilitating and

providing all of our primary care providers, you know, the appropriate expertise you need. So anytime there's a question about a nodule, never worry about reaching out to us. Please dare and we're happy to help.

Dr. Corrine Rhodes: Yeah, thank you for having me, Kendal. I think if I was to add anything, it's think about the system solutions. If you have something that works for you, what happens if you leave? And so for these patients, we always want to set up a solution that will be ongoing for them, even if you were removed from the equation.

Dr. Anil Vachani: Having come into a practice where multiple people had just left and inheriting all their patients, I really can speak to that as being very germane. So thank you so much to both of you for joining the Penn Primary Care Podcast. And thanks to the audience out there for joining us for yet another episode. We hope the information was valuable, and come back next time. Take care.

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