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Diagnosing Pneumonia: A Look at Key Obstacles & New Testing Modalities

Announcer:
You're listening to *Deep Breaths: Updates from CHEST* on ReachMD. This is a non-promotional, non-CME disease state educational podcast produced in partnership with the American College of Chest Physicians and is supported by bioMèrieux.

Here's your host, Dr. Randy Young. Dr. Young is physician who specializes in pulmonary and critical care medicine in Hummelstown Pennsylvania.

Dr. Young:
Welcome to *Deep Breaths: Updates from CHEST*, on ReachMD. I'm Dr. Randy Young, and joining me to discuss the etiology, diagnostic challenges, and current trends in pneumonia diagnostics is Dr. Tufik Assad, a board-certified internist, pulmonologist and critical care intensivist. He practices critical care and pulmonary medicine at Williamson Medical Center in Franklin, Tennessee where he also serves as Director of the Critical Care and Lung Nodule programs. Dr. Assad, welcome to the program.

Dr. Assad:
Thank you so much, Dr. Young, and thank you, CHEST and ReachMD, for the opportunity to discuss.

Dr. Young:
Let's start, if we can, by just helping all of us understand why pneumonia is such an important clinical problem to discuss today?

Dr. Assad:
Yeah, I think that's a great question. Whenever we have conversations in clinical medicine, I think it's necessary to frame it in the backdrop of the relevance of that problem, and I think we can all agree that pneumonia is not some esoteric problem that very rarely affects providers and clinicians. It's one of the most common problems that internists, emergency room providers, outpatient providers, ICU doctors encounter. And so, this is something that we, as healthcare providers, encounter on a very regular basis. And probably one of the biggest reasons why we, as healthcare providers, prescribe antibiotics in the United States and globally. This is common, it's huge, and it's extremely relevant.

Dr. Young:
What do you think are the main factors that make the diagnosis of pneumonia so challenging? And how good are we, as clinicians, at diagnosing pneumonia in the clinical setting?

Dr. Assad:
You know, pneumonia is really a diagnosis that doesn't have one test that just seals the deal. Like many things in clinical medicine, it's a clinical diagnosis, and it's challenging because there's many variables that go into the decision about whether a patient has pneumonia, and what type of pneumonia. We've talked about the clinical symptoms that go into pneumonia that a good clinician has to take. We've talked about some of the abnormal imaging characteristics that we see on chest x-rays or CT chest that help us diagnose pneumonia. And then we talked about some of the labs and other diagnostic tests. There is so many different things that go into diagnosing pneumonia. what makes a diagnosis challenging is that there's many variables and many different ways to interpret everything. There's not one test that just says, 'Oh, this patient's got pneumonia. Here, we got to give them this antibiotic and then they're good to go.' that's at the meat of the challenge, and another issue for me is I'm an inpatient and an outpatient doctor, but when I see patients in the inpatient setting, I oftentimes see that patients are given empiric antibiotics for this or that. by the time I try to do some of the diagnostic tests to help seal the deal on a patient with pneumonia, they've already been on three or five or seven days of an antibiotic in the

outpatient setting, which greatly limits our ability in our diagnostic test to help figure out what's going on with the patient. To me, those are the things that sum up the challenges in making the diagnosis. And honestly, how good are we at making the diagnosis? That's a really great question, and I think the best study that sort of sum that up was the 2015 CDC EPIC study, published in the *New England Journal of Medicine*. And as I'm sure a lot of our providers or listeners know, this was a landmark clinical study that looked at how good are we as outpatient or inpatient providers at diagnosing pneumonia for patients who are hospitalized. And what they found, which I think stunned a lot of providers when it came out, is that bacterial pneumonia, which was previously thought to be one of the more common causes of pneumonia, is only definitively diagnosed just under 15 percent of the time. And that viral pneumonia was diagnosed more than that, at a quarter of the time. But honestly, almost two-thirds of the time, when patients had characteristic symptoms and imaging findings and lab findings, we were only able to identify something on either multiplex PCR panel for an upper respiratory swap or culture, like a third of the time. And so, I think the short answer is pneumonia is a clinical diagnosis with a lot of variables, and in general, with conventional microbiologic techniques, clinicians are pretty bad at sealing the diagnosis.

Dr. Young:
I think not only do we have to distinguish between viral and bacterial infections, but then there's a whole host, as you know, of noninfectious etiologies that get confused for pneumonia. I find that once the radiologist reads multifocal pneumonia on the chest radiograph or the CT scan, it's very difficult to get people to expand their thinking, to include noninfectious etiologies, like something as simple as congestive heart failure.

Dr. Assad:
Absolutely. I couldn't agree more. The problem with the chest x-ray is that we rely pretty heavily on those abnormalities, and then we say that the patient's got a cough and they're short of breath, and they've got radiographic abnormalities, and maybe they have a low-grade fever. Here, just throw some antibiotics at them. But obviously, that's not good practice either, as you said, that there's no infection at all, and we need to diurese the patient, or give them steroids for an inflammation-related problem, or maybe they aspirated, or maybe they have viral pneumonia, which doesn't respond to antibiotics obviously, and we need to either treat them supportively or give a targeted antiviral. And obviously, in the COVID era, I don't think anybody needs to be reminded that there is a whole wide world of infections out there, and pneumonias that aren't going to get better with antibiotics.

Dr. Young:
For those of you just tuning in, you're listening to *Deep Breaths: Updates from CHEST*, on ReachMD. I'm your host, Dr. Randy Young. Joining us today is Dr. Tufik Assad, and we're discussing pneumonia. Dr. Assad let's talk for a second if we can, about what new modalities exist in the realm of pneumonia diagnostics.

Dr. Assad:
I wanted to discuss a couple specific modalities. One which is a lab test, and one which is a PCR test, run on sputum specimens. starting with the lab test, it's not exactly new, but procalcitonin is a lab diagnostic which can help to distinguish bacterial infections from either viral or noninfectious causes of lower respiratory tract infection. Procalcitonin is a peptide precursor to calcitonin, which is generally involved in calcium homeostasis, normally synthesized in the thyroid gland. And we know that in certain inflammatory states, particularly bacterial infections, procalcitonin can be elevated and detected in the serum at high levels. It can be a useful test, a fairly quick lab when you have suspicion if a patient has viral or bacterial pneumonia, and an elevated procalcitonin gives more confidence that it may be bacterial and you would generally use antibiotics in that case, while waiting on additional diagnostic testing. The other one which is definitely newer and a lot more exciting, in my opinion, is multiplex PCR technology on lower respiratory tract specimens. there are a number of different companies out there who have released similar products, and almost all of them are run either on expectorated sputum, on an endotracheal aspirate for a patient who's on mechanical ventilation, or on a bronchoalveolar lavage for a patient that undergoes bronchoscopy. And almost all of these multiplex PCR technologies have a number of different viral and bacterial DNA targets, so that on a lower respiratory tract specimen, you're able to test for a variety and multitude of viral or bacterial pathogens that could be causing pneumonia, and several of them also have antimicrobial resistance genes as well, which give you very useful, real time information on whether a patient has a specific antimicrobial resistance gene, such as the mecA/C and MREJ gene which is known to cause methicillin resistance for staph species, and a number of different resistance genes for ESBL or carbapenemase gram negative rods.

Dr. Young:
What are some of the other major advantages of these modalities? Particularly, how important is it for us to be this precise when we're diagnosing pneumonia?

Dr. Assad:
I think that that's a great question and my answer to that is the advantages of these modalities are that one is, I think, time. Sputum culture, endotracheal aspirate culture, or bronchoalveolar lavage culture takes several days. multiplex PCR technology, depending on

the test, generally gives you results within minutes to hours, as compared to several days on culture alone. the real time information that you get from this testing is really incredible. The second big thing is that syndromic testing for pneumonia is what this sort of modality does, and instead of having to order a variety of tests, you know, upper respiratory viral panel, and then the legionella antigen, and then the streptococcal pneumonia antigen, and then the culture, and then this and that, instead of all of these individual tests, ordering a panel of a variety of viruses and bacteria just simplifies things. one test that gets you results really quick can really help. I think those are some of the huge advantages of this modality.

Dr. Young:
Those are some great points. Thank you. Conversely, are there any major limitations to these modalities?

Dr. Assad:
Well, I think one of the downsides of any highly sensitive test like this is that sometimes, you're going to identify colonizing bacteria within a patient's upper or lower respiratory tract, which may or may not be causing infection. we always have to be mindful that when you have a really good sensitive test, you have to be careful about the situations in which you order it. my response to that would be, I only order a multiplex pneumonia panel, which I've had at my hospital for several years now, and have really relied on greatly, when I have a very high suspicion for infection. I don't order it on everybody who has a cough, who has a slightly abnormal x-ray. I order it when I really think they have a bacterial infection that actively is going on that I need to know about. just like any highly sensitive test, you got to know the situations when to order it, and you got to know the situations when to interpret it, and you got to know the situations when to ignore it. I think, conversely, this is a really incredible test for the pathogens on their panel, but it's a limited panel, and you have to be aware of that. There are going to be some more rare, bacterial infections or viral infections that may or may not be on these panels, and just because the panel comes back negative, if you have a very high suspicion for a bacterial infection and you don't get any results on this, I would use all of the other aspects of our clinical judgment in our decision making.

Dr. Young:
I think those are some great points, thank you. Unfortunately, we're just about out of time. Dr. Assad, thanks for joining us today. I'm sure our listeners have really enjoyed the conversation, and it's been great having you on the program.

Dr. Assad:
Thank you so much for having me, Dr. Young, and thanks again to ReachMD and CHEST for the opportunity to have this conversation.

Dr. Young:
It's been great. I'm Dr. Randy Young. Thanks for listening.

Announcer:
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References:
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