[MUSIC PLAYING]

DANIEL A. PRYMA: All right, we're going to start this morning with state of the art and emerging applications. So as you can imagine, trying to go over what is the current generation high end cameras, what they can do, some of the other permutations out there, and then towards the end, some of the things that are maybe on the horizon. And many things that you see on the horizon never quite materialize, so keep that in mind.

The first is obviously PET/CT. A long time ago, when PET/CT first started coming out-- not that long ago, really, it's only been about 15 years since PET/CT systems were commercially available-- it seems like it's been longer, just because PET only devices have completely gone by the wayside. I think there is one vendor that still intermittently tries to sell one, but it really doesn't make a lot of sense because when you combine these two, it's really a 1 plus 1 equals 4.

So those of you who started in the PET world prior to PET/CT will remember that the attenuation correction with a PET only scanner requires rod source transmission scans, which are basically very, very crude CTs that take about as long as the PET acquisition itself, in some cases longer. So you shorten the scan time by over half, just by doing PET/CT without any of the other additions that have come along that I'm going to talk about.

So SPECT/CT, actually the first SPECT/CT scanners were out before the first PET/CT scanners, but they were much slower in the uptick. It's the same concept as PET/CT, same benefits as PET/CT. And you have this wide portfolio of approved SPECT tracers, whereas with PET/CT we're mostly talking about FDG imaging. And there are isotopes that you never thought you could do SPECT of, so things like Indium 111 white blood cell scans, and I-131 scans of thyroid cancer that just, the count rates are so low that the SPECT images really are a blob in space, and you have no anatomic correlate. But now with the addition of CT, you can actually consider doing SPECT of those, and I'll show you a few examples in the next talk.

So SPECT/CT has the same thing. Although just in general, SPECT is less exciting, I think, in terms of the overall people's thoughts of where the field is moving. But hopefully I'll convince you that there's still a lot to be done with SPECT. There are some potential benefits to PET/MRI. One of the most obvious is a dose reduction benefit, because you replaced your CT radiation dose with MR, that doesn't have any ionizing radiation. So that is important, but in the grand scheme of things, this is an oncologic imaging meeting. Most of these patients have advanced cancers and a reduced life expectancy, so dose reduction, while still important, may be less impactful, except, for example, in the pediatric world.

Some of the more exciting things is you could potentially do concurrent imaging of dynamic processes. MR is not purely anatomic. There's a lot of functional information in MR. PET is largely functional, so you can look at multiple processes at the same time.

There's been some interesting stuff looking at real time motion correction. So for example, in the heart, as you are detecting the movement of the heart with the MR, you can use that to correct the PET photons that are coming out, to know what they're doing. With PET-CT, these aren't truly fused images. They're acquired in sequence, and overlaid as long as the patient hasn't moved in between, whereas with PET/MR, you could do potentially truly fused imaging. The one big challenge with PET/MR that's been largely mostly solved, not perfect, is attenuation correction.

All right, so emerging applications for PET/CT and SPECT/CT, there's a huge amount of research going on in PET/CT, relatively less active research in SPECT/CT. There are a lot of tracers in the pipeline on PET/CT. There been a few notable-- I don't want to call them failures yet, but less than optimal rollouts on PET/CT, primarily in the amyloid imaging world, where there are now three FDA approved amyloid imaging PET agents, and zero Medicare approved billing codes. So these companies spent tens of millions of dollars to get these approved, and no one can scan these patients, because insurance isn't reimbursing it.

So it really remains to be seen what hurdles there will need to be in order to not only get tracers approved-- it used to be that was the only hurdle to get it approved. Now you have to get it approved, and the bigger hurdle seems to be getting Medicare to pay for it, because the private insurers follow along Medicare. And so if that doesn't happen, I think the pipeline is going to grind to a big halt, but hopefully that will be worked out, as long as there's some kind of rational plan to getting things approved, and proving that it's cost effective.