# Digital Pathology Implementation at Duke Health

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**Becca Battisfore:**

Welcome to the latest edition of the College of American Pathologists CAPcast. I'm Becca Battisfore, Content Specialist with the CAP. In this episode, Dr. Joe Sirintrapun will be talking with Dr. Diana Cardona about her experience with implementing digital pathology. Before we get into the questions, let's learn more about our guests, Dr. Sirintrapun, please introduce yourself.

**Dr. Joe Sirintrapun:**

I'm Joe Sirintrapun. I'm at Memorial Sloan Kettering Cancer Center. I go by Joe, because it's just so darn hard to actually say my last name. And my title is ... I'm the Director of Pathology Informatics and been heavily involved in CAP on several of the committees over the last several years, as well as involved in the informatics space, being past president of the Association of Pathology Informatics during 2021, so just had a long history of being involved in informatics, digital path, and AI.

**Becca Battisfore:**

Great, and Dr. Cardona?

**Dr. Diana Cardona:**

Hi again. Thank you for inviting me to join this conversation today. My name's Diana Cardona. I'm a PCP pathologist at Duke University where I specialize in GI, liver, and bone, and soft tissue pathology, but I'm also the Vice Chair and Director of Anatomic Pathology for the Clinical Laboratories as well as the Associate Medical Director for Duke Health Clinical Laboratories across the house. And so, those roles have afforded me the opportunity to really help both develop the strategy and help implement our digital path forward at Duke. So, it's been exciting.

**Becca Battisfore:**

Thank you both for joining the podcast today, Dr. Sirintrapun, I'll let you take it from here.

**Dr. Joe Sirintrapun:**

So, let's start with the first question here. What were your challenges getting your institutional leaders in the laboratory, and such, just agree on digital pathology implementation?

**Dr. Diana Cardona:**

Yeah, great question. So, I would say that our odyssey, so to speak, started probably about six years ago. And the initial struggle, I think back then, was really answering two questions. The first was, why now? The health system wants to know, with competing priorities, why do we need to make this investment, not only in money, but time, and resources to implement digital pathology? And then the second was, and what would be that return on investment? Defining that for the institution. I think both of those questions probably most places have to try to figure out the answers to.

So, I think that when you're having a big ask, like building a digital infrastructure from scratch, we're talking millions of dollars, and that really puts you in competition with other priorities with the health system, whether it's new buildings, renovations, surgery, radiology equipment, et cetera. So, we had to be really creative in figuring out both contractually as well as with partnerships with industry, how to just get the instrumentation, so to speak, the basic infrastructure for us to start building our plan moving forward.

I would say that after we were successful in doing that, it really was pushing for partnerships with IT, and a very large health system, again, with very competing priorities everywhere in the health system for IT asks. And so, we were successful in getting a lot of things pushed forward, such as creating hyperlinks. We're on Epic Beaker, so having a very seamless workflow for our pathologists in which they're already in a case in Beaker hit that hyperlink, and the digital pathology images pop up. We really wanted to make it as easy for pathologists, not burdensome, not much different in their workflow from their perspective in order to promote uptake.

And then, we were also able to put in tracking events. So, we had transparency in what was getting scanned and what wasn't getting scanned. And once we implemented that, we were able to actually implement CPT codes, which as I know you know this Joe, but there are new Category 3 CPT codes that are available that CMS approved with the AMA, and CAP advocacy, and working on it. And so, we really need to start using those codes to start getting a better vision into utilization, so that eventually we can actually get paid for this additional effort. So, all of that really was a struggle. I'm not going to say it was easy. It was really advocating on behalf of the labs, and on behalf of the department to get those things moved forward. But thankfully, we were successful in getting that done.

**Dr. Joe Sirintrapun:**

It sounds like really amazing and great work over the years. And I just happened to catch something you mentioned, which as you mentioned was been something that I've been working on too, is the CPT codes, the digital pathology CPT codes, which there's a lot of enthusiasm, and rightly so. I know that the CAP has been really working hard on this. The Digital Computational Pathology Committee, which I'm on, and this podcast is part of that effort. I had a webinar back in December, and it's actually planning on follow-up on that, and I think a lot of it has to do with implementation. Because even though in theory it makes sense to try to automate things, but in practice there's a lot of hurdles. I'm curious about how has your experience been in terms of implementing the codes?

**Dr. Diana Cardona:**

Yeah, I will say that I probably have a slight advantage for a lot of others in which like you, I'm also very involved in the CAP, and I'm on the Council of Government Professional Affairs, of which the Economic Affairs Committee reports to. And so, that's the committee and the college that created these codes were the ones that advocated at the AMA and CMS to get them pushed through. So, I had a little bit more knowledge and background that it was coming down the pipeline, and how they were intending to use them. So, I will put that caveat in that I was maybe at an advantage.

But the way that we built them out, and if you look at the codes, they are specific to a partner code. So, an 88305, for example, has a specific digital Category 3 code, and 88307, 88309, each of them have their own code. And it was built intentionally so that if you look at the base code, the 88305, for example, there's already an expected amount of slides that are going to be created, and effort involved in that. And they wanted to ensure that the digital piece, if you're scanning all those slides matched the effort. And so, same thing with 88307, 88309 in which the complexity, and usually the size of the case increases. And so, all of that proportionally increases as well.

And so, we wanted to be very specific as far as which kinds of base codes were being used for the digital efforts. The way that we built that was through our tracking events. So, anytime we scan a case, we track it in Epic Beaker to say that digital asset has been created, essentially. And when that is done, prior to a case being verified, then that in the background, the pathologist doesn't have to do anything, automatically adds in the specific CPT code for the base code. So if it's an 88305, that's the base code for that tracking event, it would add the specific digital code to it.

We thought that was the best way to do it, because, A, we didn't want to add burden to the pathologist to begin with. And then second, we wanted to make sure that the codes were only added when the digital case was being utilized for primary diagnosis. If it was being utilized for teaching, for archival purpose, for research, we still add the tracking event, but oftentimes, those cases are already signed out. So, we were safe in the fact that if the tracking event added the code prior to verification only, that it really was ensuring that we were using the codes appropriately. And so, that's how we built it, to reduce the burden for pathologists, and ensure that we really were only adding the codes when it was being used for diagnosis, and for nothing else.

**Dr. Joe Sirintrapun:**

Wow. That's just a goldmine, just what you said right there for the audience, in terms of how you're able to automate it with the pathologist in mind. Because I have to admit, this is my little mea culpa at MSK, we haven't automated it yet. There's many reasons, which you'll probably come of it in future podcasts, but tracking was very key. We don't have Epic Beaker here, so our ability to track is not as connected to our LIS. And our LIS, I won't name the name, but many people heard me talk about them, is not capable of actually incorporating tracking. So, we have to do a lot of stuff manually. So, we're at a disadvantaged by not having a well-integrated tracking functionality built into our LAS, otherwise we could do it automatically. That's one factor. But you gave a lot of really good things. There's a lot of Epic Beaker users out there, and they can certainly use what you just provided there in terms of trying to automate. We have other reasons, which will come up on probably future podcasts about why it's hard to automate CPT codes, but I really appreciate that. That's really invaluable. So, let me go into the second question here. Did you face any pushback from your colleagues when digital pathology was proposed?

**Dr. Diana Cardona:**

Okay, so I have to admit, at the beginning, I did not have my pathologist knocking on my door, pounding on my door saying, "Why are we not digital yet?" I would say that probably one of the silver linings of COVID was the fact that our faculty finally saw the value in having digital pathology accessible to them. It really allowed them to have the flexibility that they needed with childcare issues, et cetera. We offered both a digital pathology route as well as remote sign out with a scope and slides at home. And so, we really did try to make it as flexible as possible for our faculty. But I would say that COVID's one of the silver linings, and I do think there were quite a few actually, despite the pain of the pandemic, that it allowed us to really push our digital strategy forward at Duke.

Now, is everyone sold on it still? No, there's still some diehards that are just opposed, and have no interest, but I would say the vast majority of our faculty now are excited, and eager to help us with additional validations as we bring in new instrumentation. For example, we just got a new immunofluorescent scanner, a high-volume scanner, and we've got people volunteering with hands raised to help us with that primary diagnosis validation, as well as working on AI algorithms, and how we're going to implement that seamlessly into our workflow. How do we validate those? How do we monitor their performance moving forward? Prior to COVID, it really was on the shoulders of a few of us running the labs. But now, I have really engaged faculty members, which makes a world of difference, both from a uptake and implementation piece, but also for excitement overall for digital in the department.

**Dr. Joe Sirintrapun:**

Yeah, I'm seeing the same thing, too. I think when I started this back, what in 2009, 2008, or something like that, it was pretty much crickets over whoever wanted to do that. And nowadays, I mean we get fellows here at MSK, they're all interested. They may not know exactly what is involved, but they just hear about it, and they just want to get involved with actually knowing even some of the details. So, I'm actually seeing a generational shift in it. Everybody really wants to get involved, which is really exciting. It's great. But as you mentioned, winning hearts and minds can be very tough too.

There's some people that are just very stubborn. I've set up a lot of easy digital telepathology types of setups there. And even then, you still have people that's like, "Ah, bring me the glass slides," even after you've made it easy for them. So, it takes a while. It takes a while.

**Dr. Diana Cardona:**

It does.

**Dr. Joe Sirintrapun:**

But I do see the generations changing from that mindset.

**Dr. Diana Cardona:**

I agree.

**Dr. Joe Sirintrapun:**

So the next question here, what advice would you give yourself if you had a chance to do this project over again?

**Dr. Diana Cardona:**

Yeah, that's a tough question. I think if I had to choose one thing, it would've been to push harder on the need to take on some risk. And the reason I say that is we still don't have a primary software management system at Duke. We are still very piecemeal, and are patching things together. It's working, but it's probably not the most efficient or maybe the best way to enable us to continue to move forward efficiently. So, I wish I would've pushed a little bit harder on Duke to say, "We need to make this investment or create our own software in-house." I think both of those are options if you have the resources. In general, I think pathologists are risk averse. I definitely am one of them. I am very focused on being fiscally responsible, and really defining that return on investment, and pre-COVID. It was hard to say, "Yes, it's worth making the $2 million+ investment on a big software program right now without having a clear defined return on that investment," back then. So, I think that's one maybe in retrospect I wish we would've pushed a little bit harder on.

**Dr. Joe Sirintrapun:**

Well, I'm going to put on my therapist hat here, and say, because hindsight is 2020.

**Dr. Diana Cardona:**

Yeah.

**Dr. Joe Sirintrapun:**

And from hearing all you did, especially with the risk, you never know when you look forward, moving forward, what risks are you going to encounter? It's only with hindsight you look back, "Oh, I could have been a little more aggressive there." So, I think you've done great considering what you've accomplished. So, yes, it could have been, but eh, I think you did great. And the other part about piecemeal, you're not alone.

**Dr. Diana Cardona:**

Yes.

**Dr. Joe Sirintrapun:**

We had to build some stuff home-brew. It comes at a heavy cost. It's hard for the institution to invest in those things, but that is a challenge. It's been one of my dreams is being in an informatics space to create that ecosystem, those suite of applications that are really digitally enabled. I think some of our legacy systems, this is Epic Beaker, included as well as the other LISs, are not configured in such a way to really help the digital sign out experience. And it is my dream to create that ecosystem where they work seamlessly together. So, without having on us to rely on homebrew systems, and customizing ourself, and putting a lot of heavy effort, there's a whole market. So, if there's businesses out there and startups, please listen to that line, and so, there's a lot of opportunity for disruption.

**Dr. Diana Cardona:**

Well, it's so true. I think one of the hesitations initially in pulling the trigger, and really, really pushing for it was I view digital pathology as more than just what most people think about now, a glass slide that's being scanned. I feel that there are so many digital assets in laboratory medicine, whether it's the glass slide, the FISH, cytogenetics, chromosomes. You've got flow cytometry. You've got gross static images. There are so many different things, and assets that right now live in their own little isolated silo home in our system.

And I would love to have one software management system that actually managed it all. And that didn't exist back ... It still doesn't exist. It doesn't exist. And so, I'm like, "Well, if I'm going to make that investment, do I do that with the hopes that then that company or vendor is going to create what it is that I want to create or what I envision, or do I hold on tight until something comes along that meets those different check boxes, or do we create it ourselves in this piecemeal fashion, again, with the hope of it being as seamless, and as burdensomeless for our pathologists as possible?" which that's the goal. Because right now, they have to search here, or search there, and it's cumbersome. So, I think that was part of also the reason of the hesitancy of like, "Well, it's not going to meet all my needs right now, so why make that initial investment?"

**Dr. Joe Sirintrapun:**

Well, if we had our live cheer emoji thing, I think we would've gotten a million cheers in cheering for that one. There's a lot of people in this space that just heard that, and said, "Yes, please, somebody come and help us, somebody."

**Dr. Diana Cardona:**

Right.

**Dr. Joe Sirintrapun:**

So, anyway, so how about the next question here. And oh, you mentioned a couple, but I'd love to hear a little bit more deeper onto this. Were there any immediate wins your institution experienced?

**Dr. Diana Cardona:**

Yeah, I alluded to the one in COVID. Really, COVID allowed us to really push forward a lot of initiatives that were kind of stagnant because of competing priorities. And so, I do think that we were able to create that hyperlink, create the tracking, all the things that I'd mentioned before because of COVID, to be very honest, to help me have the power, and the support to push it from an IT perspective. I would say the other major win, which was an initial return on investment that we could sell to the health system was historically we would recut every single case that we would send out to another institution. That was just a policy that we had at Duke where we felt it was our responsibility to care for the original glass lives. And so, we always would recut every case for a second opinion, for referrals, for whatever the case may be.

That was a tremendous burden on the lab from a resource perspective. And as staffing challenges started to grow, and trying to be more fiscally responsible, it was one of those things where I'm like, "If you guys get me the scanners, I can just scan the original that way we always have a copy of it, and then send the original. We would save time on the staffing perspective. We would save money from a supply perspective. We would actually turn around the cases much, much faster," which is a huge patient satisfier. I mean, there were times where patients are like, "I'm going to be in scene tomorrow, and they still don't have my pathology." And so, that has stopped. We don't have that issue anymore.

And then, it also directly helped us start building our digital archive. And as pathologists then had access to cases that were in archives, when they had a new biopsy or whatnot, again, that was just one of those wins from their perspective that they didn't have to wait for archives to pull the case, and send it to their office to look at. They had it immediately accessible when they were reviewing the new case. And so, I think all of those were little tiny wins as a return on investment for that initial infrastructure build.

**Dr. Joe Sirintrapun:**

Yeah, I mean, we had the same wins, too in terms of just having the immediate availability. We basically reduced the number of FDS in our slide file room to be doing that. And also during frozen sections, not having to go to the slide file room was just a big plus. Or when you're reviewing a resection, not having to go to a missing slide or case when you want to review the biopsy, those are all just wins from the pathologist's perspective.

I think from the institutional perspective, for us, just like you mentioned, we actually did a study I think a couple of years back, and we saw our turnaround time actually get better. Our resections actually went down by a third in terms of turnaround time, because we actually could review the prior pretty closely. And we also showed that IC went down. So, from an institutional perspective, you save money, you increase turnaround time. So, it's pretty much there. Digital really does help even on the enterprise wide level, not only from the pathology standpoint. Let me ask you this, what was your first experience with digital pathology?

**Dr. Diana Cardona:**

It's so funny, because when I hear the term digital pathology, I feel like people think it's something new. But we've been doing it for a while. Even as a trainee, and I'm not going to say how many, many years ago that was. I remember doing ER/PR on digital, and using algorithms to do the quantification or the just maybe quantifying, and categorizing the score for ER/PR. And then, that went into Ki-67, and more recently, probably in the last seven years, then we started doing it for FISH, where FISH for solid tumors were using scans, and algorithms to help breed those out. So, I feel like, I mean, those were my first experiences was using those specific use cases. I feel like digital is really not new. We've just obviously improved technology to allow us to expand its scope, which is what's exciting, right? Because it's like, "What's coming next, and what can we do with this improved technology?" But yeah, I feel like everybody has experienced, in some fashion, with digital, even if they say they don't.

**Dr. Joe Sirintrapun:**

I think that's true, too. People don't realize that they've had it the entire time. We've just ramped it up in many different sectors, and people just think of those fancy things. But we've had stuff, I mean, even the old cameras that we use in our microscopes are digital. I still remember the days when we had film, and I take the film out. Or when they had the little SD card, that's the other one too, the SD card.

**Dr. Diana Cardona:**

Yes.

**Dr. Joe Sirintrapun:**

That was just something that was god awful that you had to take that out, and if you lost the SD card, but that's digital too.

**Dr. Diana Cardona:**

Yup.

**Dr. Joe Sirintrapun:**

So, yeah. So, we're tying things up here, but let me ask you put on a futuristic hat on this one, but where do you see digital pathology heading in the next five to 10 years?

**Dr. Diana Cardona:**

Yeah, that's the exciting question, right? I feel like I definitely expect to see much more widespread use in all practice settings, even private practice where I feel like right now I hear from them, at least in my state here, that it's cost prohibitive, and they're not quite sure they could ever define that return on investment. I think that's going to change. But what I hope develops, and this is really my hope for the future, is that the tools that we start developing really starts providing information that our eyes alone currently don't provide. And it could start out initially as prognostic or predictive type data points for our patients, and for our treating colleagues.

But eventually, what I really hope is that it's going to predict information now that our colleagues rely on really costly molecular tests to give them. And if we have algorithms that could help us avoid that costly testing, which is just proliferating nonstop, we're constantly getting new tests that are oncologists, and rheumatologists, and cardiologists, I mean, it just goes on, and on, want to do on this pathology, which is becoming an issue from a size of tissue perspective, not only just a cost perspective. But I feel like if we can develop algorithms that really help us reduce those costs, and help mitigate the need for those costly testing, then that's when the institutions will definitely see that return on investment. If we can avoid costly testing, and provide them the same, if not better information diagnostically, then that's a huge win-win. And so, that's what I hope we start seeing from an academic research perspective.

I know there's all the algorithms that exist on helping you be better at diagnosing, let's just say prostate cancer. And sure, there might be a little bit of a delta there that might help our pathologists. And my fear in that is the claims that these algorithms are going to make you faster. And if we start talking about algorithms making us faster, if it actually pans out to be true, that's actually going to hurt us in the end, because we are only going to get paid less. If you think about CPT codes, and how that works, the coding is based on the time and effort involved in rendering that diagnosis. And so, if you tell CMS that, "Hey, I can do this now faster," in their mind that just computes to, "Then that means I can pay you less." And so, anytime I'm meeting with vendors that say, "Oh, it's going to make you faster," I always tell them, "Please, please, please, don't use that as your selling point, because at the end, it's only going to hurt pathology." It really is. It's making us more accurate. It's providing information that we wouldn't otherwise be able to give our patients. So, I'm hoping that that's the dialogue, and the discussion that takes place.

**Dr. Joe Sirintrapun:**

Oh, I hear you. And yeah, actually the reasoning behind that, the efficiency, and that sort of thing, those are certainly true unintended consequences. And I pay attention to a lot of unintended consequences when something new is disruptively being introduced. And I think you are definitely onto something. But likewise, the additive parts being able to go beyond what we as human experts can actually provide, even additive. Because I think we'll still need the contextual aspect of it. They might provide extra information, but it has to be within context. And this context is the part where the human experts, and the people that really know from medical knowledge-wise, we can provide the right framework to apply the algorithm.

Otherwise, these algorithms are just sort of unleashed autonomously. They don't necessarily know when to actually work, and when not to work. And I think it's us as the experts to be able to guide that. And I think that's where we come in. They can provide these additive, but we sort of point them in the right direction. We can actually use them under the right setting. We would look at the morphology, and then say, "Okay, this is the appropriate algorithm to give us the right predictive information," rather than having the AI dictate everything. I think that's where there's a lot of wins.

And I really liked your idea about cost savings. Because I think that's where healthcare is going. Everybody's trying to cut costs, and I don't see a lot of research yet, but I think as reimbursements and everything gets strained, you'll see a lot of effort in looking at how we can look for cheaper ways to do it. And I think AI, on some of the specimens that we have, is a good opportunity to actually do cost savings. So, thanks for that insight. So, I think with that note, I'll turn it over to you to Becca, in terms of closing things up.

**Becca Battisfore:**

Thank you. And I want to thank you both again for joining the podcast to talk about your experiences and insights. And I want to thank you all for listening to this CAPcast. To learn more about digital pathology, the digital, and computational pathology committee has a great resource center on the CAP's website. The link to that will be in the episode description. And for more information about the CAP, visit CAP.org.