

The Path to Digital Pathology: IT-enabling Image and Report Access across the Enterprise

By Mary C. Tierney, MS

A vision starts with a need, quickly followed by a question—how can we accomplish it? At Hospital for Special Surgery (HSS) in New York, the vision to initiate digital pathology coupled with fully integrating radiology and digital pathology images in one enterprise imaging (EI) system started seven years ago. They went live in February—the first U.S. installation of Sectra's Digital Pathology Solution at the No. 1 orthopedic hospital in the country, 10 years running.

Ever the pioneer, HSS had the boldness to pilot and partner with their digital pathology and enterprise imaging provider, Sectra, and Epic their EMR provider to plow the integration path for half of the nation's healthcare systems ready to do the same. HSS did the development work that other healthcare systems can leverage too. If you're looking to adopt digital pathology for primary diagnosis, reporting and correlating images from radiology, pathology, and other image-rich specialties for the same patients in the same interface, the IT team at HSS has plenty of good advice to pass along.

This is HSS's digital pathology IT journey. Check out the benefits on the clinical and patient care side that we profiled here.

Where will turns to way

The vision was that of Inderpal Kohli, assistant VP, clinical applications & training who leads the IT project team. But he knew making it happen meant a commitment from the healthcare system and gathering in-depth clinical experience. Thomas Bauer, MD, PhD, joined HSS in 2017 as the pathologist-in-chief, bringing with him a long history in orthopedics and digital pathology at the Cleveland Clinic where he co-pioneered the field in the department of pathology there. Renee Slaw, MBA, FACHE, assistant director, pathology & laboratory medicine who was at his side over that decade



of discovery and deployment, also moved over to HSS from the Clinic.

“Utilizing digital pathology for primary diagnosis needs to be a shared passion of pathology and IT,” as Kohli says. “From the IT side, it was a close collaboration and teamwork with our vendors that made primary diagnosis happen. There’s a distinct benefit in using one infrastructure to save and access images across all specialties with enterprise imaging.”

The EMR needed to be the source of truth in accessing all patient data. But the HSS team quickly realized the EI platform needed to be the source of truth for pathology images and reports, like it was for radiology. They needed two links. One seamlessly integrates images in the pathologist's existing workflow in the laboratory information system (Epic Beaker), while the other allows any physician across HSS with

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permission to see when pathology images are available in the patient's EMR.

Over a year and a half, HSS's IT team worked alongside Sectra and Epic developers to create interfaces between their slide scanner (Leica/Aperio CS2), Epic Beaker LIS, and Sectra EI system that has managed radiology images since 2007, and now includes pathology images. One database for all.

This allows pathology assistants or pathologists to scan a microscope slide and upload it directly to the EI system. Quality of the tissue scan is essential, as is including all the tissue on the slide for scanning.

Once in the EI system, orthopedic surgeons, radiologists, rheumatologists, infectious disease, and other specialties with permission can view and navigate the entire digital slide while simultaneously viewing radiology studies. This better access opens up the ability to confer on cases from any location and among physicians. Instant viewing of previous cases also is an advantage and far easier and time-efficient than having to retrieve slides from long-term storage.

"For patients with multiple surgeries and multiple pathology cases, physicians can see the progression or the difference," as Kohli adds. "It's a time saver and offers better efficiency so the physicians appreciate that."

HSS has accomplished its goal, but most importantly they've cut the trail so other healthcare systems can deploy digital pathology and EI too. "Now U.S. organizations that share the same EMR can take advantage of our work," he says. "Our systems speak well to one another. Other healthcare systems and hospitals wanting to do this need only to work through their own configurations, not development."

Here's what the HSS team did—so other IT teams don't have to

Like many healthcare systems, HSS's clinical team started using digital pathology in research first. That was in 2017 shortly after Bauer and Slaw joined HSS. The healthcare system purchased a slide scanner from the Cleveland Clinic that both were quite familiar with. It was a

Along the way... the lessons have been many

As Slaw says: Writing procedures for scanning and fine-tuning the workflow are essentials. New slide etchers help in labeling slides with 2D barcodes read by the slide scanner and EI system. "PACS reads that and it looks in Epic Beaker and says, 'I have an order for that. It belongs to this patient.' The images are then saved in PACS."

"Two screens are more efficient than one, one for the EMR and one to review images," Townsend notes. "It's keeping Epic up on their main monitor and opening slides on their second monitor. It's all geared toward not changing their workflow too much."

Starting small has its advantages. HSS has one pathology lab. "We're in a prime spot to be able to do this because we're small," Slaw points out. "That's one reason we are more at this cutting-edge point than most very large hospitals. We don't have a huge number of slides per case. We're doing orthopedics, so we get soft tissue and bone and not many frozen sections. One lab is easier too than managing many sites or large geographies."

"Teamwork was the key," Gallego chimes in. "It was a lot of work by a lot of different people, but well worth the time spent to advance patient care."

Being virtual is a superpower. HSS pathologists can now work anywhere. "Sure, we are one hospital, one campus, with all six pathologists pretty much in the same space. But they don't need to be," Slaw says. "And God forbid, there's another COVID lockdown and everyone needs to be remote, it will have no impact on patient care."

Infrastructure matters. To accommodate very large digital pathology images, HSS had to scale up their storage capabilities.

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stepping stone toward primary diagnosis. But first they had a few challenges to conquer, namely interfacing their scanner and image management systems and transitioning their pathologists to reviewing digital cases.

Creating those interfaces grew out of a conversation Kohli had with folks at Sectra, HSS' long-time radiology PACS provider that has many digital pathology installations in use across Europe and Canada. "They showed us their software works with our Leica scanner and more importantly that they would work with us to integrate with Epic EMR, our source of truth," he recalls. "FDA approval in the U.S. was still a ways away but we were willing to work through a pilot."

That was 2018. HSS, Sectra, and Epic soon started building the interfaces to allow HSS to centralize on one platform for radiologists, pathologists, orthopedists, surgeons, and rheumatologists to view and correlate all types of images in a patient record.

"Most of our effort was to create this experience and not interrupt physician workflow by having to look in different systems," says Robyn Townsend, the assistant director of clinical applications who oversees applications for lab, pharmacy, and infection control.

They needed to develop two hyperlinks. One to notify the pathologist, via a microscope icon, that images were available for viewing in PACS, and another to allow all physicians across HSS to access all images in an electronic patient chart.

Townsend took the lead on coordinating and managing the project between all the vendors, along with Senior System Analyst Gordon Koch, who worked on the Epic integration engine and Senior Analyst Corina Gallego who worked on the lab system, Epic Beaker, for anatomic pathology. Slaw also had a lot of experience and understanding of the workings of the lab and pathologists from her time at the Cleveland Clinic.

"We started in December 2018, with a lot of help from Epic," Gallego notes. "We worked hand-in-hand to accomplish what we did. There was a lot

"Organizations need to budget and plan for this because it is needed and represents a significant cost," Townsend says.

Consultations are a growth area. Physicians across HSS now have the ability to offer and see consults quickly. "Since images are digital and so easily shared, physicians can consult far and wide. I think most often offering advice on cases, but also gathering opinions," Slaw says. And as Kohli adds, "Our expansion plan is around a hub and spoke model, with a main campus and the ability to reach out to the community and expand our partnerships. Being fully digital makes this work."

One image management system improves efficiency and saves time. "I like that we don't have to go out and train 3,000 or 4,000 clinical users in the organization how to access and use images," Kohli says. "They already know how. This takes us to the digital level of image sharing, research, and teaching. The goal was to really consolidate all imaging in one system. We've done that—for ourselves as well as any hospital or health system going ahead with Sectra and Epic combination. We've laid the road very well with a working model which can be rapidly deployed. Our vision has enabled everyone's new reality: digital images across all specialties."

of work on files, tables, and interfaces to mesh this together."

The HSS team ran the pilot in close interaction with a project team at Sectra and reach outs to Epic when needed. Gallego worked with a technical support contact specialized in Beaker, and Koch had a corresponding technical support resource specializing in interfaces.

Sectra set up the storage. They also did all the configurations for who can do what roles and how much they're capable of doing, Slaw explains. "We got that set up in research with Corina's help in histology, and made test slides

to be make sure the scanner and images were working from PACS.”

On the clinical side, Bauer started scanning slides and sharing images of interesting digital pathology cases with a variety of physicians. He also interpreted a limited number of scanned images for diagnosis. He started conferring remotely with orthopedic surgeons and radiologists, no longer needing to be in the same room on opposite sides of a two-headed microscope.

Then came a pandemic, and two breakthroughs. Early April brought the FDA clearance of the Sectra Digital Pathology Solution and HSS fast-lined the purchase of the FDA-cleared, higher capacity Leica scanner (Aperio AT2 DX) to improve care in a now-more-often remote environment. An FDA emergency use authorization (EUA) also allowed the HSS pathology team to read remotely via images from the AT2 DX scanner. By October, the next-gen scanner was up and running—and by February, vision became reality as HSS turned on primary diagnosis. “In terms of timing, we’re right where we wanted to be,” Kohli says.

Physicians and caregivers are where they want to be too, with a new tool in their arsenal to improve patient care. “There are so many things the physicians tell me they are glad for,” Kohli says. “Surgeons are now showing patients or their families the digital pathology images to

explain a condition. They’ve never had that before. That expands patient and family education significantly.”

And the list goes on from there. Efficiency is greatly enhanced with pathologists now able to work from home and no longer needing couriers to deliver glass slides. They also see benefits in extending the reach of individual pathologists in covering more hospitals or geographies and streamlining remote conferences, consultations, and correlations among physicians within HSS. “The accuracy of diagnosis too can be enhanced, many of our physicians agree,” he notes. “Think of it, even if this changed one diagnosis for one patient and made a difference in that person’s care. This is all worth it.”

Opportunities could open too in expanding HSS’ referral reach across the country or even world at some point. They’ve got no firm plans yet, but have the capacity and expertise to see that evolve in the future.

“With one system, common tools, and a common interface bringing more data to physicians’ fingertips comes more data-rich decision-making for patients,” Kohli says. “This enhances the care HSS can offer as well as our digital front door strategy and services. Where is there unmet need? We can help in consulting, education, and therapy. We’ve only just begun to truly understand how this will change and improve the care we provide.”