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Insight Report: Digital Pathology



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Pathology Is Going Digital: Lessons from Early Adopter

By Dave Pearson

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Five years ago, two key takeaways from a survey of their pathologists sent NorthShore University HealthSystem toward the front lines of a technological revolution: digital pathology.

The team almost unanimously agreed that, first, it was time to consider AI as an aid to microscopic tissue analysis. And second, 73% wanted the flexibility to work remotely at another site or at home, at least sometimes, via telepathology.

Together, they set the ball rolling on their path to digital pathology, also known as whole slide imaging. While whole slide matters, it's imaging that does the heavy lifting. But how to get there?



“Early on, we made sure system leadership knew this was going to be a big lift,” says Groth, a physician champion helping to lead the health system’s charge into digital pathology. “They understand that whole slide imaging is a piece with a bigger vision of technology adoption.”

Pathologist John Groth, MD, Endeavor Health

In a nutshell, digital pathology includes acquiring, managing, sharing and interpreting pathology information, including slides and data, in a digital environment. Traditional glass slides are captured with a scanning device to provide a high-resolution digital image or digital slide that can be viewed on a computer screen or mobile device. High-res monitors replace microscopes for pathologists diagnosing disease via digital images. While slides are tucked away for safe-keeping, pathologists’ new workflow mimics that of radiologists reading CT, MRI and ultrasound images.

Because whole slide images are both highly magnified and easily focused on minute areas of interest, digital pathology aids diagnostic accuracy, measurements and calculations while boosting efficiency and productivity. It also simplifies and speeds collaboration among pathologists and subspecialists opens access across diverse geographies to improve care (experts can be across town or across the globe) and reduce patient wait times.

At NorthShore, the physician feedback signaled the march toward digital pathology had become inevitable, if not imminent. And there was more.

The need for a new strategy also spurred vocal support from pathology stakeholders beyond the MDs. Nonphysician leaders, administrators and department staff piped in, calling for modernizing the handling and management of cumbersome, fragile and constantly accumulating glass slides.

Meanwhile, the department as a whole had long wished for fresh thinking on microscope maintenance, pathologist ergonomics and service contracts for microscopes and other lab instruments.

Whole slide imaging is the answer to all these concerns.

Phased Adoption

As it happened, a 2023 merger made NorthShore University HealthSystem part of the newest (and third-largest) health system in Illinois, Chicagoland-based Endeavor Health. The bold new identity has indirectly motivated the push for modernization across the enterprise.

Despite all the momentum, progress toward the specialty’s future has been slower than the department might have liked. But no one is dispirited. As Endeavor Health pathologist John Groth, MD, puts it, the journey from manual to digital is one of learning—and investing—in discrete and planned phases.

In fact, he says, Endeavor Health Pathology still needs another two years before going fully digital.

“Early on, we made sure system leadership knew this was going to be a big lift,” says Groth, a physician champion helping to lead the health system’s charge into digital pathology. “They understand that whole slide imaging is a piece with a bigger vision of technology adoption. For example, we’re already using technology to innovate new modes of specimen collection and optimize tissue segments for analysis.”

From there, Groth says digital pathology will be a natural next step toward applying clinical AI algorithms, generating automatic and physician approved reports and even implementing in vivo microscopy during patient procedures.

“Exploring and embracing new and emerging technologies is all about equipping pathologists for answering questions from patients as well as referring physicians,” he explains. “We believe these new toolkits will greatly help us perform those primary duties to the best of our abilities.”

ROI Realism

So five years in, why is Endeavor Health’s pathology department still talking about whole slide imaging in the future tense?

Mostly because the transition is costly, to say the least, while short-term ROI and long-term benefits aren’t always clear on the front end.

Theoretically, all that’s needed to become a digitized pathology department are two commercial products—a slide scanner and an image-management system with a built-in or aftermarket viewing application supported by data storage and infrastructure to manage images long term. The image management systems long used in radiology are called PACS (picture archiving and communication systems) or enterprise imaging when multi-specialty images are managed such as cardiology, orthopedics and now digital pathology. In fact, many pathology departments are taking advantage of their existing enterprise imaging solutions that bring the advantage of one searchable, cross-functional system for all ‘ologies. Artificial intelligence and other aids for streamlining workflow and optimizing accuracy are add-ons.

In practice, however, the transition is quite involved. A slow trek seems the norm. The lag is especially pronounced when viewed alongside radiology, in which PACS and digital imaging equipment have been ubiquitous since the early 2000s.

“Pathology departments have distinct needs for digital pathology systems, yet the cost of digital workflows is cited as a major barrier for widespread adoption by many organizations,” according to Orly Ardon, PhD, MBA, and colleagues in the pathology department at Memorial Sloan Kettering Cancer Center

(MSKCC) in a study published in the *Journal of Pathology Informatics* in 2023.¹

An early digital adopter—MSKCC been making “incremental investments” in whole slide imaging for more than 15 years. In the study, the authors share their own experiences and itemize real-world expenses they’ve incurred on the road from manual to digital pathology.

Dollars for Digitization

Among the largest line items in Memorial Sloan Kettering’s annual spend on digital pathology in 2021 (as percentages of total digitization budget for that year) are these portions:

- **33%**—IT infrastructure, storage, hardware and software
- **21%**—Scanner acquisition
- **21%**—Direct labor cost for digital pathology support team (slide handling, image uploading, lab device maintenance and related tasks)
- **10%**—Scanner service
- **10%**—IT support staff for ongoing technical support
- **7%**—Staff and faculty engagement in the digitization project (identifying technologies, evaluating vendor solutions, securing institutional funding)

As for hard dollar numbers, annual examples from MSK in 2021 include:

- **\$7.5M+**—Cumulative estimated cost of MSK’s high-throughput scanner purchases (2006–21)
- **\$2.5M**—Annual slide handling costs that could be minimized or eliminated with digital workflows (searches for lost slides, legal glass slide requests, transfer of slides by pathologist office coordinators, collation of slides before pathologist review, any legal costs associated with lost slides)
- **\$1.6M**—Annualized data center costs (capital expenditures with a 5-year straight line depreciation and the ongoing need for increased data storage)

- **\$1.3M**—Additional annual slide handling by pathologist office coordinators (using hybrid of manual handling and digital workflows during transition period)
- **\$1M**—Per-petabyte annual cost for on-premises storage infrastructure (including redundant storage)

Speaking of data in big bytes, Endeavor Health's Groth emphasizes that data storage and management are key elements in every successful digital pathology implementation. For that reason, he says, "a close working relationship with IT is critical."

Then too, institutional leadership is attuned to listen for big numbers, he suggests, when asked for buy-in on major technology upgrades.

Prioritizing Patient Care

Of course, simply describing the scope of the undertaking won't persuade any C-suite to approve a digital strategy budget from the pathology department. Equally important, if not more so, is laying out the benefits, soft as well as measurable.

Here Ardon and MSKCC co-authors cite previous research projecting pathology digitization to yield five-year cost savings of \$12.4 million "based on anticipated improvements in pathology productivity and histology lab consolidation" and of \$5.35 million "due to improved diagnoses and avoidance of unnecessary treatment costs."

The researchers also list improvements in patient care tracing to the development of digital pathology capabilities at Memorial Sloan Kettering. For one, there's the improvement of pathologists' diagnostic accuracy due to the integration of pathology in the EMR. The authors state this has:

- Allowed the integration of computational pathology, including for developing pathology-specific AI algorithms;
- Improved turnaround time to case signout;
- Made pathology images immediately available to referring clinicians;

- Extended availability of pathologist expertise to weekends for difficult cases and emergencies; and
- Made world-class pathology available to underserved populations.

"The return on investment for this disruptive technology cannot simply account for these capabilities," Ardon and colleagues write, "and the effect on patient care is one of the most dominant factors in the adoption of digital pathology at Memorial Sloan Kettering."

Vendors on a Learning Curve

Case studies from Endeavor Health and Memorial Sloan Kettering offer representative but anecdotal evidence of the long lead time many if not most pathology departments need to progress from planning to implementation. A new market study offers a more panoramic view, presenting data aggregated from 14 early adopters.

Released in November 2023, KLAS Research's relevant "Segment Insights" report² shows 93% of the cohort have realized time savings from going digital. Some 77% have improved interdepartmental or external collaborations. And 69% have used whole slide imaging to mitigate the ongoing physician shortage, severe in some areas.

Co-lead author Sidney Tate was impressed to find some pathology organizations reporting efficiency gains of 15% to 20% after transitioning to digital workflows. Other standout groups report taking "overnight leaps" rather than phased approaches into digital transformation, Tate says.

Meanwhile a number of pathology tech vendors tell KLAS they have at least one client digitally diagnosing more than 100,000 cases per year.

"The figures exceeded our expectations," Tate says. "It's going to be interesting to see how these vendors scale their products as the pace of adoption picks up over the next few years. However that plays out, the deepening penetration is a good sign for industry people as well as pathology providers."

‘Still Early Days’

Other inside voices weighing in on the sluggish but steady pace of pathology’s digitization include Michael Quick, president-elect of the Digital Pathology Association (DPA). He recently told a pathology business publication that the association has surpassed 4,000 members and attendance at its upcoming annual meeting will be the highest ever.³

“There are a lot of champions who are moving [digital pathology] forward, excited about the technology and transitioning that into clinical practice,” Quick says before adding that, alas, discussions at general pathology meetings indeed reflect the sluggish rate of adoption across the specialty.

“It’s still early days,” he says.

Nevertheless, Quick says, the level of interest in whole slide imaging seen at DPA surely reflects intensifying interest in digital pathology.

Back at Endeavor Health in Illinois, pathologist Groth is looking forward to the advancement of CPT codes from the Centers for Medicare and Medicaid Services. “The implementation of these codes is part of our ROI strategy,” he says.

At present the number of billing codes available is limited, as CMS is working through details like what kinds of screens pathologists can use for reading images.

“Pathology imaging has largely been the same as it’s been for many years,” Groth adds. “Special and immunohistochemical stains and molecular technologies have advanced our capabilities. And now digital pathology and AI provide us with an opportunity to advance our capabilities to new levels.”

This story was created by the editorial team at Health Imaging, Radiology Business and HealthExec that are all part of Innovate Healthcare’s news sites. Educational support for the series was provided by Pure Storage.

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1. Orly Ardon, Matthew Hanna, et al., “[Digital pathology operations at a tertiary cancer center: Infrastructure requirements and operational cost.](#)” Journal of Pathology Informatics, June 7, 2023.
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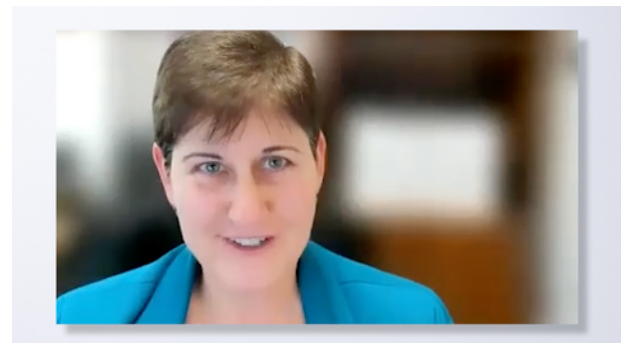
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15 years into digital pathology, Memorial Sloan Kettering offers questions to ask, data to learn from

By Dave Pearson

Q&A with Orly Ardon, PhD, MBA, Director of Digital Pathology Operations at Memorial Sloan Kettering Cancer Center



With more than 7 million digitized slides on hand, the pathology department at Memorial Sloan Kettering Cancer Center in New York City represents one of the largest repositories of whole slide images in the world. It's no surprise the library is so large, as it's been accruing new images since 2008. And with total case volumes exceeding one million slide reads per year, the inventory continues to grow at that scale.

What's more, because Memorial Sloan Kettering is entirely focused on cancer, many of the images are of rare or otherwise unusual samples. This makes the collection important for academic pathology professionals involved with teaching and research. And indeed, for most of its 15-year history, education and research were the repository's primary reason for being and growing.

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That changed in 2020. That year, during the COVID-19 pandemic, the department validated its digital pathology systems for clinical practice. It did so to the satisfaction of the New York State Department of Health, which cleared it to proceed on a test basis.

In 2023 the team knew it was time for a deep dive—what had they learned, how much had it cost, how are resources being allocated and how to garner C-suite support? And they knew many other programs were asking the same questions without the experience to answer them. They fleshed all of that out in a comprehensive study that's been the buzz of pathology, published in the *Journal of Pathology Informatics*.¹

The study's lead author, Orly Ardon, PhD, MBA—Memorial Sloan Kettering's director of digital pathology operations—took questions from *Health Imaging* on operational lessons learned and economic benchmarks set. Here's the conversation, lightly edited for clarity.

Fifteen years is a long time, and your digitization project is still a work in progress. Along the way, how have you known you've been on the right track? [View video](#)

From the beginning, we've been pursuing digitization in increments, taking a phased approach. We started small, using technologies as they became available. Because whole slide imaging wasn't a proven technology when we were just starting out, it was essential to get that all-important C-suite support. So we achieved some small successes and built on them. Institutions starting out today don't require a 15-year development window. They can learn from what others have done, including Memorial Sloan Kettering, and shorten their timeframe.

One thing you have to do, as we've learned, is build a strong business case. You can refine it as you go, but you have to follow it as much as possible. One of the reasons we decided to do the 2023 study was the questioning we were getting from both inside and outside Memorial Sloan Kettering. A lot of people were impressed by our progress into digital pathology, but they wanted to know what it was costing us. When

we dug in deep to get a full and accurate accounting, we realized the data was not readily available.

As we began compiling the data we needed, we quickly saw that, when it comes to disruptive healthcare technologies, there are always different ways to look at making investments and building infrastructure. As we were capturing costs, we realized that there are other costs that need to be included. There are confounding factors like depreciated costs, equipment lifecycle expectations and other variables that aren't easily quantified with simple mathematics. You can't just add up 15 years of investments and think you'll be able to capture every expense instantly.

What you can do is examine one year's costs as a snapshot in time. I decided we would take 2021 since it was recent and, just as importantly, easy enough to analyze for innovation and development costs we had incurred in getting to the state of digitization we were in as of that year.

Your study shows that, in 2021, information technology costs—infrastructure, storage, hardware and software—made up 33% of your total spend. That portion dwarfed slide scanner invoices, staff compensation and everything else. From what you know, is this typical? [View video](#)

I'd say the answer is both yes and no. We're in a unique situation at Memorial Sloan Kettering because we were such early adopters. We needed tools that were not commercially available when we started down this road. For example, because the industry was still in its infancy, we needed a universal viewer that had yet to be developed. Today universal viewers are becoming the digital pathology standard. They're offered by multiple vendors.

We also needed a way to de-identify images for teaching and research purposes. We needed tools to connect the dots between the hardware and the images. That alone required a major investment in infrastructure. And again, we had to take into account a certain amount of the development costs we'd incurred over those

many years leading up to 2021. So our spending for digital pathology has been typical in some ways and atypical in others.

View video

Going forward, I expect we're going to see lower spending on software and technology development, but we have to remember that getting into digital pathology is not just a matter of plugging in slide scanners. Those scanners have to be monitored for image quality, usage patterns, failures and downtimes and so on. You need a lot of IT support. You need integration with your laboratory information system and your image management system. You need to acquire or develop various tools to run AI and other applications. All of these needs have costs, and many, if not most, of the costs have IT components.

Part of the issue is the sheer size of the digital image files, correct?

Yes, that's right. Right now we have about 7 petabytes (PB) of data stored. And data storage size is something that many pathology operations are only now starting to appreciate, from what I've seen and heard. A lot of people are getting sticker shock when it comes to the cost of storage for these files. It doesn't matter if you look at cloud storage or on-prem storage. Either way you go, it's a large expense that many institutions are not prepared for.

The AI revolution is driving pathology departments to start their digital journey sooner rather than later. And AI itself is highly demanding of compute power, infrastructure wherewithal, IT support and all that comes along with those kinds of things. View video

AI is definitely a big reason to digitize slides in the first place. In 2024 and beyond, everyone doing medical imaging of any kind needs to accept the inevitability of AI, and you cannot do AI without digital images. We've developed some of our own algorithms, and we're also looking at algorithms developed elsewhere. We have several algorithms in various phases of testing and adoption.

Your pathologists got a taste for remote work during the pandemic. Is telepathology another motivator for digitization?

Telepathology is definitely something that we can do right now. We have a validated remote sign-out ability. It's a huge plus for our pathologists. And when you think about the global demand for pathologist expertise, especially in underserved regions, telepathology is probably going to grow quickly over the coming years.

As you wrote the study report, what did you discover—or re-learn—about the role of corporate culture and C-suite support in sustaining a long-horizon and investment-intensive project? View video

I think those factors are the deal-maker for all innovation. We all know institutions with similar capabilities. Some have been successful and some have not. And attaining success has much to do with following your original vision. You're always taking the long view of where you can go with whole-slide imaging in service to your parent institution.

If you think about stamina—the ability to sustain a years-long project like this without a quick return on investment—there's really only one end goal that justifies the investment of time and money, and that's improving patient care. All the other benefits may or may not be sufficient to justify the commitment.

In our situation, we talk about the business case regularly. We break down our costs. That was a big reason for doing the study we're discussing here. I needed to write a business plan to expand the project, and I wanted to base the plan on real data. I wanted to be able to go to leadership and explain why we needed what we were asking for in objective terms. We'll have to wait and see how that goes, as our digital pathology adoption journey is still a work in progress. Who knows what the future will bring?

Picture a pathology department at a provider institution with less-deep pockets than Memorial Sloan Kettering. Assume they're mulling a move toward whole slide imaging. What guidance or advice might you offer them? [View video](#)

First, I would point them to our study. It's really hard to proceed when you don't know what questions to ask. You need to understand what you're getting into in order to understand all the components. This was really part of why we wanted to publish this paper—to help other institutions see what you need to think about and look into before developing their business case.

At the same time, it is important to emphasize that the answers will differ greatly among institutions. Every parent institution and pathology department has its own priorities and potential use cases. Some small academic institutions will not need to get into this at the same scale as us.

Regardless, one of the things that just makes sense for everyone is to start small. Nobody has the resources to do everything all at once. You really can't expect to scan every histopathology slide from Day 1. As in other initiatives, you're wise to concentrate on one small goal and show some success, learn from your mistakes, and then build it up just like any other new technology that you bring in. Pacing is important because you don't want to fail. That's why we took a phased approach.

Similarly, in digital pathology, you really want to have that small success to get things going. Focus on just one use case, like scanning H&E slides [which are stained with hematoxylin and eosin, the most commonly used dyes in diagnostic histopathology practice]. Think of something discrete, very well-defined, and what it is that you want to achieve. People at every institution will have to think about their unique needs, their immediate needs. What would make sense to leadership? What would make sense for pathologists? What aspects of the profession are they teaching or researching? With those preliminary points in hand, you can divide your project into phases; once you have

those phases outlined, you can begin to write your business plan.

How far along is your department heading into 2024? Asked another way: When will clinical pathology be 100% digital at Memorial Sloan Kettering Cancer Center?

I think we should be there in the next year or two. Our pathologists still receive glass slides, but we are prospectively digitizing all our H&E slides and a lot of our IHC [immunohistochemical] slides. What we have is a hybrid workflow. Of course, if you think about return on investment, this doesn't make perfect sense. It means we're allowing and supporting traditional workflows at the same time we're adding digital ones. But the hybrid approach lets us make sure all our pathologists are getting comfortable with digital workflows.

As of January 2024, I would say most of our pathologists are opening digital images, but some still refer to the glass slide for sign-out. It really varies from one pathologist to the next. We have some pathologists who are 100% digital or close to it, and we have some who are more resistant to the change. But lately we're starting to see that even they are getting on board.

As a group, how enthusiastic is your team about leveraging this technology to save and improve life for cancer patients and their families? [View video](#)

There's a lot of excitement, and it's not just among the younger team members who grew up with digital technologies. We have some older pathologists who are very excited about whole slide imaging. At this point, I think everyone understands the numerous benefits of the technology. Everyone knows it's the future. It's going to change the profession of pathology. At Memorial Sloan Kettering, that change is well underway.

This story was created independently by the editorial team at Health Imaging, Radiology Business and HealthExec that are both part of Innovate Healthcare's news sites. Pure Storage provided an educational grant but did not have a hand in the content.

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1. Orly Ardon, Matthew Hanna, et al., "[Digital pathology operations at a tertiary cancer center: Infrastructure requirements and operational cost](#)." *Journal of Pathology Informatics*, June 7, 2023.



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The Path to Digital Pathology: 3 Obstacles, 3 Opportunities

By Dave Pearson

It was about 2000 when Yale pathologist John Sinard, MD, PhD, first heard the prediction. “In five years, we won’t be using microscopes,” a respected peer quipped. “We’ll be examining all our slides as digitized images on computer monitors.”

Nearly a quarter-century later, Sinard reports: “I’m at my workstation, and my microscope is sitting right here next to me.”

Sinard’s mistaken colleague shouldn’t be faulted for repeating hype that started circulating around the turn of the 21st century. The only real error in the prediction was the timeframe.

Which is to say that whole slide imaging will indeed transform pathology everywhere pathology is practiced. It’s just taking longer to fully arrive at a national scale than early enthusiasts expected.

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“A lot of people try out whole slide imaging for teaching or research tasks before bringing it into clinical workflows.”

Eder Lagemann, Co-lead Author, KLAS Report on Digital Pathology

Soon to catch up

The pace of digital pathology adoption at Yale has been deliberately slow—cautious, even. Yale-New Haven Hospital is consistently ranked as one of the top academic medical centers in the country. Yale School of Medicine’s pathology operation appears on numerous listings of the best pathology programs in the country.

“The reality is that [even well-resourced] medical centers generally don’t have tens of millions of dollars floating around for investments with uncertain returns,” says Sinard, who founded Yale’s pathology informatics program and serves on the Information Technology Leadership Committee at the College of American Pathologists. “Whole slide imaging costs a lot of money and has a very poorly defined ROI. It’s a tough sell for the leadership of both medical schools and their affiliated hospital systems.”

That said, Sinard knows pathology’s future is digital.

“We were starting down the path in a concerted way when COVID-19 hit,” he recalls. “The disruption put us behind the eight ball. Today we have a couple of slide scanners and some limited data storage, and we’re slowly deploying some individual use cases.”

Yale’s staged entry into the digital pathology arena offers an apt starting point to explore the proposition that, for those mulling digital transformation but not yet moving toward it, every obstacle can be recast as an opportunity. Here are three examples.

OBSTACLE 1: Financially speaking, digital pathology—aka whole slide imaging—is hugely expensive and notoriously ROI-elusive.

OPPORTUNITY 1: There’s no need to go “all in” all at once. Many pathology practices and departments have demonstrated the feasibility—and the strategic soundness—of digitizing in stages undertaken over many months, years or even decades.

In a 2023 KLAS Research study looking at 14 early adopters of digital pathology, most respondents—71%—said they’re digitizing in incremental phases. Only 29% had opted for a “big bang” approach.¹

Among the benefits a phased approach brings, according to the KLAS report:

- Pathologists’ comfort with digital pathology develops organically, leading to easier buy-in from a diverse group of pathologists.
- Issues are addressed in smaller groups before broader rollout.
- Approach requires less capital expenditure up front (organizations can begin with fewer slide scanners).
- Less-disruptive approach to workflows; scanning can be gradually increased.

“Most pathology departments purchase the components of digital pathology separately” as a comfortable way to spread out the cost of entry, says Eder Lagemann, co-lead author of the KLAS report.

Lagemann says slide scanners of the size needed for large academic medical centers run roughly \$300,000 apiece, and most departments need several.



“So far there’s no AI that produces real dollars. The main argument for going in this direction is that AI is coming and will revolutionize the field.”

John Sinard, MD, PhD, Founder, Yale pathology informatics program, Yale School of Medicine and Member, Information Technology Leadership Committee, College of American Pathologists

Other obvious costs include an image management system (IMS), often called PACS for picture archiving and communication system or multi-department enterprise imaging system, which render the scans for viewing on a monitor. Image-viewing software needs some serious compute power, so it’s usual to have to buy new computers as well as medical-grade monitors.

The image management system may have some storage capacity, but for long-term archiving of the very large files generated by whole slide imaging, dedicated storage solutions—on-prem, cloud or hybrid—are must-haves.

For a large academic medical center, the initial price tag for all of this is probably going to be around \$5 million, Lagemann estimates. “Then again, those who want to adopt digital pathology in phases can buy a small scanner for maybe \$50,000 and learn the technology that way,” he says. “A lot of people try out whole slide imaging for teaching or research tasks before bringing it into clinical workflows.”

OBSTACLE 2: Members of hospital leadership perceive the digitization of pathology as driven more by intra-specialty peer pressure than by sensible business planning.

OPPORTUNITY 2: Yes, ROI data is sparse at the specialty-wide level. However, there’s enough anecdotal evidence to build a winning business case for supporting the journey to digital pathology and, with it, pathology AI.

In the 2023 KLAS study on the state of digital pathology, 93% of the 14 early adopters included reported significant time savings. In addition, 77% saw improved clinical collaborations, 69% used the technology to

mitigate a pathologist shortage and 64% improved their diagnostic accuracy.¹

Importantly, the study authors note a strong positive correlation between diagnostic accuracy and AI deployment. In fact, the association is more than strong—it’s exclusive. Most organizations that aren’t leveraging AI report that pathologist accuracy is no better with digital slides than with glass slides, the authors report.

AI isn’t doable without digitization, of course. This point alone may be enough for the many healthcare C-suites that have already gotten comfortable envisioning clinical AI applications as essential to healthcare’s future.

Meanwhile, those who follow the investment markets in pathology probably already know about one pointedly AI-motivated acquisition announced in November 2023. That’s when Australia-based Sonic Healthcare said it was buying “unprofitable” Pathology Watch of Murray, Utah, for \$150 million.²

Sonic CEO Colin Goldschmidt called the acquisition “an enormously exciting step in Sonic’s transition to digital pathology and pathology AI,” adding that the transaction “offers multiple avenues for value creation.”

Commenting on the deal, Robert Tessier, co-founder of the Panel of National Pathology Leaders, points out that Pathology Watch has current yearly revenues of “only” \$15 million and has barely been breaking even.

“Sonic Healthcare must believe it’s going to have a very significant return on its \$150 million investment over time,” Tessier says. “I believe they expect AI will boost productivity in pathology in a time of potentially worsening pathologist shortages.”



“The answers to some key questions around storage aren’t as clear yet for digital pathology. There are still a lot of proprietary image formats floating around, so there’s the question of how to bring in proprietary image formats. That’s one key question right there. We think the answers will come as providers work through the pathology portion of their enterprise imaging strategies.”

Sidney Tate, Co-lead Author, KLAS Report on Digital Pathology

Yale’s Sinard points out that, so far, the only pathology AI application that has FDA approval and is in relatively wide use is Paige Prostate, which flags areas of interest on prostate biopsy images.³ But he’s not skeptical about AI’s likelihood to penetrate pathology across the board.

“You really can’t argue against the sort of efficiency claims that say, ‘If we scan whole slides, tumor boards will be easier to do,’” Sinard offers. “Or ‘We won’t have staff constantly pulling glass slides. Slides won’t get lost as frequently. And in emergency situations, we’ll be able to view slide images elsewhere.’”

Until CMS issues a full set of CPT codes for reimbursing the use of AI in pathology, the technology’s ROI will come in “a lot of these soft things,” Sinard says. “So far there’s no AI that produces real dollars. The main argument for going in this direction is that AI is coming and will revolutionize the field.”

That’s a hard argument to counter, he acknowledges. And this alone makes the case for taking steps toward digital pathology sooner rather than later, he suggests.

“If one has not built the infrastructure and acquired the experience of working with whole slide images,” Sinard says, “one is going to be left way behind when that [AI revolution] happens. AI will not replace pathologists, but I definitely see a future in which pathologists work with algorithms to deliver higher quality patient care.”

OBSTACLE 3: The necessary spend on IT alone—enterprise-level infrastructure and storage as well as department-specific computers and software—is exorbitant.

OPPORTUNITY 3: The overall spend for digital pathology can be strategically navigated between a.) the best scanner supplier, b.) the best image management system vendor and c.) the best storage and IT infrastructure partner.

It’s true that IT tends to consume the largest single area of budget expense for digital pathology transition. This was borne out in a recent single-site study at a large tertiary cancer center in New York City.⁴

Relatedly, getting a full picture on infrastructure planning calls for factoring in network bandwidth, as moving around large digital files can present a special problem for departments housed in old buildings with outdated cabling. Pathology leaders at a large integrated healthcare system made note of this need as an important aside when they catalogued their saving of around \$12.4 million through digital pathology implementation. They credited the financial gain mostly to improved pathologist productivity and histopathology lab consolidation (from several hospital-based labs into two main labs).⁵

The good news is that the researchers and other experts agree: All challenges related to IT and infrastructure for digital pathology can be met by picking the right industry partners.

For starters, slide scanner purchases and service contracts can be straightforward, budget-driven decisions.

Shopping for image management and storage solutions, on the other hand, is more involved. It entails looking for industry partners who will work closely with pathology physicians and staff and IT teams over time.

A good place to start is with the 2023 KLAS Research report on digital pathology. The concise document looks at KLAS-validated IMS vendors by name and offers tips on vendor selection and management.

On storage, KLAS says most early adopters of digital pathology use tiered storage plans to allow image access for the life of the patient. Generally speaking, the older the images, the less readily accessible—and thus the less costly—they can be. Cloud storage is common for slower-access files, which are often sent to the cloud after living in on-prem hardware for 90 days post-pathologist interpretation.

“Outside of whole slide images, there is much more that can be stored for digital pathology,” the authors note. “Some early adopters have found it advantageous to store everything pertaining to a patient’s case—including microscopic images, gross images and scanned documents—for easy access across the organization.”

To this point, study co-lead author Sidney Tate adds that KLAS is turning its attention to enterprise imaging strategies—and finding pathology second only to point-of-care-ultrasound in interest levels among healthcare provider organizations.

Pathology naturally comes up in planning for enterprise imaging, Tate believes, because of the massive sizes of the files.

“A lot of organizations are asking: ‘Can my VNA [vendor neutral archive] handle this?’” Tate notes. “Can I really store these big pathology files on top of my images from all the other ologies?”

A growing number of radiology PACS and enterprise imaging vendors are adding pathology to their PACS and viewer capabilities, Tate points out. So many pathology departments are joining in on the enterprise imaging capabilities already being used by radiology, cardiology, orthopedics and others.

“But the answers to some key questions around storage aren’t as clear yet for digital pathology,”

he adds. “There are still a lot of proprietary image formats floating around, so there’s the question of how to bring in proprietary image formats. That’s one key question right there. We think the answers will come as providers work through the pathology portion of their enterprise imaging strategies.”

At Memorial Sloan Kettering, one course-altering lesson involved the need for dedicated staff who could identify digital pathology technologies to acquire and then evaluate proposals from bidding vendors. These team members also led the effort to secure institutional funding.

Facilitating this slate of duties meant accepting an additional category of labor cost. In the end, the researchers suggest, the technological deliverable was worth the human investment.

“These innovators,” Ardon et al. write, “dedicated time and efforts that resulted in the early adoption of digital pathology at Memorial Sloan Kettering.”

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