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Advancing Disease Research and Drug Development on an Enterprise Pathology Software Platform

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As pathology data informs every drug brought to market, life sciences organizations are increasingly adopting digital pathology to advance data-driven approaches to drug research and development (R&D). Proscia Co-Founder and Chief Strategy Officer Nathan Buchbinder discusses the impact of this technology and why pharmaceutical companies and contract research organizations (CROs) are turning to the enterprise pathology platform to realize the full promise of digitization in this Q&A with Pharma's Almanac Editor-in-Chief David Alvaro, Ph.D. By unifying teams, data, and applications, including AI, the enterprise pathology platform overcomes existing data silos, streamlines collaboration, and unlocks new insights, helping to accelerate timelines, reduce costs, and advance precision medicine.

David Alvaro (DA): Can you give me an overview of the role that pathology plays in drug R&D?

Nathan Buchbinder (NB): Pathology is the study of disease. It plays a vital role in drug R&D, factoring into all stages of the process. Pathology data, which largely centers around tissue biopsies, informs every drug brought to market.

I'll illustrate its impact with a few examples. In discovery, pathology data helps scientists to reduce libraries of thousands of compounds down to a few hundred potential leads to explore further. Toxicopathology studies conducted during preclinical development enable scientists to evaluate the safety and efficacy of these drug candidates in animal models so they can determine which to advance to human clinical trials. In clinical trials, where drug developers learn more about safety and efficacy to work out appropriate dosage levels, pathologists make diagnostic assessments of human tissue biopsies to understand drug response.

What's especially exciting is that the digitization of pathology is enabling it to play an even more significant role in the drug R&D process. Digital pathology has shifted the standard from microscope slides to high-resolution images of tissue biopsies, called whole slide images. Each whole slide image is made up of over 1 billion pixels that tell the story of a patient's disease and contain so much more information than what the human eye can see. They are among the best representations of disease, shedding even more light to bring new life-saving therapies to market.

DA: What can you tell me about the maturity of digital pathology and why organizations are adopting it?

NB: Recent research found that 70% of top life sciences organizations and CROs surveyed have already adopted digital pathology. 95% of organizations surveyed were planning to adopt digital pathology by the end of 2023.

The same research found that 83% of organizations are investing in digital pathology to improve collaboration and operations, and this very much aligns with what we are hearing from our customers. Today's research teams are often widely distributed, and pharmaceutical companies rely on the expertise of CROs that must collaborate among their internal teams and sponsors. Unlike glass slides, whole slide images and the accompanying metadata can be instantly shared in a few clicks, driving efficiency and eliminating shipping costs.

More generally, 80% of respondents view digital pathology as a means of getting new drugs to market faster, and 68% of respondents see going digital as a way to reduce costs. This is hardly surprising given that the average drug takes 10 to 15 years and costs $2.6 billion to bring to market. These benefits, in part, come from the role that AI is playing in unlocking new insights. Life sciences organizations can leverage these insights to accelerate R&D activities, cutting overhead expenses.

There's one last finding from our research that I want to touch on: 53% of organizations that have adopted digital pathology are running on legacy systems that primarily support basic image viewing. I believe that there will be an imminent shift to the modern enterprise pathology platform as life sciences organizations look to realize the full promise of digital pathology today and in the future.

DA: Could you define what you mean by enterprise pathology platform?

NB: Proscia's Concentriq is a great example of an enterprise pathology platform, so let's start there.

Concentriq serves as the place where data lives and work happens across the R&D value chain. It unifies people, data, and applications, including AI, to power diverse workflows, streamline collaboration, and unlock new insights. Scientists and pathologists at 14 of the top 20 pharmaceutical companies and leading CROs rely on it each day.

Beyond offering the functionality that these research teams need to share data and perform their routine analysis, the platform is open and delivers world-class interoperability. This ensures that teams can centralize pathology data from all of the different solutions that they use and incorporate all of their applications into routine workflows. Concentriq is also cloud-native, which helps it to scale to support growing data volumes and teams.

DA: You mentioned unifying data. Data silos are known for impacting many aspects of R&D. Can you elaborate on the challenges they pose to pathology efforts?

NB: Definitely. What I'm about to explain will probably sound pretty familiar since the same situation plays out when it comes to many other types of data. Pathology data has largely remained siloed and disorganized because research teams have traditionally turned to it to answer a specific question during a specific moment in the R&D process. Organizations have lacked a system for centralizing all of their data, and, in turn, they have been unable to leverage it to inform subsequent breakthroughs. This is because most solutions are designed for only one phase of R&D, like discovery or clinical trials.

I like to say that your next major breakthrough lies in the data that you already have. Tapping into these opportunities means that scientists must be able to access all of their organization's pathology data and incorporate it into routine operations. As life sciences organizations look to data-driven approaches to advance precision medicine, centralization is becoming all the more important. This is one of the ways in which the enterprise pathology platform, in serving as a system of record for all R&D, shines most.

DA: Can you look backward as well as forward, to extract more insights from existing data sets?

NB: Retrospective data is just as valuable as prospective data in learning about disease. Many organizations already possess massive amounts of pathology data. Though perhaps a bit of an extreme example, the Joint Pathology Center, one of our customers, has a repository of 55 million glass slides. It is in the process of digitizing them.

There are many ways that more insight can be extracted from this data. Most simply, it can be incorporated into more studies, and this requires that it is easily accessible. Scientists can also apply AI to this data to unlock new insights that the human eye can't see. Very related, this data can be used to build and train new AI algorithms that play a similar role in generating new insights.

DA: Is the enterprise pathology platform designed to allow data access to people who haven't received conventional training in pathology?

NB: While making data more accessible is part of our aim, it's unlikely that someone without training would be able to meaningfully interpret whole slide images. Our aim is for Concentriq to improve access for the scientists and pathologists who can fully tap into this data.

The platform often does so by streamlining sharing among CROs and their sponsors as well as among research teams from the same pharmaceutical company that are distributed across sites. One of our customers, the AIDS and Cancer Specimen Resource, is a biorepository that is using Concentriq to share data with investigators located around the world. It has been able to reduce the time it takes to share pathology data from weeks to days. I should also note that the platform offers robust search and data management capabilities so that data is easy to find.

With that said, there's one exception that I should point out. Concentriq offers developer tools so that organizations can build AI applications using their own pathology data. It makes this data accessible to the data scientists developing these solutions.

DA: Can you tell us more about how AI is impacting drug R&D today?

NB: There are two main use cases of AI that we see in practice today. I've hinted toward one a few times now – applications that unlock new insights that go unseen by the human eye. The other involves process automation applications that streamline manual, repetitive tasks to drive quality and efficiency gains.

Let's unpack each of these use cases in more detail, starting with insight-driving applications. Digital companions, like PD-L1 detection algorithms, are a great example. A landmark 2016 study found that non-small cell lung cancer (NSCLC) patients who expressed the PD-L1 biomarker on over 50% of tumor cells demonstrated longer survival following treatment with pembrolizumab, commonly known as Keytruda, compared to platinum-based chemotherapy.

While it can be challenging for scientists and pathologists to quantify PD-L1 under the microscope, detection algorithms are able to do so accurately and consistently. This information – the presence or absence of PD-L1 – can then help to drive more informed decision making, accelerating the introduction of new drugs, lowering the cost of developing them, and expanding the types of therapies that can be delivered. It can also help to improve the precision of prescribing them.

As for process automation solutions, Proscia's Automated Quality Control (QC) application is reducing the time it takes to perform QC on scanned images. QC is critical because it ensures that scientists and pathologists receive high-quality data. Our AI application is seamlessly embedded in Concentriq and can perform QC about six times faster than manual review. Considering that research teams work with tens of thousands, if not millions, of images, this can potentially shave days off of study timelines. The technicians who previously had to perform QC can also focus their time adding value elsewhere.

With that said, we're only just getting started when it comes to realizing the full promise of AI-enabled digital pathology. Just look at how much the pace of AI development has accelerated in the past year. There's no doubt that new use cases will continue to emerge — some that advance precision medicine, some that automate routine tasks, and others that we can't yet envision today. One of Proscia's imperatives is to make all of these applications available on our platform.

DA: To what extent does your vision align with that of your customers?

NB: At Proscia, our vision is to see pathology play an elevated role in the precision medicine paradigm. Our customers are investing in an enterprise pathology platform to realize the full promise of digital pathology in advancing data-driven R&D, and much of this hinges around bringing new, individualized therapies to market.

Doing so requires them to continue scaling their digital pathology implementations – to incorporate more data, to work with additional collaborators within and outside of their organizations, and to take advantage of new technologies like AI. Our Concentriq enterprise pathology platform delivers this scalability. We've touched on how it supports growing data volumes and teams. As an open platform, it is also designed to integrate with the solutions that you use today — scanning systems, AI applications, and other data systems – but also with technologies that you may implement in the future as digital pathology continues to evolve.

Finally, in driving innovation that translates into the clinic, our customers are helping to generate more data to fuel additional research breakthroughs. The enterprise pathology platform is designed to accelerate this flywheel effect. In addition to sitting at the center of routine research operations, Concentriq is used by diagnostic laboratories to drive their day-to-day workflows.

DA: We have mostly focused on the benefits of digital pathology for drug developers. How is it benefitting physicians on the diagnostic side?

NB: Digital pathology is making a tremendous impact on the diagnostic side. The microscope-based standard of care can no longer keep pace with demand for diagnostic services. There's a growing volume of biopsies to be read as more patients are having them taken and a shortage of pathologists, particularly in some geographies. All the while, patients have heightened expectations of the standard of care given the rise of precision medicine.

Digital pathology is driving quality and efficiency gains. It is enabling diagnostic pathologists to quickly share images with specialists regardless of where they are located to expand access to expertise, just as it is improving collaboration among research teams. Laboratories are also increasingly turning to AI to unlock new, clinically impactful insights that can aid pathologists in making a more precise diagnosis.

DA: Finally, do you have any recommendations or takeaways for a life sciences organization looking to get started with digital pathology?

NB: I can't overstate the importance of balancing your short-term adoption plan with a long-term strategy. Your short-term plan will ensure that your digital pathology investments meet your needs today and enable you to realize the immediate benefits of your implementation. At the same time, digital pathology is evolving so quickly. It's critical that you can scale your implementation to address new use cases, support growing teams and data volumes, and incorporate new technologies. This is how you will realize the full promise of digital pathology over time.

The good news is that there are solutions available that will enable you to do so. Concentriq is one. You should also seek out a vendor who wants to serve as your trusted partner to help ensure your success.

Last but not least, remember that, like any digital transformation, the shift to digital pathology is a journey. When you consider that it's helping life sciences organizations to solve some of their biggest challenges, like the long timelines and high costs of drug R&D, and capitalize on some of the biggest opportunities, like advancing precision medicine, the decision to go digital is really exciting and worth every step along the way.

ABOUT THE AUTHOR

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Nathan Buchbinder is Co-Founder and Chief Strategy Officer at Proscia, a leader in digital and computational pathology, where he sets company strategy and industry-focused initiatives. Under his direction, Proscia's AI-enabled enterprise pathology platform has become the leading solution driving modernization across life sciences organizations and diagnostic laboratories.

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