Getting the most out of going digital: Top 5 tips for digital pathology implementation success

As new paradigms in healthcare emerge, we see a continued shift to outcomes-focused, value-based medicine and collaborative care. Digital pathology is a key enabler of this healthcare evolution. The technology goes beyond the simple digitization of slides and requires integration into existing workflows and development of new clinical models. As such, implementation of this technology should be carefully planned and designed. The team at GE Healthcare along with Omnyx LLC, their joint venture with the University of Pittsburgh Medical Center, have assisted several customers with deployment of the Omnyx™ Integrated Digital Pathology (IDP) system. Best practices shared in this paper highlight key considerations to include when developing your own digital pathology strategy.
CURRENT CHALLENGES IN DELIVERY OF PATHOLOGY SERVICES

Laboratory medicine is an essential element of the healthcare system. Treatment plans and care for individual patients depend on having accurate and timely pathology and laboratory results. The pathologist's diagnostic interpretation is frequently the basis of any further therapeutic intervention, especially in cancer patients. In fact, laboratory findings represent up to 70 percent of the information used in making treatment decisions. Yet this critical service typically accounts for only 5 percent of a hospital's budget.¹

Increasing workloads due to an aging population, workforce shortages and increased complexity in testing have put an additional strain on delivery of pathology services and may affect quality of care. Moreover, geographically-distributed regions face the challenge of providing equitable access to high-quality care to populations in remote regions. Cost-versus-quality pressures require new technologies and strategies that enable productivity and efficiency gains to relieve current pain points in practice.

UNLOCKING THE POTENTIAL OF DIGITAL PATHOLOGY

Digital pathology takes traditional pathology specimens and transforms them into digital images that can be shared electronically by care providers. Recent advances in digital image processing and imaging technology, increased internet bandwidth capacity, and the declining cost of computing have made digital pathology a reality for use in routine practice. Combined with the implementation of electronic health records, the increasing emphasis on cost control and quality measurement, and the move toward coordinated care delivery models, hospitals and laboratories are looking to digital pathology as a way to reduce expenses, optimize quality control, drive operational efficiency, and enhance treatment decisions.

TIPS FOR SUCCESS

Digital pathology is a disruptive technology with the potential to positively change existing paradigms, alter workflows, and transform pathology practice. Implementation is complex and requires detailed planning. There are several considerations to take into account early on while developing a digital pathology plan: in particular, planning and understanding how to interface with current workflow and ensuring IT readiness to implement and scale. Ultimately, to maximize value of the investment and realize clinical impact, organizations must develop new clinical workflows that align with existing imaging processes, thereby increasing collaboration between pathologists and other clinicians, and generating value across the continuum of care.

Here are 5 key factors for ensuring success when implementing a digital pathology solution at your organization.

1. Ensure pathologist satisfaction
2. Evolve laboratory and pathology workflow
3. Transform practice to optimize clinical impact
4. Evaluate alignment to your IT infrastructure
5. Measure success against defined metrics


2. Top 5 Tips for Digital Pathology Implementation Success
Defining your business use case

Institutions will implement digital pathology to achieve the values most specific to their business needs. Early on, develop a thorough understanding of your organization's short- and long-term objectives and then go on to devise a plan to achieve both. Identification of bottlenecks in current workflow and business drivers will help your organization define its digital pathology use case. Drivers may include one or more of the following: need to eliminate cost and risk associated with shipping, improve resource utilization, reduced turnaround time, operational efficiency, elevated consistency and quality of diagnostic services, and expanded service and outreach.

Here are four classic use cases of digital pathology that can impact your organization today:

**Introoperative consultation:** During surgery, pathologists are often called to make a quick determination as to the course of action based on analysis of tissue while the patient is still on the operating table. Response is often required within 20 minutes, traditionally requiring the pathologist to be present on site. With digital pathology, slides can be viewed remotely from the pathologist’s own office, allowing for reduced travel expense, enhanced time utilization, and scheduling efficiencies.

**Expert teleconsultation:** Traditionally when pathologists seek a second opinion, slides and paperwork must be packaged and sent to the specialist, which could increase the turnaround time to diagnosis. Digital pathology allows access to experts in the field for assistance in diagnosing challenging cases. Moreover, increased collaboration promotes knowledge transfer from the leading experts and provides quality assurance of your organization’s most challenging cases.

**Remote telepathology:** Geographically isolated locations have difficulty offering pathology services close to patients’ homes. By virtually connecting remote sites to pathology groups, digital pathology can help to enable equitable access to high-quality care, the same quality of care received at urban centres.

Moreover, pathology outreach can be a revenue generation opportunity for the organization. Digital pathology supports organizations seeking to expand their services and generate additional income through outreach activities.

**Distributed network:** With multi-laboratory consolidation, cases are sent to pathologists at different hospital locations from the centralized laboratory facility. In this situation, electronic delivery of slides could limit slide loss, expedite slide retrieval, reduce shipping costs, and reduce turnaround time.

In a digital environment, highly distributed organizations with pathologists spread across multiple sites could benefit from level-loading workload across their small staff locations. Moreover, a digital workload distribution enables these networks to transform to a subspecialist model, as cases can be electronically routed to the appropriate pathologist expert within the group.

1. **Ensure pathologist satisfaction**

   In choosing the right solution for your organization, one must first and foremost consider the pathologist’s experience and perspective. New technology implementation is traditionally met with some hesitance. Pathologists are very comfortable with their glass and paper workflow, which has been the standard practice for decades. Digitizing a pathology laboratory represents a paradigm shift in which pathologists read digital images on computer screens instead of using microscopes. Digital pathology systems that have the ability to closely replicate current workflow while not slowing the pathologist down may help overcome resistance. Consider applications that are intuitive and have a short learning curve, as these will gain faster acceptance in the department and more quickly realize the value and ROI of your technology investment.

   Image quality is paramount to enabling a pathologist’s ability to make an accurate interpretation. Images must be of high resolution, particularly for reliable identification of sub-micron cellular features such as microorganisms and subcellular structures in the tissue. Images acquired from high-resolution scanners and viewed on high-definition monitors are fundamental to sharp and reliable digital slides for routine usage in diagnosis.

   Image quality is also dependent on the quality of the glass slide. Histology artifacts such as air bubbles, tissue folds, and poor staining could result in subpar image acquisition. Your organization should take the opportunity to analyse and improve histology processes and the quality of slide preparation in the laboratory prior to digital pathology system implementation.

   User satisfaction is central to obtaining successful adoption of your technology implementation. Involving your pathologist group in designing and conducting controlled testing to validate the system would result in increased user acceptance and smoother transition to digital case review. This phase would also serve to mimic how the system is to be used after go-live, boost user comfort with the system, and help identify and resolve any issues before actual roll-out.

   Identify change champions in your department and consider them to be the first participants to be trained and use the system before rolling out to the rest of the department. These champions will help convince their colleagues that making the shift to digital case review will be beneficial to their work, especially in the long run.

2. **Evolve laboratory and pathology workflow**

   Laboratory processes have been designed to prepare tissue and physically deliver glass and paper to the pathologist. In order to realize optimum value of digital pathology, organizations must account for changes necessary for re-engineering this process for delivering digital cases and slides. Identify opportunities for enhancement of current workflow. A digital workflow eliminates the need for manual case assembly and physical delivery of slides to the pathologist, thereby opening up opportunities to optimize resource utilization throughout the digital lab. In addition, Lean-Six Sigma and change management methods could be applied to evolve laboratory processes.
Efficiencies with a digital workflow would be better realized in a continuous workflow environment, compared to the batch-oriented processes practiced in most laboratories today. Scanners with continuous loading technology would additionally support such an environment. A continuous workflow would ensure slides are processed and digitized throughout the day. This would result in a more consistent workload, thereby driving down the number of scanning devices, other laboratory equipment, and staff needed. Moreover, in this environment slides would be delivered to the pathologist faster, potentially reducing waiting time and increasing pathologist productivity.

Installing barcode and tracking systems would also better prepare your laboratory and pathology department for the digital future. Barcodes minimize risk of slide loss, reduce rework, and help enhance efficiency and safety; as specimens and slides can be followed throughout the laboratory.

Furthermore, in a digital world, pathologists would no longer receive glass slides and paper. Consider systems designed to help pathologists prioritize and organize their work and that notify them when digital slides are ready to review.

3. Transform practice to optimize clinical impact

Digital images without the associated case information are meaningless. To bring digital pathology into clinical workflow, your organization's digital pathology strategy must include plans to interface with the existing laboratory information system (LIS) and often the electronic medical record (EMR). With this ability, all pathology information – clinical history, prior case information, gross images, and whole slide images – would be consolidated in one place, simplifying the pathology diagnostic process.

Also look to obtain or develop software applications that support the pathologist's diagnostic expertise by providing precise measurement and image analysis tools such as those that objectively quantify protein expression. In addition, consider applications that allow for easy sharing of whole slide images to encourage collaboration among pathologists. Greater communication will lead to enhanced diagnostic outcomes and better support of treatment decisions.

Furthermore, consider interfacing with the organization's imaging archive (PACS) systems to expand the ability to share information across departments and even across institutions. Anytime, anywhere access to histology images is particularly useful during multidisciplinary tumor boards, ensuring that pathologists have access¹ to information when they need it and can collaborate effectively with their colleagues in the broader diagnostic team.

4. Evaluate alignment to your IT infrastructure

Pathology images, relative to their counterparts in radiology, are very large and will drive the need for extensive storage and information life cycle management. The IT department needs to be involved from the beginning to ensure smooth implementation. Particularly for remote telepathology use cases, IT support would be critical in linking multiple sites and departments and working around access and security considerations unique to each facility. Moreover, collaboration among your organizations' IT groups would be critical for enabling enterprise-wide sharing of pathology images.

While looking for a digital pathology solution, organizations must consider systems that can effectively address concerns around network utilization, storage, security, and system scalability.

Network utilization – Large image files would have an adverse impact on the organization's IT infrastructure as images are moved across the network. In considering a digital pathology system, look for those with efficient streaming technology that would reduce network impact without degrading the pathologist's viewing experience. Also consider a system which is highly configurable and flexible with the ability to distribute image storage, hence limiting the movement of data across the network.

Storage – IT must coordinate with the laboratory to estimate storage needs based on the volume and distribution of cases. In considering systems, look for those with advanced data compression algorithms as this will reduce image size, thereby decreasing storage needs and lowering associated costs. To complement image size considerations, opt for systems that support scalable storage platforms that can accommodate growing needs as your organization scales or storage requirements increase over time.

Also, healthcare organizations are required to save medical records for a specified time. Most pathology images are accessed in the first 30 days to render the initial diagnosis; images can be migrated to lower cost storage after a configured period of time.

Scalability – Consider a system which has a service-oriented architecture, allowing for the replication of services across multiple machines and the ability to scale as your organization's demands increase. This design enables the system to handle larger units of work as more resources are required without deteriorating system response and ensures higher system availability.

Security – As healthcare facilities move towards electronic data to manage patient information, security and privacy concerns come to the forefront. To mitigate these risks, consider systems that provide a highly secure and configurable user authentication and role-based access control (RBAC) and maintain detailed audit trails.

Inevitably, there will be times when electronic systems are not available, requiring robust safeguards to protect data and ensure system availability. Include digital pathology within your business continuity strategy and build backup, redundancy, and disaster recovery plans to reduce system downtime and prevent loss of data. Robust availability and business continuity solutions will become essential as digital pathology is integrated into the operation of the department.


3. Anywhere an internet connection is available
5. Measure success against defined metrics

Define what success will look like based on your organization’s objectives and problems you are trying to solve with digital pathology technology. Build out a plan for measuring success that includes how you determine baseline, track value, and report on results. Assign stakeholders to own these deliverables and use these success measures to evaluate progress and highlight areas for improvement.

Examples of success measures to consider include:

- Reduced turnaround time to diagnosis since digital slides may be instantly available without the need for transport
- Increased funds from revenue generation activities such as consults, in-sourcing, and scanning services
- Increased workforce productivity due to the reduction of rework and redundancies among administration, histology, and pathology staff
- Increased pathologist satisfaction due to efficiency gains inherent with the system
- Increased collaboration with surgeons, oncologists, and radiologists
- Better resource utilization due to the ability to level-load work among pathologists at different locations
- Increased cost-savings realized from reduced shipping and handling of slides
- Cost avoidance by not having to staff remote locations
- Increased access to high-quality care due to access to sub-specialist expertise

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Reporting project progress and success helps communicate real value to all stakeholders involved, ensuring their buy-in and sustainability of the program. Furthermore, following up on feedback received through this process would ensure success of integrating digital workflow into current processes.

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