

The endless applications of Digital Pathology

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What exactly is Digital Pathology and does India need it? Yes. Why? What purpose will it solve and what value will it add to patient management? From simply remotely viewing patient slides, to consulting specialists real time within India and other parts of the world – the applications of digital pathology are endless.

Until the advent of this technology, histological slides and photographs the primary ways images seen under a microscope lens could be shared with others. Digital Pathology eliminates some of the issues associated with sharing slides such as the degradation of samples and inability to share samples. In addition to preserving quality, specimen images can be transferred to colleagues in a timely fashion. It has immense role in Diagnostics – a hospital or laboratory can share images anywhere in the world, possibly decreasing the time it takes to properly diagnose and treat. In addition, using networking tools, multiple pathologists can assure that he/she is discussing the same aspect of the sample. It breaks the geographical barriers and brings experts together in the virtual world even though they are oceans apart and need strong expensive logistics to bridge that distance. For rural areas this will open a new window as they will get access to experts sitting anywhere in the world.

In surgical pathology, biopsied tissue is dissected, fixated, embedded and cut into very thin slices, which are then stained and permanently mounted on glass slides. The slides are then examined by a pathologist under a light microscope to arrive at a diagnosis. WSI, on the other hand, refers to the digitization of the stained tissue mounted on glass slides. When utilizing WSI, the tissue is prepared as it normally is for light microscopy. However, the slide is then converted into a digital whole slide

image that the pathologist views on a computer monitor instead of through microscope oculars.

Digital slides can be reproduced an unlimited number of times which has been a major limitation so far. This is very useful for chronic and recurring diseases e.g. cancer.

In essence, Digital Pathology extends the limits of microscopy, enabling students, educators, researchers, and clinicians to share tissue samples. Images sent or shared over the Internet or through specific analysis software open the path to a new and exciting microscopy tool ensuring optimal patient treatment. It lends algorithmic objectivity to numerous tests that were otherwise subjective by nature and through image analysis software quantification is possible which can be monitored before and after treatment.

Pathology in the near future will provide digitally-enabled services as the norm to provide primary diagnosis of disease, facilitate personalized medicine where therapies are tailored to the individual, extract and analyse data to understand the links between tests and treatments, and to maximize outcomes. It will help pathologist's access prior data and data from a spectrum of different data sites quickly. It will also empower people to manage their own health through access to electronic health records.

In a major breakthrough, it has received regulatory clearance from the FDA (via De Novo classification), marking a significant leap forward for the pathology services industry in the U.S. De novo classification is the regulatory pathway for marketing clearance for novel, low- to moderate-risk medical devices that are the first of their kind. This news has implications not only for improving laboratory workflow and efficiencies, but also for improving the quality and accuracy of cancer diagnostics through computational pathology—an approach to rendering disease diagnoses that incorporates multiple sources of data and uses mathematical models to generate clinically actionable inferences.

Just as picture archiving and communication systems (PACS) turned radiology on its head, this may be about to do the same for pathology. Digitized slides can reduce turnaround times, improve communication between physicians, and are well-suited to computer-aided detection, similar to the technology widely used in mammography.

Pathology occupies a similar role as radiology in hospital workflows, as a referral-based service. As many as 95 percent of clinical pathways pass through the pathology department, according to a 2013 NHS study, so increasing efficiency in pathology can improve the hospital as a whole.

Digital pathology systems have been used for primary diagnosis in Europe for several years. Now that some digital pathology systems have received FDA approval for narrow applications, it has opened up new avenues.

To conclude, Digital pathology is a dynamic, image-based environment that enables the acquisition, management and interpretation of pathology information generated from a digitized glass slide. Healthcare applications include primary diagnosis, diagnostic consultation, intraoperative diagnosis, medical student and resident training, manual and semi-quantitative review of immunohistochemistry (IHC), clinical research, diagnostic decision support, peer review, and tumor boards.