Anatomical Pathology (AP) is undergoing a series of rapid and dramatic changes as new technologies and capabilities arrive to allow pathologists to pursue the same type of dramatic changes that their colleagues in radiology and cardiology have experienced in the last decade. Advances in image processing, internet bandwidth capacity, the declining cost of processing power as predicted by Moore’s law, have coalesced to make digital pathology a reality for use in the pathology lab every day.

A digital pathology system can be expected to improve a lab’s capacity in some or all of the following areas: teaching, remote consultation, remote diagnosis, quality control and quality assurance, whole slide imaging, publications, enhanced reporting capability, research, quantification to assist diagnosis, adherence to emerging guidelines, image archiving, rapid retrieval, and operational cost savings. However there are practical considerations that each lab must review when deciding to implement digital pathology.

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I. Quality Of Image
Pathologists are dependant on the quality of the image presented to make an accurate diagnosis. After all, the image is the single most important factor in an accurate and consistent AP diagnosis. At a minimum, the digital viewing experience needs to replicate that seen when using an optical microscope.

Prospective users must consider factors such as monitor resolution and size, true color reproduction, smooth image viewing, and ease of use when deciding which solution to choose.

II. Physical Size
Laboratories in general and AP labs in particular have limited space, especially bench space. Any system intended for use in the AP lab must be designed with space restrictions in mind. A small footprint is critical to minimize the bench space consumed. If the system relies on other components to operate such as power supplies, cooling systems, or computers then they should be able to be located remotely and flexibly.

III. Ease of Use
One aspect of digital pathology that is often overlooked but is exceptionally important is the ease of use of the system and its software. A pathologist using a digital pathology system will spend hours daily within the software environment screening slide images, choosing relevant fields of view, annotating relevant structures to support the diagnosis, and then storing those images away for future reference. The software environment must be flexible enough to facilitate moving among different platforms, communicating with the laboratory or hospital information systems, and outside parties such as the oncologist or a consulting pathologist. The pathologist and lab staff need to evaluate the graphic user interface (GUI) for its ease of use and ability to replicate the work flow that the lab staff uses daily in evaluating slides and signing out cases.

IV. Image Management
Image management is the backbone of the software platform because AP is driven by images. A useful system must be comprehensive in its ability to handle a wide range of image types, must be robust enough to allow the pathologist to move rapidly and reliably from one image type to another and must enable the pathologist to retrieve or assemble images from other sources to illustrate the patient report and to support the diagnosis. Images must be stored for the pathologist until they are no longer needed routinely and then can be stored off site at a lower cost. A practical system must be able to sort, store, and retrieve images that are located in any location quickly, accurately, and along multiple parameters to be truly useful. The ideal system must also allow a comprehensive approach to image annotation storage and retrieval of specific fields of view or the entire whole slide image if so desired. Retrieval must be quick, easy and reliable despite the fact that the images can often be substantial in size and tagged with metadata or annotation.

Digital image of a HER2/neu stained tissue

Anatomic Pathology Laboratories house a variety of instruments
Practical considerations while implementing

a digital pathology solution

Any modern medical facility deals with image data not just from pathology, but also from radiology, cardiology etc. All these different modalities along with relevant patient information should be ideally provided through one unified view. An ideal system must be able to handle many different image file formats (including DICOM for radiology and pathology) and allow remote access over the Internet through the most commonly used browsers like Microsoft’s Internet Explorer or Mozilla’s Firefox.

A well-designed image management system will go beyond the direct application to slides and allow users to realize other benefits such as user groups for histotechnologists, lab managers, and pathologists (both external and internal), generate billing case studies, allow case scheduling, or the setting of personal reports on a user by user basis.

V. Technical Factors

Before implementing any digital pathology solution, the lab staff must consult the hospital informatics group to discuss the impact on the hospital of such factors as the size of the images stored and transmitted, the ability to up and down load related images to and from other imaging databases, the impact on the hospital's internal bandwidth and internet provider, the file formats and compression approaches used, how, where, and for what duration will images be archived, and the ability to interact with other imaging modalities such as ultrasound, flow cytometry, CT or PET scanners.

VI. System Installation and Integration

Another factor that needs to be taken into account is how quickly and with what effort can a system be deployed. If a system is functional but takes a considerable amount of time to set up, train and validate then that is counterproductive. The ideal system should be able to be deployed rapidly, with little if any optimization and should be intuitive in operation so that training is straightforward and brief. In addition the manufacturer should have the ability to support integration with either lab or hospital information systems.

Interested stakeholders in the hospital want to see the benefits from a digital pathology solution begin to flow as soon as possible. Ideally the decision-making process needs to include the obvious consideration of software and hardware utility but should also include the oftentimes overlooked, but important, integration services capability.

VII. Affordability

Once the lab has completed the information gathering process and weighed the attributes of the various product offerings, it must determine whether the system of choice is affordable. AP labs face internal competition from other departments for scarce capital resources. From the view point of the lab manager and the hospital’s VP of Finance, any choice that does not require substantial capital outlay offers an attractive alternative to the competitive process within the hospital whereby capital budgets are reviewed and allocated annually. Systems which offer low or no capital outlay can often be approved at the departmental level and save scarce capital resources for other uses within the AP lab or hospital.