Has the cloud industry solved a big problem for digital pathology?

Pathology produces immense amounts of imaging data compared to other disciplines. Could a different approach to cloud storage prevent a potential cost crisis? Sectra's Chris Scarisbrick explores a sustainable strategy some healthcare providers are now taking.

Digitisation in pathology is taking place at an unprecedented pace. Healthcare providers almost everywhere are now progressing their plans for the biggest transformational change that the centuries-old discipline has ever seen.

Such progress is exciting and important – with significant implications for clinical collaboration and enhanced patient care. The UK government has placed such importance on modernising diagnostics, that it is currently investing hundreds of millions of pounds into digitising diagnostics, within the space of a single year. Gone are the days when we can continue to expect pathologists to stand over microscopes, working in relative isolation from each other.

But as necessary as digital pathology is, an inevitable challenge to the longer term sustainability of initiatives has continued to trouble some people – the cost of storage.

How big is the problem?

It has been a big challenge, from a data generation point of view at least. Pathology is by far the largest consumer of digital storage when compared to other diagnostic disciplines. In radiology, a typical x-ray might consume about 35 megabytes of data. A more complex examination, like a CT scan, might produce images in the region of 300 megabytes. But in pathology, digital images created from the scanned biopsy slides associated with just a single average patient examination generate as much as five gigabytes of data.

Putting the challenge into context, one of the world's most advanced digital diagnostic initiatives recently reported that it had produced half a petabyte of radiology data over a 10-year period. Having also now digitised pathology, the programme soon expects to produce around three petabytes of data every single year from scanned slides. That's 3,000 terabytes of data every year, for a relatively modest regional population, and just from digital pathology.

For healthcare organisations with ready access to expansive storage options, this is less of a challenge. But for many others, who might produce several times the data in the above example, alternative solutions are being sought to ensure the cost of digital pathology storage remains sustainable.

Solving the storage problem

Despite its immense storage footprint, pathology has one very significant advantage. Once digital slides have been reported and the clinical diagnostic cycle is complete, images are relatively less likely to be needed again.

This differs to other diagnostic arenas. In radiology, for example, access to historical imaging is clinically important, allowing healthcare professionals to quickly see what might be historically normal for a patient, or to monitor progression of areas of interest over time. A single x-ray might be looked at many times as a point of reference during a person's life, especially if it highlights potential areas of concern.

But in the vast majority of pathology cases this isn't a requirement. Any valuable information is typically extracted at the point of reporting. Once a clinical decision has been made and the patient is on a pathway, biopsies are not usually revisited for ongoing patient care.

Some recent regional digital pathology initiatives I have spoken to are now taking strategic advantage of this situation, coupled with emerging developments in cloud computing. In particular, they are opting to utilise archive storage capabilities that started to emerge a few years ago and which have now become common solutions from major cloud providers.

Retrieving data from such deep layers of archive storage can come with a cost, but overall, it means that vast quantities of data can be stored at scale whilst remaining affordable and sustainable.

Ending the storage of glass slides altogether?

If such images are so infrequently needed, you might legitimately question why they need to be stored in the first place.

Some initiatives have decided to try to manage without storing images in the longer term. They have chosen to purge imaging data from servers, instead opting to spend time retrieving the original physical slide that is kept in storage and to then re-scan that slide at the point the image is needed.

When slides are revisited, it is often for medical-legal reasons. For example, if a cancer has been missed, an inquiry may want to understand if a cancer should have been detected, and to see what was visible to the pathologist at the time of reporting.

One potential challenge with this approach is that the quality of physical slides can degrade over time, meaning that what is visible when that slide is rescanned, might differ to the original image at the time the diagnostic report was made. A high quality digital image, on the other hand, will remain the same indefinitely – providing a highly reliable record that might also provide significant value for research or for the training of AI, for example.

Novel cloud archiving options being put into practice now are likely to defeat the case for data purging strategies. Indeed, they might even raise questions as to whether physical slides should be retained. Current guidance from organisations like the Royal College of Pathologists do for the time being require tissues to be retained and stored. But is the storage of slides an unnecessary cost in itself if a reliable digital image is all that is needed?

Cloud is the way forward

Nearly every digital pathology initiative I have encountered recently is reliant on the cloud, for many reasons. It is a more secure option when it comes to cyber security. Cloud providers invest vast resources into their cyber resilience – whereas an on-premise solution managed by an already busy hospital IT team, can only defend against so much.

Cloud also offers flexibility of scale, and to 'pay as you go' rather than investing large amounts of capital into hardware, capital that does not exist for many healthcare providers.

Cloud helps to drive forward consolidation and regional multi-organisation pathology programmes. It can help to standardise and simplify digital pathology deployments. And it can help to reduce the time to deployment – with projects not dependant on sourcing increasingly scarce hardware that would otherwise dictate timescales.

For that and other reasons, cloud is the way forward. But storing petabytes upon petabytes of data in traditional online environments would likely become too expensive, too quicky for most initiatives. Archives might now be the answer many have been searching for.