

## Pathos processing: the Liverpool experience

Conventional tissue processing in histopathology can be a time-consuming exercise. However, use of the very latest technology is having a major impact on working patterns in histopathology, as Emma Colgan explains.

The Royal Liverpool Hospital is part of the Royal Liverpool and Broadgreen University Hospitals NHS Trust, one of the largest and busiest hospital trusts in the north of England with an annual budget of over £300 million. It employs more than 5000 staff and sees almost a million patients each year.

The trust comprises the Royal Liverpool Hospital, the Broadgreen Hospital and the Liverpool University Dental Hospital, and provides general hospital services and emergency care to the local community, as well as specialist services - including a regional centre of excellence for cancer surgery - to north-west England.

The histopathology department at the Royal Liverpool Hospital receives approximately 30,000 surgical specimens and 400 autopsy specimens each year from the trust itself, other local trusts (eg Liverpool Women's Hospital and the cardiothoracic centre) and local GP practices.



Following completion of the evaluation reported here, the Royal Liverpool Hospital took delivery of its own Pathos processor last February.

Staff in the department work in teams of between four and eight people, with each team being responsible for a specific area of work (eg specimen reception and dissection). The teams comprise biomedical scientists and medical laboratory assistants, and are headed by a team leader (senior biomedical scientist). The system usually works well and is sufficiently flexible to deal with fluctuations in workload.

## **Calling on Pathos**

During the summer of 2007, the loss of two biomedical scientists to maternity leave, combined with a large number of recently employed trainees (who needed training, supervision and time out to complete their portfolios) meant that a significant backlog developed.

Staff felt incredibly demoralised because, although they worked really hard, they were unable to complete the day's work, and the backlog continued to grow. On average, an urgent biopsy would take two days from receipt of the specimen to sections being sent to a pathologist for reporting, a biopsy with suspicion of cancer would take four days, while resection specimens and non-suspicious biopsies would take even longer.

Patients would return for follow-up appointments to find their reports unavailable, so team leaders were continually 'fire fighting', and cases that remained non-urgent just got pushed further and further back. The staff worked harder and became more demoralised and stressed as the backlog continued to grow.

The possibility of introducing rapid processing had been in our thoughts for some time, and we produced a 'wish list' of what we hoped technology such as the Pathos rapid histoprocessor from Surgipath Europe could help us to achieve.

## **Completing the day's work**

Obviously, the most important thing we wanted to achieve was to remove our backlog. We wanted to be able to complete a day's work before the end of each day.

## **One-stop clinics**

We also wanted to improve the service we offered to our users. Most importantly, we wanted to provide the opportunity for one-stop clinics, where a patient could have a biopsy taken and then return a few hours later for their report.

## **Improved patient care**

Patients waited for up to two weeks for their follow-up appointments. Thus, same-day result would mean far less waiting and worry for the patient.

## **Improved renal biopsy turnaround times**

We offered a same-day report service for renal biopsies received before noon. So, would rapid processing mean that we could offer the same service, no matter what time a specimen was received?

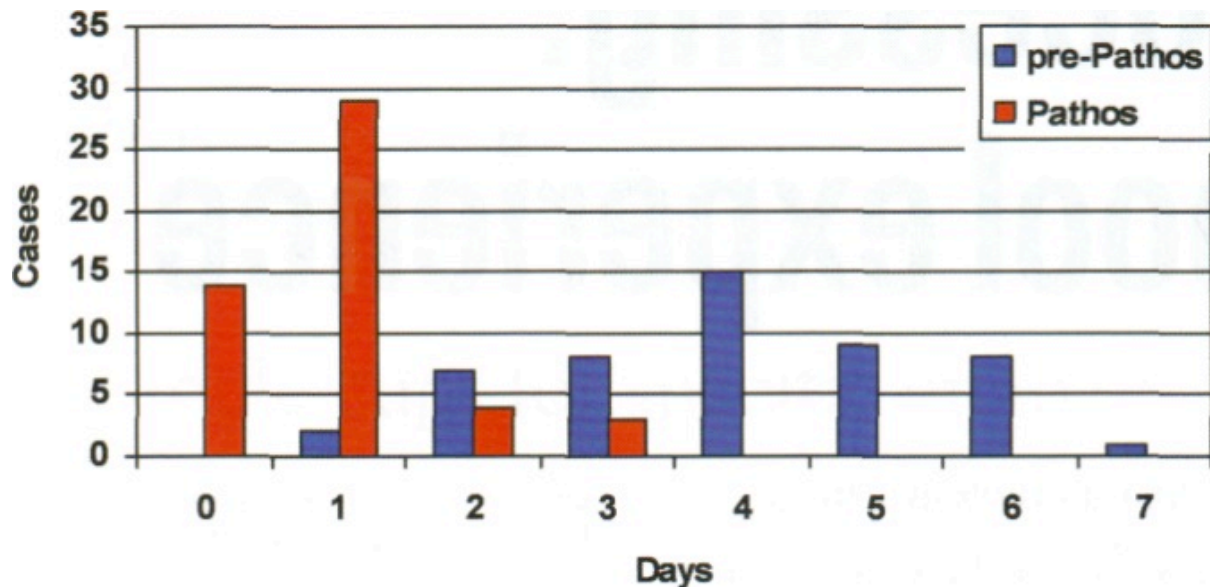
## **Reduced turnaround time**

Turnaround times will continue to get squeezed, in order to meet the increasing number of targets the service is set. Clearly, therefore, rapid processing is a must.

## **Which specimens?**

So, would we process every specimen rapidly? Should we limit it to cancer specimens or only biopsies? We chose to process all biopsy specimens on the Pathos because such samples are diagnostic and represent the main workload of a same-day diagnostic service.

With resection specimens, the patient is likely to be in hospital for several days and also the time taken to fix resections is a rate-limiting step in the process. Furthermore, it proved possible to process up to three biopsy runs in the time taken to process larger blocks from resection specimens.



### Working patterns

As mentioned previously, the laboratory staff worked in teams, so it was decided to create a Pathos team comprising a member of staff taken from the laboratory team and another from the cut-up team. Composition of the Pathos team changed weekly to give as many staff as possible the opportunity to work with the new technology and to provide feedback.

The Pathos team was responsible for the biopsies throughout their journey through the laboratory, which was a departure from normal working practice. The usual pattern saw the cut-up team responsible for the specimen to the point where it was loaded on to a processing machine, after which responsibility passed to the laboratory team. Specimens that were not being processed on the Pathos continued to be dealt with in the usual way, which meant that we had two modes of working running in parallel.

### Effect on immunocytochemistry

Would immunocytochemistry (ICC) be affected? One of the key areas that we hoped would benefit from same-day diagnosis was the breast clinic. Would the

microwave processing or the difference in processing reagents compromise the ICC tests for HER-2 and other prognostic markers?

As we were running the Pathos alongside conventional processors, our long-term plan - if we decided to move to rapid processing - would be to rapidly process biopsies (including breast cores) and keep the conventional processors for large blocks. Therefore, we needed to know if our ICC protocols

would work on tissue processed through the Pathos system, as it would prove difficult to work to two sets of protocols, depending on which machine was used to process the tissue.

Thus, our immunocytochemistry methods were tested on biopsy-sized pieces of control tissue processed on Pathos. This also allowed us to test the rapid technology before using it to process clinical samples.

### **More staff needed?**

Finally, would we need more staff in order to reap the benefits of rapid processing, or could we do it with the same number of staff, or even less?

Clearly, the benefits of rapid processing in terms of reagent savings, time savings and the ability to perform same-day diagnosis would have to be balanced against the cost involved if significantly more staff members were required.

### **The trial**

Once satisfied that the processing protocols had not damaged our 'test' tissues, we then move on to the clinical specimens, and began with endoscopic out-patient biopsies. The clinical details supplied were screened by a consultant pathologist, and only those specimens that were not expected to need ICC were processed on the Pathos. Once we were happy that routine ICC results were not affected by the Pathos, we then used it to process all endoscopic biopsies, cervical biopsies and prostate cores.

We took duplicate blocks of breast tumours during specimen dissection in order to ascertain whether or not HER-2 testing was affected, but a lack of large tumours meant that we struggled to find suitable material. We knew that breast cores referred to us from other trusts that used microwave

processing sometimes showed suboptimal HER-2 staining, but that fluorescence *in situ* hybridisation (FISH) testing results were unaffected. Therefore, following consultation with the pathologists and the immunocytochemistry team, we decided to process breast cores on the Pathos, making sure that all HER-2 tests performed on these specimens would be backed up with a FISH test.

Comparison of pre-Pathos and Pathos laboratory turnaround times (from receipt in laboratory to the issue of a report).

We did not process breast cores using the fatty process as satisfactory results were achieved using the normal program. Subsequently, we decided to process all our small biopsies on Pathos, and average turnaround time for these specimens was 0.92 days. Needless to say, the backlog disappeared within a very short time. Staff morale increased significantly, as people could see that they were getting through the work each day and no longer felt that they were chained to a microtome for seven hours a day, while at the same time seeing a backlog continue to grow.

Amazingly, the number of people in the Pathos team remained stable at two, even when it was responsible for processing all the biopsy specimens. Additional help was available but the team never felt that it was needed. Processing quality was never compromised and ICC (ER/PR/HER-2) was not affected. Furthermore, the potential to increase the renal biopsy service was clearly apparent.

Staff feedback was consistently positive. Those who, like me, had been a little cynical about the difference that Pathos could make were overwhelmed by the outcome, and the value of the system was emphasised when, despite the best efforts of the staff, a backlog began to accumulate again once the Pathos unit was returned to Surgipath.

All in all, the trial of the Pathos rapid histoprocessor taught us a lot about how the service we provide could be improved. It is not surprising, then, that the Royal Liverpool Hospital purchased the system and took delivery in February 2008.

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