

Tissue Block Archiving and Storage with Arcos

University Hospital of Wales



The pathology department at the University Hospital of Wales Cardiff (UHW Cardiff) is responsible for carrying out processing of patient tissue for diagnosis of cancers and other diseases. Last year they processed almost 45,000 patient cases, leading to production of around 85,000 blocks and over 600 mega blocks. All of these must be retained and stored securely in case of recall for further investigation or treatment. As part of technological advancement they have recently invested in the Arcos™ block management system from EpreDia to facilitate ordered and traceable storage, and simple retrieval of patient blocks.

Profile

University Hospital of Wales in Cardiff first opened in 1971 and is part of the Cardiff University School of Medicine.

Previously part of Cardiff & Vale NHS Trust, the hospital is now operated by the University Health Board and, as the largest hospital in Wales serves a population of over 450,000. Their focus is on caring for people and keeping them well. Lean workflow is a key part of their practice, enabling them to maximise throughput and achieve best possible turnaround time and minimal costs.

Scott Gable is the Cellular Pathology Services Manager at UHW Cardiff, managing a team of around 50 full time equivalent staff. Last year they processed almost 45,000 routine surgical requests as well as over 15,000 non-routine, speciality cases from paediatrics, neuropathy, foetal and post mortem pathology. They are also a regional neuro centre as well as providing a regional service for breast HER2 screening.

As part of the Royal College of Pathology guidelines on retention and storage, processed patient blocks must be retained for 30 years. Due to a range of factors such as the ageing population, increased cancer detection and improved treatment methods including personalised medicine, the volume of blocks has significantly increased month on month in recent years to well over 7,000 per month by the end of 2016. Secure and traceable storage is therefore a vital consideration.

Lean workflow at UHW Cardiff

UHW Cardiff has an excellent lean set-up for optimum laboratory throughput. This includes implementation of a triple line processing path and through the day processing using their bank of Excelsior™ tissue processors from EpreDia. Each block is sectioned, checked, sorted, filed and then archived. Previously, and in line with common practice in histology laboratories, Cardiff used cardboard boxes to store patient blocks. An average of over 360 blocks per day meant that this was a very labour intensive and risk laden process, as misfiling a patient block can have significant implications for patients further downstream. Additionally, a typical block can be recalled a number of times over its lifetime, and the manual process of ordering the blocks numerically further adds to the burden and increases the potential for error.

All blocks are labelled with a unique identifier- an accession number- which is used to identify patient cases. 2-D barcodes on the blocks encrypt the accession number. Blocks are also scanned upon sectioning, and the unique barcode is also printed onto the slides for continued traceability throughout the workflow.

In 2016 Cardiff began discussions with EpreDia regarding the potential of trialing the new Arcos block management system. Their ultimate aim was to improve efficiency within the department and, importantly reduce the risk associated with lost patient blocks. A decision was made to test out the Arcos system for a period of time in order to make calculations of potential benefits and savings in the laboratory.



The Arcos block management system

The Arcos uses a system of filing blocks in durable plastic trays, each identifiable by a unique code. At the end of the shift, or when the tray is filled it is simply inserted into the scanner. Each block is scanned, photographed and recorded in a database and the tray can be placed in purpose designed cabinets. User selectable locations can be created in the system to map the exact location of cabinets and trays. As the trays and blocks are all barcoded for complete traceability, and all data is stored in the system they do not need to be manually sorted out. Up to three different location series can be created – such as laboratory, store room and basement archive so that trays can be reassigned as required when no longer needed.

An important security aspect of the Arcos system is that block locations are not obviously apparent (such as from dates marked on cardboard boxes). This helps to prevent unauthorised removal of blocks from the trays. Any removal must be carried out by identifying the required block and scanning it out using the associated PDA (Personal Digital Assistant). This can only be done in a very formalised way, increasing the traceability and security of the patient specimens. Upon scanning out a block, the identity of the pathologist as well as a reason for removing the block must both be entered, as well as the expected date of return.

The Arcos system features “3+3 Security of Data”, including triple data back-up within the scanner, computer and the facility network. Universally readable back-up systems mean that there would never be an issue of losing location data. There is also a triple tier security level – comprising User, Manager and Administrator.

“I like it a lot. It is a brilliant bit of kit!”

Scott Gable, UHW Cardiff

Verification of the Arcos system in Cardiff

The standard filing system

During verification of the Arcos system in Cardiff, and at that time averaging over 260 blocks per day, it was found that the total time required sorting, checking and filing was approximately two minutes per block during its passage through the lab. This equated to over 189,000 minutes of time – 3150 hours or 1.9 whole time equivalent members of staff. At the appropriate Band level of staff the associated cost of this equated to almost £38,000.

Furthermore it was necessary to retrieve approximately 5% of the blocks for associated rework followed by the necessary refiling. This represented a total of 4725 blocks during the study. The nature of the filing system in place in Cardiff, as well as the need to file in numerical order meant that the associated process took an average of five minutes per block. This equated to a total of almost 400 hours per year, or 0.23 full time equivalent staff at an approximate cost of over £4700.

In addition to the time spent on the process, the cardboard boxes previously used would take 280 blocks, and each tray cost £10.38. As 337 trays were required in the past year this calculated to almost £3500.

The Arcos system

The Arcos system requires a single filing action on completion of block checking, which represented a time of 0.5 minutes and with no further movement required. Scanning of a full tray of 240 blocks took an average of one minute, representing 0.004 minutes per block and a total time of 794 hours. While blocks in need of rework would still be pulled from the file they would not need to be put back in the same ordered position. Instead they would be placed in the next space in a current tray. Allowing 2.5 minutes per block to be retrieved and 0.004 minutes to rescan this represents a time requirement of 187 hours and an annual spend of £2250.

Arcos filing trays hold 240 blocks, which would lead to a requirement for 394 trays to hold the annual workload at that time. The cost for this was calculated as £4570.

Summary of findings

	Current (Manual) Method	Arcos Block Management System	Difference
Sorting, filing and archiving (WTE)			
Time	3,150 hr.	794 hr.	2356 hr.
Cost	£ 38,000	£ 9,550	£ 28,450
Reworks			
Time	394 hr.	187 hr.	207 hr.
Cost	£ 4,735	£ 2,251	£ 2,484
Filing Trays			
Cost	£ 3,498	£ 4,570	£ -1,072
TOTAL			
Total Time	3,544 hr.	981 hr.	2,563 hr.
Total Cost	£ 46,131	£ 16,370	£ 29,761
Time per Block	0.03 hr.	0.01 hr.	0.02 hr.
Cost per Block	£ 0.49	£ 0.3	£ 0.19

Outcome

The studies carried out at UHW Cardiff demonstrated that with investment in the Arcos system, considerable time and cost savings could be potentially realised. They found that the system offers assurance of quality around the block filing process. While it is difficult to quantify exactly the reduction in risk for loss of blocks and potential impact upon patients further downstream it is clear that there are major benefits given by the Arcos system. As a result UHW Cardiff purchased Arcos and it is now in use successfully in the laboratory. Scott Gable commented, "I like it a lot. It is a brilliant bit of kit!" They are now working through a backlog and will then move completely across to the archiving system. Scott again commented, "location based archiving is the way forward – Amazon™ have been doing it for years!"



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