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REVIEW

Strategies for laboratory cost containment and for pathologist shortage: centralised pathology laboratories with microwave-stimulated histoprocessing and telepathology

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Summary

The imposition of laboratory cost containment, often from external forces, dictates the necessity to develop strategies to meet laboratory cost savings. In addition, the national and worldwide shortage of anatomical pathologists makes it imperative to examine our current practice and laboratory set-ups. Some of the strategies employed in other areas of pathology and laboratory medicine include improvements in staff productivity and the adoption of technological developments that reduce manual intervention. However, such opportunities in anatomical pathology are few and far between. Centralisation has been an effective approach in bringing economies of scale, the adoption of 'best practices' and the consolidation of pathologists, but this has not been possible in anatomical pathology because conventional histoprocessing takes a minimum of 14 hours and clinical turnaround time requirements necessitate that the laboratory and pathologist be in proximity and on site. While centralisation of laboratories for clinical chemistry, haematology and even microbiology has been successful in Australia and other countries, the essential requirements for anatomical pathology laboratories are different. In addition to efficient synchronised courier networks, a method of ultra-rapid tissue processing and some expedient system of returning the prepared tissue sections to the remote laboratory are essential to maintain the turnaround times mandatory for optimal clinical management. The advent of microwave-stimulated tissue processing that can be completed in 30–60 minutes and the immediate availability of compressed digital images of entire tissue sections via telepathology completes the final components of the equation necessary for making centralised anatomical pathology laboratories a reality.

Key words: Microwaves, histoprocessing, telepathology, centralised laboratories, ultrarapid processing, cost containment.

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INTRODUCTION

Many pathology laboratories in Australia and worldwide are staffed by a single pathologist who has responsibility for anatomical pathology as well as the haematology, biochemistry, microbiology and immunology services. While all these services are largely automated, anatomical pathology is essentially a manual, labour-intensive discipline that requires the pathologist to personally carry out grossing, dissection and cut-up of specimens, and reporting. In addition, one technologist, and often two because of leave coverage, are required for tissue processing and section preparation, and to assist during specimen cut-up. Such solo practices may accession up to 5000 surgical biopsies per year, taking up most of the pathologist's time and effort. In large laboratories with trainees/residents, the latter perform the grossing/cut-ups as part of their training, allowing pathologists to conduct other duties additional to the reporting of biopsies. More importantly, there is a national and worldwide shortage of pathologists, particularly anatomical pathologists, so there is an immediate need to rationalise and consolidate this resource.

It is estimated that maintenance of such small, one-pathologist laboratories for histopathology is in the region of AU$170 000 per annum, comprising $80 000 for technologists' salaries (1.5 full-time equivalent [FTE]), $40 000 for consumables and equipment maintenance, and $50 000 for laboratory space and overheads. These laboratories are necessary because conventional histoprocessing requires a minimum of 14 hours and histoprocessing has to be conducted on site for expediency.

The rising cost of medical care has seen efforts to reduce and contain pathology laboratory budgets. Laboratory costs generally account for no more than 5% of total healthcare costs and it sometimes appears that pathology receives disproportionate attention, perhaps because laboratory activities seem more amenable to measurement and analysis. Even if external forces do not impose restriction of laboratory costs, there are potential virtues in laboratory cost containment; saved money can be invested in the modernisation of facilities such as laboratory information systems and computers, development of new diagnostic tests and technologies, establishment of new positions or competitive salaries to attract and retain valuable professionals, and improvements in the work environment, to name a few.

The consolidation of personnel resources provides for long-term staff shortages in peripheral laboratories and short-term back-up during periods of shortage due to planned and emergency leave for pathologists and technical staff.

There are at least three essential components for the successful centralisation of pathology laboratories; namely, an efficient and speedy network of couriers, rapid

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processing of specimens and a rapid method of returning the results to the remote laboratory. All three components currently operate for most disciplines of pathology other than anatomical pathology. Efficient courier services exist, automated processors in clinical chemistry, haematology and immunology enable rapid specimen turnaround and the use of the fax machine or automatic server downloads via the Internet allow many private laboratories to consolidate through laboratory centralisation. However, this has not been possible in anatomical pathology except perhaps for a small proportion of specimens of mostly small biopsies.

This paper examines some of the strategies for laboratory cost containment and focuses on the potential for centralisation of anatomical pathology laboratories in order to accommodate the current shortage of anatomical pathologists.

EFFICIENCIES AND WORK FLOW PATTERNS

There are many strategies for cost savings in the pathology laboratory. Personnel costs are usually in the region of 60% or more of total costs and constitute the single largest component of the laboratory budget. However, lowering personnel salaries is not a feasible strategy in the current climate of an impending shortage of qualified professional staff. Instead, efforts directed at improvements in the productivity of staff, and changes in technology and skill-mix levels to extend the productivity of existing staff, remain the more viable alternatives. For example, competent pathology assistants can be trained and, under supervision, can conduct many tasks previously performed by pathologists, including the grossing and transfer of small biopsy specimens, and autopsy dissections. New technological developments such as automated vision systems that are designed for cytology screening can reduce cytopathology workforce requirements significantly and conduct quality assurance tasks. Other technological innovations in anatomical pathology that reduce manual intervention and demands on technologists' time include cassette and slide label printers, automated tissue processors, automated routine slide stainers and pathologist-operated digital photography units. However, despite this significant list, major technological innovations in anatomical pathology are few and far between compared with other disciplines of pathology and laboratory medicine.

The re-engineering of processes is one opportunity for cost containment that is often overlooked. Most processes can be studied and subjected to time and motion analysis. For example, the receipt/accessioning of biopsy specimens in the laboratory, through tissue processing and preparation of stained slides, through to the signed surgical pathology report for small and large biopsy specimens can be quite different. As such, specimens should be triaged and handled differently according to the time of day received, processing requirements and clinical urgency.

The familiar pattern of work in anatomical pathology laboratories has peak activity in the morning when overnight histoprocessing is completed and paraffin blocks are sectioned and stained. Activity subsides significantly in the afternoons when only re-cuts, special stains and grossing are the major functions in the laboratory. Continuous and even flow of activity would allow greater efficiencies than the conventional pattern of peaks and troughs that almost all laboratories experience. Component processes linked by commonalities such as specimen size and therefore processing requirements, time of arrival, clinical turnaround time requirements, transcription, etc., can be identified, allowing batching of specimens and greater efficiencies. Each of these processes will have productive time and time spent waiting for something to happen. If ways to remove waiting and non-productive time can be devised, the entire flow can be compressed into a shorter time period, making individual contributions more efficient. Voice transcription reporting has met with varying success but computer validation and editing of anatomical pathology reports by pathologists is well established and contributes to expediency.

CENTRALISATION/CONSOLIDATION OF LABORATORIES

Partnerships and consolidations is another approach. In general, larger laboratory size brings economies of scale. Reagent and instrument costs should be volume-dependent and common laboratory information systems not only save on costs but also allow seamless transitions between laboratories both for pathology reports, specimen tracking and billing.

Two different laboratories would invariably have different practices and approaches to the 'default' number of blocks and slides on particular types of cases/specimens, laboratory information systems, staining protocols and processing laboratories. The major consolidation strategy would involve adopting the 'best practices' between the laboratories, including the best laboratory information system as well as single-site consolidation of histopathology processing and preparation, and cytopathology screening. Equally important is the establishment of single leadership at the levels of director and supervisors so that 'best practice' decisions can be made quickly and efficiently. Centralisation of anatomical pathology laboratories has the potential for significant cost savings but this has not been possible in the past because clinical turnaround time requirements necessitate that the laboratory and pathologist be in proximity and on site. Histoprocessing required a minimum of 14 hours and any delays in report generation would impact on patient care and hospital bed costs, the latter between $1000 and $2500/bed/day.

SYNCHRONISED COURIER SERVICE

Many private pathology services have successfully established sophisticated courier networks that employ road and air services. The majority of couriered specimens are blood and body fluids, results of which can be faxed to the source or accessed from a central database. When processing of tissues is centralised it generally results in delays because of the mandatory time required by conventional tissue processing and because the prepared tissue sections need to be couriered back to the source laboratory.

An integral component of our proposed system is a well-synchronised and efficient courier system that delivers by