Productivity Commission Study:

Impact of Advances in Medical Technology on Healthcare Expenditure in Australia

Introduction

Advances in medical imaging, and mammography in particular, have been identified as amongst the greatest medical innovation of the last 30 years (Fuchs and Sox 2001).

Digital mammography is the latest advance in medical imaging, and it will deliver many benefits both for the early detection of breast cancer and in the delivery of health services in this area.

This paper provides a broad overview of the potential impact of digital mammography on health care expenditure. Further detail can be provided on request.

Mammography in Australia

Mammography is the key imaging modality in breast cancer diagnosis. The largest user of mammography in this country is BreastScreen Australia (BSA), which provides screening for breast cancer in well women over fifty years of age. In 2000/2001, over 1.56 million women were screened with BSA (AIHW, 2003). BreastScreen Australia services are delivered at a State/Territory level, and are funded though the Public Health Outcomes Funding Agreement (PHOFA) between the Australian Government and each jurisdiction. The services are free of cost to women.

Mammography is also used in diagnostic settings to detect cancer in symptomatic women. Diagnostic mammograms are funded through Medicare. A cost may be incurred by the woman for services delivered by private providers.

Breast Screen Victoria (BSV) screens over 200,000 Victorian women at 63 locations across the state, through a combination of fixed sites and mobile vans.. Services are delivered through a partnership with public and private hospitals, as well as private radiology providers.

Changing technology: analogue to digital

The analogue mammography system currently in use requires film processing to produce a hard copy x-ray film for the radiologist to assess. BSV produces over 1 million hard copy images annually.

Full field digital mammography (FFDM) produces a digital image of the breast that is stored as data. This can be manipulated to improve cancer detection and reduce clinical intervention. It can be transmitted to any networked location and stored in centralised state wide system accessible across the state. A digital

image enables the development of an e-health record with a unique patient identifier, a single electronic record incorporating images.

For these benefits to be realised, digital mammography must be integrated with an appropriate Client Information Management System.

At present, mammography is an outlier in the world of medical imaging. All other modalities, including general x-rays, are progressively adopting digital technology and benefiting from resulting productivity gains. The high initial capital investment required to move into digital mammography has impeded its uptake and excluded mammography from developments such as telemedicine and the development of e-health records.

Analogue mammography is at the end of the technical development cycle. Current research and development efforts in breast cancer diagnosis focus on digital mammography, and developments reliant on its introduction such as computer-aided diagnosis (CAD) and tomosynthesis.

As imaging companies such as GE, Siemens and Sectra focus their development and production efforts on digital mammography, analogue mammography will become more expensive. New analogue machines, replacement components for existing ones, as well as film stock, processing machines and chemicals, will all become harder and more expensive to obtain.

To gain the maximum cost benefit from this technology, integrated, evidence-based, uptake is required. It is essential to avoid *ad hoc* uptake that fails to capitalise the potential of this technology

Impact of digital mammography on demand

Demand for breast cancer screening is increasing. BSV currently screens 60% of our target demographic (women 50-69 years of age). The national standard is that the Program should screen 70% of this group.

The age cohort referred to as the ‘baby boomers’ has started to turn fifty. This cohort - a result of the post-war increase in family size and in immigration – is significantly larger than preceding cohorts. It will result in women in the target age group being the fastest growing demographic in the next decade (ABS, 2003).

The introduction of digital mammography may also stimulate and change demand for mammography due to the following factors:

- better cancer detection and reduced need for interventions for diagnosis may increase its use by clinicians and acceptability to consumers
- reduced radiation dose may increase acceptability to consumers

- improve access to services in rural areas by ameliorating the effects of rural/metro workforce disparity.

Impact of digital mammography on expenditure in breast cancer screening
Digital mammography can deliver

- productivity gains of up to 40% by transforming work flow in screening;
- better utilisation of scarce radiologist resources through the ability to share and transfer digital images on a network;
- eliminating the requirement for couriering of x-ray images to be processed and, by enabling viewing on the van, eliminating the need for women to make a second visit to the van if the original image is inadequate;
- more efficient, timely delivery of services and enhanced quality and integrity of client data;
- improved occupational health and safety;
- improved health outcomes, including enhanced cancer detection and reduced radiation doses for women being screened.

Cost
FFDM has been available for four years as a breast screening technology but the capital cost of the equipment is higher than the current analogue/x-ray technology. This cost difference has constrained its use. However this was the same issue that initially stalled the introduction of Picture Archiving Communication Systems (PACS). It was postulated that PACS would positively affect work productivity, but the economic benefits were hard to quantify.

At the recent conference of the Radiological Society of North America, two papers presented data demonstrating both large cost savings and rapid return on investment with PACS implementation. The studies showed that the payback period came 3.5 years after implementation of PACS and that return on investment was almost 30% per year (Trevino, 2004).

These studies also showed that simply moving to a film free environment alone will save costs. However the mode of implementation of integrated information and imaging systems will determine the extent of additional savings to be leveraged from the changeover.

This supports BreastScreen Victoria's case that a coordinated transition to digitial mammography is essential to realise its maximum benefits.

Expenditure reductions in breast cancer screening
Productivity increase resulting from the introduction of digital radiology including mammography has now been well documented (Daus, 2004). The introduction of an integrated digital mammography system can reduce expenditure through:

1. Transforming workflow
Digital mammography removes significant portions of workflow in mammography including:

- •film processing
- •eliminating need to repeat films for technical reasons
- •processing QA
- •physical transport of hard copy films
- •hanging of films for reading

This will allow for the screening of more women with the same clinical resource.

2. Changing work practice
Currently films can only be read in one place at one time. In BSA, where films are double read (by two radiologists for quality assurance purposes) this can lead to considerable expenditure in both human and time resources. It also makes inefficient use of one of our scarcest resources – the medical specialist workforce – by requiring radiologist to travel from one location to another to read films.

The production of a digital image that can be sent to any networked location means that the image can be read in different places at the same time. It also takes the work to the workforce. This is important in overcoming the constraints imposed on the delivery of services in areas where the workforce is scare – primarily rural and remote areas of Australia.

Currently women in remote areas must travel long distances for further assessment after screening. The development of “real time” transfer of images will enable some assessment services to be delivered locally. A system could be developed to send images in real time to a clinician, who can be based anywhere in the state eliminating the need for women to travel to have extra images taken

Synergies with information technology
The model of implementation for digital mammography that BreastScreen Victoria has developed integrates digital mammography with an HL7 (an international protocol for exchange of health information) compliant client information management system through use of an EVDO (evolution data only) wireless high-speed broadband network.

Existing use of broadband networks for large-scale e-health service delivery, by organizations such as BreastScreen Victoria, can underpin regional telecommunications infrastructure investment and sustainability. It can provide leverage for wider community access to broadband services, generating economic and social benefits.

The integration works within the framework identified in the *"Health Online: A Health Information Action Plan for Australia"* using a collaborative approach and national and international standards and protocols including HL7, open architecture, and legal and privacy frameworks. It will promote and develop e-health systems and applications.

Results and images will be electronically transferred to GPs in accordance with frameworks under the Commonwealth "Health*Connect"* program. It will be a demonstrable e-health application for GPs and other health providers supported by GP access to IT and broadband connectivity, funded under the $35 million Commonwealth "broadband for health subsidy", which provides broadband internet access to GPs and Aboriginal health services.

It will create applications and build critical mass, enhancing the competitive environment for broadband networks. The model, in line with "*Health Information Workforce Capacity Building - National Action Plan",* will demonstrate and develop integrated ICT capabilities, encourage the effective use of health technology to improve the health information capacity of the workforce, improve staff and systems efficiency, and enhance the quality of patient care and clinical outcomes.

BreastScreen Victoria and digital mammography
BreastScreen Victoria has developed a pilot project that offers a world first example of integrating full field digital mammography with an ICT network. This new technology is an opportunity to transform the delivery of breast screening services in rural and regional Australia,

The project will be a national and international exemplar that pilots:
- delivery of breast screening services to a fully digital environment; and
- creation of an e-health network linking service providers and users across regional Victoria.

BSV is proposing to pilot the use of Full Field Digital Mammography (FFDM) at its screening sites and assessment centres. FFDM offers an opportunity to significantly improve the delivery of breast screening services in regards to access, timeliness, and the effectiveness of diagnosis and treatment options.

Immediate benefits of the project include:

- productivity gains of up to 40% by transforming work flow in screening;
- .better utilisation of scarce radiologist resources through the ability to share and transfer digital images on a network;
- eliminating the requirement for couriering of x-ray images to be processed and, by enabling viewing on the van, eliminating the need for women to make a second visit to the van if the original image is inadequate;

- more efficient, timely delivery of services and enhanced quality and integrity of client data;
- improved occupational health and safety;
- improved health outcomes, including enhanced cancer detection and reduced radiation doses for women being screened.

The project will be delivered over three years and will demonstrate many of the elements necessary to promote absorption of broadband in health service delivery, such as digital image capturing, transmission, and storage using mobile connectivity and integrating health alliance broadband networks with mobile and health agency ICT infrastructure.

The project has been designed to identify and evaluate the technical, work flow and clinical issues raised by the transition to a digital working environment in breast screening in conjunction with the development of the e-health network. New research areas such as breast density and computer aided diagnosis have already been identified as key features of the pilot and over time the project will lead to new on-line education programs in diagnosis and assessment.

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