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Key Elements of a Successful PACS Implementation -The Experience in England

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In October 2003, the government in England established a national IT programme for the National Health Service (NHS), to establish a standardised approach to IT support in England and to develop a universal patient record. The national programme, now known as 'Connecting For Health', (CFH), recognised early on the significant advantages of PACS as part of the overall IT strategy in supporting patient care and, as a result, established a tight schedule for the national implementation of PACS throughout England, with completion expected towards the end of 2007. This review highlights the lessons learned from this implementation and explores the results of the programme.

There are several key elements that will help ensure that all benefits that can be derived from PACS are realised, through continuing appropriate management and support of the system. Prior to the national programme, considerable experience had been gained through various PACS implementation projects and the lessons learned from the current basis of advice to new users and to those managing an existing system.

Organisational Change Management Most PACS solutions constitute a ready-to-use Commercial Off the Shelf Solution (COTS), which, when the instructions on the tin are adhered to, works. Indeed, evolving PACS solutions are blurring the margins between how images are viewed and manipulated in the radiology department, wards and clinics, creating a seamless solution for the whole healthcare organisation. However, there is a significant degree of organisational preparation required to facilitate acceptance of the system by all clinicians and to promote understanding of the changes to working practice that will take place.

Changes to working practice clearly depend upon the final hardware solution defined in the business case, which should be reached through early involvement of all members of the healthcare organisation. This can take at least twelve months preparation.

The formation of a Clinical Advisory/Advocacy Group is strongly recommended with all key stakeholders involved. More often than not, the main detractors for the project become the true advocates. There is probably no point in implementing PACS or any other IT 'solution' if members of the organisation do not understand that there is a problem to be resolved or there are better ways of doing things that the 'solution' is meant to facilitate.

Benefits Realisation

To facilitate the preparation process, it is beneficial to promulgate the benefits of PACS, which should have been clearly identified in the business case. How quickly the benefits are realised will depend upon such factors as the transition period from a film-based to a digital environment, the rate at which PACS is made available to the whole of the organisation and willingness.

Types of benefits fall into three broad categories: Cash Releasing such as savings on chemical; Quantitative such as improved efficiency in reporting because of improved workflow; and Qualitative derived from the universal and instant availability of images to inform clinical decision-making processes or the ease of access to prior imaging to better inform the current radiology report.

Overall success of the project can be judged on how many of the identified benefits have been realised. In terms of the strategic benefits, in the context of a national implementation programme, it is essential to understand the future impact of the ability to share images with other organisations and the potential to separate the acquisition of the images from the site of reporting.

PACS Workflow Integration

One of the major benefits of PACS, improved workflow and reporting quality, can only be realistically achieved through full integration with the Radiology Information System (RIS). The RIS should ideally be integrated with the organisation's Patient Administration System (PAS). Standards exist that allow easy integration of these systems and the functionality required by the users of the integrated systems is defined in the framework known as 'Integrating the Healthcare Enterprise' (IHE). Understanding how worklists generated on the RIS can drive more efficient ways of working is essential in defining the requirements of the business case in terms of system integration. IHE requirements should be incorporated into the business case with the help of specialist advice.

Further benefits can be derived by the addition of value-added PACS components such as electronic requesting for diagnostic tests, which can feed into the reporting worklists with the presentation of the clinical referral in electronic form. A greater benefit perhaps in significantly improving the time reports reach the requesting clinicians is the incorporation of digital dictation systems into the PACS implementation. Integrated Voice Recognition software now means that a fully verified report can be sent directly to the referrer.

IT Infrastructure and Environment

Failure or delay in the delivery of the images to the end user is unacceptable. There should be clear requirements in the business case for a robust and well-managed IT infrastructure that supports a sufficiently high bandwidth and a clearly defined management structure to ensure 24-hour support. Also important are environmental conditions in which images are viewed, such as placing a bright high-definition monitor under bright lights results in poor image quality. Much thought needs to be given in designing a hospital-wide PACS for optimal viewing conditions and there is an ideal opportunity to incorporate this into new hospitals.

Training and Education

Considerable time and resources are required to enable the successful introduction of a PACS in terms of training and education for all end users. This involves the deployment of a lead trainer, usually the PACS administrator, and key trainers throughout the organisation that will include a variety of people such as nursing staff and radiographers who will cascade the skills required to operate PACS.

The IT department may be required to identify staff who need basic PC and keyboard training. Time allocated for training in Computerised Radiography (CR), is critical to ensure minimal disruption to the imaging service at the time of full PACS implementation. Some organisations may introduce digital acquisition prior to full go-live, to establish a digital archive and to provide training requirements. In terms of training end-users, the timing of this is critical to success; too early and much may be forgotten and leaving it to the last minute will disrupt the process. Training needs should be incorporated into the business case including training rooms and backfill for training staff and, most importantly, time!

System Support

Once the system is fully operational, one requirement is to ensure ongoing training for current and new members of staff. This role is undertaken by a PACS administrator and support staff to enable round the clock system management. Some aspects of system management will clearly be a contractual requirement with the PACS vendor, but in addition, the organisation's IT department needs to give year-round infrastructure support. It is one of the key roles of the PACS administrator to coordinate these areas. One of the most system-critical functions of the administrator's role is to keep the PACS database clean, such as ensuring that all images obtained for a patient study are properly associated with the event entry on the RIS. This is one of many daily housekeeping tasks that enable an efficient and patient-safe PACS.

Results of the Programme

The national PACS implementation is supported by the deployment of five central data stores that will manage and archive all image data. Individual hospitals will have enough local storage to support one year's image data online. The central data store system will support image sharing between organisations across the country. The benefits of the data-sharing architecture must be balanced against the frequency at which image data is accessed locally or by another healthcare organisation over the ensuing years. Currently assessing dataflow and retrieval will inform how best to manage the large amount of image data being produced and stored on the five central data stores.

As of the 8 January 2007, 64% of NHS hospitals in England are using PACS, including 42 Trusts that already had PACS before the national programme. Just over 50% of the NHS CFH PACS deployments have been achieved. It is anticipated that by spring 2007, the majority of the 129 NHS hospitals in England will have signed off their business cases for the NHS CFH PACS.

Finally, there is an acknowledgement within the programme that the financial benefits of PACS outweigh overall initial investment, which may vary from £2 – 5 million, depending on the size of the hospital. The impact of PACS on the overall efficiency of delivering imaging services has been calculated to reduce the cost per image produced in the face of increasing demand for the service. Moreover, it has been stated that the

national programme has negotiated substantial reductions in the capital outlay for a PACS implementation.

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