SESSION II: Radiology Reengineering: The Team, Planning and Implementation

Process Reengineering: The Role of a Planning Methodology and Picture Archiving and Communications System Team Building

John A. Carrino, Paul J. Unkel, Philip Shelton, and Thomas G. Johnson

The acquisition of a picture archiving and communications system (PACS) is an opportunity to reengineer business practices and should optimally consider the entire process from image acquisition to communication of results. The purpose of this presentation is to describe the PACS planning methodology used by the Department of Defense (DOD) Joint Imaging Technology Project Office (JITPO), outline the critical procedures for each phase, and review the military experience using this model. The methodology is segmented into four phases: strategic planning, clinical scenario planning, installation planning, and implementation planning. Each is further subdivided based on the specific tasks that need to be accomplished within that phase. By using this method, an institution will have clearly defined program goals, objectives, and PACS requirements before vendors are contacted. The development of an institution-specific PACS requirement should direct the process of proposal comparisons to be based on functionality and exclude unnecessary equipment. This PACS planning methodology is being used at more than eight DOD medical treatment facilities. When properly executed, this methodology facilitates a seamless transition to the electronic environment and contributes to the successful integration of the healthcare enterprise. A crucial component of this methodology is the development of a local PACS planning team to manage all aspects of the process. A plan formulated by the local team is based on input from each department that will be integrating with the PACS. Involving all users in the planning process is paramount for successful implementation.

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From the Department of Radiology, Harvard Medical School, Brigham and Women's Hospital, Boston, MA; the Joint Imaging Technology Project Office, Fort Detrick, MD; the International Radiology Group, Dallas, TX; and Wilford Hall Medical Center, Lackland Air Force Base, TX.

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Address reprint requests to John A. Carrino, MD, Instructor in Radiology, Harvard Medical School, Brigham and Women's Hospital, Department of Radiology, 75 Francis St, Boston, MA 02115.

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PICTURE ARCHIVING AND COMMUNICATION SYSTEMS (PACS) are rapidly becoming the preferred technology to transmit, store, retrieve, view, and interpret large amounts of image data. The paradigm shift that will occur with implementation of a PACS is an opportunity for reengineering radiology services within a hospital or enterprise. Strategies for quality improvement should begin by considering the entire chain of events from image acquisition through image display and communication of reports. While there is still a way to go in terms of streamlining data flow of the system so that images and reports find the user, PACS is an enabling technology that improves the time efficiency of referring providers and radiologists. In the near term, PACS will facilitate rapid real-time consultation and treatment decisions.

There are many challenges to implementing a full-scale PACS network: either within a hospital or throughout a healthcare enterprise. Some of the challenges include overcoming the initial equipment and installation costs, maintenance cost, organizational restructuring, image quality acceptance, matching PACS functionality with clinical needs, and inadequate network infrastructures. Implementation of PACS is an expensive and complex project. To manage this paradigm shift for radiology services, a well thought out and executed plan will reduce the risk associated with such a project. An organized and intelligent plan executed by the PACS team is critical to the success of the business process reengineering of radiology using this technology.

PACS PLANNING METHODOLOGY: OVERVIEW

Table 1 outlines the phases and subphases of the Department of Defense (DOD) Joint Imaging Technology Project Office (JITPO) model.

Table 1. Methodology: Summary of the PACS Planning Phases Used by the DOD JITPO

(1) Strategic planning
(A) Hospital executive briefing
(B) PACS team building
(C) PACS goals and objectives planning
(D) Resource planning
(2) Clinical scenario planning
(A) Facility/region planning
(B) Radiology department planning
(C) Clinical department planning
(D) Equipment planning
(3) Installation planning
(A) Preliminary installation planning
(B) Procurement requirements planning
(C) Vendor planning
(D) Installation plan
(4) Implementation planning
(A) Installation and acceptance testing
(B) Clinical training planning
(C) Implementation of digital radiology
(D) Maintenance planning

Strategic Planning

This phase defines the program objectives, educates the hospital staff, outlines a methodology, develops broad program milestones, identifies financial resources, and develops the PACS team.

Hospital executive briefing. The concept must be understood by the hospital's key decision-makers starting from top-level management down to each clinical department that will be affected by the PACS. The executive level needs to be cognizant of the cost and complexity of the tasks necessary to complete the program successfully.

PACS team building. This methodology calls for the hospital to have two teams: the program team and the consulting team. The program team consists of approximately six people running the PACS program, including a radiologist, radiology technologists, a physicist, a clinical engineer, a purchasing department representative, and an information management representative. The consulting team includes a representative from each clinical area, including orthopedics, internal medicine, family practice, surgery, pediatrics, emergency, obstetrics/gynecology, urology, oncology, inpatient wards, neurology, neurosurgery, and intensive care units.

PACS goals and objectives planning. This outline should be well documented, evaluated by all participants, and contain enough detail to grossly estimate expenses and be approved by the executive committee.

Resource planning. Fiscal restraints can limit the scope of the PACS implementation and thus needs to coincide with the goals and objectives. The fiscal responsibilities can be broken down into three major areas: equipment cost (including network upgrades), installation cost, and annual maintenance cost.

Clinical Scenario Planning

Evaluate and define how each user will interface with the PACS and ensure that the functionality matches the users' requirements. A generic equipment configuration is developed based on the clinical needs.

Facility/region planning. Stratify how the PACS will fit within the enterprise, including any teleradiology objectives.

Radiology department planning. The radiology department will be affected by the PACS more significantly than other clinical areas. Therefore, it is important to develop a well thought out and thorough radiology clinical scenario.

Clinical department planning. Develop a PACS clinical scenario for each clinical department with the representative from the consulting team and plan for migration to a filmless environment.

Equipment planning. The PACS equipment configuration is outlined in the clinical scenario. This equipment configuration requires each clinical department to plan for equipment space. Therefore, planning needs to begin early in the process so that facility limitations will be addressed, researched, and resolved.

Installation Planning

Formalize a concrete overall global program for installation.

Preliminary installation planning. The objective is to develop a matrix for the installation plan. The program team will be working on the overall equipment package required to meet the functionality. Update the PACS clinical scenarios and develop a "blueprint" for a fully operational system within each respective functional area.

Procurement requirements planning. Convert the PACS plan to a "requirements" document and formalize the request for proposal (RFP).

Vendor planning. Vendors are contacted relatively late in the process after the institution has identified concrete goals, become PACS literate, and developed an RFP based on desired functional-

ity. This allows the institution to compare different vendors equipment configurations and cost based on specific and identical functionality.

Installation plan. The installation plan should be finalized and completed by the PACS vendor who was awarded your contract. The institution will work as a team with the PACS vendor to complete a formal installation plan signed by both the PACS team representatives and the vendor. This is a formal binding document that clearly defines the rolls and responsibilities (terms and conditions) for both the hospital and PACS vendor through to the maintenance period.

Implementation Planning

Convert the facility to a fully operational electronic environment. If the system does not function as planned or the staff is not properly trained, the PACS will struggle to gain clinical acceptance.

Installation and acceptance testing. Final payment for the system will not be given until it passes the acceptance testing, which should consist of functionality testing and component-level testing. Testing the functionality should include all aspects (eg, acquisition, display, Digital Imaging and Communications in Medicine [DICOM] functionality) and at the extremes of use (eg, heavy network traffic) before final acceptance in order to certify complete contract compliance.

Clinical training planning. Planning to train a large hospital population, especially with many being healthcare providers, can be difficult to coordinate. The timing of training should be based on the schedule for phasing the functional areas into a filmless environment and integrated into existing predetermined times when sections, divisions, or departments routinely meet.

A strategy for training new personnel in the future must also be in place.

Implementation of digital radiology. A plan for migrating to filmless radiology must be developed to assure a smooth transition. The number of months of images in the long-term storage needed before turning off film images should be determined. Subsequently, a transition plan for each department and for the entire hospital will be developed.

Maintenance planning. A plan for quality control, preventive maintenance, and unscheduled maintenance is paramount. The users or a hospital representative typically performs quality control

periodically. The vendor performs preventive maintenance on a scheduled basis. Unscheduled maintenance is the procedure to be followed in the event of a system or a component failure. Who is responsible for what and the correct contacts must be clearly defined. During this failover period, a specified course of action should be followed to insure that images can be recovered into the PACS.

PACS TEAM BUILDING

A PACS team approach is the cornerstone to developing a cooperative effort (Table 2). The first step in building an effective on-site team is educating all team members about basic PACS technology and developing a common PACS language.

There are two subteams: the program team and the consulting team. The program team consists of approximately six people coordinating the PACS. The consulting team should have a representative from each of the departments or functional areas to approve of decisions that affect their respective clinical areas. A member of the administrative staff should be included on the consulting team to address financial concerns.

The on-site program team composition is typically as follows: radiologist, physicist, radiology technologists (one to three from different modalities), clinical engineer, information management, and project manager. The team leader is usually a radiologist or physicist. The team leader acts as a single point of contact for consistent interaction with the vendor and other users. One of the technologists should be or trained to be a digital radiography expert. It is also important that the

Table 2. PACS Team Building: Recommended Team Configurations

Consulting team
Representatives from each of the functional areas in the institution
Program teams
Institution
Project manager
Radiologist
Physicist
Technologists
System administrator
Vendor
Project manager
Field engineers
System administrator
Network specialists
Subcontractors

medical information systems team member develop an intimate knowledge of the PACS database and associated hospital/radiology information system (HIS/RIS) gateway.

REVIEW OF THE MILITARY EXPERIENCE

Within the DOD, the JITPO collaborates with the hospital developing the local PACS team and educates the facility on digital radiology. The JITPO acts as a consultant to the team and performs the project management role. Its members keep on top of schedules (eg, construction), delivery orders, and modifications to the contract, and interacts with the appropriate institutional agencies, such as facilities management, logistics, biomedical engineering, equipment maintenance, administration, etc.

By following the previously outlined methodology with early development of a local PACS team, there has been improvement in matching the PACS functionality with the clinical needs of the facility. This has eased the transition to filmless operations and has subsequently improved initial acceptance of the installed PACS.

The ability to compare vendor's proposals based on identical requirements has led to true vendor competition and subsequent significant savings in initial purchase cost and maintenance costs in comparison to the generic pricing quoted with the initial contract.

SUMMARY/CONCLUSION

The advent of digital radiology and PACS changes the traditional process of providing radiology services within a hospital or enterprise. This complex change in business process requires the hospital to reengineer their radiology services. As a result of both success and failures within the DOD, a business process reengineering methodology (PACS planning methodology) provides the metric to develop and implement the changes. This planning methodology is currently being used at more than eight DOD sites and each site is at a different phase in the process. One of the key concepts to success is the proper building of a local PACS team

to run the program. Digital imaging affects the entire facility, not just radiology, and keen insight into the needs of all users is critical.

Two additional areas that are important include user acceptability and the clear definition of the true equipment requirement. This PACS planning methodology is designed to develop two teams: a program team and a consulting team. By developing these two teams and clearly defining the responsibilities of all team members, users are well informed and responsible for the implementation scheme within their respective area. This has led to an improved initial user acceptance through a clear definition of how the PACS will interface with all users. The JITPO role has been to develop the teams and it attempts to make each hospital self-supporting as soon as possible. Additionally, the JITPO manages the project and provides lessons learned at both the clinical and technical level from more than 30 facilities from the legacy program (Medical Diagnostic Imaging Support [MDIS]), as well as lessons learned implementing more than eight Digital Imaging Networks-PACS (DIN-PACS) sites. The PACS team ensures that the unique PACS requirement for the hospital match their clinical needs. This requirement is provided to the DIN-PACS vendors for identical functionality proposals.

Considerable improvement has also been seen in the equipment cost and maintenance costs. There has been savings in the initial purchase cost (equipment and installation) ranging from 1 to 2 million dollars per site compared with the generic implementations outlined in the DIN-PACS contract. Competitive pricing is also seen in the operation and maintenance pricing compared with the DIN-PACS contract. As a result, the overall life-cycle cost saving adds up to 2 to 4 million dollars per site.

This methodology has been an effective tool for preparing business plans to procure the PACS. This provides the key decision-makers at the hospital with written plans that provide clear objectives of the project, life-cycle cost for a total of 9 years, and implementation milestones that can be tracked.