Using Technology Assessment as the Picture Archiving and Communication System Spreads Outside Radiology to the Enterprise

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Picture archiving and communication systems (PACS) are being implemented within radiology departments, and many facilities are entering the next stage of PACS use by deploying PACS to departments outside of radiology and to other facilities located at a distance. Many PACS vendors and department administrators have based cost-justification analyses on the anticipated savings from expanding PACS to these areas. However, many of these cost-savings analyses can be highly suspect in their assumptions and findings. Technology assessment (TA) at the hospital/health system level is an organized, systematic approach to examining the efficacy of a technology in relation to the health system's mission and clinical needs. It can be an organized and unifying approach to aid in the distribution of limited capital resources. As extra-radiology PACS deployment is a costly endeavor, TA may be used to plan for PACS implementation throughout the enterprise. In many organizations, PACS is thought of as a radiology domain as its first uses were centered on this image-producing service. Now, as PACS technology spreads to other service areas, such as cardiology, dermatology, pathology, orthopedics, obstetrics, etc, the need to incorporate other viewpoints in a system-based PACS is necessary to avoid having independent PACS that may duplicate archives and may not communicate with each other. How to meet the diverse PACS needs of clinical services can be a challenging task; a TA program has been demonstrated to effectively handle the clinical needs, demands, and timeframes of PACS planning and support throughout hospitals and health systems. A hospital-based TA program can assist health care organizations to present PACS as a system-wide need and program rather than a radiology-based program gobbling up the capital budget. Submitting PACS to the TA review process can identify essential elements in planning and help avoid many of the pitfalls of PACS implementation and operations. Thorough cost and/or return on investment analyses, phasing decisions, workflow re-engineering, and outcomes assessment programs are a few of the issues that a TA program can address to help in the transition to a complete electronic image environment. The TA process includes clinician selection, evaluation criteria and their selection for technologies under review, a policy for review/authorization/denial, and measurement of expected outcomes.

"IN A FEW YEARS, your diagnostic imaging services will operate in a filmless environment." Depending on what year it was and to whom you were speaking, that prediction ranged from 1 to 10 years; in some cases, the answer was "Never." One of the difficulties in implementing a picture archiving and communication system (PACS) to support diagnostic imaging services was that feasibility or return-on-investment (ROI) studies were conducted in a vague manner at best, and their objectivity was questionable. Hard and soft savings differed in interpretations, and the numbers could be manipulated to achieve any desired outcome. Group purchasing organizations and manufacturers also developed formula-driven cost/benefit analyses for PACS, at times adding to the mystery surrounding what is measurable and important in assessing PACS as they consider various cost savings and expenditures in their own fashion.

As the cost of a PACS ranges from less than $100,000 to several million dollars, finance departments generally require some justification. Mini-PACS for ultrasound can be implemented cost-effectively, and may be relatively simple to justify based on cost savings. Conversely, incorporating cardiac nuclear medicine images, perinatology ultrasound images, and the chest images for tuberculosis screening at the nearby immigration center into a diagnostic imaging-based archive may require an investment of several million dollars. A ROI study may say that it is a feasible option, yet actual clinical success and outcomes may differ from cost savings projected by such a study.

Workflow streamlining, reduced operating expenses, and improvements in patient care have been assessed differently (or not at all). Once decisions are made to proceed with PACS, it is very difficult to return to original processes, and the need for a true understanding of its impact is paramount. Unfortunately, not every PACS facility implementing a system analyzes necessary issues.

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0897-1889/00/1302-1026$10.00/0

doi:10.1053/jdim.2000.6841

THE QUESTIONS

Are personnel reductions in the film library a true savings? Are incremental efficiencies achieved by not waiting to retrieve hard-copy images? Is productivity enhanced as technicians and physicians do not have to travel for image review? How many systems administrators are necessary to support the PACS? Can personnel actually be reduced by, as an example, 0.38 full-time equivalent (FTE) personnel in any one shift? As PACS planning programs address these issues in varying manners, there are numerous feasibility outcomes. This variation obviates the need for a higher level analysis of the benefits of PACS to any health care institution.

At some health systems, PACS planning has expanded, to its benefit, to include or to be organized by information technology, development and marketing departments, as well as senior administration representatives. Image management is greater than a diagnostic imaging department as endoscopy, cardiology, other patient data, and other visual light-based clinical services are beginning to plan for a hard-copyless environment. The need to expand outside the radiology department for PACS planning is necessary for enterprise-wide implementations of PACS.

With this expansion outside of diagnostic imaging services, many health care organizations have used a technology assessment (TA) process to evaluate the proposed PACS plan. TA processes, like ROI studies, vary. Health care provider-based TA can be thought of as a process wherein the health care provider assesses new and emerging technologies (devices, procedures, pharmaceuticals, or new services) with respect to the provider's vision and strategic mission. Provider-based TA differs from other perspectives as it is microcosmic; it is focused on determining whether the technology is suitable and appropriate for a defined community. Macrocosmic TAs, such as those performed on behalf of government, regulatory, or payer agencies, often are focused on the inherent clinical effectiveness of a technology in a broad sense. A TA of tamoxifen for the prevention of breast cancer in the general population differs from one that examines whether a dedicated stereotactic breast biopsy system in a health system's market area can affect patient outcomes in a cost-effective manner. The microcosmic TA that is performed by a health care provider—one that seeks to align its mission and vision with new and emerging technologies—evaluates costs and benefits to the community and the health system, as well as a technology's effectiveness.

The process of TA allows health care providers to make consensus judgements about what clinical technologies are best for the whole provider, rather than what is best for the clinical service. By gathering perspectives from different fields and focusing on the technology's fit with mission and strategy, providers can depoliticize technology decisions through the TA process. The million-dollar capital budget grab that PACS can be seen as can instead be represented as a valuable service for all clinical services when presented and evaluated through a TA committee.

TA programs have been implemented by all types of health care providers. Although initially TA was centered in academic facilities who had the resources and personnel that could commit to the process, many community-based providers and physician groups have implemented TA programs as the benefits of a system-wide evaluation have been beneficial in the scramble for limited capital budgets.

TA programs that have been effective use predetermined criteria to measure quality and outcomes. Specific areas that are examined include the following: technology effectiveness; impact on the community health status; need for the technology; and impact on length of stay (LOS), cost of care, revenues, and other technologies

Effective TA committees are generally composed of a limited number of people, with a greater representation of physicians than administrators; physician representation is essential, as the TA committee deals with patient care. The capital budgeting for new and emerging technologies should occur after TA committee review, and is most likely handled by administrators and finance representatives.

At facilities where a PACS was being considered, the TA committees have often used the feasibility analysis as the starting point for the committee's evaluation. Generally, the radiology department administrator or chairperson had managed the feasibility analysis. When PACS entered the TA arena, the TA committee strongly encouraged the PACS champion to examine additional criteria, which each technology being evaluated by TA committees should be submitted to. These criteria are generally established early on by the

committee and are continuously refined and customized for each technology request. Both tangible (quantitative criteria) and intangible factors (qualitative criteria) are assessed. A TA-weighting variable is applied to each criterion in the analysis, allowing the committee to assess mission impact in addition to the cost benefits associated with a feasibility study.

Quantitative criteria used in some PACS TA evaluations have included the following:

- Does the acquisition technology (eg, digital radiography [DR]) have Food and Drug Administration approval?
- Is PACS a source of referrals for the health care provider, even when the provider is in a highly managed care environment?
- What is the impact of PACS on access to or the promotion of health care?
- What training programs have to be implemented to effectively use PACS?
- How many DR systems are necessary to support the existing base of radiography services?
- What staffing changes will occur as PACS is implemented?
- What facility modifications are required, including renovation and new construction costs?
- What are the costs of converting archived films to a digital environment?

Qualitative criteria that have been used by successful PACS implementers include:

- What are the alternatives in image management?
- What services and existing technology may be eliminated with PACS implementation?
- How will PACS affect LOS?
- Is PACS required to meet evolving standards of care?
- What are the short- and long-term risks, both for the patient and the provider?

These criteria are samples that PACS implementers have used, and are by no means a complete list.

In the majority of the TA assessments we have been involved with, PACS has been approved. However, in some cases, the PACS programs have been delayed as the TA committee found that PACS did not fit in well with short-term strategic goals, that it would not reduce costs significantly enough at the time to justify its implementation, or that it was too early in its development for certain hospitals to implement such a fast-changing technology. In some cases, PACS were to be approved after the TA committee recommended an implementation phasing change, the implementation and familiarization with computed radiography technology and soft-copy reads as an initial step, an archive scalability option, or after upgrades to the information technology infrastructure were accomplished. Where PACS were approved, the goals of PACS implementation and its impact on all clinical services were much better known as the TA committee was able to clearly focus on benefits besides the costs savings that came from the feasibility analysis.

The TA process did add some time to the final approval date as TA committees had to collect, evaluate, and issue decisions—sometimes asking for additional criteria data for its evaluation after initial submission. With PACS technology changing rapidly, the short delay in successful requesting facilities resulted in greater capabilities being available as PACS technology has been maturing rapidly.

The TA process allowed health care facilities to move feasibility studies to a larger review plane and away from manufacturer-sponsored cost justifications. Overall, PACS have been approved through the TA process, and when they were delayed the goals, benefits, and costs were much better understood by all clinical personnel than had these health care providers just relied on questionable assumptions of feasibility studies. Clinical acceptance was also found to be higher after the TA evaluation as it was a health-system program rather than a department-based program.