TECHNOLOGY DECISION MAKING

I n hospitals the authority to make decisions about the purchase and use of technology is usually diffused among a great many people. Sometimes chief executive officers will approve physicians' or department heads' requests for new or replacement equipment with only limited reference to the hospital's overall technology needs, strategic goals, and mission. Other hospitals may use medical staffs or capital budgeting or technology assessment committees for such recommendations.

Hospital executives often feel uncomfortable with technology decision making. Questions regarding the proper use of technology have such far-ranging effects that it is often a divisive issue for healthcare planners, as well as for hospital executives, physicians, and patients. Technology is simultaneously presented as the solution to our problems, a major reason for escalating healthcare costs, and a source of competition for resources between and within hospitals.

Finding a more constructive approach to this issue will require a paradigm shift in the way healthcare managers and administrators think about, plan for, acquire, and manage new tech-

A Constructive Approach to Planning And Acquisition Will Require a Paradigm Shift

BY DAVID A. BERKOWITZ & MELANIE M. SWAN

nologies. They must learn to view technology as an integrating, rather than a divisive, element in hospital planning. And to achieve this, hospital senior managers must establish and support a broad vision of the proper approach to technology and technology assessment.

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Summary   Technology should be viewed as an integrating rather than a divisive element in hospital planning. In the past, technology decision-making responsibility has often been diffused throughout hospitals, but providers are beginning to take a more considered and coherent approach.

The process of making decisions about technology has four key elements: assessment, planning, acquisition, and management. The most important aspect of the assessment phase is the formation of a technology advisory committee to review and evaluate requests for new and emerging technology; review capital budget requests for new and replacement technology; and set mission-based and strategic priorities for new, emerging, and replacement technologies.

Technology planning allows hospitals to set long-term goals for technology acquisition. The process involves an audit of existing technologies, evaluation of other hospitals' technologies, and review of technology trends. A well-defined technology plan will, in turn, facilitate the acquisition and management process, allowing hospitals greater flexibility in negotiating costs and budgeting for training, spare parts, service, upgrades, and support.

By pooling resources with other providers in their region, hospitals can further enhance the effectiveness of their use and acquisition of technology. Collaboration allows providers to share the risks of technologically volatile and intensive services and avoid costly duplication of equipment and facilities.

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SOME DEFINITIONS

Many different terms are currently in use regarding medical technology and technology assessment. The most valuable definitions we have found are as follows:

- *Technology*: an existing, new, or emerging device, pharmaceutical, procedure, or protocol
- *Technology assessment*: the practical process of determining the value of a new or emerging technology, in itself or compared with existing or competing technologies, using effectiveness, outcome, risk management, strategic, financial, and competitive criteria
- *Technology planning*: the systematic method of determining a hospital's technology needs and setting short- and long-term priorities based on strategic, financial, risk management, and clinical criteria
- *Technology acquisition*: the process of determining which manufacturer provides the best equipment and support for the hospital's needs
- *Technology management*: the rational process of ensuring that a hospital's technology is used and supported properly and effectively

Technology assessment, planning, acquisition, and management are the key elements in effective technology decision making. By properly integrating each in a coherent, well-managed approach (see **Figure**, p. 44), hospital managers can ensure their decisions support their facility's overall mission and goals.

TECHNOLOGY ASSESSMENT

Implementing a technology assessment program is not complex, but it does require time, information, staff, and, most important, a strong commitment from management and physicians.

The key functional element of a technology assessment process is a technology advisory committee. This committee, which should report to senior hospital management, reviews and evaluates requests for new and emerging technology using predefined criteria; reviews capital budget requests for new and replacement technology; and sets mission-based and strategic priorities for new, emerging, and replacement technologies.
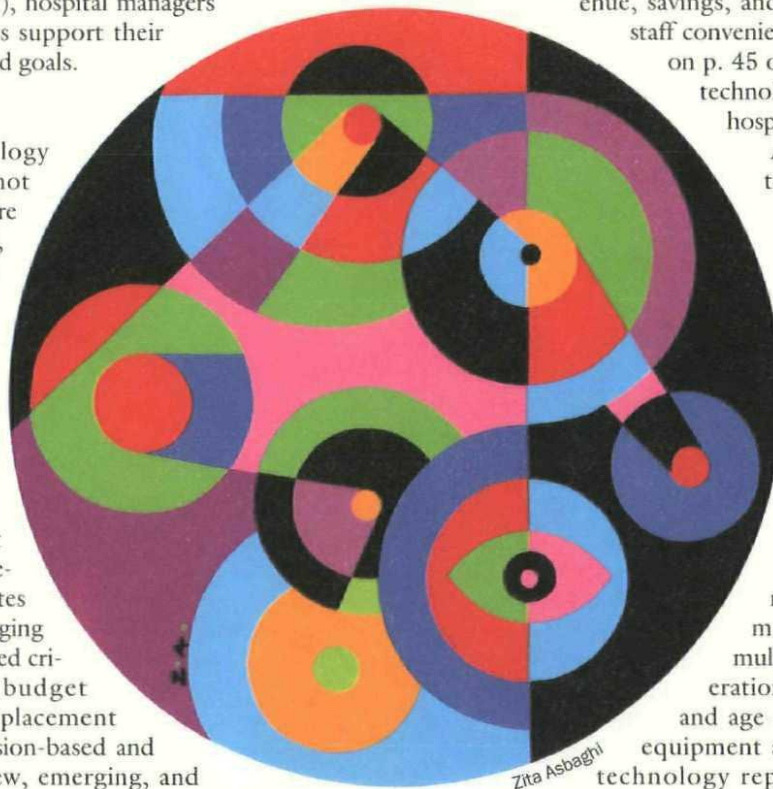
It is especially important that physicians be part of the technology advisory committee. The rapid development of new technologies and other medical advances often outpaces medical training. Involving physicians in the planning process helps everyone stay current on technological developments. More than any other group, they are aware of recent advances in their specialties. Physician involvement also reduces conflicts over priorities and makes peer review of other physicians' requests possible.
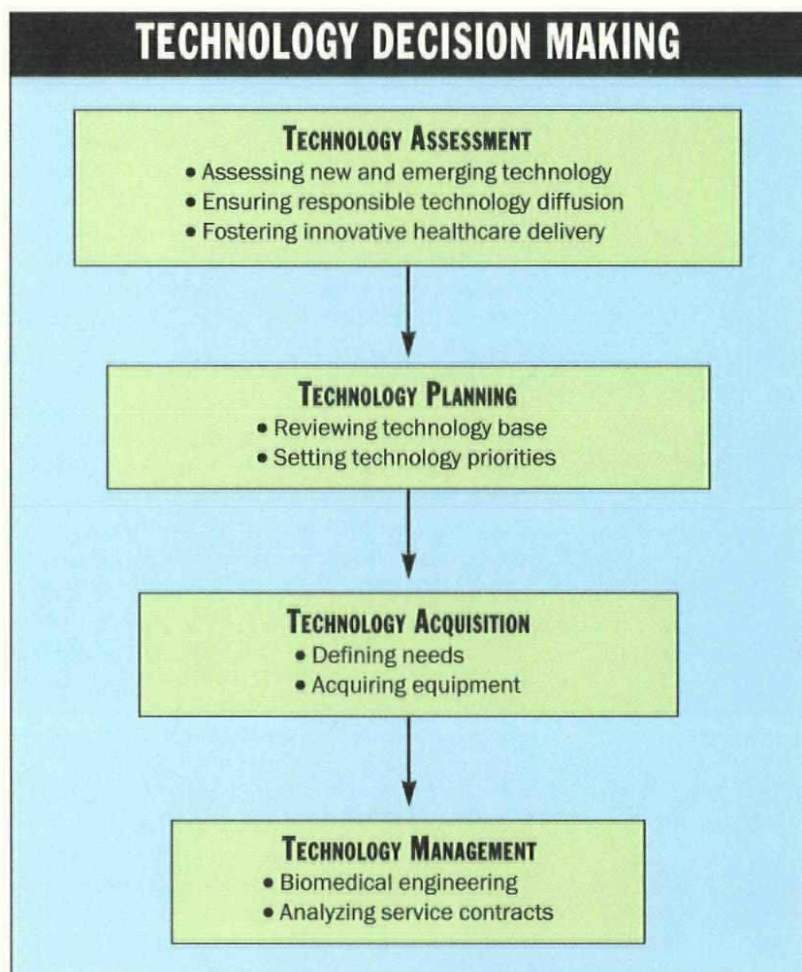
In the technology assessment process, persons making requests from or offering ideas to the committee describe the technology or procedure and explain how it will affect outcomes, existing technologies or procedures, and staffing. The committee screens the request to determine if it meets basic predefined criteria. If so, it conducts a more detailed analysis of the proposed technology or procedure, considering financial and other issues. The committee then sets priorities for this technology consistent with the hospital's mission, strategic plan, and other priorities.

The criteria for reviewing new and emerging technology requests are straightforward. They include the technology's potential impact on patient care; standards of care; utilization; revenue, savings, and market share; patient and staff convenience; and urgency. The **Box** on p. 45 outlines a case study on how technology assessment works for a hospital system.

Another critical task of the technology assessment committee is to review the value of existing technologies to ensure they are not overutilized or underutilized. Areas requiring such review at most hospitals include infusion technology and telemetry systems.

Practical technology assessment encompasses both new and emerging technologies and replacements for existing equipment to be acquired over a multiyear period. Safety considerations, standard-of-care issues, and age or obsolescence of existing equipment are among the reasons for technology replacement proposals. Ac-

> Technology assessment, planning, acquisition, and management are the key to effective decision making.

Zita Asbaghi

TECHNOLOGY DECISION MAKING

TECHNOLOGY ASSESSMENT
- Assessing new and emerging technology
- Ensuring responsible technology diffusion
- Fostering innovative healthcare delivery

TECHNOLOGY PLANNING
- Reviewing technology base
- Setting technology priorities

TECHNOLOGY ACQUISITION
- Defining needs
- Acquiring equipment

TECHNOLOGY MANAGEMENT
- Biomedical engineering
- Analyzing service contracts

quisitions can also be proposed to consolidate several service areas, expand a service area, or add a new service area.

Technology assessment and planning can be conducted for a single department, product line, or clinical service. It can focus on one or several high-priority areas, on all hospital operations, or on an entire region.

Such planning optimizes the way a hospital's capital resources contribute to its mission. It encourages choice of cost-effective new technologies that allow a hospital to remain competitive. The planning effort also improves the quality of patient care by ensuring that the appropriate technology is used.

ASSIGNING RESPONSIBILITY
Increasingly, hospitals are assigning a senior manager (e.g., an administrator, planner, director of medical affairs) the primary responsibility for

Technology planning optimizes the way a hospital's capital resources contribute to its mission.

developing the strategic technology plan. A person in this position will enlist the help of key physicians, senior executives, and department managers.

Sometimes, engaging outside help is the best way to develop a strategic technology plan. Some hospital administrators believe they need a neutral and informed party to balance the perspectives and conflicting demands of physicians or to steer through political and technological issues. However, even with outside assistance, key personnel should offer input as the plan is developed, review the draft report, and ratify the recommendations.

Initially, conflicting departmental interest may lead some to attempt to "game the system." However, once the members of the technology assessment committee understand the hospital's mission and strategic objectives, they tend to support the overall plan and be less parochial.

TECHNOLOGY PLANNING
Technology assessment allows providers to look at new and emerging technologies in the context of the hospital mission, goals, and objectives. Technology planning allows hospitals to set rational long-term goals for acquiring new and replacement technology. Whether technology planning involves one department, a hospital, or a region, the steps are similar.

Audit Existing Technology   The first step planners should take is to audit existing technology. Critical elements include the following:
- Review all existing technology-based services.
- Catalog each major equipment item's current condition, capabilities, and history of problems.
- Compare utilization statistics with equipment capacities, and review anticipated increases in volumes.
- Review incident reports and repair records to determine what problems have occurred (this often identifies equipment that needs to be replaced).
- Involve each department's manager, the clinical engineering director, the risk manager, and other personnel knowledgeable about both the technology and the technical literature that describes other institutions' experience with it.

A thorough technology audit can reveal whether existing equipment (e.g., an anesthesia machine) complies with a technology-related standard of care. And interviews with clinicians and other personnel can identify the need for training or credentialing of physicians in the use of particular technologies, such as lasers or

laparoscopic procedures.

Evaluate Other Hospitals' Technologies   Another key element of technology planning is to evaluate what other hospitals are doing. Planners should review competing institutions' plans for adding new technologies (if these plans are available). Such a review can reveal reasons to acquire the technology. More important, it will enable administrators to understand the dynamics of the local environment.

Planners should also assess technology-based services offered by other hospitals and freestanding facilities in the service area. Item-by-item information about the condition or use of a competing hospital's equipment is rarely available, aside from utilization statistics for major services collected by a state agency or hospital association. However, it is often possible to learn about other

> **P**roviders should create a prioritized list of needs for patient-care equipment.

hospitals' experiences with equipment from physicians who have staff privileges at these hospitals.

Review Technology Trends   It is also important to be aware of new technological developments. Planners should review technology trends in the clinical areas where purchases are being considered. In addition, they should determine what new and emerging technologies present strategic opportunities or complement existing services. (Planners must be sure to consider Medicare and Medicaid antikickback provisions that can come into play if arrangements with physicians are involved.)

Develop a Long-Term Plan   The result should be a multiyear plan that identifies, department by department, the institution's total resource needs. If the available capital funds in a particular year are insufficient to acquire all needed equip-

TECHNOLOGY ASSESSMENT: A CASE STUDY

A large not-for-profit system—comprising 11 hospitals, a home health service, a prepaid health provider, and a purchasing alliance with major strengths in cardiology, oncology, and obstetrics—faces intense economic and competitive pressures. Managed and capitated care providers have a strong presence in the system's service area. As part of its strategic plan, the system wanted to develop a technology assessment program to evaluate the impact of new and emerging technologies and to assess the need for and assign priority to the acquisition of both new and replacement healthcare technology.

This system implemented a three-step technology assessment process to evaluate new and emerging technologies. In addition, the process allowed the system to assess the value of existing technologies or procedures such as telemetry monitoring.

The system brought together clinicians and hospital managers to form a technology advisory committee to make informed decisions about whether technologies are appropriate for individual hospitals within the system or for the system as a whole. The technology advisory committee was responsible for

coordinating the technology assessment process.

According to the protocol developed by the committee, the technology assessment process begins when a physician or other healthcare professional proposes that the committee review an emerging technology. The proposal briefly describes the technology, its clinical status, its necessity within the system, and clinician support for the proposed technology. Once the committee decides whether to further investigate a technology, appropriate staff evaluate it from a qualitative perspective, using such criteria as the technology's impact on other services, its effectiveness compared with current medical practices, its effect on patient outcomes, and patient preference for the new technology.

Based on this evaluation, the technology advisory committee then decides whether to continue the assessment from a quantitative perspective. The quantitative analysis focuses on the technology's impact on the hospital—its clinical status, its fit with the system's mission and strategic plan, staff credentialing requirements, facility and staffing needs, third-party coverage,

and key financial indicators, such as internal rate of return and payback period. Based on the quantitative evaluation, the proposed technology is then recommended for approval to the system's oversight committee, which comprises the system's president, chairperson of the board, and senior vice president for medical affairs.

Key factors in the process include keeping the person who originally proposed the review thoroughly informed of the assessment and keeping the process moving. Evaluations are performed as thoroughly and as expeditiously as possible.

The system realized several benefits from implementing the technology assessment process. First, it found an objective and effective way of bringing physicians and hospital managers together to make difficult technology decisions, minimizing the conflict and politics that often hamper technology decision making. Second, it was able to make educated decisions about acquiring a technology. Third, it found a rational way of setting priorities for technology acquisitions in the context of budgetary and other economic and competitive constraints.

ment, unfunded items can be considered in a subsequent year's capital budget.

Providers should create a prioritized list of needs for patient-care equipment. Such a list can be the basis for a major segment of the hospital's capital budget in the years covered by the plan. Hospitals should also ensure that they account for all costs associated with an acquisition. In some cases, renovations are actually an element of a new technology's cost. The hospital must also consider other capital needs for such expenditures as new construction and support department equipment.

An important by-product of the technology assessment process is that the hospital's physicians become aware of the value or lack of value of specific technologies. In an era of diminishing resources, growth of new technologies, and high patient and physician expectations for high-quality care, hospitals must reconcile these sometimes conflicting trends and capabilities. More technology is not always desirable. Hospitals need to take a stand against competitive pressures to acquire unnecessary new technologies, especially ones whose clinical effectiveness is not proven.

Sometimes, therefore, technology planning

> **E**ffective technology management offers perhaps the largest potential savings.

requires what can be called "reverse marketing," in which planners explain to the medical staff—and to patients—that a thorough consideration of a particular new technology has resulted in the decision not to make it available. If insufficient demand is the reason, it is important to tell patients who need the technology that the hospital will arrange for them to have access to it at a nearby facility. By discussing the planning process and its results in the literature the hospital distributes to patients and the community, managers can even turn decisions not to acquire technologies to strategic advantage. Technology planning thus can be an integral part of total quality management, promoting physician cooperation in aligning physician and patient needs.

TECHNOLOGY ACQUISITION AND MANAGEMENT

Under current arrangements technology acquisition is often determined by the personal preferences of physicians who may not be the primary users of the technology. On the other hand, hospitals that develop multiyear plans with input from a variety of sources will have more control over the entire capital acquisition process. When separate departments have long-term plans, hos-

THE LIFE CYCLE OF HEALTHCARE TECHNOLOGY

The life cycle of a healthcare technology can be seen as a series of five distinct phases through which the new technology or procedure advances. The cycle has been described by H. D. Banta, C. J. Behney, and J. S. Willems (*Toward Rational Technology in Medicine*, Springer Publishing, New York City, 1981).

Innovation The invention of a new product, process, or practice. Typically, little is known about the value of the technology at this phase. Examples of technologies currently at the innovation stage include many biotechnologies, biomagnetism, conformal radiation therapy, and photodynamic therapy.

Early Diffusion The major announcements in the mass media and scientific meetings. Such publicity raises patients' expectations concerning the technology and the physicians who might use it. It also arouses curiosity among physi-

cians. Technologies that fall into this category are positron emission tomography, stereotactic radiosurgery (the gamma knife), surgical lasers, and high-frequency ventilation.

Incorporation When recognition as an established technology increases its use. Normally, a technology has achieved recognition when a consensus that it is valuable develops or when it is approved for reimbursement. Technologies currently at this stage include laparoscopic cholecystectomy, automatic implantable cardioverter defibrillators, and multihead single photon emission computed tomography systems.

Utilization A period of widespread use of the technology. This is the point at which the most significant information about the technology's benefits, resource consumption, dissemination, and safety is being accumulated. Often, however, little attention is paid to this

information. Technologies now at this stage include telemetry systems, infusion technology, magnetic resonance imaging, and ultrasound.

Abandonment The phasing out of technologies based on lack of benefit, safety problems, unacceptable risk, or replacement by more effective, efficient technologies. Because the rate of innovation has far outpaced the rate of abandonment, a number of competing technologies are now in use. Healthcare providers often resist change because they have invested time, effort, and training in certain technologies and because in the past marginal improvements in a technology have often forced them to make replacements prematurely. Technologies in this category include gastric freezing and biliary lithotripsy. There have been marginal changes in such technologies as physiological monitoring and thermometry.

pitals can phase in large purchases over several years. Because purchases are planned, hospitals have the flexibility to prepare bids and negotiate prices. Having a plan not only allows hospitals to purchase technology at better prices; it also enables them to budget for costs related to training, spare parts, service, support, and upgrades. For multi-institutional systems, plans to redeploy equipment to other departments or facilities and bundle and pool capital equipment purchases can also lead to significant cost savings.

Effective technology management, a frequently overlooked area, offers perhaps the largest potential savings. Many hospitals do not carefully review how much equipment support costs, how well it is done, and whether less expensive alternatives are available in such areas as time and materials, maintenance insurance, in-house support, or the use of third-party service organizations. Providers can often save between 10 percent and 30 percent of current maintenance costs on clinical equipment.

REGIONAL OPPORTUNITIES

Many assessment and acquisition approaches can be applied on a regional basis. With a regional technology acquisition plan, individual hospitals that would normally compete with each other can avoid excess expenditures on such high-technology services as positron emission tomography, magnetic resonance imaging (MRI), renal lithotripsy, and cardiac catheterization. Such arrangements allow hospitals to share the risks of technologically volatile and intensive services and avoid costly duplication of equipment and facilities. Many hospitals have also taken advantage of mobile technologies to provide better patient access and minimize risk.

By implementing a consistent regional strategy, hospitals not only strengthen their relationship with affiliated providers, they also:

• Distribute technology and services more rationally, allowing patients access to a continuum of care

• Maximize patient convenience and the overall attractiveness of services by providing as many technology-based services as can be clinically and economically justified

• Optimize use of available space at affiliated hospitals by housing a broad range of technology-based ambulatory services in them

• Identify local, affiliated hospitals as the source of high-technology services to enhance their overall reputation in the community both because of the services provided and because their

With a regional technology acquisition plan, individual hospitals that would normally compete with each other can avoid excess expenditures on high-technology services.

affiliations are more specific and visible

A regional strategy not only improves collaborating hospitals' capabilities, but also enhances their attractiveness to the area's primary care physicians and healthcare consumers. Because physicians play a major role in determining the use of diagnostic and therapeutic technology, enlisting their support is essential.

Successful regional strategies require that collaborating facilities take the following steps:

• Develop telemedicine systems that link facilities and physicians to one record (including data on preadmission testing and teleradiology) that is accessible from many locations.

• Institute clinical practice guidelines and outcomes management systems.

• Collaborate with physicians on technology assessment and planning decisions.

• Coordinate high-technology services to improve patient access and reduce duplication of expensive diagnostic and therapeutic services.

• Plan to reduce duplicative clinical and diagnostic services.

• Use a mobile van or truck to bring services to the hospitals' customers. Patient scheduling should be handled by a technology center coordinator employed jointly by all affiliated hospitals. Initially, services might include lasers, ultrasound, echocardiography, ECG, and stress testing. Additional services to be phased in gradually might include mammography, computed tomography, and perhaps MRI.

A PRACTICAL PROCESS

Technology assessment, planning, and management are not magic: They are practical ways of reviewing information about technologies and procedures and comparing them with existing approaches and other priorities in the hospital or system. Hospitals should demand good information on the value and efficacy of technology, on competing technologies, and on cost-effectiveness. Hospitals must also educate consumers on technical and clinical realities.

Most important, healthcare providers must learn to see technology as an integral aspect of strategic planning. An informed perspective on technology and technology assessment will enable senior managers to effectively integrate strategy, operational and management practice, and financial and risk management issues with such qualitative issues as outcomes and patient satisfaction. With such a vision, providers can ensure their choices and plans for technology acquisition fully support their overall mission and goals. □