Medical Equipment Planning

Healthcare providers worldwide are facing an increasingly competitive environment and, in response, are downsizing to reduce costs and improve efficiency. Providers that are unable or unwilling to become more efficient will close. To stay in business, healthcare institutions must consider the cost of medical equipment and plan accordingly. Policies based on sound principles and experience prevent costly and/or harmful mistakes. In this article, we discuss the different phases of equipment planning, detail some of the relevant concepts and terminology, describe how clinical engineers can become involved, and highlight ECRI resources available to those carrying out the process.

Whether you are a clinical engineer facing downsizing and consolidation, a healthcare administrator with a mandate to rein in the costs of technology, or a minister of health facing the task of building or maintaining a nation’s healthcare infrastructure, this article will help you seize opportunities and meet challenges.

Overview

Medical equipment planning is the overall process of selecting equipment for a healthcare facility. Properly executed, it ensures the availability of appropriate equipment at the right time and in the right place. In addition, by encouraging the choice of cost-effective technologies, it optimizes the use of the hospital’s capital resources. And it improves the quality of patient care by ensuring that equipment is up-to-date and functioning. Its implementation can range from an ad hoc examination of a department’s bedside monitors to an institutionwide review of every piece of equipment on every floor.

The following are the components of medical equipment planning:

- Needs analysis
- Technology assessment
- Facility evaluation
- Financial evaluation, including a life-cycle cost analysis and business feasibility study
- Equipment planning for new facilities or for renovations to existing ones, including architectural coordination and engineering support

In this article, we discuss the general principles behind each component and describe how clinical engineers can expand their role in the planning process. ECRI can provide specific guidance on implementation of a medical equipment planning program; a list of relevant ECRI services and information products is provided on page 11.

Components of the Equipment Planning Process

Needs Analysis

When performing a needs analysis, a healthcare facility or system evaluates the status of its existing technology, determines when to replace or condemn equipment, and identifies new and replacement technologies to consider. A needs analysis focuses on replacing existing equipment or adopting proven technologies. As such, it differs from technology assessment, which generally focuses on incorporating recently introduced technologies. (See the detailed discussion in the section on Technology Assessment below. Also see the supplemental article, “Basic Concepts of Needs Analysis and Technology Assessment,” on page 6, for a profile of terms and ideas important to these processes.)

The formal protocols of needs analysis (e.g., needs assessment forms, replacement justification procedures) ensure that patient care issues, alternative technologies, financial implications, and other treatment options are thoroughly considered in a balanced manner. They also ensure that replacement technologies have substantiated clinical value and are consistent with the mission and goals of the healthcare provider. In addition, a properly conducted needs analysis identifies technologies that complement existing services, as well as those that present strategic or short-term financial opportunities — as in the case of a high-visibility technology that, if made available, will provide a marketing advantage and will generate considerable income in the first few months of use.

It is essential to involve each department’s manager, the clinical engineering director, the risk manager, and other personnel knowledgeable about the technology being reviewed. It is also necessary to be familiar with other institutions’ experience with the technology. The best way to gather information is to send questionnaires to your staff and conduct follow-up or supplementary interviews with selected staff members and other individuals inside and outside the institution. Questions should cover the perceived adequacy of the current equipment, physician and clinical
staff preferences and their rationale, estimates of the technology's impact on patient volume, and the equipment and systems needed to meet that volume. In addition to gleaning valuable data, questionnaires and interviews serve to include clinicians in needs analysis, thereby stimulating their curiosity and participation and increasing their inclination to accept decisions reached through this process.

Reviewing Existing Equipment

One component of needs analysis is a thorough review of the institution's existing medical equipment. It consists of the following:

- Cataloging the current condition and capabilities of each major piece of equipment.
- Comparing use statistics against equipment capacities (e.g., the number of procedures that a given device can perform per day) and reviewing projected changes in use volumes.
- Reviewing incident reports and maintenance records to quantify the reliability of the equipment and assess how this reliability affects patients and costs. By performing this analysis, the facility can identify equipment that should be replaced because it poses risks to patients or staff or because it requires continual service and repairs that will be more costly than replacement.

Condemning and Replacing Equipment

When deciding whether to condemn or replace equipment, the facility should ensure that both the existing equipment and its proposed replacement(s) are scrutinized by individuals who are clinically qualified (e.g., physicians) and technically qualified (e.g., clinical engineers or physicists).

Requests for equipment replacement are made for a variety of reasons. Clinicians may request a new model because it has a "hot" feature. Sometimes requests are made simply because an item is old. A formal justification process ensures that inappropriate requests are denied and that those based on changed utility, useful life, safety, and economic factors are given serious consideration.

We discuss some of these factors, as well as others involved in the condemnation or replacement decision, in the remainder of this section.

Useful Life

The useful life of equipment depends on factors such as frequency of use, reliability, quality of design, and the level of support the manufacturer will provide. Changes or advances in a technology's capabilities and applications may make current devices clinically obsolete before they are technically obsolete, or vice versa. Such advances may justify the replacement of existing equipment if the new devices will have a positive effect on patient care, patient safety, performance, reliability, or operating costs.

Safety

Although safety is a vital concern, safety issues justify replacement and upgrades only if continued use of current equipment presents a clear hazard that cannot be otherwise remedied — for example, by increasing preventive maintenance frequencies. It is proper to replace equipment based on personal observations of unsafe conditions, reports in the clinical literature, manufacturer information, safety alerts and recall information, or an independent testing organization's determination that the risk cannot be eliminated. Every healthcare provider should be aware of and respond to equipment recall and hazard notices. A system for monitoring and accountability should be in place. Moreover, the healthcare provider must institute interim safety measures to prevent further risk or harm until the unsafe item can be replaced.

Economic Factors

Economic factors alone may justify replacing equipment. These include excessive repair costs and the availability of new equipment that decreases operating costs and favorably affects productivity and patient outcome.

The costs of repairs include more than just the price of parts and labor. Unscheduled downtime affects patient care, patient service standards, and patient outcome. For example, if a chemistry analyzer in the main laboratory fails, stat tests may not be available as quickly as usual, resulting in delayed treatment decisions, extended lengths of stay, and worsened patient outcomes. Additionally, if the analyzer generates revenue, downtime may mean deferral or outright loss of this revenue. For instance, income normally generated from tests performed for physician practices will be lost; if this occurs frequently, the contract will also be lost. Moreover, excessive repairs burden the schedule of the clinical engineering department, possibly preventing the department from performing preventive maintenance or service on other equipment. And with repeated failures, clinical staff will become distrustful of the analyzer and dissatisfied with the working environment.

Even if a device does not have a history of major problems, replacement is justified if it results in significant direct reductions in operating costs. Such reductions can be provided by equipment that reduces the time

(continued on page 8)
Basic Concepts of Needs Analysis and Technology Assessment

A number of concepts are fundamental to discussions of needs analysis and technology assessment. We define and describe these below.

**Healthcare Technology**

This term covers devices, equipment, systems, software, pharmaceuticals, biotechnologies, and medical and surgical procedures used for the prevention, diagnosis, and treatment of disease; for rehabilitation; and for assistive purposes. Broadly defined, healthcare technology encompasses most of the human interventions intended to cope with disease and disabilities. (However, in this Guidance Article we use the term technology to refer strictly to devices, equipment, and software, not to pharmaceuticals, biotechnologies, or procedures.)

**Appropriate Technology**

This term is used to mean that a specific technology is suitable for use in a specific healthcare environment, that the environment can successfully assimilate the technology, and that the technology will have a significant, positive impact on the target disease and/or population.

**Primary and Secondary Technology Assessment**

Primary technology assessment develops previously nonexistent data through research — specifically, long-term clinical studies and outcomes measurements (see below). Secondary technology assessment is usually based on published data, interviews, questionnaires, and other information-gathering methods, rather than original research.

**Outcomes Measurement**

Outcomes measurement assesses overall clinical results and the impact of a technology on patients to evaluate the effectiveness of healthcare. Examples of specific outcomes measures are mortality, morbidity, health status, and quality of life (see below).

**Quality of Life**

This is a broad concept concerned with all aspects of well-being. Among the many factors used in judging the quality of life are symptoms, functional status (e.g., mobility, physical activity), role activities (e.g., work, household management), social functioning (e.g., personal interaction, intimacy, community interaction), emotional status (e.g., anxiety, stress, spiritual well-being), cognition, sleep and rest, energy and vitality, health perceptions, general life satisfaction, and socioeconomic status.

**Technology Diffusion**

Technology diffusion is the process by which a technology is adopted, beginning with its emergence as a new technology and continuing until it is in common use and the marketplace is saturated.

**Efficacy, Effectiveness, and Performance**

Efficacy is the theoretical ability of a diagnostic, therapeutic, or rehabilitative modality to fulfill its intended clinical purpose under ideal conditions. Efficacy rarely has highly reliable quantitative measures. It is related to, though distinct from, patient outcome (see Outcomes Measurement above). Efficacy is best measured by carefully designed and implemented clinical trials and best judged by formal technology assessment studies once the data from these trials is available.

Effectiveness refers to a technology’s ability to fulfill its intended clinical purpose under real-world conditions — for example, some healthcare professionals and facilities may be limited in their ability to assimilate, manage, apply, and support the technology, which can reduce the technology’s effectiveness.

Performance is a measure of the ability of equipment to fulfill its intended purpose, primarily from an engineering perspective. It includes such factors as frequency response in electrocardiographs, resolution in imaging systems, and resistance to electromagnetic interference in electroencephalographs. Failure to meet specified performance parameters may lead to diagnostic errors, harm to the patient, malpractice or liability claims, and costly troubleshooting and corrective action.
Safety

There is no such thing as absolute safety. Safety is a matter of relative risk, rather than a matter of reaching a theoretical (but in fact nonexistent) fail-safe point. As such, it involves more than just the functional safety of a device or procedure. It is a systems concept that extends to overall facility operations and policies. It includes the training and competence of the user, the reliability of supporting services such as electrical and medical gas distribution systems, and periodic preventive maintenance and safety inspections by clinical engineering staff.

Other components of safety as a systems concept include the following:

- **Intrinsic product safety**, which includes such factors as electrical leakage protection, protective incompatibility of gas fittings, fail-safe design, and human factors design that decreases the risk of error by following established conventions (e.g., power is increased by turning a knob clockwise rather than counterclockwise).
- **Equipment reliability**, especially for medical emergency and life-support equipment. Equipment that fails to function when needed can be as dangerous to a patient as equipment that malfunctions. (Reliability is further discussed below.)
- **Clinical safety** — for example, preventing adverse outcomes such as those associated with ionizing radiation, thermal burns from nonionizing radiation, and drug side effects.

Reliability

Reliability is a measure of consistent performance and safety without failure. Like safety, reliability is a systems concept. It, too, is greatly affected by the competence of equipment users (or the lack of it — for instance, misuse of equipment or failure to provide appropriate maintenance).

Reliability is a process of continuing improvement, not a fixed characteristic. For example, experience in practical, real-world use of the device (such as alpha and beta trials) often results in design and manufacturing improvements to improve reliability before marketing. Further improvements, based on user feedback, are then made once the equipment is in widespread clinical use.

Intrinsic reliability emerges from sound design, choosing properly rated components, premanufacture component testing, and manufacturing quality assurance. Good Manufacturing Practice inspections, as conducted by regulatory agencies, may contribute significantly to quality and reliability.

For most electronic and mechanical equipment, reliability generally peaks — and plateaus — about 12 to 20 months after a product is first introduced.

Features

The features of a unit or system can affect its capabilities, performance, safety, ease of use, convenience, and versatility. Competing brands and models often have significantly different features, but there are exceptions. For example, third- and fourth-generation products usually conform to de facto marketplace “standards,” in addition to formal published standards (see below). As a result, their most important features can be very similar. This frequently leads manufacturers to exaggerate insignificant variations in features to differentiate their products from competing ones.

Standards

A wide variety of formal standards and guidelines related to healthcare technology exists, with new ones developed and adopted almost daily. Standards apply to

- design, development, and manufacturing practices for devices, software, and pharmaceuticals;
- safety and performance requirements for certain classes of technologies (for example, standards related to radiation or electrical safety);
- performance or even construction specifications for specific types of technologies; and
- subjects ranging from administrative processes to medical and surgical procedures and the related training of clinical personnel.

Standards and guidelines are produced by government agencies, international organizations, and professional and specialty organizations and societies. According to ECRI’s Healthcare Standards Directory, there are more than 13,000 individual standards and guidelines produced by more than 800 organizations and agencies from North America alone.

Because standards for medical equipment are time-consuming to produce, de facto marketplace standards will often develop in advance of the formal process; thus, device-specific standards are often of very limited value. However, design, manufacturing, and sizing standards for simple devices (e.g., bandages, dressings, needles, connectors) are both common and useful.
required to identify and treat illness, that reduces waste, that reduces the use of consumable items or the need for unnecessary testing, or that in some other way improves the efficiency of care.

However, replacing equipment is not always cost-effective. New equipment that requires expensive supplies, disposables, or accessories may not decrease operating costs — especially if it does not increase throughput or reduce staff intervention. For example, many point-of-care laboratory devices require the use of very expensive cartridges and/or reagents and can perform only a few tests. While these devices improve patient care in limited settings, their excessive costs will likely prohibit their use throughout a facility.

The Standard of Care

As new technologies become widely accepted, there is often an advance in the de facto standard of care — the perception of what constitutes appropriate care — that may or may not be reflected in written standards from regulating bodies or other organizations. Every time a new technology develops that allows safer, less invasive, and/or more effective provision of patient care, the standard of care eventually advances.

Recruiting and Retaining Clinicians

Equipment replacement decisions may be influenced by a wish to make state-of-the-art equipment available to help recruit or retain clinicians needed to fill a need in a particular specialty or subspecialty. Physicians whose training has included using the newest diagnostic and therapeutic instruments, and physicians who have kept up-to-date in their specialty's technology, are not likely to be as attracted to, or to remain in, a hospital with outdated equipment.

Assessing Replacement Equipment

When evaluating replacement equipment, consider the probable effect of the equipment on patient care and other services, on clinical outcome, and on patient volume; also consider patient and staff safety issues. Examine the ability of the staff and facility to assimilate the equipment (e.g., will it require additional staff, training, or changes in heating, ventilating, and air-conditioning [HVAC] systems or electrical wiring?). Consider the impact on the clinical engineering department: Can the equipment be serviced by in-house staff? Will it require a service contract? In addition, explore alternatives to the proposed equipment — either a different technology or another means of providing the service.

Technology Assessment

Technology assessment determines the clinical value, risk-benefit ratio, and cost-effectiveness of new healthcare technologies. Technology assessment also examines factors that will vary among nations and cultures, including legal and ethical considerations. There are two levels of technology assessment: macroassessment and microassessment.

Technology Macroassessment

Technology macroassessment takes the “big picture” approach and is usually undertaken by governments, academic institutions, payers (e.g., third-party insurers), and ECRI. Although not generally performed within healthcare institutions, its impact on a specific facility can be considerable — for example, as it affects an insurser's willingness to reimburse for a particular emerging technology.

Macroassessment analyzes a particular healthcare technology for its unique attributes. It considers the clinical efficacy and effectiveness, cost-effectiveness, and safety of the technology, taking into account alternative technologies intended to serve the same purpose; the technology's value and significance balanced against the other healthcare needs of a nation or of a specific region or province; and opportunity costs — that is, the sacrifices that may need be made to take advantage of the technology.

Technology macroassessment is useful to ensure the proper use and introduction of a technology. More specifically, it has the following purposes:

1. To prevent premature adoption of unproven technologies that may be neither clinically effective nor cost-effective
2. To maintain a proper order of priorities for healthcare goals and practices at the overall national or regional level
3. To maintain a proper order of priorities for allocating clinical services within a geographic area, based on how certain technology resources are regionalized

Technology Microassessment

Technology microassessment evaluates a technology for adoption within a specific healthcare facility, perhaps as part of a departmental review or for a general procurement process. It also monitors the value of a technology once it has been integrated into a facility's operations. The process includes the following steps:

- Clinical assessment — to determine whether the technology is appropriate and desirable for the clinical and epidemiological needs of the patient population. This
step asks the question: Does the technology suit our treatment needs?

- **Supplier/equipment assessment** — to evaluate the equipment supplier and the specific systems or units being considered for acquisition. This step asks the question: Are these the right units from the right source?

- **Integration of assessments** — to make a final decision based on information and conclusions drawn from the clinical and supplier/equipment assessments, as well as — in some cases — previous assessments conducted in other areas of the facility. This step answers the question: Should the technology be adopted?

- **Reassessment** — to reevaluate the technology after it has been implemented, as well as the related processes that were adopted or altered to accommodate the technology. Reassessment should take place one year and three years after the technology has become operational. Reassessment is important to determine if the recently adopted technology has fulfilled expectations in improving quality of care, length of stay, and the financial picture. This step answers the question: Was it worthwhile to adopt the technology? Do we need to adjust our equipment profile? How well did our technology assessment process function? This follow-up information will improve the reliability of future assessments.

The frequency of later reassessments depends on the size and resources of the facility. At the very least, a technology should be reassessed whenever a replacement is being considered. Compare new technologies with all possible alternatives, including those already in use at the facility, as well as other treatment options that have emerged.

It is not necessary to perform every step in the technology assessment process for every acquisition. However, if you are giving thought to applying a completed technology assessment to another setting, be certain that there are no differences between the settings that might invalidate this use. Achieving such certainty will include analyzing historical data to project future trends, including need, use, cost, and revenue.

If technology microassessment is properly undertaken, healthcare facilities will realize several major benefits:

- Meeting the healthcare needs of the population served
- Realizing cost savings from enhanced productivity and from avoiding unnecessary or obsolete technologies
- Improving safety and the quality of care

- Implementing technologies that are consistent with the facility’s mission and level of service
- Acquiring baseline information that can be used in reevaluations, planning, and examination of cost-effectiveness and cost-benefit ratios

**Facility Evaluation**

In this component of the medical equipment planning process, the practical considerations specific to replacing an existing piece of equipment or implementing a new technology are explored. Specifically, you will need to determine whether the facility has the physical and human resources necessary to assimilate and support the technology.

When evaluating the facility, consider any safety hazards that may develop from introducing the technology. Consider structural, electrical, human factors, and other special concerns (e.g., electrical or radiation shielding). If safety concerns cannot be addressed within the existing facilities, renovations or new construction may be necessary.

It is just as important to examine the human resources necessary to deploy and use the equipment. Will there be enough trained staff available to operate the equipment? How will the stress of learning a new technology affect staff morale? How much training will be required? Is there a need for ongoing training? What are the minimum qualifications for proper operation?

**Financial Evaluation**

In a financial evaluation, the costs associated with owning and operating a technology are examined. This analysis requires more than just raw dollars-and-cents data. Experience and judgment about the relative importance of features and the ability of the technology to fulfill the intended purpose also contribute critical information to the cost-effectiveness analysis. For example, if a technology is less costly than the one currently in use, but does not meet its intended goals, it is not cost-effective. Or if the healthcare provider has experienced poor response times from a supplier, it may not matter that the supplier’s equipment is less expensive.

**Life-Cycle Cost Analysis**

The specific cost of ownership is best calculated by the life-cycle cost (LCC) method, which considers the total cost of the technology for a selected time frame. This method takes into account factors such as initial purchase price, maintenance, service, shipping, renovations, installation, supplies, associated disposables, training, annual upgrades, and staffing requirements. Other factors, such as cash flows (including reimbursement), dollar discounts, and inflation, are also considered.
While the concept may appear simple, an LCC analysis can be difficult to perform. For example, the costs of some of the factors mentioned above may be difficult to obtain or calculate, and attempts to simplify the process by using estimates may lead to misleading or invalid conclusions.

**Business Feasibility**

A business feasibility study should also be included in a financial analysis. This step determines whether the specific technology will attract enough patients and generate enough income to warrant its cost of ownership.

**Equipment Planning for New Facilities or Renovations to Existing Ones**

When new facilities or major renovations to existing facilities are planned, certain interrelated architectural coordination and engineering support concerns must be addressed, in addition to the equipment planning stages already discussed. Because healthcare facilities have unique concerns and are subject to special building and design regulations, the first step is to find a qualified architectural firm. The paramount qualification for such a firm is experience with healthcare facility design and engineering coordination. After completing the conceptual design, the architectural firm will coordinate the services of engineering specialties.

Based on the conceptual design of the new or renovated facility and the needs imposed by special equipment (e.g., ensuring the floors can withstand the load of an MRI), structural engineers will develop a structurally sound facility. Electrical engineers will design the layout of all wiring to ensure safety and adequate capacity. Facilities/industrial engineers will consider human factors and traffic flow to make sure the conceptual design can be applied practically. Mechanical and communication engineers will plan HVAC, plumbing, and communications equipment within the structure.

As the design becomes more detailed, medical and other equipment will be included in the plan. It is important to coordinate and plan the properly staged delivery of both construction supplies and medical equipment. Delivery should be scheduled for the appropriate phase of construction. If supplies are not delivered on time, construction delays are sure to occur. On the other hand, if supplies or equipment arrive too soon, they may be damaged or stolen if proper storage is not available.

Placement of every item — from doorknobs to imaging equipment — will be predetermined to ensure that structural, electrical, facility, and other engineering concerns have been properly anticipated. Every item will be accounted for and ordered based on these specifications.

**Equipment Planning Challenges and Opportunities for the Clinical Engineer**

Traditionally, the clinical engineering department has had only limited involvement in equipment planning. However, there are ways in which clinical engineers seeking to broaden their role in their institutions can become a more essential part of this process.

For most clinical engineering departments, the first challenge is educating administrators about the depth and scope of the department’s knowledge. To develop a program that assures administrators that the information obtained from the clinical engineer is reliable, accurate, and easily accessible, we suggest that clinical engineers do the following:

1. Have or acquire an understanding of the general processes and information requirements of the medical equipment planning process.
2. Determine which types of information your department is most suited to manage based on its experience and role within the organization (for example, you will want to focus on the technical performance rather than the clinical efficacy of a piece of equipment).
3. Have appropriate information, procedures, and forms available in an accurate and accessible format. This includes literature, historical databases, and questionnaires to facilitate the process.

As the clinical engineering department successfully meets these challenges and proves to be a reliable source of information, opportunities to participate in the planning process are likely to grow. Depending on the institution’s circumstances, the clinical engineer may be able to play a role in most or all of the equipment-planning steps, as detailed below.

**Needs Analysis**

Clinical engineers should have information available that supports the condemnation and replacement justification process. Typically, this includes information concerning equipment inventory and status; equipment repair history, including costs; service contract terms, conditions, and costs; safety and hazard alerts; and manufacturer recalls.

**Technology Assessment**

Because technology macroassessment generally takes place outside the hospital, clinical engineers are...
ECRI Resources and Services for Medical Equipment Planning

ECRI has a variety of services, publications, databases, and software to assist in medical equipment planning. For easy reference, we have provided this guide, which can be photocopied and posted in a convenient location. For information on any of the resources and services listed here, contact ECRI, 5200 Butler Pike, Plymouth Meeting, PA 19462-1298, U.S.A.; (610) 825-6000; Fax (610) 834-1275; E-mail ecri@hslc.org.

Needs Analysis

ECRI has assisted a broad range of organizations, from single-entity healthcare providers to entire nations, in performing needs analyses. Our resources include the following:

Personal Assistance. Our Health Systems Group has extensive experience in helping healthcare providers — including hospitals and entire nations — to develop needs analysis programs.

Equipment Management Software. ECRI’s HECS™ software collects, maintains, and reports information on equipment inventory and status. Now available in version 4.0 for Windows, HECS keeps an up-to-date and accurate equipment inventory, manages repair schedules, and tracks costs — information that is necessary to support needs analysis.

Publications. A number of these, including Health Devices, alert readers to hazards and recalls. Additionally, subscribers to ECRI services can access such data from online ECRI resources.

Technology Assessment

Healthcare Technology Assessment Information Service. This service produces a variety of technology assessment reports, including both macroassessments and microassessments.

Secondary Technology Assessment. Organizations that wish to undertake this process on their own can access a variety of databases through membership in different ECRI programs. These databases include the ECRI/National Library of Medicine Technology Assessment database, the ECRI Expanded Technology Assessment database, and the ECRI Health Devices Alerts database.

Technology Microassessment. ECRI’s SELECT™ Custom Analyses incorporate all of the pertinent elements of this process in a clear and concise format. These reports combine (1) information from our User Experience database, (2) realistic cost projections and operating costs based on our Price Paid Database, and (3) a life-cycle cost analysis.

Strategic Technology Planning. Offered by our Health Systems Group, this is a process developed by ECRI to link high-level technology assessment with provider-level processes of planning, budgeting, priority setting, selection, procurement, and assimilation of technology. We assist healthcare providers in determining where a proposed technology fits into the institution’s overall strategic plan and priorities.

Facility Evaluation

ECRI’s Health Systems Group and Health Devices Group have an up-to-date understanding of the unique needs and concerns associated with state-of-the-art medical equipment. We have successfully guided many healthcare facilities in technology implementation. We have also assisted facilities whose implementations have been unsuccessful because the facility was not evaluated before equipment was purchased.

Financial Evaluation

ECRI’s SELECTplus™ program offers a wide variety of resources that can help you in your budgeting process, life-cycle cost analyses, purchasing decisions, and much more. And our PriceGuide™ service allows users to confidentially compare what they currently pay for disposable products with the national average and lowest prices paid.

Facility Construction and Renovation

Our Health Systems Group can coordinate and oversee an entire project, from choosing the architects and engineers to negotiating fair and equitable contracts.
not typically involved — although their departments may feel the impact of macroassessments that, for example, affect reimbursement decisions. On the other hand, clinical engineers may have a larger role in microassessment, since it generally takes place at the facility level. For each of the areas involved in technology microassessment, the clinical engineer can provide relevant information about existing equipment as it compares with models of a new technology, as well as about the new technology itself.

**Clinical Assessment**

If a clinical engineer has useful information available (e.g., a relevant journal article), it should be forwarded to the technology assessment committee.

**Supplier/Equipment Assessment**

Clinical engineers can help to evaluate suppliers and equipment by answering the following questions:

- What alternative suppliers are available for the equipment?
- Do you have, or do you know of anyone who has, experience with the alternative suppliers?
- How well did the alternative suppliers respond to your needs?
- Has the equipment had unscheduled downtime?
- Are parts readily available?
- Is there a service/support hotline?
- Has the equipment been designed for easy repair or to decrease the likelihood for repair?

**Integration of Assessments**

During the integration process, the technology assessment committee will assign priorities to the technologies under consideration and create a single document that includes the information from the previous assessments. To facilitate this process, the clinical engineer should provide information on alternatives, including other suppliers, other technologies that meet the same goals, and other models.

**Reassessment**

Immediately before and shortly after acquisition, the clinical engineering department should be prepared to collect information on the new technology, such as maintenance costs and downtime; documented hazards, alerts, or manufacturer recalls; manufacturer response time to service calls and/or availability of parts; quality of the manufacturer’s service and of its service school; and user problems with the equipment. This information can be used in future technology assessments and is useful in determining the benefits of the purchase.

**Facility Evaluation**

Clinical engineers can play a very important role in facility evaluation. Their expertise will help the planning committee determine if the technology can be safely implemented in the existing facility. Clinical engineers can advise administrators about the need for renovations by evaluating the original architectural, electrical, and mechanical design prints; by understanding any safety requirements associated with the new equipment that might require additional construction; and by comparing the existing facility with anticipated needs.

**Financial Evaluation**

During the financial evaluation, clinical engineers should focus on how owning the equipment will affect their department, including the costs associated with maintenance and repairs. It may be helpful to answer the following questions:

- Does the equipment fit into the long-range budget objectives of the department (e.g., will servicing the new equipment require additional personnel or material)?
- Have maintenance and repair costs been realistically estimated?
- Is there an alternative (either a different technology or another means of providing the service) that may be more cost-effective?
- Are there any site construction, maintenance, or other special facility costs (e.g., ventilation, utilities, electrical capacity) connected with using the equipment?
- Will there be charges for hardware and/or software upgrades?
- Have all service options been considered?

**Equipment Planning for New Facilities or Renovations to Existing Ones**

If new construction or facility renovation is planned, clinical engineers should work closely with the architects and design engineers. Because clinical engineers have a unique understanding of the requirements for medical equipment, they can provide input on equipment placement, safety requirements, and human factors design. For renovation projects, clinical engineers will have intimate knowledge of the facility and may know of changes that have been made that are not reflected in the original blueprints. This knowledge can save time and money. The Guidance Article, “Facilities Construction: Involving the Clinical Engineer,” published in *Health Devices* 25(1), January 1996, provides useful insight and information on this topic.