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Clinical Engineering Helps Reduce Equipment Costs

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Clinical engineering involves, among other activities, managing equipment repair and maintenance activities, assessing technology needs and potential equipment acquisitions, training users, Negotiating service contracts, and optimizing patient-care equipment utilization. Effective clinical engineering programs can help healthcare organizations reduce the high cost of acquiring and maintaining patient care equipment.

A significant portion of a healthcare organization's annual expenditures goes to acquiring and maintaining patient care equipment. One study shows that U.S. hospitals spend an estimated $7.3 billion annually to acquire new and replacement patient care equipment, including physiological monitoring, imaging, laboratory, and other diagnostic equipment/ therapeutic equipment; life support equipment; and ancillary equipment, such as information, paging, and telephone systems.*

Acquisition and maintenance of patient care equipment are complicated by many factors including:

- The sophistication of patient care equipment;
- The number of manufacturers offering similar equipment;
- Limited sources of capital equipment funding;
- Difficulties within complex healthcare organizations in setting priorities for equipment acquisition;
- Difficulties in quantifying the effects of equipment on patient outcomes;
- Lack of attention to the total cost of ownership (installation, maintenance, and operation, in addition to purchase price);
- Difficulties calculating the effect of reimbursement on capital equipment investment returns;
- Thje effect of mergers and consolidations; and
- The need to contain costs, especially under capitated payment arrangements.

Although most astute healthcare executives are aware of these issues, many are unaware of the growing clinical engineering (also called biomedical engineering) field and the ways in which effective clinical

engineering programs can influence the cost of acquiring and maintaining patient care equipment.

Clinical engineering in practice

Accoring to the American College of Clinical Engineering, a clinical engineer is "a professional who supports and advances patient care by applying engineering and managerial skills to healthcare technology." Thus a state-of-the-art clinical engineering program involves more than having simple service arrangements that ensure that safety checks and equipment repairs are performed. Rather, clinical engineering has evolved to encompass all aspects of tehcnology management, including responsibility for or participation in such activities as:

- Planning capital equipment replacement;
- Assessing technology needs;
- Evaluating new product offerings and evaluating equipment prior to purchase;
- Writing equipment-related requests for propsal and analyzing vendor responses;
- Managing all medical equipment's repair and maintenance including that performed in-house as well as by outside vendors;
- Negotiating and managing vendor service contracts;
- Training users;
- Ensuring environmental safety;
- Investigating device-related incidents;
- Designing and customozing patient care equipment;
- Coordinating and documenting clinical trials of equipment;
- Installing equipment; and
- Managing equipment-related regularory compliance.

In addition to these activities, clinical engineers often act as financial management consultants that centralize and proactively manage all technology maintenance and repair budgets.

The growing complexity of healthcare organizations' diverse equipment needs, rapid technology development, and organization-wide use of patient care equipment have made this expanding role for clinical engineering both inevitable and necessary. The equipment-related "Environment of Care" standards of the Joint Commission on Accreditation of Healthcare Organizations emphasize the importance of an effective technology managment program, which casn be cost-effectively implemented and managed by a comprehensive clinical engineering program. Standards in the Joint Commission's 1995 *Accreditation Manual for Hospitals* require that a hospital's equipment-management program include provisions for user treaining, equipment-inclusion criteria, incident analysis, scheduled maintnance procedures, incoming inspections, equipment emergency plans, and assessments of the program's overall effectiveness.

Clinical engineers should work effectively with healthcare financial managers. Virtually all clinical engineering activities affect financial management. For example, by helping assess and prioritize equipment purchase requests, clinical engineers can help financial managers to reduce or offset capital spending. Clinical engineers and financial managers also can work together to identify, monitor, and reduce costs related to effective and efficient maintenance, repair, and operation of equipment.

Many organizations employ clinical engineers within specific equipment-intensive departments, such as radiology, anesthesia, cardiology, critical care, or pulmonary services. Other provider organizations receive clinical engineering and maintenance services from shared service providers or other contract management service (ousource) organizations.

There is little consistency in size or capability among clinical engineering departments. In some facilities, in-house staff maintain only the simplest of clinical equipment, using outside vendors under service contracts to maintain the most expensive equipment, while in-house staff in other facilities service almost every piece of clinical equipment. Due to decentralized equipment management practices, many organizations are unaware of their total clinical equipment maintenance costs, which can range from 3 per cent to as high as 15 percent of the equipment's acquisition cost.

Regardless of what vendor, department, or individual performs clinical engineering maintenance, healthcare organizations should evaluate whether their existing clinical engineering program is effectively organized, staffed, and supported to carry out the full range of necessary equipment-management activities. The need to manage costs and to cope with the quantity and complexity of patient care equipment make effective clinical engineering program analysis a pressing concern.

Financial influence of clinical engineering

The financial influence of a clinical engineering program varies from one facility to the next. In many facilities, clinical engineering has reduced costs significantly while improving equipment management processes. The following brief examples show cost reductions accomplished by clinical engineering departments throughout the country.

Arkansas. The clinical engineering department of a 250-bed hospital in Arkansas monitored the performance of service vendors responsible for maintaining the hospital's computer tomography (CT) units. The engineers documented that the true cost of service provided was 42 percent less than the contract cost. Over four years, by undertaking maintenance of costly equipment previously maintained by vendors under contract, the hospital saved approximately $2.6 million.

Washington, D.C. The biomedical engineering department at a 900-bed hospital in Washington, D.C., managed the equipment acquisition process for new physiological monitoring systems and negotiated a multi-unit purchase, saving the hospital $275,000. During the preceding several years, the same

department reduced the cost of equipment maintenance from 9 percent of equipment acquisition value to 4 percent, while expanding its scope to cover more than $65 million worth of clinical equipment. The department's involvement with technology management and acauisition saved the institution more than $1 milliion over 18 months.

Minnesota. The clinical engineering department at a 700-bed hospital in Minnesota took over maintenance of all surgical tables within the organization, resulting in a net savings of more than $60,000, even after funding one additional technician, spare parts, and specialty training. Prior to this undertaking, the facility spent more than $138,000 on multiple service contracts covering tables sold by various vendors. This diversity of vendors made finding a sungle service provider and negotiating a better price difficult. Having in-house staff maintain surgical tables was not only cost effective, but also decreased maintenance time.

Multi-state. A group of 28 hospital-based clinical engineering departments compiled their cost savings for a management report. The total identified savings were $6.5 milion. These savings arose from activities such as:

- Second-sourcing parts;
- Eliminating full-service contract arrangements;
- Refurbishing selected equipment to extend its useful life;
- Evaluating equipment prior to purchase;
- Redesigning work flow;
- Adjusting preventive maintenance frequencies;
- Developing centralized in-house endoscopy repair services;
- Using equipment maintenance insurance, using in-house maintenance for personal computers and printers; and
- Improving use of vendor time and material repair services.

Missouri. The clinical engineering department at a 1,200-bed hospital in Missouri canceled manufacturer support of more than $1 million worth of anesthesia equipment (acauisition value). The department developed in-house support capabilities far in excess of those offered by the manufacturer's field service staff. Downtime was reduced by 50 percent, response time improved dramatically, equipment performance increased, and support costs were reduced by more than $80,000 annually after taking into account in-house costs.

Louisiana. The clinical engineering department at a 350-bed New Orleans, Louisiana, hospital reported a 23 percent reduction in equipmnt service costs (an average reduction of $35,000 per year) by implementing a maintenance insurance program on selected equipment. This program reduced and capped budgeted maintenance cost for equipment that had the potential for unpredictable, high-cost failures, such as CT tube failures. Premiums for this program ranged from 10 percent to 40 percent less than service contract costs. Reimbursement for the work performed by the in-house clinical engineering staff generated non-patient revenues of more than $8,000 annually. Total annual savings were estimated

to be more than $43,000. The clinical engineering department manages all aspects of the program, including budgeting, determining which vendor to call in for service, and processing paperwork for the insurance provider. Administrative costs to support and manage this program were estimated to be $1,620 per year.

Conclusion

Decisions about clinical engineering programs--for example, whether to outsource, expand, reorganize, downsize or eliminate--should be made only after carefully assessing the existing program's capabilities, limitations, and cost-saving opportunities. Healthcare executives should consider their organizations' total equipment maintenance costs (in-house, vendor, time and material, and contract services), equipment age, planned future acquisitations, equipment and cost-management goals, previous equipment-related incidents, and equipment-related requrements of external agencies, as they determine how best to support their technology-management program.

Executives considering downsizing or outsourcing their existing clinical engineering services should determine whether short-term savings from downsizing may be less than potential long-term savings that can be achieved by investing in a comprehensive equipment-management program. Prior to any decision to downsize, an organization's executives should assess whether their existing clinical management services are cost effective and of measurable value. If not, executives should consider how to enhance, redesign, or otherwise acquire those services to best manage all facets of equipment acquisition, use, and maintnance.

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* *Medical Device Register,* Montvale, N.J.; Medical Economics Data, 1991.

About the author