


**A clinical engineer** is a professional who supports and advances patient care by applying engineering and managerial skills to healthcare technology.—ACCE Definition, 1992

The convergence of Information Technology (IT) systems and medical equipment systems is changing the practice of Clinical Engineering—the priorities, the body of knowledge, and the scope of work. 

As the clinical environment moves from stand alone medical devices to a world dominated by clinical systems, intimately bound to the IT department by network connections and the two way flow of data, clinical engineers and Information Technology professionals will increasingly interface at many levels.

This change is altering the practice of clinical engineers by deemphasizing the traditional compliance functions of preventive maintenance and repair, and energizing the more strategic issues of information and communication. Similarly, the information technology department is facing new challenges as it moves beyond the business side of healthcare and enters the clinical arena.

Clinical engineers are responding to these changes by developing strong relations with the IT world at their hospitals. Working together, they can achieve the maximal levels of efficacy and safety as these new technologies are deployed.

## **The American College of Clinical Engineering**

Founded in 1990, the American College of Clinical Engineering (ACCE) is committed to enhancing the profession of clinical engineering. With members in the United States and around the world, the ACCE is the only professional society for clinical engineers with international recognition.

### **Mission of the ACCE**

- To establish a standard of competence and to promote excellence in clinical engineering practice.
- To promote safe and effective application of science and technology in patient care.
- To define the body of knowledge on which the profession is based.
- To represent the professional interests of clinical engineers.

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# **Clinical Engineering and Information Technology**

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## Clinical Engineering Is Converging With IT

Today, clinical equipment and information systems are converging to create an Environment of Information that extends outward from the patient, carrying signals, statistics, and identifiers to all corners of the hospital and beyond. Clinical engineers are being charged to extend their scope as communicators, problem solvers and experts in integrating high technology systems. With increasing frequency, they rely on and interact with their Information Technology (IT) counterparts to pave the way for the newer technologies. Clinical Engineering and IT collaborate in areas such as planning, standards, safety, and security, to improve patient care. 

### Planning & Installation

Many of the digital marvels we take for granted are not as easy to implement inside the hospital. Legacy facilities can provide roadblocks to updating the infrastructure, from power demands that must be met, to walls that block wireless signals. The hospital is a challenge to "wire." Clinical engineers have a long history of working with clinicians and facilities engineers, and they are skilled in weighing the concerns of the various parties in the planning process and in communicating the needs of one group to the others.


The upgrading of hospital facilities to accommodate the new technologies and systems will require investments in the network infrastructure to assure that adequate bandwidth exists to handle both business and clinical applications and that appropriate levels of "gate-keeping" are in place to assure that critical signals are not lost in network bottlenecks.

Digital technology in the hospital will also include a plethora of wireless devices. Telemetry and cell phones are only the tip of this iceberg. PDA's are finding their way into clinicians' hands throughout the hospital. Other wireless devices, whether for locating people or equipment, reporting lab results, patient telemetry, physician order entry, or patient communications will create an atmosphere rife with electronic noise. Clinical engineering aided design and deployment of these systems can minimize potential losses of function as a result of inter-

ference from other devices or loss of signal as a result of building configuration.

### Standards / Standardization

As with every technology in healthcare, the Environment of Information is replete with standards. IT professionals are familiar with DICOM (Digital Imaging and Communications in Medicine) - the image exchange standard for networked devices, and HL-7 (Health Level Seven)—the data exchange protocol for healthcare messaging. The devices and systems must also conform to a range of technical standards and protocols. Wireless networks are governed by IEEE standards 802.11 (a-g); short range device based wireless follows the Bluetooth standard; the Wireless Medical Telemetry Standard (WMTS) defines the frequency band allocation for medical telemetry; and electronic communication between devices is governed by a range of standards developed by IEEE and other bodies. New clinical systems are giving meaning to the question "Where does the medical device end and the computer begin?" Clinical engineers will be in the forefront of assuring that existing standards are met and that standards keep pace with the evolving technologies.

One area where clinical engineering and IT are already working closely is in the IHE (Integrating the Healthcare Enterprise) program. This project, a joint effort of the Radiological Society of North America (RSNA) and the Healthcare Information Management Systems Society (HIMSS), has brought together over 40 major vendors of imaging and other systems in a collaborative effort to improve the way computer systems in healthcare share information. The IHE has now extended its program beyond radiology to include cardiology and other clinical specialties. The American College of Clinical Engineering has joined this program to support the domain of Patient Care Devices. 


### Patient Safety

While patient safety can be compromised at any of the interfaces between the patient, equipment, caregiver, and environment, the distributed nature of digital systems and the added "interface" of software increases the difficulty of detecting potential hazards.

Clinical engineers are sensitive to the subtleties of complex systems; of software or hardware errors that could impact a patient as clinical judgments are made remotely; of hidden program errors that do not surface for weeks or months after deployment; or of errors introduced into the system by poor human factors design.

Clinical engineers and IT professionals, by combining their strengths, and harnessing their diverse backgrounds can reduce the occurrence of medical errors and improve patient safety.

### Security

A significant consequence of the growth of information technology in healthcare is an increasing risk to information security. An aspect of this risk that is sometimes overlooked is the rapidly growing number of medical devices and systems that are being computerized and networked. With diagnostic and therapeutic signals potentially sharing the information systems backbone, risks extend beyond patient privacy. Compromises to diagnostic or therapeutic signals can impact patient care and well being. Clinical engineers and IT professionals are increasingly focusing and coordinating their efforts in this critical area. ACCE has been a leader in the advancement of medical device security through its work with HIMSS, IEEE, and other societies. 

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*As the clinical and Information Technology worlds continue to converge, clinical engineers will assist in the integration of these new technologies into the healthcare system, foster the acceptance by the clinical communities, and remain vigilant to the needs for patient safety and clinical information security.*

