The Ingredients to IT Training: What Biomeds Need to Know

Andrea Hall

As responsibilities of biomedical equipment technicians (BMETs) and information technology (IT) specialists increasingly overlap, many BMETs and clinical engineers (CEs) find that learning more about IT is crucial.

In most hospitals, medical devices are now networked. Without understanding how these devices communicate with each other, it can be difficult to locate the source of a problem. Without the ability to access the system, it may be impossible to perform routine maintenance. Without understanding how a virus protection patch was applied, a biomed may not even know that a device has been altered to the point that it no longer meets FDA regulatory requirements. "There are many people out there getting baptized by fire," says Larry Fennigkoh, associate professor of electrical engineering at the Milwaukee School of Engineering.

BMETs and CEs should know the language of IT so they can communicate with IT. They need to understand, for example, "the difference between a data file and a database, or the difference between media and multimedia, or between application software and operating system software," says Elliot Sloane, assistant professor of decision and information technologies at Villanova University. Otherwise, "reading product service manuals and talking to people in the IT department will be very difficult," he says. This includes understanding that the functioning of a system is an interdependent process, and that each piece of the system has to do its part properly for the whole system to work.

As BMETs meet the IT challenges presented to them, they also may encounter turf issues, says Ken Maddock, director of clinical technical services for Baylor Health Systems in Dallas. "With the more complex issues, there's no reason to duplicate the expertise of the IT department," he says. "You want to build up your knowledge to the point where there's a smooth transition between the two departments." BMETs should know when to bring in the IT expert, and should be able to talk to that expert intelligently.

What follows is a discussion of some of the major IT challenges that biomeds are now encountering in their workplaces, and the types of training that would be useful in meeting those challenges. It is by no means an exhaustive list, and it is important to keep in mind that what's important for one BMET or CE may be irrelevant for another.

IT Literacy

BMETs and CEs should begin their IT education by taking one or two good overview courses on the IT framework so that they understand the language and environment of information systems, explains Sloane. These courses, such as those taught at community colleges and technical schools, typically cover hardware components; software components, including input and output, tools, equipment, techniques, and programs; communication and networks; and the components of

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computer systems, which may include multiple local and remote servers, personal computers, and personal digital assistants (PDAs). Biomeds will need to learn the framework, or general concepts of IT before they try to master a specific system. Each brand of technology is often a very unique blend of hardware and software, Sloane says. "You cannot just take what you learned in one specific system and transfer it to another."

Elliot Sloane

Some in the biomed and engineering fields recommend obtaining A+ certification, which demonstrates competency in core hardware and operating system technologies, including installation, configuration, diagnosing, preventive maintenance, and basic networking. Having this certification shows people you're ready and prepared to tackle these challenges, says Frank Painter, systems professor in the Department of Biomedical Engineering at the University of Connecticut, and president of Technology Management Solutions LLC, a health care technology consulting company in Trumbull, CT. If a biomed doesn't have the time or resources to devote to this level of training, taking one or more courses in the certification program can be beneficial.

Ken Maddock

Networks

"Without a real understanding of how networks work, BMETs and CEs will, in the future, be at a real disadvantage because most medical equipment will be connected to the hospital's network or to a stand-alone network," Painter says. An understanding of networks should now be "a basic" for all BMETs, adds Maddock. "They need to have a comprehensive understanding of the systems in order to understand and resolve problems," Maddock says.

Biomeds can learn the basics of networking by taking an introductory class, such as those offered at community colleges. Many recommend the courses leading to Network+ certification, which demonstrates technical knowledge of networking administration and support, as well as media and topologies, protocols and standards, network implementation, and network support. (This certification also requires nine months of network administration and support experience.)

Larry Fennigkoh

Individual manufacturers, such as Cisco, Microsoft, and Novell, offer courses on their own products and systems. Depending on what's in place at a particular facility, BMETs may need to get training in one or more of these systems. "It's best if the hospital or clinic builds training into the purchase price [of the system] so that the staff can get training upon installation," says Fennigkoh. The manufacturers that teach these courses assume the trainees have a certain level of knowledge about networking. "However, most BMETs, unless they have very recently graduated, do not have this foundation," explains Steve Yelton, program chairman in the information and engineering technologies divisions at Cinncinnati State. Another reason to start with a basic networking course.

Some biomeds may also need to learn the wiring, cabling, and fiber optics of networks, says Fennigkoh. "Everything is literally connected to everything else, and you need to know how that works." For example, if something is simply plugged into the wrong place, a working device may appear to be defective. "Without a big-picture understanding, a biomed could be totally lost, or actually do some damage and cause a nightmare for the IT people," Fennigkoh says.

Storage and Database Management

Although many think that expertise in this area is best left to the IT people, others believe that a working knowledge of storage and database management systems is helpful for BMETs and CEs who work in departments where there are voluminous patient records, such as radiology or an intensive care unit monitoring system. They should learn the details of how these storage systems work, and about relational databases in particular, according to Sloane.

Operating Systems

Most BMETs and CEs are comfortable with the common PC platforms such as Windows, but not with the more specialized ones like UNIX. In developing knowledge of operating systems, "go beyond whatever is near and dear to the PC user," says Sloane. "If you're already familiar with Windows, for example, extend your

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knowledge to other environments, such as UNIX or Linux, as well as the variants being developed for handheld devices, like WindowsCE or PalmOS."

Whether learning these other platforms would be helpful depends upon how specialized the biomed's job has become, Fennigkoh explains. "Sometimes you need to know an operating system just to perform basic diagnostic testing on a device."

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> —Larry Fennigkoh

Software

It will be difficult, if not impossible, to find training for a foundation in software because each program is so different. Instead, BMETs and CEs should focus on the programs used in their workplaces and find out if the manufacturer offers instruction.

To learn the software side of the network, a biomed may consider becoming a Microsoft-certified systems engineer (MCSE), for example. Other systems manufacturers offer their own certifications. However, this "may be too ambitious a goal for most biomeds," because of the cost and time involved, explains Painter. "Moreover, it takes them out of the biomedical realm and into the information services realm," running into the career path of an IT technician, he says. As with other certification programs, a BMET or CE could benefit from taking some of the courses in the MCSE or other system's curriculum.

As with storage and database management, some believe that proficiency in this area is best left to the IT people. "Although most people I know have migrated readily to IT, with software they're more hesitant," says Fennigkoh. "It can be very specialized, and is so very dynamic that it's almost impossible to maintain your level of competency." Although the hardware technology also is advancing, it's "not nearly as fast as the software," he adds.

Safety and Virus Protection

To understand how to protect a medical device or network from viruses or hackers, BMETs and CEs must become familiar with firewalls, spam filters, virus management tools, passwords, and authentication. Some of this training may be embedded within network or operating systems instruction or the training for individual proprietary products. Biomeds must first understand how their networks are designed, which should come from network training. They can then design a network that is isolated from the outside world so that no viruses can attack it, Painter explains. "While those of us with personal computers have firewalls and virus protection software, the devices that are connected to a hospital's network may not have that protection," he says.

An IT employee, in putting a shield or patch on a device, could end up affecting the function of that device, Fennigkoh explains. "You'd like to hope the device would be designed to prevent that from happening, but some devices are just PCs set up to serve clinical functions," he says. The damage caused by that kind of patch or firewall application might be so subtle that it may not be discovered for a while, he adds. Biomeds should be able to communicate with IT specialists before they undertake this kind of task. "You need someone who can represent the medical device interest in the problem," Maddock says.

Another common problem is some computerized clinical systems have specific warnings, which are not certified for anti-virus software. Users should check before buying a system, and also check before installing anti-virus software on existing systems.

Ready, Set ...

The biggest challenge in all of this may be getting started. And depending upon whom you talk to, there are several "best" routes to getting IT training. If a biomed opts to go the community college route, he or she should start with one or two courses, attending classes two nights a week for eight months out of the year, recommends Sloane. Then each year, build upon that knowledge, choosing coursework based on the clinical area and specific modalities he or she is expected to work with. For example, smart pumps work with basic wireless communication, but not Windows.

Distance learning and online courses also are available. This takes a certain amount of discipline, Sloane says. What works for one person may not work for another. This is evidenced by the fact that some distance learning companies are now developing live training programs, Yelton says. Some people prefer to self teach,

read books, and surf the Internet, "but having evidence of coursework or certifications on your resume will make a difference," says Sloane.

Some find short, intensive, boot-camp-style seminars to be the best way to come up to speed quickly, especially for those without the time to devote to the semester-long format of college or technical school classes. "It shouldn't take a major investment of time to come up to speed," Fennigkoh says, "if you have the financial support of your institution, because many of these classes cost around $1,000." Assuming they already have a basic knowledge of computers, BMETs can "return from a seminar and hit the ground running." He adds that the instructors at these classes are often a great resource to "get network or wiring problems solved—the kind of subtle things that plague hospital systems."

In addition, many medium-sized cities have computer service companies, installers, or resellers that do training. These local companies can give biomeds the opportunity to take a short, specialized class without having to incur travel costs.

Yelton and Cinncinnati State are working to develop partnerships among the community college, hospitals, and medical device manufacturers to offer IT training to BMETs that's more specialized than what they might get from a generic networking course.

Although the technicians that come to Cinncinnati State for continuing education start with one or two general networking theory classes, they move on to focused classes that tie medical instrumentation into the networking education.

Cincinnati hospitals have hired newly graduated BMETs that know the IT world, and now the hospitals want all their technicians to have up-to-date IT training.

Remember that once you come up to speed on the IT aspects of your job, you may not be done. The frustration in keeping your skills current "is that it's a moving framework," says Sloane. "Several years after you get certified, is your education current or relevant?" he asks. Although the general structure is very portable, the details change rapidly. "It's an educational treadmill you have to stay on," he says. ◆

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Finding the IT Training to Fit Your Needs

Community Colleges and Technical Schools

Most of these schools offer basic IT classes, such as Introduction to IT, Engineering Technology and Network Communications Management and Technology. Some also offer more specialized courses, as well as those leading up to A+, Network+ and other certifications.

To find a community college in your area, go to *www.aami.org/resources/education/ed.map.html*, *www.edu-directory.org*, or *www.utexas.edu/world/com-col/state*.

To find a technical school, go to *www.technology-schools.net* (information on certifications, including A+, Linux+, Microsoft, Cisco, Oracle and Sun, and a state-by-state listing of schools) or *http://tech.degree resource.com* (a listing of technical schools).

Manufacturers

To find information on training offered by individual systems device, or software manufacturers (or their training partners) visit their Web sites. See, for example:

- Oracle—*www.oracle.com/global/us/education/index.html*
- Access—*www.geaccess.com*
- Microsoft—*www.microsoft.com/learning/*
- Cisco—*www.cisco.com/en/US/learning/index. html*
- Novell—*www.novell.com/training*
- PalmOS—*www.palmos.com/dev/training/*

Online Resources

- *www.comptia.org/certification/index.htm*
  Offers A+, Network +, and Linux + certifications.
- *www.novell.com/education/certinfo*
  Provides certifications for Novell and Linux, as well as self-study kits.
- *www.cisco.com*
  Contains its own certification program and has a list of learning partners and online learning resources, including video on demand, Web-based training, and online assessments.
- *www.himss.org/ASP*
  The Healthcare Information and Management Systems Society's Web site has health care IT certificate programs, online learning, tapes and CDs, and conferences.
- *www.cramsession.com*
  Includes information on A+ and Network+ certifications, as well as links to individual vendor's certifications and exams, including Microsoft, Cisco, Oracle, and Sun.
- *www.opengroup.org*
  Includes a comprehensive resource on UNIX, including certification programs.
- *www.redhat.com/training*
  Consists of various types of training for Linux, including e-learning, onsite and custom training, and Web-based programs through accredited educational institutions.
- *www.knowledgenet.com/*
  Offers "live" e-learning and other online teaching products.

Local Biomed Organizations

These groups can be another resource for training information. See *www.aami.org/resources/links/biomed.html* or *www.bmet.org/links.html* for links to biomed associations.

Seminars

To find health care IT seminars, check out:

- *www.expocentral.com/healthcare/industry_healthcare_health_IT.html*
- *www.computertrainingschools.com/*
- *www.the-resource-center.com/INDEX/seminars.htm*
- *www.trainingplanet.com/index.html*

Other Sources

An Introduction to UNIX and Networking

- This software manual focuses on the basic commands and tools of UNIX, the most common operating system for servers. To learn more about this AAMI manual, go to *www.aami.org/publications/Books/unix2004. html*.