

## Using Human Factors to Facilitate Medical Technology Procurement, Implementation, and Safety

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Hospitals face increasing demands. Workforce shortages, advances in medical technology, and rising financial concerns are just a few of the challenges. Although technology has great potential, its implementation is often viewed as a mixed blessing. The promises of new systems, software, and equipment are rarely realized. Systems that looked good during the initial sale presentation are likely to create as many problems as they solve. Even when systems undergo some level of evaluation, their implementation is all too often associated with surprises that require changes in work methods and processes.

To capitalize on the potential of technology in health care, it is incumbent on hospital personnel to scrutinize needs, evaluate systems, assess impacts on personnel, establish work procedures, offer training, and provide technical support and maintenance. Given the number of choices and the limited time and resources hospital personnel can devote to such an endeavor, a method to facilitate the selection process is needed. One method makes use of techniques from the field of human factors.

### What is Human Factors?

Human Factors consists of “a body of information about human abilities, human limitations, and other human characteristics” and is applied by human factors engineers/psychologists “to the design of tools, machines, systems, tasks, jobs, and environments for safe, comfortable and effective human use” (p. 11)<sup>1</sup>. With regard to hospitals and medical technology procurement, it entails determining if the technology conforms to basic human factors principles and whether it will negatively influence the system (hospital staff, patients, other equipment, etc.) to which it will be integrated. Increasing numbers of health care organizations are turning to human factors as a means of facilitating the process used to specify, evaluate, procure and implement new technology.

### Benefits

The systems approached used by human factors practitioners can give health care organizations a systematic approach when purchasing and implementing medical technology. Using established human factors methods can:

- Increase patient and staff safety
- Decrease numbers of adverse events
- Minimize the potential for new hazards to be introduced into the system

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<sup>1</sup> Chapanis, A. (1996). *Human Factors in Systems Engineering*. New York: John Wiley & Sons, Inc.

- Improve staff acceptance
- Increase work efficiency
- Better integrate with existing technology
- Decrease training time needed to reach competency
- Minimize the need for modifications, “work arounds,” and/or shortcuts

### **Solutions**

Human factors practitioners use a variety of methods when evaluating, designing, or procuring technology. Two general human factors approaches can be used to analyze potential state-of-the-art medical technology prior to procurement and implementation: expert reviews and usability testing.

#### *Expert Reviews*

Expert reviews consist of a human factors expert assessing the medical technology to diagnose potential problems that might arise from the technology itself or after its integration in the current system. One of the strengths of an expert review is that it allows the human factors expert to “weed out” medical technology that has poor usability. Moreover, it seeks to identify if the technology conforms to established human factors principles, including:

- Assuring systems are easy and natural to use
- Maintaining consistency when possible
- Making things visible
- Providing appropriate feedback
- Minimizing reliance on users memory
- Allowing for reversal of action

Examples of expert reviews include heuristic evaluations, guideline reviews, and cognitive walkthroughs.

#### *Usability Testing*

Usability testing consists of having people from the target audience (i.e., hospital personnel) to identify potential problems while performing typical tasks with the technology. The steps required to complete a usability test include writing a test plan, designing the test, performing a dry run, recruiting users, conducting the test, analyzing the results, and determining the appropriate action to take.

### **Final Thoughts**

The goal of human factors is to create systems that enhance human productivity, safety and efficiency. Human factors experts often use expert reviews and usability testing to evaluate systems. Expert reviews are necessary to assess how well new technology will integrate with a current system.

However, expert reviews cannot capture the level of staff acceptance and increased work efficiency for new medical technology. Thus, it is necessary to also perform usability testing with hospital personnel. While both methods have their place, used in tandem they can have the greatest impact and success.

Hospitals are encouraged to incorporate both expert reviews and usability tests to identify potential problems with the introduction of new technology into an existing system. Moreover, it also helps determine whether the technology effectively serves the hospital goals. Human factors methodologies are designed to help hospitals maximize the return on investment (ROI) by reducing the overall impact new technology creates on the hospital system.

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