Health Information Technology's Use in Promoting Patient Safety

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As the use of technology in society increases, health information technology (HIT) is becoming more common in direct patient care settings. Its use has the potential to promote patient safety through such measures as reduction in medication errors, its ability to remind practitioners of important duties or responsibilities, and its capacity for containing large amounts of medical and clinical knowledge in one location. Despite these benefits, it has become clear that the potential for harm still exists. Balancing the good that can be gained with strategies to mitigate the undesirable consequences of its use is an important facet of effective and safe use of HIT.

HIT: The Good, the Bad, and the Ugly

When it comes to the use of HIT in direct patient care, there are three types of news: the good, the bad, and the ugly. The good news is that HIT has the potential to make vast improvements in patient safety. For example: a hospital in Boston implemented an electronic medication administration system that "reduced errors by more than 40%" (Domrose, 2012, parap. 1). This is quite an achievement, and strongly suggests all institutions should be using HIT. The bad news, however, is that HIT "can pose danger for patients if technologies are not properly designed and used" (Domrose, 2012, para. 9). Care must be taken through the entire process of development and use of HIT to avoid these dangers. Finally, the ugly news is that "reports have emerged of serious harm caused by health IT" (Domrose, 2012, para. 8). Serious harm ranges from loss of function to loss of limb and even loss of life. Because the stakes are so high, it is vital that HIT use be carefully considered and implemented.

Areas of Concern

When it comes to the use of HIT, this paper discusses three main areas of concern. The first is designer error, which is introduced long before the technology product arrives on the market. The second is the lack of regulation and standardization between different developed and used technologies. The final area of concern is related to user error when HIT is in use in direct patient care settings.

Designer Error

Before any HIT product is available for use in patient care settings, it must be designed and then implemented by individuals who are not necessarily familiar with the ins and outs of patient interaction and care. This introduces concerns relating not only to the nature of technology itself, but also to misunderstandings between clinical needs and actual product implementation.

The nature of technology. Technology is a difficult beast to tame. Throughout the design and development process, unexpected issues continually arise. Designing a system to correctly interface with existing systems and procedures only complicates the situation. Rouse, Boff, and Aarts (2011) correctly state that "[p]rogrammed systems are complex… When different programmed systems are connected, complexity increases exponentially, and the chance of software errors and failures increases. Humans interacting with technology add a new level of complexity" (p. 336). Clearly, the more involved the technology is, the more difficult it becomes to ensure its ability to perform intended functions.

Complexity and integration aside, as any technology programmer is intimately aware, there are always problems with the code. Rouse et al. (2011) explain that "[a]ny programmed systems contain software code errors. Software verification and validation procedures are in place to reduce errors as much as possible" (p. 339). However, despite the best efforts by

programmers to eliminate code errors, the stark reality is that errors will continue to be discovered. For this reason, upgrades will be necessary to any HIT as errors are uncovered and rectified.

Misunderstandings between clinical needs and actual product implementation. Because programmers are almost never involved in direct patient care, misunderstandings are bound to arise regarding the design and implementation of HIT. As Rouse et al. (2011) explain, the "root cause" of failure is often due to "the mismatch between the department's workflow and system design" (p. 337). They go on to explain that a poor understanding by the developers of the purpose of the project can cause the project to be "doomed from the outset" (Rouse et al., 2011, p. 339).

Lack of Regulation

After design and development of HIT, it moves into use in clinical practice. At present, there exists little regulation regarding the development of HIT and this transition into clinical use. Consequently, HIT programs are not standardized and do not conform to a minimum set of requirements. This is in direct contrast to the use of medical procedures and medications, which are highly regulated and tested prior to implementation in practice (Rouse et al., 2011). This lack of regulation and testing means that HIT could potentially make recommendations or inform clinical decisions based on incorrect information or assumptions. While some consequences may be insignificant, others could be severely detrimental or even deadly.

User Error

Even if HIT is well-designed, well-implemented, and highly standardized, tested, and regulated, the potential still exists for user error. User error is defined by Computer Hope (2017b) as "any error that has been caused by the user of the computer and not the computer,

hardware, or software running on the computer" (para. 1). These errors can include such things as medication errors and workarounds, and can be due to causes including alert fatigue and lack of adequate training.

Medication errors. Mitka (2009) estimates that "1.25% of medication errors [involving some aspect of computer technology] resulted in harm to a patient" (p. 587). Medication errors can be some of the most costly errors made in healthcare. Unfortunately, many of these costs are not recoverable. For instance, according to Domrose (2012), a medication error involving HIT directly caused the death of an infant in 2010 at a hospital in Chicago.

Workarounds. A workaround is defined by Computer Hope (2017c) as "a temporary or permanent method of resolving an issue occurring with software or hardware" (para. 1). Workarounds can occur for different reasons. First, when clinicians are required to transition to new ways of performing their duties, they often disagree with or misunderstand the way the HIT requires them to perform that duty. Second, errors in HIT code can cause problems that interfere with patient care. These causes, among others, can lead to clinicians knowingly or unknowingly developing workarounds to enable them to complete their duties (Mitka, 2009). However, such workarounds can bypass important safety features of the HIT, resulting in errors in patient care that were intended to be caught by the HIT.

Alert fatigue. One benefit of HIT is the ability to alert the user to problems or concerns that may require attention. This is done through an alert box, defined by Computer Hope (2017a) as "a small window that pops up providing information to the user [that] typically includes an OK button, and sometimes a Cancel button" (para. 4). However, an unfortunate consequence of these alerts is that "busy clinicians ignore or routinely bypass them," often without reading or understanding their use (Domrose, 2012, para. 16). This phenomenon, known as alert fatigue,

can lead to errors when clinicians become too accustomed to simply clicking the OK button on the alert box and don't take the time to read and understand the alert.

Lack of adequate training. When HIT is implemented in direct patient care, time and money must be invested to train staff members in its use. This can pose problems when funding for training is not sufficient, when those performing the training are not aware of clinical practices, or when clinicians are resistant to learning new ways to perform their duties. Inadequate training results in HIT being used inefficiently and/or inappropriately, and this can cause errors directly impacting patient safety (Domrose, 2012).

Suggestions to Mitigate Concerns

Concerns regarding the use of HIT in direct patient care should not be cause for blanket dismissal of the use of such technology. The potential benefits gained from using HIT can far outweigh the risks, if some important strategies are used to ensure proper application of the technology. Some strategies to mitigate the concerns discussed previously include involving clinicians in the development process, standardizing and regulating HIT, and providing continuing education about HIT while stressing the importance of clinicians using their critical thinking skills in practice.

Clinician Involvement in the Development Process

Involving clinicians in the development process for HIT is vital to its success. Mitka (2009) explains that clinicians must be involved "in the planning, selection, design, and reassessment of the system" (p. 587). This allows actual practitioners to guide the development of an HIT project from beginning to end, so that it will be useful in patient care settings. Mike Mistretta explains that his company involves clinicians by "run[ning] reports on alerts listing what has been overridden or ignored to understand what the clinicians in the field are actually

doing. If an alert is consistently bypassed, we bring it forward to our physician advisory committee to determine if it is something we should continue to prompt" (Advice, 2012, p. 24). In this way, clinicians are able to inform programmers of areas where further changes are necessary to avoid workarounds and alert fatigue.

Standardization and Regulation

To ensure accurate and safe use of HIT, standardization and regulation of such technology is warranted. Traynor (2012) discusses a report published by the Institute of Medicine recommending that the Food and Drug Administration (FDA) "create a framework" to use in regulating HIT safety (p. 92). Rouse et al. (2011) recommend HIT be regulated and standardized by the FDA, the National Institute of Standards and Technology, the Office of the National Coordinator for Health IT, and the Joint Commission. Having standards and regulation will help ensure the accuracy and safety of HIT for use in patient care.

Continuing Education and Use of Critical Thinking Skills

Perhaps the most important suggestion to implement when mitigating negative consequences of HIT is the continuing education of clinical staff and the constant focus on such staff members using their critical thinking skills. Mitka (2009) suggests "establishing training and refresher courses for those using the technology" as a way to ensure HIT is being used properly and effectively (p. 587). But even more important than continuing education on HIT systems is the reminder to clinicians that their critical thinking skills are vital to patient safety. If it doesn't seem right, clinicians must investigate and problem solve instead of simply relying on what the HIT is directing. Computer programs can only do what they have been programmed to do. As mentioned previously, programming errors are always present. Humans can adapt to

circumstances, apply knowledge to new situations, and extrapolate information from prior experiences. These skills must never be replaced by technology.

Conclusion

It is vital to balance the use of technology with critical thinking and safety measures when considering use of HIT in patient care. Clearly, HIT has a useful place in direct patient care. Its use has been shown to reduce medication errors and can be useful for assisting clinicians as they care for patients. It may simplify processes and allow more efficient care. However, there are concerns related to its use that must be addressed. Designer error, lack of regulation, and user error are three areas that require mitigation. This can be accomplished by involving clinicians in the design and development of HIT, standardizing and regulating HIT, and continually educating clinicians while reinforcing the importance of their critical thinking skills. Above all, health care workers must understand that technology should never be used to replace their own critical thinking and clinical judgement. Only then can HIT be safely and effectively used to improve patient care.

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