

Ergonomics for the Placement of Computers on a Nursing Unit

by

Elizabeth C. Elkind, PhD, MBA, RNC-OB,
Michael J. Finley, RN, MSN, CCRN
and Robert J. Narloch, MSN, RN

Citation:

Elkind, E., Finley, M. & Narloch, R. (October, 2008). Ergonomics for the Placement of Computers on a Nursing Unit. Online Journal of Nursing Informatics (OJNI), 12, (2). Available at http://ojni.org/12_3/elkind.htm

Abstract

The use of computers by nurses in the hospital setting has not received much examination in nursing research. The current guidelines for the configuration of computers are generally appropriate for a desk-bound office worker. An examination of computer use in an acute care environment leads to several ergonomic considerations that should be kept in mind when choosing how to implement computers.



Introduction

The use of Clinical Information Systems (CIS) in the hospital setting has become more pervasive in the United States. The use of a CIS can lead to increased patient

satisfaction, improved outcomes, and improved nursing documentation (Bowles, 1997; Nahm & Poston, 2000). The federal government's recent initiative to increase adoption of the electronic health record (EHR) will only lead to increased adoption of a CIS in hospitals. Computers and technology vary from acute care organization to organization in terms of the extent of system automation and workflow. The EHR implementation and expansion will continue to evolve in the coming years, ergonomics needs to play a vital role with its growth and considerations for the future picture.

The computer has therefore become a vital tool for nurses. It would be nice if it were a tool with which nurses are satisfied. Sadly, this is often not the case. Overall satisfaction with computers by nurses has remained fairly low. The Healthcare Information and Management Systems Society (HIMSS) Nursing Informatics Task Force (2005) survey showed over 80% of nurses either ambivalent or dissatisfied with the information technology (IT) resources available to them where they work. While there may be many reasons fueling this dissatisfaction, it is interesting to note that availability of hardware is cited by a large percentage of nurses as being one of the statistically significant factors affecting satisfaction with computer use in the clinical setting (HIMSS, 2005). Using the best software in the world can be an unpleasant experience if the hardware on which it runs is poorly laid out. This is why consideration of ergonomic factors is extremely important when installing computers within the acute care environment.

Hebda, Czar, and Mascara (2001) define ergonomics as "the scientific study of work space, including details that affect productivity and worker health" (p. 370). Proper ergonomic placement of computer hardware can significantly improve nurses' satisfaction with

a CIS. Unlike software design, a unit's ergonomics are largely within the control of a hospital's own personnel.

Considerations for Age and Selection of Technology

Healthcare is in the midst of embracing the wireless and hand-held technologies, along with smaller size workstations to combat the limited space issues in the healthcare delivery environment. These alone should not be the driving forces for selection and arrangement. There are additional considerations that should be included in the selection and decision process.

Research on the registered nurse (RN) workforce presents an aging population that should have a importance in the selection matter (Buerhaus, Staiger, & Auerbach, 2000). Buerhaus, Staiger, and Auerbach (2000) noted the Census Current Population Survey illustrated the working RNs average age as 41.9 years. Between the ages of 40 to 50 years there are common vision changes (Nini, 2006). Loss of elasticity in the eye lens that reduces one's vision to focus and may cause blurred vision. Each individual will have varying degrees of loss from mild to severe (Nini, 2006). Lighting and glare can further compound one's ability to read the screens (US Department of Labor for Occupational and Health Administration [OSHA], n.d.).

OSHA puts forth essential information on computer workstations and components (n.d.). Computer workstations should begin with the selection and arrangement of hardware. OSHA imparts "Medical Awareness and Training" that incorporates potential hazards and potential solutions, and these resources are readily available at its web site. How the OSHA recommendations are being used in the acute care setting environment varies from organization to organization.

The Five Rights of Computer Ergonomics

The importance of proper ergonomics with the implementation of computers on a nursing unit has been established. Most ergonomic advice, such as that provided by OSHA (n.d.) presumes a traditional office environment: a single user at a fixed location using a single computer. This scenario does not translate well to the nursing workflow in the acute care environment. A bedside nurse's workday entails frequent movement in order to provide care for patients. It would be time consuming and impractical for a nurse to return to a single location to access the CIS. In addition, nurses are typically not given exclusive access to a single computer, but rather must share a pool of computers with the other nurses as well as personnel from other departments.

Under these conditions, the standard ergonomic advice does not apply, or at least does not apply without modification. Rather than describing how to set up a single computer for a single user, ergonomic setup of a nursing unit must dictate how to set up multiple computers to be used on an ad hoc basis by multiple users. For this scenario, the "five rights" of ergonomics should be employed for a nursing unit. In order to properly serve the nurses on a unit, it must have 1) the right number of computers 2) available at the right locations 3) viewable at the right height 4) with the right size monitor 5) set to the right resolution.

The Right Number of Monitors

How to determine the number of computer monitors needed on each nursing unit? This question presents a challenge. Foremost is the fact that there has been an exceedingly small amount of research done in this subject area. Research to date captured qualitative data that reported themes and statements related to there were not enough computers on the nursing

units or limited information such as availability of computer access (Moody, Slocumb, Berg, & Jackson, 2004). The research does not provide the answers to how many computers are a sufficient amount. The current practice in healthcare organizations is to leave the decision up to the individual institution.

One such example is the Kaiser Permanente Healthcare System in California. Lobash (2006) stated they are poised to construct between 10 and 13 hospitals in the next five to eight years and the administration has already begun to discuss how many terminals are needed on each unit. They start with an organizational template and then the 50 people working in strategy and design meet with several different end users such as doctors, nurses, security officers and medical technologists, in the region where they are planning to build (Lobash, 2006).

The Right Location

It is also difficult to find information on what is considered the right location of computer terminals on nursing units. Janeway (2007) describes Delnor Community Hospital's difficulty with the location of their computers. On one unit, the only computer terminals were at the nurses' station. The nurses were writing patient information on paper towels and entering it into the computer whenever they would return to the main nurses' station. This led to information not being recorded in real time with significant time lags. The physicians complained about having to look for the nurses to obtain the necessary information. To combat this problem the hospital purchased mobile medication carts. This enabled the nurses to provide medications and document at the same time. Even if a nursing unit has 20 computers for 10 nurses, it does not help if all of these computers are placed in close proximity to each other and are unable to be used effectively. Computers on wheels (COWs) provide an alternative to better meeting the needs (Janeway, 2007; Van Plas, 2007).

The Right Height

Healthcare employees are at high risk of obtaining injuries due to the increasing activities required with the CIS. These injuries are known as cumulative trauma disorders (CTDs). It may take weeks to years for these symptoms to manifest. As more hospitals are instituting the CIS, these disorders are becoming more prevalent (Nielsen & Trinkoff, 2003). Vendors in response to the height issues have included controls on the COWs that will raise and lower the height of the computer screen with a few movements.

The Right Size Monitor

Paper-based documentation provides a greater information density; a printed page can legibly contain significantly more information than can a computer monitor of the same dimensions. Its lightweight allows for the use of a tri-fold flowsheet that permits even more information to be readily available. Reading paper documents produces significantly less eyestrain than reading documents on a computer screen. Technology can compensate for this through the use of larger monitors. A larger monitor screen decreases eye strain that reduces overall fatigue during the course of a shift (Ross, n.d.). It also permits more information to be displayed on the screen at one time and minimizes the need for scrolling or screen changes in order to see all pertinent information.

The size of a computer monitor screen does have a significant impact on productivity (Pfeiffer Consulting, 2005; Ross, n.d.). Pfeiffer Consulting (2005) found the time to perform some tasks reduced by more than half by using a 30-inch monitor instead of a 17-inch. Less dramatic, but still significant reductions were realized by going to a 20-inch monitor from 17-inch. Although this study was done using common office software tasks, it is reasonable to

anticipate similar improvements when using a CIS. In addition to productivity gains, a larger screen could also contribute to improved patient outcomes. The ability to see more data could make it easier to detect trends in a patient's condition that might be missed when scrolling or switching between screens.

Financially an increase in monitor size is one of the least expensive ways to produce gains in efficiency. According to Consumer Research (2007), the viewable area of a 20-inch monitor is 77% larger than that of a 15-inch monitor, yet the price difference between these two sizes is generally small for comparable models. As prices decrease for monitors, the price difference between different sizes should become even less significant (Consumer Research, 2007).

The Right Resolution

The legibility of a CIS on a computer monitor is a function of two factors: the size of the monitor and the monitor's resolution. The resolution of a monitor refers to the number of pixels (picture elements) that are displayed on the monitor's screen. The resolution of a monitor should be chosen carefully because too high a resolution on a small monitor will make the information on the screen uncomfortably difficult to read. While too low a resolution on a larger monitor will unnecessarily limit the amount of information that can be displayed on the screen. Ideally, the monitor size and monitor resolution should be coordinated by the IT department. The resolution will be varied based on the size of the monitors (Consumer Research, 2007; Ross, n.d.). As a rule, the larger the monitor, the higher the resolution to which it should be set.

Conclusion

The EHR is will continue to expand and the healthcare delivery team is increasingly dependent on the electronic clinical information for patient care management. Nursing computer practices that include workflow in the acute care settings are tremendously different than that of the general office setting. There is great potential for nursing research in areas such as the balance ergonomics, nursing demographics and workflows in the selection, set-up, and location of workstations and is just the tip of the iceberg. Without research and evidence, changing practice is more problematic.

Authors' Bios

Elizabeth C. Elkind, PhD, MBA, RNC-OB

The Coordinator of Thomas Jefferson University's Graduate Nursing Informatics Program. The past 15 years of her practice focus has been in healthcare technology and nursing informatics in both the clinical and academic settings.

Michael J. Finley, RN, MSN, CCRN

Received both his BSN and MSN in Nursing Informatics from Thomas Jefferson University. He is employed as Senior Clinical Analyst by the University of Pennsylvania Health System. Current interests include examining how hardware allocation affects the use and acceptance of clinical software.

Robert J. Narloch, MSN, RN

Currently employed at Thomas Jefferson University Hospital as a Clinical System Analyst in the Blood Bank Donor Center. A graduate of Jefferson School of Nursing's Graduate Nursing Informatics Program in 2007. He was involved in implementation of the new HCLL system, which was the first hospital in the country to go live with the system.

References

- Buerhaus, P. I., Staiger, D. O., & Auerbach, D. I. (2000). Implications of an aging registered nurse workforce. *JAMA*, 283 (22), 2948-2954.
- Bowles, K. H. (1997). The barriers and benefits of nursing information systems. *Computers in Nursing*, 15(4), 191-196.
- Consumer Research. (2007, January). Computer monitor reviews. Retrieved on September 12, 2008, from <http://www.consumersearch.com/www/computers/computer-monitors/#intro>
- Healthcare Information and Management Systems Society Nursing Informatics Taskforce. (2005). The impact of HIT on the role of nurses and interdisciplinary communication - results of a national survey. Retrieved on September 14, 2008, from <http://www.himss.org/ASP/researchHome.asp?PageNum=2>
- Hebda, T., Czar, P., & Mascara, C. (2001). *Handbook of informatics for nurses and health care professionals* (2nd ed.). Prentice Hall: Upper Saddle River, NJ.
- Janeway, L. (2007). Mobile computer on medical laptop cart improves patient care at Delnor community hospital. Retrieved on September 14, 2008, from <http://healthcare.infologixsys.com/products/Success-Stories/Mobile-Laptop-Cart-Delnor-Hospital/default.asp>
- Lobash, M. (2006). Managing hospital construction projects. *Building Operating Management*. Retrieved on September 14, 2008, from <http://www.facilitiesnet.com/bom/article.asp?id=4806&keywords=construction,%20project%20management,%20hospitals>
- Moody, L. E., Slocum, E., Berg, B., & Jackson, D. (2004, November/December). Electronic health records documentation in nursing. *Computers, Informatics, Nursing*, 22(6), p.337-344.
- Nahm, R., & Poston, I. (2000). Measurement of the effects of an integrated, point-of-care computer system on quality of nursing documentation and patient satisfaction. *Computers in Nursing*, 18(5), 220-229.
- Nielsen, K. & Trinkoff, A. (2003). Applying ergonomics to nurse computer workstations. Retrieved on September 14, 2008, from <http://www.medscape.com/viewarticle/455618>
- Nini, P. (2006). Typography and the aging eye: Typeface legibility for older viewers with vision problems. Retrieved on September 10, 2008, from <http://www.aiga.org/content.cfm/typography-and-the-aging-eye>

Occupational Safety & Health Administration. (n.d.). Computer workstations. Retrieved on September 12, 2008, from <http://www.osha.gov/SLTC/etools/computerworkstations/index.html>

Pfeiffer Consulting. (2005). The thirty-inch Apple cinema HD display productivity benchmark. Retrieved September 12, 2008, from http://www.pfeifferreport.com/Cin_Dis30_Benchmarks.pdf

Ross, S. (n.d.). Two screens are better than one. Retrieved on September 12, 2008, from <http://research.microsoft.com/displayarticle.aspx?id=433>

Van Plas, J. (2007, July 25). Healthcare information technology: Computers on wheels offer cautionary IT lesson. *Wisconsin Technology Network News*. Retrieved on September 12, 2008, from <http://wistechnology.com/articles/4083/>