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Handheld Computing

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Handheld computing technology has the potential to become an important component of integrated information management systems for intensive care. These devices provide a portable platform for point-of-care clinical reference, patient management and communication.

Hardware Options

Handheld computers are used by 30% to 60% of physicians in North America. They have the advantages of portability, relatively low cost and switch on immediately without the delay of a booting process (Adatia and Bedard 2002). However, potential disadvantages include the small screen size and unfamiliarity of many users with handwriting recognition systems or thumb keyboards (Lapinsky et al 2004). Currently the Palm and Microsoft Windows Mobile operating systems (OS) dominate the market. The Microsoft systems allow efficient file transfer with many Windows desktop programs but Palm OS devices are more commonly used by medical professionals, taking advantage of the variety of medical applications available (Adatia and Bedard 2003).

This handheld technology can be used as a stand-alone device or functioning as a client linked to a network. As a stand-alone system, data is stored on the device memory or a removable memory card. This simple and cheap solution is limited by the amount of memory available and the ability to update data. Using wireless connectivity (cellular, Bluetooth, WiFi), data on a central server can be accessed in real-time, offering the benefits of increased memory and computing power and access to up-to-date information. While concerns exist regarding electromagnetic interference with medical equipment, wireless devices can be implemented in the critical care environment with appropriate precautions (Shaw et al. 2004).

Roles for Handheld Computers

The handheld device can act as a mobile point-of-care interface to access patient information and enter orders, as a component of an electronic clinical information system. Electronic prescribing can reduce costs and errors and improve quality of care by providing dosing and drug interaction checks. The prescription can be transmitted directly to the pharmacy using wireless systems. However, the size of the screen allows only a limited portion of the clinical record to be viewed and order entry carries the risk of typographical errors. Data security and patient confidentiality need to be addressed, and systems utilizing the handheld as a browser to access a central data repository have the advantage that no confidential data is stored on the device.

As an independent function or a component of a clinical information system, the handheld computer enables access to management guidelines and protocols at the point-of-care. The small screen is not optimal for viewing long text documents and applications should take full advantage of searching and hyperlinking functions (Lapinsky et al. 2004).

The scheduling and address book functions of handheld devices remain the most commonly used and valuable applications (Fischer et al. 2003). Time and cost benefits can be achieved through the integration of the physician's handheld device with a personal or institutional scheduling application.

Computerized billing applications using handheld devices are increasingly used and have demonstrated financial benefits. Mobile computing devices can also be used to improve communication in hospitals, combining pager, cellphone, email and messaging in a single device.

Barriers to Handheld Devices

Although use is increasing amongst physicians, handheld computers have not reached the level of acceptance of conventional computers. The

major limitations are the small screen size and memory capacity, and unfamiliarity. Images can be displayed, but are not adequate for medical diagnostic purposes. The Palm OS does not support multi-tasking, allowing only one application to be opened at a time. While many users become proficient in the handwriting

recognition systems, they continue to generate errors. The small thumb keyboards are effective, but typing speed is limited.

In addition to the physical and functional barriers of mobile computers, a culture of resistance remains to changing physician practice. In many cases this may be directly related to the functional limitations or to previous experience with a new and error-prone system. If a desktop computer is immediately available, this is often a preferable interface. The physician is often not the recipient of the benefits and may feel that a handheld system involves more work or complexity.

Conclusion

Information technology is essential to enhance the efficacy and reliability of intensive care. Handheld computing technology offers a potentially important component of future integrated information management systems.

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