

From Pens to Pentiums: A Review of Tools Used by Registered Nurses for the Processing of Client Information

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**"The desire to represent information in ways that allow real world issues to be more easily managed has been a common pursuit for centuries"
(Cesnik, n.d., History of Computing, ¶ 2)**

Throughout nursing's history, registered nurses have developed and worked with tools that have helped them deal with the complexities of information management in nursing practice (Sandelowski, 2000). Sandelowski suggests that registered nurses have "always used a variety of tools, instruments, and machines" (p.1) but seldom think about them as technology rather they are thought of as tools for the better provision of health care. Nurses have collected data and processed the resultant information in various ways but have often struggled to make sense of the tools or how to use the tools in a given environment. When an information system is built to manage information, much of the value relates to the outcomes from the tool (Herz, 2005). Thus, as Herz states, that information may be properly and adequately categorized but if no one accesses it then how valuable is the information?

In health care environments, information is a central element in decision-making and an essential requisite for the effective provision and management of health care. Access to this information is recognized as a critical ingredient for both the delivery of health services and health program planning, operation, supervision, and control. Currently, information and communication technologies (ICTs) are seen as indispensable tools for the evaluation of clinical practice and managerial interventions (McHugh, 2001; PAHO, 2001; WHO, 2000).

Registered nurses have always had significant needs for timely, accurate, and appropriate information to provide safe, competent care to clients. They have historically used a variety of tools to assist with the collation of data and processing of information starting with pens and moving to the technological context. This article provides a brief description of some of the more common tools that registered nurses have used to assist with the documentation and processing of this information. Tools such as pens, charts, telephones, computers (Pentiums), and personal digital assistants (PDAs) are described in terms of how these tools have assisted registered nurses with the collection and processing of client information. Finally, a look at what the next generation of tools for information processing look like will be presented.

The Pen

As early as 1857, Florence Nightingale recommended the establishment of a statistical department in the army (Kaminski, 2005; Saba, 2001). She compiled and processed information using pen and separate sheets of paper. The first step toward

turning the pen from a handmade tool into a manufactured commodity was taken sometime in the early 19th century, when mass-produced steel pen points began to appear. These pens had various holes and folds manufactured into them to hold ink, and came in a variety of shapes to suit particular writing styles and applications (Connor, 2005). To record her notes, Florence Nightingale would have held her pen, dipped it in an inkwell, wrote a line, dipped, wrote a line, and dipped again...



Lewis (1890) later described the need for accurate compiling of client observations by stating, "It is one of the most important duties of a modern nurse to be able to give an intelligent report of a case; but it is also that duty which a nurse is longest in acquiring, and which requires, perhaps more hard work to attain perfection in than anything else which a nurse has to do...all who wish to cultivate the power of observation should keep a book wherein, when they go off duty, they may jot down anything they have observed during the day" (pp. 6-7).

Inspired by the emergence of the steel pen point (or simply the 'pen,' as it was known in those days), contemporary inventors tried their best to eliminate the necessity for repeated dipping into the inkwell. They generally didn't work very well (either leaving too much ink on the page or none at all), so the traveling inkwell and the lap-desk became the Victorian analog of the laptop computer, along with ornate holders and gold points. Ink writing had at last become portable (or at least semi-portable) and nurses were able to record their observations and nursing care as a permanent record. These records were read by other nurses and assisted with the planning and implementation of nursing care for clients.

The Hospital Chart

In the early 1900's, the pen and paper method of detailing observations by nurses moved from the 'field' into hospitals where they were used for extensive reporting and recording of patient care. Harmer and Henderson (1939) stated that variation in practice occurred with relation to recording by nurses and to the value attached to the notes. In their text of 1939, the authors stated that "for practical purposes this written information must be collected in a form that makes it convenient to handle and possible to file for future reference" (p. 275). Over the years, the hospital charting system has evolved to reflect the need for accurate, efficient, and effective recording and processing of client information (Ronald, n.d.).



These 'paper charts' have become the recognized system of information exchange and legal documentation of patient care in most health care environments. They include a variety of pages for documenting nurses' notes, recording medications and vital signs, and capturing doctors' records. In addition, protocols, guidelines, checklists, and decision support tools are included to assist with the planning and implementing of client care (Kokol, n.d.; Mercer, 2001).

The Telephone

Prior to the widespread availability of web communications, the use of the telephone specifically for telehealth programming became an important means to share and process client information (Chang, 2003; Simpson, 2004). Historically, telehealth programs used elements of radio broadcasting. Later, they progressed to using the telephone for transmission of client information and processing the information by connecting several health care professionals at one time. In 1973, the first conference was held on telemedicine in the United States and by the late 1980s, telemedicine was being used routinely to deliver general health services to remote regions (Darkins & Cary, 2000). In Canada, the federal government has sought the assistance of experimenters and scientists to help jump start the spread of telemedicine applications in Canada by providing time and space on communications satellites as well as funding for "social experiments" in health and education.



"The true value of telehealth services to nurses, and to the patients they serve, lies within the capacity of telehealth systems to provide the necessary nursing interventions needed to diagnose and treat human responses" (Brennan, 2000, p. 131).

Chang (2003) suggests that while telehealth was developing, "nurses provided leadership in designing patient-centered multimedia programs, implemented electronic information and communication applications and evaluated systems" (p. 934). Overall, nurses have been using the telephone in various capacities to improve access to clinical services for various patient groups since the 1980s (Coyle, Duffy, & Martin, 2007). Through the use of the more common and low-tech tool of the telephone, telephone enabled advice has formalized and become part of health delivery systems.

The Pentium

The first digital computer, ENIAC, was created in the 1940s. In the 1960s, minicomputers emerged and promised a major leap forward in the concept of personal computing (Cesnik, n.d.). The first hospital information systems (HIS) and decision support systems (DSS) were developed "in the late 1960s and were focused on applications for acute care" (Staggers, Thompson, & Snyder-Halpern, 2001, p. 75). Since the early 1990s, the Internet and the World Wide Web (WWW) have resulted in amounts of information that has clearly overwhelmed society's capacity to process it (Strauss, 2007). The first book that described computers and their relationship to nursing practice was titled *Using Computers in Nursing* by Ball and Hannah and was published in 1984 (Ronald, n.d.). Although computers were starting to appear on some nursing units in the 1980s, the hardware and software were limited in application and ease of use. The literature suggests that nurses and nursing students were encouraged to use the computers by adding comments to the standardized care plans, inserting their client information, storing the document, and then retrieving it at a later time and place. At the time, this method of processing client information seemed "like magic and was a little 'scary'" (p. 6).



The changes in the tools that occurred throughout the 1990s were tremendous. They, in part, resulted from the increased availability of home computers, user-friendly software and operating programs, and the rapid expansion and use of the World Wide Web. At the same time, changes in the health care system and methods of professional practice made information processing a critical component in the delivery of safe, competent nursing care (Roland, n.d.; Simpson, 2005). Nursing staff started working with more sophisticated software such as word processing, database management systems, spreadsheets, and decision support systems.

As computer use proliferated, the field of nursing informatics emerged. Although the term *informatics* can be traced back to the 1960s, the term *nursing informatics* was not used until the late 1980s and was defined as “the use of any information technology by nurses in relation to the care of patients, the administration of health care facilities, or the educational preparation of individuals to practice the discipline of nursing” (He, 2003, pp. 120-121). The earliest definitions focused solely on the use of computers but the current focus is on the gathering and processing of information to create knowledge.

According to the Canadian Nurses Association, “Every health system task force or commission in Canada over the last 10 years has highlighted the importance of having better information with which to manage the health care system” (Canadian Nurses Association, 2006, Background, ¶ 1). This is reflected in a newer model of nursing informatics that includes computer science, information processing, cognitive science, and nursing science (McNeil & Odom, 2000). The main goal of informatics is to study the nature of information in all its forms, which leads to classification, organization, representation, storage, retrieval, understanding, and use of information (He, 2003, p. 118).

The Personal Digital Assistant (PDA)

The personal digital assistant (PDA) is one of the newest technological tools that has the capacity to bring powerful capabilities and portability to the pockets of nurses practicing in a wide variety of settings. Registered nurses now have access to information that is portable, saves valuable time, and provides the flexible utilization of software programs, including the recording of client information (Dee, Teolis, & Todd, n.d.; Fontelo, Ackerman, Kim, & Locatis, 2003; George & Davidson, 2005).

While PDAs were introduced in the mid-1990s in their current format, recent studies indicate that the majority of practicing registered nurses still do not use PDAs in their practice (Davenport, 2004). This trend exists despite the potential for PDAs to give better information management in a light and mobile model that puts the answers in the nurses’ hands, not at the nurses’ station.



Registered nurses are proficient regarding information management as they routinely collect and organize data, seek evidence, and research treatments and interventions (Hebert, n.d.). However, most do so without the benefit of any Information and Communication Technology (ICT) resources. The literature suggests that registered nurses spend an average of 36-94 percent of their time handling and documenting client information (Executive Summary, 2004). The time needed for processing client information is frequently linked to insufficient numbers of providers relative to client demands, lack of time to record the details of care provided, and the absence of structured forms for data collection and retrieval system.

The Future

Registered nurses have historically used a variety of tools to assist with the assessment, collection, and processing of client information. They have expanded and adapted the use of tools to best meet their practice needs. Tools, whether they reflect aspects of pens or pentiums, will continue to be used by registered nurses in accessing and processing client information. Health information needs to be accessible to nurses and other health care professionals, but also to clients as consumers of information and data. One of the major challenges comes from the rapid advances in information technology. "There will be new transmission methods, faster and more powerful means of data transmission, and more cost-effective and powerful tools for information creation and manipulation" (He, 2003, p. 121).

One example of the new tools available to consumers and health care providers is the iPod[®] which is a portable media device that appeared on the markets after the turn of this century. The device was immediately used for downloading music and videos. The iPod[®] was not designed with health care in mind but it has potential for both clients and registered nurses as a tool to access health care information. There are many health care podcasts available for viewing or listening that are aimed at influencing health care consumers (Sarasohn-Kahn, 2005).

Could the iPod[®] have the potential to impact "the trend of using the must have/must carry handhelds (usually cell phones) as wireless monitors for either chronic disease or health maintenance purposes" (Sarasohn-Kahn, 2005, 3 ¶)? The iPod[®] has set the stage for bigger and better things in healthcare as this compact electronic media device combines technology and healthcare (McGonigle, 2007). As Richardson (2006) states, "No matter what you think about the iPod, it's clearly a springboard for the latest and greatest technology" (12 ¶). iPods[®] provide creative and functional uses for the present and imagined uses for the future (McGonigle).

"Further contributions will come from the advent of low cost portable and wearable computers. These will allow access to knowledge at the right time and in the right place through ubiquitous computer networks and wireless connections to the Internet" (Eysenbach & Jahad, 2001, The future, ¶ 1). In health care environments of the future, these tools will have a significant impact on decision-making and will become an essential requisite for the effective provision and management of health care.

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