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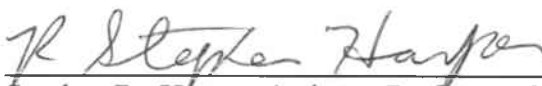
This thesis for honors recognition has been approved for the Department of Nursing



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Many, many thanks to my friends for their enthusiasm and confidence.

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Nursing Informatics: A Challenge for Change
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Running Head: COMPUTERS IN NURSING

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Abstract

Although information systems were introduced into the health care setting over thirty years ago, their full potential remains consistently under-realized by nurses (Bongartz, 1988). Kurt Lewin's Change Theory provides the conceptual framework through which the stages of change — unfreezing, moving, and freezing — can be identified and analyzed. Cost savings, elimination of redundancies, and improved communication were identified as facilitators to change using Lewin's Force Field Analysis. Resisters to change identified were computer anxiety, poorly conceived systems, and lack training. Through the identification of computer misconceptions held by nurses, selection and development of software specifically designed to meet the needs of nurses, and the careful planning and execution of nursing information systems, change can be successfully achieved. Although advances in hardware and software systems have been made, ideal systems for the clinical nurse do not yet exist. NursesAid, a nursing assessment and diagnosis program developed by the author, provides the foundation for improving available software systems for nurses.

Nursing Informatics: A Challenge for Change

Nursing informatics is a unique combination of nursing science, computer science, and information science aimed at "supporting the practice of all nursing specialities in all sites and settings of care" (American Nurses Association, 1994). It is relatively new to nursing, having only been designated as a nursing speciality by the American Nurses Association in 1992 (Simpson, 1995b). The need to designate nursing informatics as a nursing speciality became apparent after the mandate set forth by the Joint Commission on the Accreditation of Healthcare Organizations (JCAHO) in 1991 requiring nurses to be involved in the evaluation, selection, and integration of all computer systems affecting patient care (Simpson, 1995a). Certification through the American Nurses Association in this speciality has been available since October, 1995 (Simpson, 1995b).

The informatics nurse is described as being responsible for: ". . . identifying, collecting, processing, and managing data and information to support nursing practice, administration, education, research, and the expansion of knowledge" (American

Nurses Association, 1994). According to the standards of practice set forth by the American Nurses Association, informatics nurses are accountable for participating in the analysis, design, development, implementation, evaluation, or maintenance of information technologies in order to (1) collect patient and client data; (2) utilize patient and client data to support decision making; (3) provide for identification of outcomes for patients and clients; (4) develop plans for achieving identified outcomes; (5) document implementation of the plan; and (6) provide for outcome measurement and evaluation (American Nurses Association, 1995).

The Center for Healthcare Information Management defines a nursing information system as:

". . . a software system that automates the nursing process from assessment to evaluation, including patient care documentation. It also includes a means to manage the data necessary for the delivery of patient care, e.g., patient classification, staffing, scheduling and costs. It is not separate, but an integral part of the healthcare organization's overall information system" (Simpson, 1995a, p. 218).

According to the American Nurses Association, nursing informatics is:

". . . concerned with the legitimate access and use of data, information and knowledge to standardize documentation, improve communication, support the decision-making process, develop and disseminate new knowledge, enhance the quality, effectiveness and efficiency of health care, empower clients to make health care choices and advance the science of nursing" (Simpson, 1995a, p. 217).

Conceptual Framework

A change theory was chosen to serve as the conceptual framework for this thesis because change is inherent in nearly every aspect of computerization. With a basic understanding of the change process, those implementing change, namely informatics nurses, can better anticipate, plan for, and facilitate it. The change theory chosen to serve in this capacity is Kurt Lewin's Change Theory. Derived from his Field Theory, Lewin's Change Theory describes the change process as occurring in three steps: unfreezing, moving, and refreezing (Lewin, 1951).

During the first step, unfreezing, one gains an awareness and a desire for change (Ollikainen, 1986). This often originates from dissatisfaction with present practice. A piece of the unfreezing step requires the application of Lewin's Force Field Analysis in which

the forces both supporting and resisting change are identified (Kozier, Erb & Olivieri, 1991; Snyder, 1984). See Figure 1 for a graphical representation of this analysis.

Moving, the second step in Lewin's Change Theory, involves the actual planning and implementation of change (Lewin, 1951). Finally, during freezing, new behaviors are practiced and stabilized (Lewin, 1951). At this point the people involved with the change come to recognize its value and integrate it into their own value system (Kozier, Erb & Olivieri, 1991).

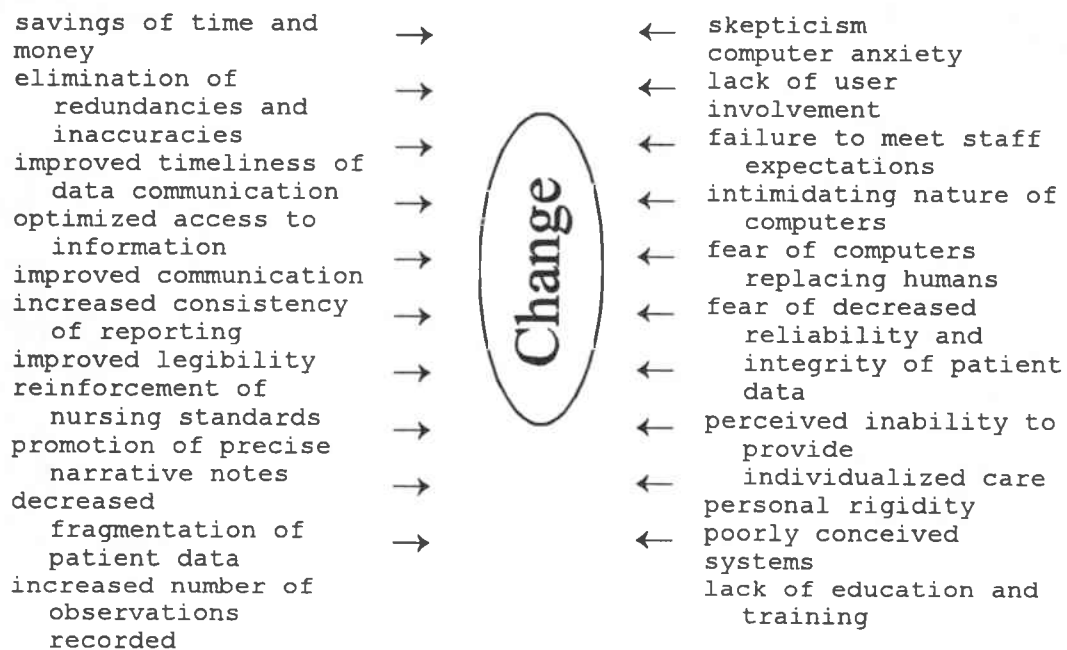


Figure 1. Graphical representation of Force Field Analysis with those factors facilitating change on the left (advantages) and those factors inhibiting change on the right (resistors).

Literature Review

Step I: Unfreezing

During Lewin's first step in the change process, unfreezing, the desire for change becomes apparent, often due to dissatisfaction with current practice (Ollikainen, 1986). Current dissatisfaction with today's health care system comes from its inability to meet the American public's demands for "a healthier population, universal coverage, and convenient access to a cost-effective, quality-oriented health care system" (Heller, Mills, Romano, 1996). Computer information systems seem to be the answer for increasing efficiency and accountability in the delivery of patient care (Heller, Miller & Romano, 1996)

Computers, when utilized appropriately, can save time, money, and energy in the clinical health care setting (Gibson & Rose, 1986; Hughes, 1995). The most readily apparent embodiment of these advantages is found in point-of-care computerized nursing documentation systems which are designed to record data where and when it is given, usually the patient's bedside (Hughes, 1995). The advantages of such a

system lie in its ability to (1) minimize the time spent in documenting patient information; (2) eliminate redundancies and inaccuracies of charted information; (3) improve the timeliness of data communication; (4) optimize access to information; and (5) provide the information required by the clinician to make the best possible patient care decisions (Hughes, 1995).

Since documentation is the most frequent cause of over-time in the clinical setting (Moody & Snyder, 1995), point-of-care documentation systems can save the institution money by saving nurses' time. Having a centralized information data base, as is supported by nursing information systems, eliminates duplication of documentation, reduces nurses' time and effort, and results in a cost savings (Schlehofer, 1992).

Research consistently supports the use of computers in nursing documentation for its many other advantages (Hughes, 1995; Minda & Brundage, 1994; Moody & Snyder, 1995; Ventura, Ackerman, Gugerty, Skomra, & Crosby, 1991). These include improved communication, increased consistency of reporting, improved availability of patient records, and consistent location of patient data. By utilizing computerized

flow sheets, as do these point-of-care information systems, nurses can also improve the quality of patient care by increasing the consistency of information recorded, eliminating problems of legibility, reinforcing nursing standards, promoting precise narrative notes, and decreasing the fragmentation of patient data (Moody & Snyder, 1995). The legal advantages of such complete, accurate, objective, and timely documentation cannot be underestimated (Minda & Brundage, 1994).

Minda & Brundage (1994) discovered that computerized documentation not only decreased the amount of time nurses spent on documentation, but also enhanced nursing practice by increasing the number of observations recorded. Computers are also instrumental in the quality assurance and improvement arena, since they can be used to collect, process, and report data in an effective, immediate, and cost effective manner (Ventura, et. al., 1992).

Force Field Analysis

Through the application of Lewin's Force Field Analysis, supporting and resisting factors to change can be identified. Identification of such forces is

crucial because support and strong commitment from the nursing staff promotes the successful implementation of nursing information systems in the health care setting (Brodt & Stronge, 1986; Krampf & Robinson, 1984; Scarpa, Smeltzer & Jasion, 1992; Soonit, 1987). The anticipation of acceptance or resistance can aid in the development of strategies to successfully facilitate the implementation of the nursing information systems. Figure 1 graphically identifies the application of Lewin's Force Field Analysis.

The research conducted in the 1960s and 1970s evidenced that nurses had a generally negative attitude toward computerization (Bongartz, 1988) while recent studies reveal nurses' attitudes towards computerization to be generally positive, although not strongly so (Scarpa, Smeltzer & Jasion, 1992). Nurses remain skeptical (Brodt & Stronge, 1986; Scarpa, Smeltzer & Jasion, 1992) and hesitant (Gibson & Rose, 1986; Krampf & Robinson, 1984) and have generally adopted a wait-and-see attitude before fully accepting computerization in the health care setting.

Many studies have been conducted in order to gain insight into the reasons for nurses' attitudes towards

computerization. In a 1991 study, Wilson determined that 21% of the participants had a high degree of computer anxiety and concluded that such high levels of anxiety result in computer avoidance (Wilson, 1991).

Dowling (1980) further identified eight factors which could contribute to nurses' skepticism and hesitance towards computerization. These include: pre-existing organizational problems, failure of the change process, insufficient resource support, hardware and software problems, lack of user involvement, neglect of staff reward structures, and failure to meet staff expectations.

Krampf & Robinson (1984) identified the following as common anxieties among nurses who had little personal experience with computers: fears that computers would replace humans, restrict flexibility in medical decisions, threaten job security, and deny reliability in the integrity of patient data. Gibson & Rose (1986) suggest that the intimidating nature of computers; the threat to job security; the fear of job dissatisfaction due to decreased interaction and communication with patients; the perceived inability to provide individualized care; and the questionable

confidentiality of patient information to be factors contributing to nurses' reluctance to engage in change.

Herrick & McCullough's study (1989) confirmed Watson's 1969 hypothesis that a nurse's resistance to change was directly correlated to his/her personal rigidity, while Carter & Axford (1993) reported that nurses lack the knowledge required to take full advantage of technology.

Hughes (1995) identified the following as potential hurdles to computerization in the health care setting: refusal to engage in behavioral changes, technological gimmicks, poorly conceived systems, limited accessibility to and usability of data, and lack of education and training for nurses. Nurses studied by McConnell, O'Shea & Kirchhoff (1989) believed computers improved the quality of patient care while dehumanizing the care the patients received.

Finally, the cost of bed-side computer systems remains a barrier to their wide-spread integration (Simpson, 1995a). The price of these systems, fortunately, has decreased in recent years, and their wide-spread implementation is becoming more conceivable (Simpson, 1995a).

Many studies have also been conducted in an effort to identify the personal indicators which reliably predict a nurses' resistance or acceptance to computerization in the health care setting. Brodt & Stronge (1986) identified educational preparation, length of nursing service, and the type of nursing unit as significant indicators in the determination of a nurse's attitude toward computerization. According to the results of their study, nurses with higher levels of educational attainment, i.e. RNs versus LPNs, with more experience in nursing service, possessed significantly more positive attitudes than did their counterparts. In addition, nurses working on Rehabilitation-Pediatrics unit and in administration had significantly more positive attitudes than those nurses working on the medical-surgical unit. Age, length of employment, shift worked, and presence of a terminal on the unit were not reliable indicators of nurses' attitudes towards computerization. Brodt & Stronge's (1996) findings, however, are in conflict with Scarpa, Smeltzer, & Jasion's study (1992) which reported no significant difference in attitude between nurses with different levels of education, years of

nursing experience, and job titles. Rather, their study indicated previous computer experience was the only significant indicator of nurse's attitudes towards computerization. Nurses having the greatest amount of computer experience had the most positive attitudes towards computerization.

To date, research regarding the factors influencing nurses' attitude towards computerization remains unclear and inconclusive. Future research in this area, including the replication of past research studies, is needed to clear up the inconsistencies which exist.

Step II: Moving

During moving, the second step in Lewin's Change Theory, the actual planning and implementation of change is executed (Lewin, 1951). The following have been identified as potential solutions for promoting nurses' acceptance of computerization: identifying and correcting misconceptions nurses have concerning computers; selecting/developing software specifically designed to meet the needs of the intended users; and carefully planning and executing implementation of nursing information systems (Gibson & Rose, 1986;

Herrick & McCullough, 1989; Krampf & Robinson, 1984; Moody & Snyder, 1995).

Identifying misconceptions nurses hold of computers

Before full utilization of nursing information systems can be achieved, the concerns of those nurses directly affected by the change must be identified and strategies to alleviate them must be developed (Gibson & Rose, 1986). Some of the concerns held by nurses have already been identified in the previous section. Among these are: dehumanization of patient care, reduction in flexibility of medical decisions, threats to job security, and questionable integrity of patient data and confidentiality (Gibson & Rose, 1986; Krampf & Robinson, 1984). In addition, the misconception that a solid mathematical background is necessary for the proper utilization of computers has been reported among some nurses (Kramf & Robinson, 1984).

Educational programs can serve as the vital link in the elimination of misconceptions nurses hold about computers, as it has been shown that nurses with previous computer experience generally have a more favorable attitude towards computerization (Herrick &

McCullough, 1989; Scarpa, Smeltzer & Jasion, 1992).

Selection/development of software specifically designed to meet the needs of the intended users

The correct selection/development of software for a nursing unit is an essential part of the moving process. Before the selection process can begin, however, those nurses who will be utilizing the software must carefully analyze their needs. (Moody & Snyder, 1995). Incorporation of the nurse's input into the design and selection of the computerized system facilitates the match between the system and the users' acceptability and capability (Dowling, 1980).

Planning and execution of implementation of nursing information systems

Extensive planning, organization, and communication are required in the implementation of nursing information systems (Herrick & McCullough, 1989). Gradual introduction of computers into the health care setting helps facilitate the acceptance and the success of computerization (Gibson & Rose, 1986). Conducting a pilot study is important in this regard, since it promotes the gradual introduction of computerization, and allows for the identification and

correction of problems before institution-wide changes are made. (Moody & Snyder, 1995). Additionally, an adequate, knowledgeable resource staff must be available to nurses at all times to answer questions and trouble shoot problems (Krampf & Robinson, 1984). Finally, administrators must be knowledgeable about computers and act as sensible and experienced change agents (Gibson & Rose, 1986).

Step III: Freezing

During Lewin's final step in his Change theory, freezing, new behaviors are practiced and stabilized (Lewin, 1951). At this point the people involved with the change come to recognize its value and integrate it into their own value system (Kozier, Erb & Olivieri, 1991).

Proper education and training of staff in the use of the new nursing information system can be of great service in achieving this step. These educational programs must, however, be sensitive to the unique learning needs of adults who may require a "slow-paced, flexible, fail-proof, human interaction with the computer itself" (Krampf & Robinson, 1984, p. 34). Additionally, attention to nurses with less educational

achievement is imperative. These nurses require, "the most intensive orientation to computers" (Brodt & Stronge, 1986, p. 86). Formal instruction on an institution's computer system should also be included in each new employee's orientation (Brodt & Stronge, 1986), and those nurses with previous computer experience can be called upon to assist in the training and education of fellow nurses (Herrick & McCullough, 1989; Scarpa, Smeltzer & Jasion, 1992). Additionally, learners must retain an active role in the identification of their learning needs, as research shows learning is best achieved when learners are involved in the educational process (Carter & Axford, 1993).

Current and Future Trends in Nursing Information Systems

Many information systems have been developed to assist and support the nurse in nearly every aspect of nursing within the health care spectrum. Systems are available to nurse administrators, nurse researchers, nurse educators, and nurse clinicians practicing in all types of settings. Because this thesis focuses on the use of computers to support and facilitate the practice

of the nurse on a medical/surgical unit, the next section will focus on current and future trends as they relate to these nurses.

Hardware for Medical/Surgical Units

The computer hardware systems available to clinical nurses are not yet ideal for the clinical setting (Hughes, 1995). Hughes (1995) describes the ideal hardware system as:

". . . portable, real-time communication device with multiple reliable input technologies (i.e., touch, pen, voice), the ability to display all of the patient information needed, the appropriate graphics and trending capabilities, a quick and easy documentation method, battery power to last at least 16 hours, and batteries that fit easily into the pocket" (p. 147).

A hardware system offering all of these features is not yet available. As technology evolves, however, such systems will no doubt be developed. Common hardware in the clinical setting currently consists of full-sized personal computers and of work stations which use the standard keyboard as the data entry source. Handheld, portable interactive terminals come closer to meeting the requirements of an ideal computer hardware system. These systems allow for point-of-care data entry through a variety of different data entry

methods such as pens, touch screens, and bar code readers. Such hardware, however, can also prove to be "too heavy, too cumbersome, or too restrictive in function" (Hughes, 147).

Software for Medical/Surgical Units

Computer systems developed for the clinical nurse currently aid in the gathering of assessment data and the generation of individualized patient care plans (Mehmert, Dickel, McKeighen, 1989; Nolan-Avila, Abrams, Spitzer, Shabot, 1985; Rambo, 1994). In addition, software programs have been developed for the documentation of nursing care as well as for on-line nursing order entry (McConnell, O'Shea, Kirchhoff, 1989) and results reporting systems (i.e. lab results, x-ray results, etc.) (Schlehofer, 1992).

Point-of-care systems have been developed in an effort to "capture data at its source" (Hughes, 1995, p. 145), thereby making information immediately available to other health care providers, decreasing the amount of time spent on charting, and eliminating duplication of information. With the patient's chart immediately accessible to any authorized personnel on a networking terminal, time is no longer wasted tracking

down paper documents or dealing with interruptions involved in conveying previously documented information.

In addition to the advantages of immediate access to documentation, point-of-care systems also have additional features which enhance and improve the quality of nursing care. For example, some systems maintain records regarding patient medication administration and/or particular treatment procedures. With such information directly at the point of care, along with prompts to remind the nurse, errors in medication administration and procedural sequence can be decreased (Hughes, 1995,). Developments in software have led to the cross-referencing of drug incompatibility, as well as patient allergies (Ball & Hannah, 1984).

Point-of-care systems also provide the user with immediate access to on-line reference databases, standards of care, and provider policy and procedures guides.

Software to support the nursing process

The nursing assessment serves as the basis for the entire nursing process: nursing diagnosis; goals and

outcome criteria; intervention; and evaluation (Nolan-Avila, Abrams, Spitzer, Shabot, 1985). Assessments must be tailored to the individual patient so that complete and accurate information is gathered for the development of appropriate plans of care. Properly designed nursing information systems can help in the development of specific assessments based upon the patient's past and present health status. Nursing diagnoses can then be generated based upon the findings obtained from the nursing assessment.

Early nursing information systems facilitated the first two steps of the nursing process: assessment and diagnosis. Examples include the Computer Aided Nursing Diagnosis and Intervention (CANDI) system (Roth, DiStefano & Chang, 1989) and the Computer-Aided Research in Nursing (CARIN) system (Hirsch, Chang, & Gilbert, 1989). The assessments were gathered from both patient interviews and from physical examination and were considered in two parts: screening questions and in-depth questions. Screening questions were utilized to identify areas for further inquiry, or for in-depth questioning. Based upon the findings of these two assessments, nursing diagnoses were generated.

While these early nursing assessment and diagnosis systems are still utilized in some hospitals, newer, more complete systems which support the nursing process have been developed in recent years. One such information system is MacNursing which computerizes the nursing assessment and the patient care planning (Lloyd, Toth & Rogers, 1994). This system is not ideal, however, because the program does not make use of the assessment data to automatically develop the nursing diagnosis and care plan. Nurses must instead select the applicable nursing diagnoses from the electronic care plan and individualize the goals, outcome criteria, and interventions for each specific patient. Because MacNursing is automated and reduces duplication in documentation, it remains an improvement over the paper and pen system.

NursesAid

Program Purpose

The program developed as part of this thesis is entitled NursesAid. NursesAid records patient admission information, chooses appropriate nursing assessments based upon the patient's admitting medical diagnosis, allows for the individualization of nursing

assessments based upon individual patient needs and conditions, generates nursing diagnoses based upon the results of the nursing assessment, and records the information as part of the patient's permanent medical record. The program has been designed to allow for future expansion and eventual integration of all hospital departments providing patient services (e.g. lab, x-ray, pharmacy, financial, etc.).

The program is intended to help ease the nurse's burden of paperwork and documentation, as well as to help standardize care within an institution. In addition, the consistency of reporting data will allow for more complete statistical analysis and case management.

NursesAid is intended for use by nurses with minimal computer experience, working on a medical floor in a hospital. Only those assessments pertinent to the majority of medical conditions treated on a medical floor of a hospital have been chosen for inclusion in the program.

NursesAid was designed using Microsoft FoxPro 2.6 for Windows, the database used by the Carroll College Computer Science Department. FoxPro has been heralded

for its graphical interface "based on windows, menus, and dialog boxes" (Siegel, 1994, p. 11).

Figure 2 graphically illustrates the relationships and constraints between the program's three databases, as well as identifies all of the fields in each database. As shown in Figure 2, NursesAid is comprised of three databases: patient, mxdx (medical diagnosis), and results. The results database is related to the patient database through the common field entitled ID (patient social security number). The patient database is then related to the mxdx database using the common field mxdx_num (an arbitrary number assigned to each medical diagnosis).

The first database, patient, stores patients' personal information. The items chosen for inclusion in this database were taken from the Uniform Hospital Discharge Data Set put forth by the National Center for Health Statistics for Medicare reimbursement (Pollack, 1996). Of the fourteen variables mandated by the data set, nine have been included in NursesAid.

RESULTS	PATIENT	MXDX
id cur_date cur_time	id lname fname mi address apt_no city state zip phone_hom phone_work dob gender race admission discharge attend_md mxdx_num	mxdx_num mxdx_nam

EACH DATABASE HAD THE FOLLOWING FIELDS		
loc	edema_lf	pul_crtldr
perl	cap_refill	pul_dpl
pain	gi_abd	pul_ptl
angina	gi_bowlsnd	pul_popl
sk_color	gi_gaspain	pul_feml
sk_temp	gi_flatus	pul_radl
sk_turgor	feces_cons	pul_brachl
sk_cond	gi_bowlmvt	pul_crtld
resp_qual	urine_col	rest_pul
cough	urine_amt	rest_rr
resp	pul_dpr	rest_bp_s
o2	pul_ptr	rest_bp_d
ht_sound	pul_popr	post_pul
ht_rhythm	pul_femr	temp
edema_sac	pul_radr	
edema_rf	pul_brachr	

Figure 2. Relationships and Constraints graphic which shows the three databases used in NursesAid, the fields in each of the databases, and the fields through which the databases are related. Relating fields are in bold.

The five without direct bearing on the patient assessment and nursing diagnosis were not included: hospital identification, physician identification - operating, procedures and dates, discharge disposition of patient, and expected principal source of payment.

The patient database also includes one logical field for every available assessment so that assessments can not only be tailored to each medical diagnosis, but also to the individual patient. Although each patient, based upon his/her particular medical diagnosis, is identified for a particular set of assessments, individualization of these assessments can be accomplished by changing the status of the logical field in the patient database to either include or exclude the identified assessment.

The second database, the medical diagnosis database, contains the name of the disease and an identifying number. This database also contains logical fields for every available assessment. Inclusion or exclusion of an assessment based solely upon the nature of a patient's medical condition can be predetermined by the program. Thus patients without complicating physiological conditions can be routinely

assessed. Results, the final database, holds each individual's results as gathered during the assessment. The data is stored by the patient's identification number and can be identified later by the date and time it was entered.

NursesAid is driven through the use of eight controlling screens. The Main Menu screen is shown in Figure 3. Upon choosing an option from this menu, another appears to drive the program.

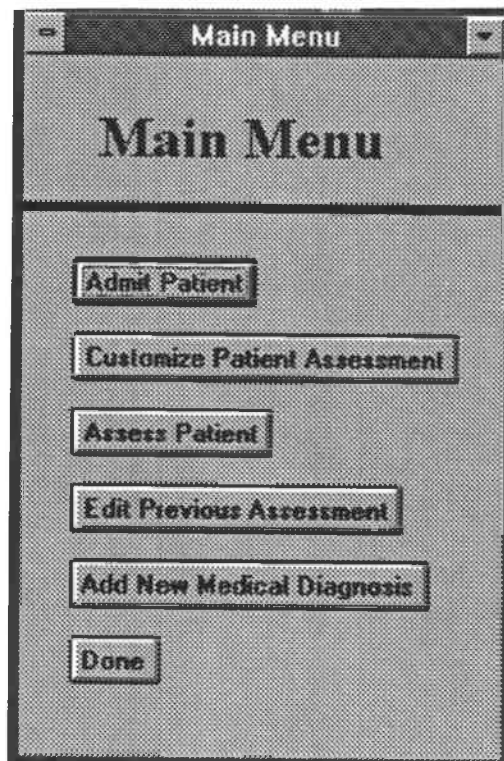


Figure 3. NursesAid's Main Menu. Selection is made by using the mouse to locate the proper choice and clicking the left mouse button or by tabbing until the box is around the proper choice and pressing enter on the keyboard.

The Admit Patient screen is shown in Figure 4. Patients are admitted by typing information into the provided boxes. Note the pull-down menu for both the race and the admitting medical diagnosis fields. These are used to save the data entry person from redundant typing, as well as to prevent the misspelling of vital information. Selection of pull-down menu choices can be made by using the arrow keys on the keyboard or by selecting the arrow key to the right of the fields using the left mouse button and then by selecting the proper choice in the menu, again with the left mouse button.

The screenshot shows a window titled "New Patient Admit". The form fields are as follows:

- Name:** last, first, middle initial
- Address:** street, Apartment Number
- City:** City, State, Zip
- Phone:** home, office
- Date of Birth:** / /
- Gender:** Gender
- Race:** Race (pull-down menu)
- Social Security Number:** - - 0
- Medical Information:**
 - Admission Date: / /
 - Discharge Date: / /
 - Attending Physician: [text box]
 - Diagnosis: Congestive Heart Failure (pull-down menu)

Buttons: Add Another, Close/Save, Close/Don't Save

Figure 3. NursesAid's New Patient Admit Screen. The user can move from field to field using either "tab" on the keyboard or the mouse.

If Customize Patient Assessment or Assess Patient is selected from the Main Menu, the screen shown in Figure 5, Pick Patient, is shown. From this screen the user identifies the patient for whom data are being entered.

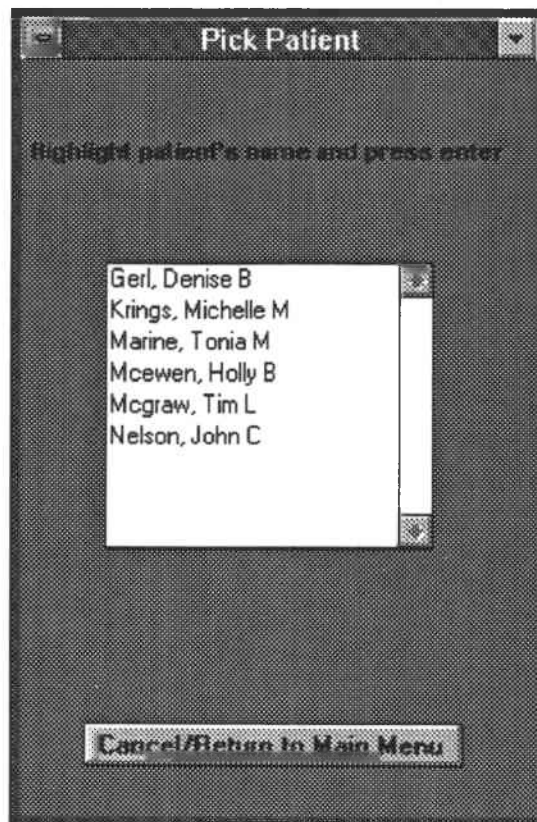


Figure 5. Pick Patient Screen. Nurse identifies intended patient by highlighting the name and pressing enter or double clicking with the mouse on the appropriate name.

The Patient Assessment Screen, shown in Figure 6, is based upon the one used on the Medical/Surgical floor at St. Peter's Hospital in Helena, Montana.

Those areas which have been identified as unnecessary for assessment of a particular patient have been disabled so that the nurse will not be able to enter data in these fields.

Patient Assessment

Denise B Geri
04/26/98 (date) 1700 (time)

Neurological
 LOC: 6 =
 PERL (y/n): Y
 Pain (0-10): 0
 Angina (y/n): N

Respiratory
 Quality: eupneic
 Cough: absent
 Sounds: clear
 O2: 100%

Genito Urinary
 Abdomen: flat
 Bowel sounds: present
 Gas pain (y/n): N
 Flatus (y/n): N
 Feces consistency: formed
 # of Bowel movements: 1
 Urine color: yellow
 Urine amount: 100 cc/hour

Integumentary
 Color: tan/pink
 Temp: warm
 Turgor: good
 Condition: dry

Cardiovascular
 Heart Sounds: S1/S2
 Regular Rhythm (y/n): Y
 Edema, sacral (y/n): N
 Edema, R leg: 0 = r
 Edema, L leg: 0 = r
 Rapid Cap Refill (y/n): Y

Pulses/Right
 Dorsalis Pedis: 2
 Posterior Tibial: 2
 Popliteal: 3
 Femoral: 3
 Radial: 3
 Brachial: 3
 Carotid: 4

Pulses/Left
 Dorsalis Pedis: 2
 Posterior Tibial: 2
 Popliteal: 3
 Femoral: 3
 Radial: 3
 Brachial: 3
 Carotid: 4

Pulses Key
 4+ = strong
 3+ = normal
 2+ = weak
 1+ = faint
 0 = absent

Vital Signs
 Resting pulse: 60
 Resting respirations: 16
 Resting b.p.: 120 / 60
 Post activity pulse: 80
 Temp: 98.60

Save/Nursing Diagnoses
 Save/Assess Another
 Close/Save
 Close/Don't Save

Figure 6. Patient Assessment Screen. Several pop-down menus are provided to ensure consistency in data recording, eliminate misspellings, and save time in redundant typing.

If at any time it becomes important to include a particular assessment for an identified patient, the nurse has the option of adding this assessment through the use of the Individualize Patient Assessment screen shown in figure 7.

Individualize Assessment
Debbie B Gard

Individualize Assessment

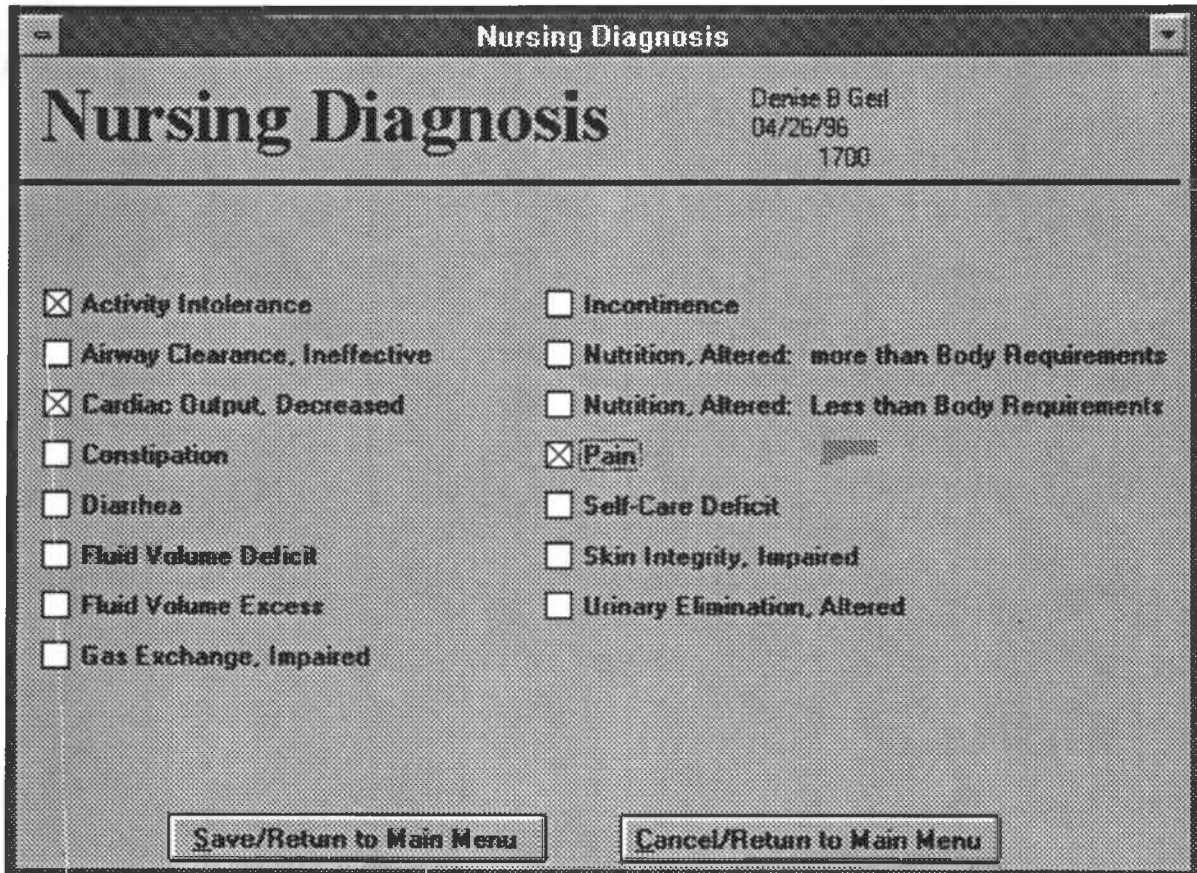
The following assessments have been recommended for patients with congestive heart failure

If the assessments needed for the above identified patient are required, please identify them by placing a corresponding "y" or "n" in the proper box

Vital Signs Resting pulse <input checked="" type="checkbox"/> Resting respirations <input checked="" type="checkbox"/> Resting b.p. <input checked="" type="checkbox"/> Post activity pulse <input checked="" type="checkbox"/> Temperature <input checked="" type="checkbox"/>	Pulses/Right Dorsalis Pedis <input checked="" type="checkbox"/> Posterior Tibial <input checked="" type="checkbox"/> Popliteal <input checked="" type="checkbox"/> Femoral <input checked="" type="checkbox"/> Radial <input checked="" type="checkbox"/> Brachial <input checked="" type="checkbox"/> Carotid <input checked="" type="checkbox"/>	Cardiovascular Heart Sounds <input checked="" type="checkbox"/> Rhythm <input checked="" type="checkbox"/> Edema, sacral <input checked="" type="checkbox"/> Edema, R leg <input checked="" type="checkbox"/> Edema, L leg <input checked="" type="checkbox"/> Rapid Cap Refill <input checked="" type="checkbox"/>	Genitourinary Abdomen <input checked="" type="checkbox"/> Bowel sounds <input checked="" type="checkbox"/> Gas pain <input checked="" type="checkbox"/> Flatus <input checked="" type="checkbox"/> Feces consistency <input checked="" type="checkbox"/> Bowel movements <input checked="" type="checkbox"/> Urine color <input checked="" type="checkbox"/> Urine amount <input checked="" type="checkbox"/>
Neurological LOC <input checked="" type="checkbox"/> PERL (y/n) <input checked="" type="checkbox"/> Pain (0-10) <input checked="" type="checkbox"/> Angina (y/n) <input checked="" type="checkbox"/>	Pulses/Left Dorsalis Pedis <input checked="" type="checkbox"/> Posterior Tibial <input checked="" type="checkbox"/> Popliteal <input checked="" type="checkbox"/> Femoral <input checked="" type="checkbox"/> Radial <input checked="" type="checkbox"/> Brachial <input checked="" type="checkbox"/> Carotid <input checked="" type="checkbox"/>	Respiratory Quality <input checked="" type="checkbox"/> Cough <input checked="" type="checkbox"/> O2 <input checked="" type="checkbox"/> Comments <input checked="" type="checkbox"/>	
Integumentary Color <input checked="" type="checkbox"/> Temp <input checked="" type="checkbox"/> Turgor <input checked="" type="checkbox"/> Condition <input checked="" type="checkbox"/>			

Figure 7. Individualize Assessment Screen. Changes are made to the screen by typing a "y" or a "n" in the appropriate box. Program is continued by pressing one of the three buttons in the lower right hand portion of the screen.

The final screen available at this time, shown in Figure 8, is the Nursing Diagnosis Screen which generates nursing diagnoses based upon the data gathered in the Patient Assessment Screen. Nurses can accept those diagnoses generated by the computer, can choose additional ones that the computer did not pick up, or can choose to take off diagnoses that the computer generated.



The screenshot shows a window titled "Nursing Diagnosis". In the top right corner, it displays the user name "Derise B Geil", the date "04/26/96", and the time "1700". The main area contains a list of nursing diagnoses, each with a checkbox. The checked diagnoses are "Activity Intolerance" and "Pain". The unchecked diagnoses are "Airway Clearance, Ineffective", "Cardiac Output, Decreased", "Constipation", "Diarrhea", "Fluid Volume Deficit", "Fluid Volume Excess", "Gas Exchange, Impaired", "Incontinence", "Nutrition, Altered: more than Body Requirements", "Nutrition, Altered: Less than Body Requirements", "Self-Care Deficit", "Skin Integrity, Impaired", and "Urinary Elimination, Altered". At the bottom of the window, there are two buttons: "Save/Return to Main Menu" and "Cancel/Return to Main Menu".

<input checked="" type="checkbox"/> Activity Intolerance	<input type="checkbox"/> Incontinence
<input type="checkbox"/> Airway Clearance, Ineffective	<input type="checkbox"/> Nutrition, Altered: more than Body Requirements
<input checked="" type="checkbox"/> Cardiac Output, Decreased	<input type="checkbox"/> Nutrition, Altered: Less than Body Requirements
<input type="checkbox"/> Constipation	<input checked="" type="checkbox"/> Pain
<input type="checkbox"/> Diarrhea	<input type="checkbox"/> Self-Care Deficit
<input type="checkbox"/> Fluid Volume Deficit	<input type="checkbox"/> Skin Integrity, Impaired
<input type="checkbox"/> Fluid Volume Excess	<input type="checkbox"/> Urinary Elimination, Altered
<input type="checkbox"/> Gas Exchange, Impaired	

Save/Return to Main Menu Cancel/Return to Main Menu

Figure 8. Nursing Diagnosis Screen. Boxes can be checked and unchecked by locating them with the mouse and pressing the left mouse button.

Future Improvements

With future improvements the Main Menu screen will become the point of entry for anyone working on the system in the hospital. For instance, nursing/medical, nursing/surgical, pharmacy, admitting, financial, etc. would each have a different set of screens based upon individual department needs. In addition, passwords need to be placed at several different levels to ensure access is limited to authorized users only.

NursesAid was designed with the intent of eventual computerization of the entire nursing process (assessment, nursing diagnosis, goals and outcome criteria, intervention, and evaluation) in the four dimensions of man as defined by Carroll College: physiological, sociocultural, spiritual, and psychological (Carroll College, 1992). At present the first two phases of the nursing process, assessment and nursing diagnosis, in the physiological dimension, are included. In future versions of the program, assessment information will be required in all four dimensions of man, and nursing diagnoses will be available to identify problem areas in each dimension.

Additionally, future versions of NursesAid will provide for documentation of all aspects of patient care, thus keeping all patient information in one central, computerized record. Additional areas of patient care to be computerized include medication administration, diet, tracking of daily weights, input/out, IV therapy, blood glucose and specific treatments such as wound care, dressing changes, etc. The option to print out all information gathered through the program will also be included in future versions of NursesAid.

Ultimately NursesAid will be a part of a larger system integrating all hospital departments providing patient services in an effort to produce a fully electronic patient record.

Conclusion

Nursing Informatics has evolved as a nursing speciality in order to help nurses meet the challenge of cutting-edge technology. It moves nurses out of the sole role of end-users and into the role of initiators in technology. Responsibility to develop useable information technology systems, therefore, remains

within the nursing profession. Nursing informatics specialists must be aware of the current attitudes of clinical nurses and must be sensitive to the steps involved in the change process in order for successful implementation of technology to occur.

Nurses are all too aware of the drawbacks of paper records as well as of poorly conceived information systems. Their continuing commitment to quality patient care plus their willingness to seek out improvements will help ensure acceptance and ownership of new, effective information technologies.

References

- American Nurses Association (1994). Standards of practice for nursing informatics (NP-100). Washington, DC: American Nurses Publishing.
- American Nurses Association (1994). The scope of practice for nursing informatics (NP-90). Washington, DC: American Nurses Publishing.
- Ball, M. & Hannah, K. (1984). Using Computers in nursing. Reston, Virginia: Reston Publishing.
- Bongartz, D. (1988, October). Computer-oriented patient care: A comparison of nurses' attitudes and perceptions. Computers in Nursing, 6(5), 204-210.
- Brodt, A. & Stronge, J. (1986, March/April). Nurses' attitudes toward computerization in a Midwestern community hospital. Computers in Nursing, 4(2), 82-86.
- Carroll College (1990). Four dimensions assessment guide. Carroll College nursing department student handbook, (pp. 41-45). Helena, Montana: Carroll College.
- Carter, B. & Axford, R. (1993, May/June). Assessment of computer learning needs and priorities of

registered nurses practicing in hospitals.

Computers in Nursing, 11, (3), 122-126.

Dowling, A. F. (1980, Fall). Do hospital staff interfere with computer system implementation? Health Care Management Review, 5, 23-32.

Gibson, S. & Rose, M. A. (1986, September/October). Managing computer resistance. Computers in Nursing, 4(5), 201-204.

Heller, B. R., Mills, M. E., & Romano, C. A. (Eds.). (1996). Information management in nursing and healthcare (pp. 2-3). Springhouse, PA: Springhouse.

Herrick, K. & McCullough, S. (1989, July). Introducing nurses to computers in a multi-hospital environment. Nursing Management, 20(7), 31-34.

Hirsch, M. Chang, B. L., & Gilbert, S. (1989, July/August). A computer program to support patient assessment and clinical decision-making in nursing education. Computers in Nursing, 7(4), 157-160

Hughes, S. (1995). Point-of-care information systems: State of the art. In M. J. Ball, K. J. Hannah, S. K. Newbold & J. V. Douglas (Eds), Nursing

- informatics: Where caring and technology meet
(pp. 144-154). New York: Springer-Verlag
- Hughes, S. (1995, July). Proceedings of the Fifth Annual Summer Institute in Nursing Informatics, Baltimore, Maryland.
- Kozier, B., Erb, G. & Olivieri, R. (1991).
Fundamentals of nursing: Concepts, process and practice (4th ed.). Redwood City, CA: Adison-Wesley.
- Krampf, S. & Robinson, S. (1984, July). Managing nurses' attitudes computers. Nursing Management, 15(7), 29-34.
- Lewin, K. (1951). Field theory in social science. New York: Harper and Row.
- Lloyd, E. E., Toth, L. L., Rogers, S. (1994, August). Development and testing of computer software for nursing assessment and care planning at a spinal cord injury center. SCINursing, 11(3), 74-77.
- McConnell, E. A., O'Shea, S. S., & Kirchhoff, K. T. (July, 1989). RN attitudes toward computers. Nursing Management, 20(7), 36-40.
- Mehmert, P. A., Dickel, C. A. & McKeighen, R. J. (1989,

- July). Computerizing nursing diagnosis. Nursing Management, 20(7), 24-30).
- Minda, S. & Brundage, D. J. (1994, November/December). Time differences in handwritten and computer documentation of nursing assessment. Computers in Nursing, 12(6), 277-279.
- Moody, L. & Snyder, P. E. (1995, January/February). Hospital provider satisfaction with a new documentation system. Nursing Economics 13(1), 24-31.
- Nolan-Avila, L. S., Abrams, R., Spitzer, R. B. & Shabot, M. M. (1985, June). Assessment driven patient care records. American Journal of Nursing, pp. 721-722.
- Ollikainen, L. (1986, March/April). Towards a change in nursing practice. International Nursing Review, 33(2), 40-43.
- Rambo, A. (1994, October-December). Computer technology: Implications for nurse educators. Nursing Forum, 29(4), 30-36.
- Roth, K., DiStefano, J. J., Chang, B. L. (1989, September/October). CANDI: Development of the automated nursing assessment tool. Computers in

- Nursing, 7(5), 222-227.
- Scarpa, R., Smeltzer, S., & Jasion, B. (1992, March/April). Attitudes of nurses toward computerization: A replication. Computers in Nursing, 10(2), 72-80.
- Schlehofer, G. B. (1992, July). Informatics: Managing clinical operations data. Nursing Management, 23(7), 36-38.
- Simpson, R. L. (1995a). Nursing informatics. In K. W. Vestal (Ed.), Nursing Management: Concepts and Issues (2nd ed.). Philadelphia: J. B. Lippincott.
- Simpson, R. L. (1995b, December). Nursing informatics certification. Nursing Management, 26(12), 49-50.
- Snyder, J. R. (1984, December). Using force field analysis to facilitate change. Medical Laboratory Observer, 16(12), 54-56, 58.
- Soonit, E. (1987). Installing the first operational bedside nursing computer system. Nursing Management, 18, 23-25.
- Ventura, M. R., Ackerman, M. H., Gugerty, B., Skomra, R., & Crosby, F. E. (1992, October). Selecting and using computer application software for quality assessment and improvement. Journal of

Nursing Care Quality, 7(1), 16-28.

Wilson, B. A. (1991). Computer anxiety in nursing students. Journal of Nursing Education, 30(2), 52-56.