THE APPLICATION AND EFFECT OF COMPUTER SIMULATIONS ON DECISION-MAKING IN SENIOR NURSING STUDENTS

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DEDICATION

I dedicate this work to Scott whose love and encouragement helped me to start this project and to Shawn whose love helped me to finish.

ABSTRACT

This study examined the application of computer simulations in nursing education - specifically their contribution to decision making skills on the part of senior nursing students.

The researcher designed three computer simulations. These, along with five commercial simulations were placed in nursing schools in St. John's, Newfoundland during the final clinical rotation of the nursing programs. The design of the study was that delineated by Gay as classic control/experimental group pretest/posttest design. Students were randomly assigned and the simulations were available to the experimental group for a six week period. The study focused on three dependent variables - decision making ability as indicated by scores on a decision making questionnaire, self-perceived frequency of decision making and self-perceived difficulty with decision making.

The results of the study indicated a significant difference in scores on a posttest which measured decision making ability of the control and experimental groups. However, there was no significant difference in scores from time one to time two testing for decision making ability, frequency of decision making, or difficulty with decision making.

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CHAPTER 1

BACKGROUND TO THE STUDY

Decision Making in Nursing

Many experts will agree that accurate decision making in the clinical setting is a significant aspect of competent nursing care (Grier, 1976; Baumann & Bourbonnais, 1984; Field, 1987; Pardue, 1987). As nurse educators we are accountable for ensuring students have beginning level competency in decision making prior to graduation. Studies to date however show little support regarding the effect of nursing education on critical thinking skills. The relationship between nursing education and clinical judgement is tentative as well (Kintgen-Andrews, 1991). Reasons for these findings may be as a result of weak instrumentation, limited sampling, or our poor understanding of the skill itself. Or maybe the findings are an accurate reflection of the present relationship between nursing education and critical thinking skills or clinical judgement. Whatever the answer, these findings should raise questions for nurse educators. Are we adequately preparing students to function competently in a patient care setting?

Although many agree that decision making skills are critical skills for nursing students, agreement beyond this point is

difficult to establish. Literature concerning decision making in nursing can be found dating back to the 1960s. Over the course of the past thirty years a number of models of decision making have arisen. These models vary from mathematical and scientific models to psychological models.

For the most part the current method of promoting decision making in nursing education tends to involve **the Nursing Process.** According to Flynn and Heffron (1988), the Nursing Process was developed in the mid 1960s by Yura and Walsh and is of continuing significance in nursing and nursing education. The four step process includes 1. assessment, 2. planning, 3. implementation and 4. evaluation. Authors such as Aspinall and Tanner (1981) suggest that the steps involved in the nursing process can guide the decision maker through a problem solving process, enabling her/him to make sound judgements.

Decision making skills are vitally important to a nurse; however, it is not really clear how such a complex skill can be developed in students. Many authors describe a step by step process for decision making, but few reveal adequate methods for teaching students how to become competent in this skill.

Computers in Nursing

Computers have become an integral part of nursing and, to some extent, nursing education. In the clinical setting, for the most part, monitoring equipment for Critical Care Units is now

computerized, with the result that nursing care in these areas demands some understanding of this "high tech" equipment. Patient information systems and computerized care planning and documentation is also evident at the unit level. Patient computer assisted instruction packages are being utilized in some hospitals as a method of patient teaching. While it is obvious that computers have moved into the clinical aspect of nursing, the integration of computers in and for nursing education has been slower.

Literature concerning computer assisted instruction (CAI) in nursing education can be found dating back to the 1960s. Authors such as Bitzer and Boudreaux (1969) identified the advantages of CAI and its possibilities for the future of nursing education. However the integration of CAI into schools of nursing has been slower than anticipated. One example of the rate of adoption of CAI in Nursing Education can be seen through the findings of two studies conducted 13 years apart. In 1975 Levine and Weiner completed a survey of 155 nursing schools in the USA, and results revealed 7% use of CAI. Hebda, in 1988, surveyed 441 NLN-accredited baccalaureate programs for use of CAI and of the 339 respondents 48% indicated use of CAI in some format.

Many advantages and disadvantages have been cited in the literature for the use of CAI. One of the most commonly noted advantages in the literature is the ability of CAI to individualize instruction (Belfry and Winne, 1988; Bratt and Vockell, 1986; Conklin, 1983; Paulanka, 1986; Quinn, 1986). Bratt and Vockell, 1986, comment on the variety of educational backgrounds of students

entering undergraduate nursing programs and suggest the use of CAI as a way of acquiring common ground. "One way to provide a more stimulating and individualized learning environment may be to use the computer ...(Bratt and Vockell, 1986, p. 247). This individualized method of instruction also allows the student to work through lessons at their own pace, and as often as necessary until mastery is attained (Armstrong and DeWit, 1985; Belfry and Winne, 1988).

CAI has the capabilities to provide students with immediate feedback (Armstrong and Dewit, 1985; Timpke and Janney, 1981; Kirchhoff and Holzemer, 1979) which is vital to learning (Quinn, 1980). This feedback may be in the form of a hint for an incorrect response, explanation of the right answer, or direction to remedial lessons.

Efficient use of time is also cited as a benefit for the use of CAI (Schwirian, 1987). Several studies have shown a reduction in learning time for those students completing lessons in CAI when compared with alternate methods of instruction (Kirchhoff and Holzemer, 1979; Bitzer and Boudreaux, 1969). As well classroom time normally spent on the CAI content can now be utilized for higher levels of learning (Bratt and Vockell, 1986; Thiele, 1986). Faculty workload would also be positively affected. Time normally spent in the classroom may now be utilized for individual tutoring or faculty research (Hebda, 1988; Collart, 1973). This efficient use of time could lead to greater cost effectiveness. CAI could also be used in distance education, allowing larger numbers of students to

have access to continuing education. This would be cost effective for both the institution and the student (Belfry and Winne, 1988).

Purpose of the study

Schools of Nursing recognize that decision making is requisite to nursing. Many authors cite a sound knowledge base and experience as two of the greatest influences in assisting with decision making (Benner, 1984; Pardue, 1987; Baumann and Bourbonnais, 1984; Bandmann & Bandmann, 1988). In a study conducted by Tanner, Padrick, Westfall and Putzier, 1987 it was found that with increased levels of knowledge and experience nurses were more accurate in their diagnosis of patient problems. Pardue (1987) examined decision making skills among associate degree, diploma, baccalaureate and master's prepared nurses. All four groups ranked experience as the most important factor influencing decision making. Knowledge was ranked as the second most influencing factor.

Throughout the duration of a nursing program students receive a large volume of quantitative information with which to build a sound knowledge base. As students, however, nurses receive limited clinical experience due, in part, to the obvious time needed for classroom instruction and examination and also to the legal and ethical issues that arise when involving nursing students in caring for patients. Why is it important to ensure ample clinical experience? Baumann and Bourbonnais, 1984, state "the acquisition of knowledge does not ensure its relevant application in the

clinical setting. Experience allows the nurse to utilize a knowledge base appropriately in patient situations.." (p. 6).

How can we increase a students clinical experience? Many authors in the medical and nursing fields advocate the use of simulations as a method of enhancing student's clinical experience (Barrows & Feltovich, 1987; Benner, 1984; Field, 1987). Field (1987) goes one step further stating "a potential learning tool that can be used to enhance decision making is computer simulation. This mode of acquiring abstract knowledge through active practice with the decision making process can help build a solid bridge into the domain of practical knowledge" (p. 569).

The purpose of this study is to examine the effect of the use of computer simulations on senior nursing students' decision making ability. The study will be guided by the following questions: 1. Is the decision making of nursing students affected by the use of computer simulations? Three hypothesis were formulated to address this question:

1. There will be a significant difference in the decision making ability reported on Questionnaire B between those nursing students who receive exposure to the computer simulations and those who do not.

2. Students who utilize the computer simulations will report significantly higher increases in the frequency of their decision making in the clinical area than those students who did not use the simulations.

3. Students who utilize the computer simulations will report significantly less difficulty with their decision making than those students who did not use the simulations.

Two supplementary questions will be considered in the analysis of data in Chapter 5:

1. Does an increase in clinical experience affect decision making?
2. Can clinical experience be enhanced through the use of computer simulations?

Significance of the Study

The use of computers and computer assisted instruction in nursing education has been studied from many perspectives. The most common of these are cognitive achievement, attitudes towards CAI and time factors. Although there is general agreement by many experts that computer simulations can be an effective teaching tool for promoting decision making there was no documented evidence found by the researcher to substantiate that claim. This study will address this issue.

Davis (1987) concurs that computer simulations can be used to teach clinical decision making; however, he claims that this approach is "currently hampered only by the availability of suitable software" (p. 286). The software used in this study has been selected and designed to encourage decision making.

Limitations of the study

A number of limitations apply to this study. In the first place, the results of the study will relate to senior nursing students in the St. John's, Newfoundland area, specifically third year nursing students at the diploma Schools of Nursing and fourth year students at the Baccalaureate School of Nursing. Participation

in the study was voluntary. Thus random selection from the population was not possible. However, participants were randomly assigned to either a control group or an experimental group.

Further, participants in the study were asked to complete the computer simulations at their convenience; computer access was limited. Computers used in this study were housed either in a library or a computer room located in the schools of nursing. These areas were opened during the week days from 8:30 am to 4:30 pm or 9:00 am to 5:00 pm. There was limited access after hours with student monitors present. Times varied between schools.

Finally, the computer simulations used in this study, both those commercially purchased and those developed by the author, have been used for the first time in relation to decision making. This pilot use of the simulations implies that their instructional capability has not been established. In some respects therefore, the conclusions reached maybe regarded as tentative, albeit suggestive for futher study.

Definitions of terms

For the purposes of this study the following terms will apply:

Decision making is a process in which one gathers all pertinent data related to the decision event, analyzes that data, and creates a list of possible options. The decision maker chooses an option based on the data analysis, a sound knowledge base and previous experiences.

Computer assisted instruction (CAI), essentially, is instruction which is provided through interaction with a computer (Billings, 1984). De Tornyay and Thompson, 1987 further defined CAI as "instructional activities that use a computer as the primary vehicle for teaching content or processes in a one-to-one interaction with a student" (p. 276).

Computer simulations, according to Collart, 1973 are "strategies that permit a model of reality for the learner in a controlled situation that allows the learner to experiment and think out all specific outcomes of an intervention" (p. 530). This powerful tool allows the student co work through a clinical situation, ask questions, gather data, and make decisions based on that data. The student is provided feedback based on the decision made. The emphasis of this style of instruction is development of problem solving and critical thinking skills rather than mastery of content. (Billings, 1986; Kuramoto, 1978; de Tornyay et al, 1987).

The Nursing Process as defined by Flynn and Heffron in 1988 is "an orderly, systematic manner of determining the client's problems, making plans to solve them, initiating the plan or assigning others to implement it , and evaluating the extent to which the plan was effective in resolving the problem identified" (p. 138).

Organization of the Study

Chapter Two presents a brief review of the research on

decision making in nursing and nursing education, and on computer assisted instruction (CAI) and its various classifications. The potential for CAI in nursing education will also be addressed.

Chapter Three describes the study and its implementation procedures. Chapter Four presents the findings and interpretation of the data based on three hypotheses - achievement gains in decision making ability, frequency of decisions made, and preceived difficulty in decision making.

Chapter Five discusses the results of the study, with implications for nursing education and recommendations for further study.

CHAPTER 2

REVIEW OF RELATED LITERATURE

This chapter contains a review of the literature on decision making in nursing and the use of computers as a teaching tool in nursing education. The first section of this review will look at a definition of decision making, decision making as a process, and current teaching methodology. The final section will examine the various types of CAI available and current research on the use of computers in nursing education.

Nursing Education

Students have a choice of entering a diploma program or a baccalaureate program to complete their nursing education. The diploma program generally takes two to three years to complete while a baccalaureate program can take from four to five years. Both programs generally include a theoretical and a clinical component. Degree programs provide a wider range of educational experiences than diploma programs with more indepth science and more liberal arts courses. "In 1982 the Canadian Nurses Association adopted the position 'that by the year 2000 the minimal educational requirement for entry into the practice of nursing should be the successful completion of a baccalaureate degree in nursing'"

(Canadian Nurses Assciation, 1990).

Each provincal nursing association outlines by-laws stipulating what should be included in nursing programs. The Association of Registered Nurses of Newfoundland (ARNN), 1991, states that nursing programs must include "clinical and theoretical experience in medical, surgical, obstetrical, pediatric and psychiatric nursing" (ARNN, 1991, p 9). All nursing programs whether, diploma or baccalaureate must receive approval from their provincial association. University programs in nursing must also receive accreditation from the Canadian Association of Univesity Schools of Nursing (CAUSN). The accreditation guidelines are the same for all university schools across Canada.

Decision Making in Nursing

Nurses need a number of skills to function in the clinical setting including interpersonal, intellectual and technical skills. It is agreed that decision making is a valuable and necessary skill for competency in nursing. Review of the literature on decision making in nursing reveals the importance of this skill and the necessity of enhancing and developing decision making capabilities in students. However, the literature also relates ambiguity about the process of decision making and confusion as to the best method for imparting and developing this skill.

The literature cites no one clear definition of decision making. Generally the definition consists of an outline of steps in

a process or model. To confuse matters further there is some overlap among the terms critical thinking, clinical judgement, diagnostic reasoning and decision making. Critical thinking is described as the "rational examination of ideas, inferences, assumptions, principles, arguments, conclusions, issues, statement, beliefs and actions " (Bandman & Bandman, 1988, p. 5). It appears that this is the type of thinking used in decision making. In fact critical thinking is considered an essential component of problem solving (Klaassens, 1988; Bell, 1991).

Clinical judgement according to Tanner (1987) is "a series of decisions made by the nurse in interaction with the client" (p. 154). This term is frequently interchanged with decision making throughout the literature. According to Carnevali and Mitchell (1987) the process of diagnostic reasoning shapes the decisions to be made concerning patient care. Reasoning is also considered a necessary component of decision making (Thompson and Thompson, 1985).

Some of the first work on decision making in nursing dates back to 1964 with Hammond and Kelly's paper on clinical inference in nursing. The purpose of their study was to gain some insight into how nurses select and gather information in a client situation and then use this information to reach a judgement about the patient's condition (Kelly, 1964, p. 314). Kelly and Hammond applied the Brunswick "Lens Model" to clinical inference. The lens model is "used to describe how a person combines the available cues in arriving at a decision and compares the importance assigned to

the various cues by the person to an optimum judgement of the values of cues" (Taylor, 1984, p. 92).

Since this initial study further work has been done by different authors using a wide range of models or processes (Bailey and Claus, 1975; Thompson and Thompson, 1985; Ford, Trygstad-Durland, and Nelms, 1979; Bandman and Bandman, 1988). Although there is some variation, generally the steps identified in the decision making process include 1. data collection and problem identification 2. creating and analyzing alternatives 3. choosing alternative. "In 20 years of research, no single theory has been investigated sufficiently to conclude that the theory can be supported or refuted or that it is in need of revision" (Tanner, 1987, p. 158). A number of other studies have focused on decision trees or decision matrixes (Taylor, 1984; Shewchuk and Francis, 1988).

The **nursing process** is probably the most widely accepted systematic process for problem solving and decision making in nursing. According to Flynn and Hefferon (1988), the process was developed by Yura and Walsh in 1967 and involves four phases. The first phase, the assessment phase, involves collecting data about the client. The data is then organized and analyzed to create a nursing diagnosis. This is an actual or potential problem statement written following the guidelines set out by the North American Nursing Diagnosis Association. Short and long term goals are also developed during this phase (Flynn and Hefferon, 1988).

The second phase is the planning phase. This involves

prioritizing the problems, specifying behavioral outcomes and designating specific nursing actions or interventions. (Flynn and Hefferon, 1988, p. 150). The third phase of implementation is when the plan is put into action. According to Kozier and Erb (1987) it is necessary to continue to collect patient data during this phase to validate the nursing action. "When the nurse performs a technical action, decision making skills are used continually to judge when modification is needed in procedural method" (Flynn & Hefferon, 1988, p. 152).

The final phase of evaluation is "an on-going cyclical activity, occurring during each step of the process" (Aspinal & Tanner, 1981, p. 6). It is necessary to ensure that goals are met and desired outcomes are achieved.

The steps outlined in the nursing process reflect a **systematic approach** to problem solving (Aspinall & Tanner, 1981; Klaassens, 1988). Field (1987) states "the nursing process as a problem solving process helps the novice develop a style of thinking that leads to judgements in the form of nursing diagnosis" (p. 570).

There are, however, those who question the value of the nursing process as a model for decision making in nursing. Grier (1976) states "the procedure for making decisions within the process is poorly understood" (p. 105). Bailey and Claus (1975) feel the process is inadequate for the increasing complexity of problems found in client situations. Henderson (1982) questioned the ability of the nursing process to address the intuitive, creative side of nursing. Jones and Brown (1991) agree: "This rule

driven approach (nursing process) to nursing practice effectively reduces the complexity of the discipline to procedural problems" (p. 529).

Although it is difficult to find agreement as to which process is the most efficient decision making process there is general agreement that a **systematic approach** to decision making is necessary (Thiele, Sloan, Baldwin, Strandquist & Hyde, 1986; Ford and Trygstad-Durland, 1979; Taylor, 1984; Klaassens, 1988). " Nurses who are not versed in the procedures of systematically attacking problems often waste time and energy in making decisions which may be ineffective and which they cannot justify" (Bailey and Claus, 1975, p. 11). Findings of a study carried out in 1976 suggest that nurses do use a model or systematic process for decision making (Grier, 1976).

Patricia Benner outlines five levels of proficiency, based on the Dreyfus model, that nurses pass through in the acquisition and development of skills; novice, advanced beginner, competent, proficient, and expert (Benner, 1984). Decision making for the novice or advanced beginner requires a rule-governed process as they are working with limited knowledge and experience (Field, 1987). Experience and knowledge are considered key elements in the development of an expert decision maker (Jenkins, 1985; Baumann and Bourbonnais, 1984; Field, 1987).

Unlike the novice, decision making for the expert is less structured. Agan (1987) describes intuition as a method of knowing about a patient. "Intuitive knowing is what distinguishes expert

human judgement from the decisions that might be made by a beginner" (Benner and Tanner, 1987, p. 23). Benner identifies experience as a major factor in the movement from novice to expert. Experience is understood to embrace not just the passage of time but also encounters with actual practical situations (Benner, 1984, p. 36).

Cognitive skills such as decision making are an essential part of a curriculum for a school of nursing (Klaassens, 1988; White, Beardslee, Peters, and Supples, 1990; Jenkins, 1985). In fact the Canadian Association of University Schools of Nursing has outlined problem solving and critical thinking skills as essential criteria in their Accreditation Program. Although these skills are deemed essential, teaching strategies which foster these skills are being debated. This debate may stem from the lack of understanding or agreement of the actual decision making process itself (Klaassens, 1988).

Many authors agree that beginning students should actually be taught a process for decision making (Ford and Trygstad-Durland, 1979; Klaassens, 1988). Suggestions for different teaching strategies which foster decision making include debate, written simulations and case study method (Bell, 1991; de Tornyay and Thompson, 1987; Bauman and Bourbonnais, 1984). The use of computer assisted instruction and computer simulations for this purpose has received a great deal of attention (Jenkins, 1985; Field, 1987; Carnevali et al, 1984; Theile et al, 1986). Computer simulations allow the student to practice decision making about patient care

without fear of harming the patient (de Tornyay and Thompson, 1987, p. 139). This is an important point as the "average consumer is no longer amenable to serving as a teaching tool for students" (Blue and Olson, 1990, p. 32). There is however, an absence of research specifically aimed at the use of computer simulations and their effect on decision making. Findings of other studies on teaching clinical judgement have not been significant, indicating a definite need for further investigation. (Tanner, 1987).

Classifications of Computer Assisted Instruction

There are many types of CAI which can be and are utilized in nursing education. The most significant of these include the drill and practice format, the tutorial format, the simulation format and the socratic format.

Drill and practice is the simplest format and at one time was the most common format available. This format, in essence, presents material that has been previously learned and allows the student to achieve mastery of the material by repetitious practice (de Tornyay and Thompson, 1987; Collart, 1973). The content is generally presented in the form of questions or problems with the student receiving feedback on accuracy or inaccuracy. The computer is considered the best medium for this type of instruction because it does not tire of repeating questions or waiting for replies (Theile, 1986; Billings, 1984). According to Coburn, Kelman, Roberts, Snyder, Watt and Weiner (1982) drill and practice

exercises have been criticized by some educators for being boring and at times reinforcing incorrect learning. However others defend this format by faulting the authors of the programs.

Tutorial mode, unlike drill and practice, presents original material. Instructional material is presented to the student and followed up with questions or problems. De Tornyay et al, 1987, describe two styles of tutorial lessons. The first style is a linear approach which involves the presentation of a series of factual statements followed by predetermined questions or responses. The second style is that of branching which directs the student to remedial work if needed or bypasses familiar material. Tutorial lessons have often been likened to programmed instruction (Kuramoto, 1978; de Tornyay et al, 1987). Levine and Wiener (1975) recommend this form of instruction for first year nursing students who must master large amounts of factual material such as anatomy and physiology.

Simulations are much more complex than the methods thus far described. Collart (1973) describes simulations as "strategies that permit a model of reality for the learner in a controlled situation that allows the learner to experiment and think out all specific outcomes of an intervention" (p. 530). This multi-faceted, powerful tool allows the student to work through a clinical situation, ask questions and gather data, and make decisions based on that data. The student is provided feedback based on the decision made. The emphasis of this style of instruction is **development of problem solving and critical thinking skills** rather than mastery of

content. (Billings, 1984; Kuramoto, 1978; de Tornyay et al, 1987). "Simulations of real-world experiences provide students with the opportunity to learn how to solve clinical problems and make sound decisions" (De Young, 1990, p. 246).

Collart (1973) discusses a fourth method which should be perfected in the near future - **dialogue or socratic style.** This method of instruction actually allows the student to dialogue with the computer in such a fashion that the computer will be able to interpret the dialogue. The socratic format has significant implications for the future of nursing education.

Research on CAI in Nursing

Much of the research available on the use of CAI in nursing appears to be centred around three variables: (1) cognitive achievement; (2) attitudes towards CAI; and (3) time factors. This has not changed significantly since Chang's (1986) review of the literature. However two additional variables which appear to be surfacing more frequently are retention of knowledge and transfer of knowledge.

Studies reviewed which looked at cognitive achievement can be divided into several categories. These include: (1) those which examined the independent use of CAI with control and experimental groups; (2) those which used CAI to supplement another form of instruction; and (3) those studies in which all participants used CAI as a learning tool.

In those studies which compared the independent use of CAI with that of another form of instruction such as lecture discussion, programmed instruction or individual tutoring, generally one of two results were found: either both groups, that is the CAI group and the group using another form of instruction, learned equally well (Boettcher, Alderson and Saccucci, 1981; Gaston, 1988; Bitzer and Bitzer, 1973;) or the CAI group scores on a post-test were significantly higher (Huckabay, Anderson, Holm, and Lee, 1979; Bitzer, 1966; Reynolds and Pontious, 1986). Theile (1986) completed a study comparing a group of nursing students who had completed a CAI package on Dosage Calculation with two groups of students in the previous semesters who had studied the same content through regular lecture discussion sessions. The CAI group had a much higher success rate (91%) on the final drug dosage test than the two groups who had studied using lecture discussion (62% and 66%). Timpke and Janney (1981) completed a similar study comparing the results of students who use CAI for drug calculations with students in the previous semester. They found the success rate on the final calculations exam for students who used the CAI packages was higher.

The second category of studies which examined cognitive achievement with CAI compared the use of CAI to supplement another form of instruction with a group who did not use CAI. For example, Bratt and Vockell (1986) studied two groups of nursing students who were completing a lesson on Respiratory Assessment. The control and experimental group both received lecture and demonstration

sessions. The experimental group were supplemented with CAI. Results on a post-test indicated that the experimental group mastered the objectives significantly better than the control group. These findings are in agreement with those of Rickleman, Taylor-Fox, Reisch, Payne, and Jelemensky (1988) and Conklin (1983).

In the final category of studies which examined cognitive achievement with the use of CAI all students used the CAI program. Results of a pre-test were compared with the results of a post-test without the use of a control group. Kirchhoff and Holzemer (1979) studied a group of junior nursing students who completed a CAI program in postoperative nursing care. There was a significant increase in post-test scores.

These results indicate that CAI is an effective method of instruction. Students using CAI will learn as well as, if not significantly better than, those students who do not use it. In fact, in those studies which used CAI to supplement another form of instruction all students who used CAI learned significantly more than the other group. This is in agreement with the conclusion reached by Rickleman et al (1988) that "when CAI is used as a supplement to ongoing instruction it generally increases learning" (p. 319).

Attitudes of students and faculty towards the use of computers in general, and the use of CAI in particular, have been studied. Overall attitudes of students towards CAI are positive (Bitzer and Bitzer, 1973; Bratt and Vockell, 1986; Gaston, 1988; Conklin, 1983;

Theile, 1986). Kirchhoff and Holzemer (1979) found that student attitude toward CAI was directly related to amount of learning. Those students who had positive attitudes towards CAI learned more than those students who found the program dull. There has been one study in which the majority of students reacted negatively towards CAI. Paulanka (1986) completed an exploratory study of 109 junior nursing students who used a CAI Pharmacology program. This program supplemented lecture discussion sessions. Student attitudes in this study were generally negative. Paulanka felt the results were due to the unusually high levels of stress this particular group of students were experiencing at the time of the study.

Delaney (1989) examined the attitudes of randomly selected administrators and faculty from private baccalaureate nursing programs towards computers. She used as a framework Roger's Social Interaction Model of Diffussion and Adoption. Findings indicated that overall the Schools of Nursing had passed through the first three stages of the model: awareness, interest and evaluation. Attitudes towards computers were more positive than negative. However, the last two stages of Roger's Model: trial and adoption, had not been accomplished. Delaney felt there was a demonstrated need for instruction regarding the capabilities and limitations of computer software. She also concluded that the greatest hinderance to accomplishing the last two stages of Roger's Model was availability of software.

Jacobson, Holder, and Dearner (1989) completed a study of computer anxiety across a wide spectrum of nurses; undergraduate,

graduate, educators, staff nurses and managers. The results indicated that as a group nurses exhibited mild anxiety, with graduate students demonstrating the lowest level, educators in the middle and staff nurses at the upper level. Jacobson et al (1989) also found that computer education and experience was associated with decreased anxiety.

Together these findings indicate that overall student attitude towards CAI is positive. Faculty attitude towards computer technology is also positive but there is a demonstrated need for computer education.

Results of several studies on CAI and time factors indicate that use of CAI decreases learning time (Bitzer and Bitzer, 1973; Conklin, 1983; Reynolds and Pontious, 1986). Bitzer and Bitzer (1973) found that students who used CAI learned the same material in one third to one half the time required for classroom instruction. Chang (1986) explained a study conducted by Larson (1982) which examined the time spent by students in medication calculation. Those students who used the computer completed the project in 23.6 minutes while those students who utilized the skills laboratory spent 28.8 minutes on the same project.

According to the research done to date CAI is also successful in promoting knowledge retention (Bitzer and Bitzer, 1973; Gaston, 1988). Bitzer and Bitzer (1973) concluded "that a combination of structured inquiry type material followed by successive multiple post-tests at about one month intervals produces superior initial learning and excellent retention" (p. 198).

Transfer of learning with the use of CAI has been the topic of some discussion, however few research studies have explored this variable. Huckabay et al (1979) investigated the effects of CAI versus lecture discussion on transfer of learning of 31 nurse practitioner students. She used a control/experimental group, pre-test/post-test methodology. Findings indicated that the experimental group, which was the CAI group, scored significantly higher on the post-test for transfer of learning. Although these findings are encouraging further research is necessary on a larger, more diverse sample.

Implications for Nursing

Computer technology has entered the clinical area and the education system. Nursing students who use the library for literature searches will now find computerized bibliographic systems. Data analysis on research findings is carried out much more efficiently with the computer. Nursing students and practising nurses must develop at least a minimal level of computer literacy. Delaney (1989) states "it is a primary responsibility of the nursing curriculum to integrate computer literacy skills" (p. 130).

CAI as an educational tool has some serious implications for nursing. Much of the course work in the first year of most nursing programs involves the instruction of large amounts of factual information. This can be a tedious task for both the instructor and the student. However, the use of drill and practice exercises or

well written tutorial packages can allow students to interact individually with the computer to master much of this content. Many authors such as Thiele (1986) and Conklin (1983) advocate the use of well written computer packages to present much of the factual knowledge that students must learn. Research has shown that students do learn using this method of instruction, and overall student attitude towards CAI is positive. Belfry and Winne (1988) suggest that the positive attitude held by students for this form of instruction may in fact increase their motivation to learn.

Computer simulations probably have the most far-reaching implications for nursing education. All students can be exposed to the same patient experience, which is not the case in the clinical setting (De Young, 1990). In fact the same student can potentially work through the same patient experience a number of times utilizing different problem solving approaches. This enables the student to analyze a situation from a variety of perspectives, all without risk to the patient. In these consumer-conscious times this is a benefit the value of which should not be underestimated.

Chapter 3

STUDY DESIGN AND METHODOLOGY

The previous two chapters examined the background of the study and reviewed the literature on decision making in nursing and the use of computer simulations as a tool for improving students' decision making ability. This chapter will present the design and methodology implemented in this study.

Design

The design applied in this study was the experimental method using control/experimental groups with a pre - post test. This method was chosen because of its value in examining cause-effect-relationships (Gay, 1987). Subjects who volunteered to participate were randomly assigned to a control or experimental group. Both groups were involved in clinical work during the study. Subjects in the experimental group were asked to complete eight computer simulations over a four week period. Subjects' decision making was examined in an attempt to determine a relationship between the use of computer simulations and decision making.

Population/Sample

The target population in this study was senior nursing students enroled in recognized nursing programs in St. John's, specifically third year Nurse Interns enroled in the diploma Schools of Nursing and fourth year students enroled in the baccalaureate School of Nursing. Two hundred fifty six (256) students were approached between 1990 and 1991. Seventy nine (79) students initially volunteered to participate in the study and sixty two actually completed the study. During the course of the experiment all students were involved in clinical practice and at this level all students had previous experience with decision making in the clinical setting. All students also had access to a computer in their resource room or library. Students who volunteered to participate in the study were randomly assigned to a control or experimental group.

Because participation in the study was voluntary, it was necessary to collect data in the same school over two consecutive years involving two different final year classes. This was required in order to ensure an adequate sampling.

All participants were asked to sign a consent form prior to involvement in the study. Participants were informed that they could leave the study at any time without being penalized.

Instruments

Three instruments were used in the collection of data for this study. These instruments, included as Appendix A to this study, were as follows: (1) Demographic Data Sheet; (2) Decision Making Questionnaire Part A; (3) Decision Making Questionnaire Part B.

Demographic Data Sheet. This one page questionnaire was used to gather personal data on the subjects which the researcher regarded as having potential relevance to the results of the study. Specific items included age, postsecondary education, computer experience, clinical area of interest, and self-perceived ranking of decision-making ability.

Decision Making Questionnaire Part A. This questionnaire was adapted by permission from a study completed by Stephanie Pardue (1987). Pardue examined decision-making skills among associate degree, diploma, baccalaureate, and master's prepared nurses. The questionnaire examined two aspect of decision making: (1) frequency of making decisions; and (2) difficulty with making decision in relation to specific clinical situations. Pardue reports a reliablity (Pearsons correlation coefficient) of .87 and .71 for the frequency and difficulty sections respectively (Pardue,1987).

The questionnaire outlined forty-four decision making situations and particpants were asked to asked to rank each situation for frequency of decision making using a four point Likert scale: (1) Never; (2) Occasionally; (3) Frequently; (4) Very Frequently. The forty-four situations were also ranked on

difficulty with making decisions using a four point scale: (1) No Difficulty; (2) Minimal Difficulty; (3) Moderate Difficulty; and (4) Great Difficulty.

The population of the current study consisted of senior nursing students. The difference in the level of participants between this study and that of Pardue's study warranted slight alteration of the original tool. Some of the decision making situations had to be deleted as they did not apply to nursing students. This resulted in a questionnaire containing twenty-nine decision making situations. Each situation was measured for frequency of decision making and difficulty with decision making using the same scale as that in the original tool.

Decision Making Questionnaire Part B. This questionnaire was designed to examine the students decision making ability. It consisted of four patient scenarios, each followed by six to seven possible nursing interventions. Students were asked to choose appropriate interventions based on the scenario and rank their choices in order of priority. For the purposes of scoring in this study the ranking of interventions was not examined. The researcher was primarily interested in whether or not the student chose the correct interventions.

This tool was completed by four nursing instructors with six or more years of experience for interrater reliability. There was 96% agreement among the experts.

Computer Simulations

Eight computer simulations, designed to stimulate decision

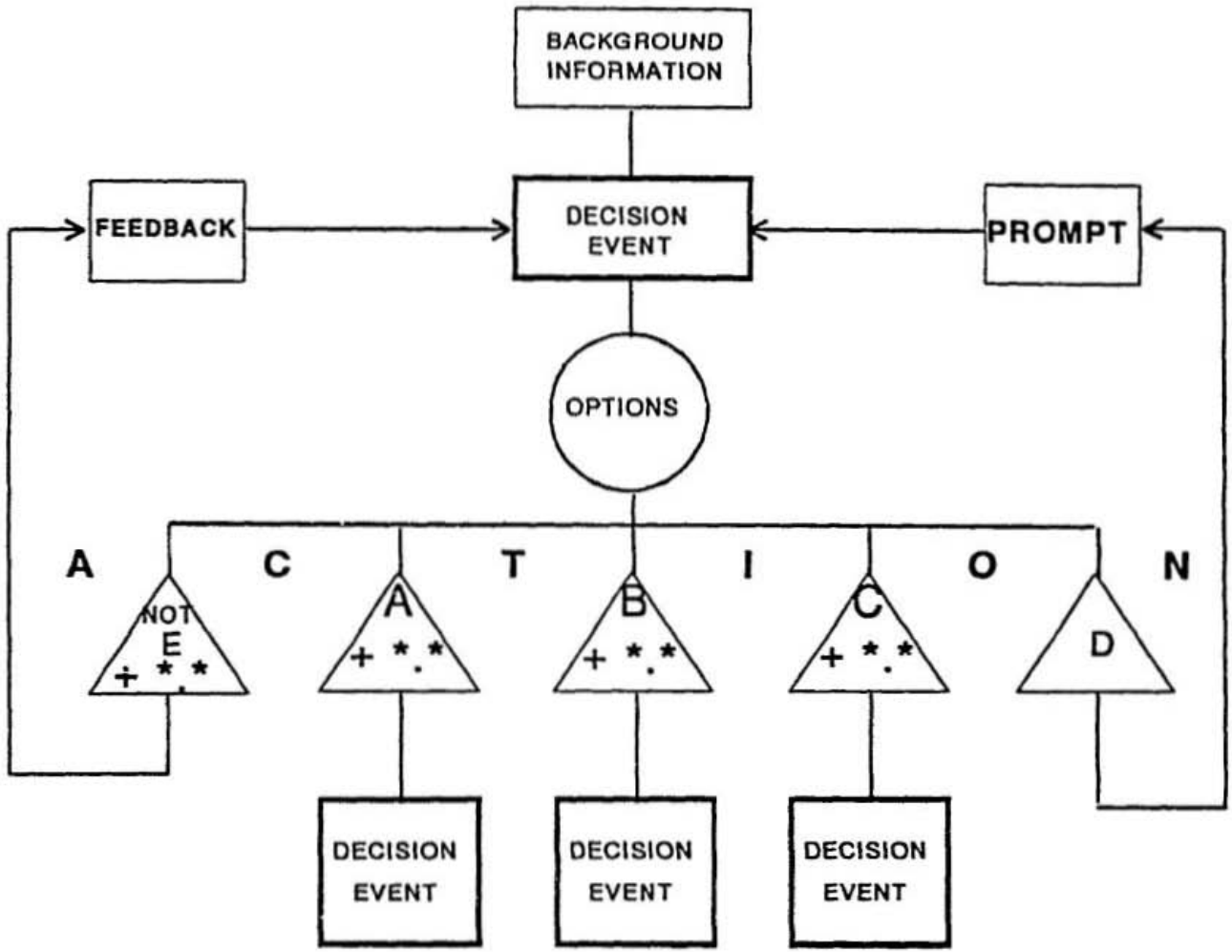
making, were used by the experimental group during the study. Five of the simulations were created by Medi-Sim Inc. and involved gathering information and making decisons about patient care. Students were presented with a case history of a patient and were required to follow this patient through to discharge. The five packages addressed the following topics 1. Diabetes 2. Cerebrovascular Accident 3. Seizures 4. Myocardial Infarction 5. Developmental concepts of an eight year old child (see Appendix C for a more detailed description of individual packages).

Three of the simulations were created by the researcher and also involved the care of patients with various surgical/medical conditions as follows: (1) Congestive heart failure (2) Pneumothorax (3) Cholelithiasis. The programs were written in Ashton Tate Dbase IV © software and installed on the student computers using the Runtime© module included with the software.

Students were presented with a case history of a client and were expected to work their way through various patient problems or decision events. Diagram 1 (p. 32) outlines a typical decision event. Each decision event is followed by a list of options and the student is required to choose one or more of these options. Feedback is given after each option is chosen, and based on the combination of options that the student chooses he/she progresses to a new decision event.

The three simulations created by the researcher were evaluated by media and content experts prior to the study. All experts ratified the three simulations. A more detailed example of these

Diagram 1. Sample Diagram of Decision Events in Computer Simulations



Note : *.* = Any other combination of options

simulations can be seen in Appendix C.

Pilot Study

A small pilot study was conducted involving nine fourth year senior nursing students from a baccalaureate school of nursing, the purpose of which was to refine the instruments and scoring routines. Feedback from the students was obtained and changes were made to clarify both computer instructions and questionnaire instructions. The size of the group did not allow for significant data analysis.

Procedure

Contact was made with the Directors of all schools of nursing to obtain permission to approach the students. Each class of students was approached by the researcher and the purpose and method of the study was explained. All students who volunteered to participate were asked to sign a consent form (see Appendix B). They were asked to complete the Demographic Data Sheet as well as the Decision Making Questionnaire Part A and Part B. These students were then randomly assigned to a control or experimental group and the list was posted in their classrooms the following week. All students were involved in the clinical setting during the time of the study.

Students assigned to the control group received no formal

instruction or assistance in decision-making during the time of this study other than what would occur naturally during their clinical experience.

Students assigned to the experimental group were asked to complete eight computer simulations over the following six weeks. All simulations were to be completed at least once. The computer simulations were placed in the library or resource room in each school with typewritten instructions explaining how to start and finish the simulations. The researcher's work and home phone number was placed at the bottom of the written instructions to provide further support. Prior to starting each simulation the students were prompted by the computer to enter their names and student numbers. This allowed the researcher to keep a record of which students had completed the simulations. At week four the researcher visited each site to note the number of students who had completed the simulations. Those students who had not completed the simulations up to that point were sent a reminder.

At the end of six weeks those students who had completed the simulations, as well as those in the control group, were sent the Decision Making Questionnaire Part A and Part B and a stamped envelope containing the researcher's address. It was not possible for the researcher to meet with students as a group at the end of the study, because all students were completing clinical work and had conflicting schedules.

Analysis

The data was analyzed using SPSSX on a DEC VAX minicomputer. The demographic data collected was initially analysed using frequencies tables to compare groups for homogeneity. Next, results of pre-test and post-test for both control and experimental groups were analyzed using both descriptive statistics and analysis of variance to assess for significant difference between groups and testing times.

Chapter 4

Findings and Interpretation

The purpose of this chapter is to present and interpret the results of the statistical analysis of the data collected during the study in light of the questions posed and the experimental treatment. The following statistical procedures were used: (1) frequencies to outline demographic data; (2) descriptive statistics; (3) multivariate analysis of variance (MANOVA); and (4) analysis of variance (ANOVA).

Demographic Characteristics

All participants were senior nursing students in the final year of their nursing programs. During the time of the study all participants were involved in some area of clinical work. The students in the experimental group and the control group were similar in age, with the mean age being 24.17 years and 23.63 years respectively. The majority of students in both groups were female and unmarried. Students from both the experimental and control group were asked to rank themselves in terms of their decision making ability. The majority of both groups, 93.1% for the experimental group and 97.1% for the control group, ranked

themselves as average in their ability (see Table 1).

Table 2 outlines other characteristics of the subjects in the study. It is interesting to note that at least half of each group had some post-secondary education other than that received in their nursing program. The control group, with 64.7%, was slightly higher than the experimental group with 51.7% . The majority of both the experimental group and the control group had also had some previous computer experience, 82.2% and 70.6% respectively. This finding is not surprising with the increasing use of computers in the clinical setting and in the library systems. Students are receiving greater exposure to computers.

Students were asked to choose their area of clinical interest. Neither group expressed a strong liking for one area over another, however the experimental group seemed to favour the maternal/child and critical care areas (24.1% and 27.6% respectively) and the control group seemed to favour the adult surgery area (35.3%) (see Table 2).

Reliability Test

The Decision Making Questionnaire B was developed by the researcher. It was examined by four content experts prior to the study to establish interrelater reliability. A reliablity test was also run on the data collected in the study and results indicated an ALPHA score of .73.

Table 1. Demographic Characteristics of Study Subjects (n=63)

Variable	Experimental Group		Control Group	
Age				
Mean + SD	24.17 + 3.51		23.63 + 3.14	
Range of ages	21 to 36		20 to 34	
	N	%	N	%
Gender				
Male	2	6.9	5	14.7
Female	27	93.1	29	85.3
Marital Status				
Single	25	86.2	31	91.2
Married	4	13.8	3	8.8
Self Ranking of DM				
Below Average	1	3.4	1	2.9
Average	27	93.1	33	97.1
Above Average	1	3.4	--	----

*Note: SD = Standard Deviation, DM = Decision Making

Table 2. Other Selected Characteristics Of Study Subjects

Variable	Experimental Group (N=29)		Control Group (N=34)	
	N	%	N	%
Post-Sec. Education				
Yes	15	51.7	22	64.7
No	14	48.3	12	35.3
Previous Comp. Exp.				
Yes	24	82.2	24	70.6
No	5	17.2	10	29.4
Area of Interest				
Adult Medicine	4	13.8	3	8.8
Adult Surgery	2	6.9	12	35.3
Maternal/Child	7	24.1	3	8.8
Critical Care	8	27.6	4	11.8
Psychiatry	1	3.4	5	14.7
Pediatrics	2	6.9	4	11.8
Cardiology	--	----	2	5.9
Public Health	1	3.4	--	----
More than one	4	13.8	1	2.9

*Note: Post-Sec. = Post-Secondary, Comp. Exp. = Computer Experience

Descriptive Statistics

Means, standard deviations, and minimum and maximum values were generated for the dependent variables of score on the decision making questionnaire B (DMS), frequency of decision making (FREQ), and difficulty with decision making (DIFF). Table 3 outlines these values for the entire sample of 63 students at the initial testing (time one) and the final testing (time 2). A comparison of means shows a slight increase of DMS and FREQ from time one to time two and a slight decrease in the DIFF mean from time one to time two.

A comparison of means by group in Table 4 revealed the mean for DMS in the experimental group increased from time one to time two, while the control group mean remained the same. The difficulty of decision making (DIFF) decreased for both groups from time one to time two however the decrease was larger in the experimental group. The frequency of decision making (FREQ) means also increased for both groups from time one to time two.

Table 3. Means, Standard Deviations (SD), Maximum (Max.), and Minimum (Min.) values for Dependent Variables, Both Groups

	Variable	Mean	SD	Max.	Min.
	DMS	19.51	3.23	25	13
Time One	FREQ	73.17	11.26	96	48
	DIFF	56.63	12.21	87	28
	DMS	19.68	3.17	25	13
Time Two	FREQ	75.63	12.78	112	46
	DIFF	54.29	13.89	91	20

*Note: DMS = Decision Making Score, FREQ = Frequency of Making Decisions, DIFF = Difficulty with Decision Making

Table 4. Comparison of Means and Standard Deviations (SD) for Experimental and Control Groups

		Experimental		Control	
	Variable	Mean	SD	Mean	SD
Time 1	DMS	20.28	2.59	18.85	3.59
	FREQ	72.86	10.16	73.44	12.27
	DIFF	57.86	13.71	55.59	10.88
Time 2	DMS	20.66	3.13	18.85	3.01
	FREQ	74.97	10.15	76.21	14.79
	DIFF	54.03	12.51	54.50	15.20

*Note: DMS = Decision Making Score, Freq = Frequency of Decision Making, Diff = Difficulty with Decision Making

Manova

A multivariate analysis of variance is used to compare means when more than one dependent variable is involved in the study. In this study three dependent variables have been measured therefore a MANOVA test would seem appropriate. However, several assumptions are necessary for the proper application of the MANOVA test. One assumption is that a variance-covariance matrix exists - that is - the dependent variables are correlated (Norusis, 1985). The Bartlett's Test of Sphericity is used to examine the correlation matrix of the dependent variables. Having run Bartlett's test on the data collected in this study it was found that the variables were not correlated ($p > .05$). Therefore an ANOVA was used to further analyse the data.

ANOVA

The previous comparison of the means revealed there was a difference in mean values in both groups from time one to time two testing. An ANOVA permitted the testing of significant differences between the two group means from time one testing to time two testing (Polit & Hungler, 1987). Table 5 outlines the F scores for the experimental group and the control group differences from time one to time two testing. The significance level was chosen at .05. Although the indicated a difference in means for the experimental group for all three variables the change was not

Table 5. ANOVA of DMS, FREQ, DIFF for Control and Experimental Groups from Time One to Time Two Testing

Variable	SS	DF	F	Sig of F
		Experimental Group		
DMS	2.08	1	.25	.617
FREQ	64.15	1	.62	.433
DIFF	212.43	1	1.23	.271
		Control Group		
DMS	.00	1	.00	1.00
FREQ	129.94	1	.70	.404
DIFF	20.13	1	.12	.74

*Note: DMS = Decision Making Score, FREQ = Frequency of decision making, DIFF = Difficulty with decision making, SS = Sum of Squares, DF = Degrees of Freedom

significant. As well with the control group there was no significant change in scores from time one to time two testing.

Next the experimental group means were compared with the control group means at time one testing and time two testing to check for any differences between the two groups during these times. Although the experimental group mean for DMS was higher at time one testing (Table 4) the ANOVA reveals there was no significant difference, .081, between the control and experimental group with this variable (Table 6). The FREQ and DIFF variables displayed .841 and .466 respectively, again indicating no significant difference between the two groups at time one testing.

The ANOVA for time two indicated .023, .704, .896 level of significance for DMS, FREQ, and DIFF respectively (see Table 6). For FREQ and DIFF, the level of significance was unacceptable at the chosen .05 level, indicating no significant difference between the control and experimental group means at time two testing. However, there was a significant difference between the group means for DMS on the Decision Making Questionnaire Part B. The experimental group mean was significantly higher than the control group mean.

Table 6. ANOVA of DMS, FREQ, DIFF Between Control and Experimental Groups

	Variable	SS	DF	F	Sig of F
	DMS	31.69	1	3.12	.081
Time One	FREQ	5.25	1	.04	.841
	DIFF	80.92	1	.54	.466
	DMS	50.83	1	5.41	.023*
Time Two	FREQ	24.08	1	.16	.704
	DIFF	3.39	1	.02	.896

* Significant ($p > .05$)

**Note: DMS = Decision Making Score, SS = Sum of Squares, DF = Degrees of Freedom

Summary

Hypothesis one stated: There will be a significant difference in the decision making ability reported on Questionnaire B between those nursing students who receive exposure to the computer simulations and those who do not. The results of the ANOVA test allow the acceptance of Hypothesis 1.

Hypothesis two stated: Students who utilize the computer simulations will report significantly higher increases in the frequency of their decision making in the clinical area than those students who did not use the simulations. Hypothesis 3 stated: Students who utilize the computer simulations will report significantly less difficulty with their decision making than those students who did not use the simulations. The results of the ANOVA test would require that both hypothesis two and three be rejected.

Chapter 5

Summary and Conclusion

The purpose of this chapter is to present a summary of the findings and a discussion of the interpretation of the findings, with due consideration to the hypothesis being tested and the existing body of related research on decision making in nursing and the present use of computer simulations in nursing education. This chapter will also examine the limitations of the research methods and suggest recommendations for future research.

Summary of Findings

This study examined the use of computer simulations by senior nursing students and their effect on decision making. Three aspects of student decision making were measured: (1) their score on a decision making questionnaire; (2) self-perceived frequency of making decisions in the clinical area; and (3) self-perceived difficulty with decision making in the clinical area.

Students who participated in the study were in their final year of their nursing program and were involved in clinical practice during the data collection phase. Participants were randomly assigned to a control group or an experimental group. Examination of the demographic data collected from both groups

indicated the groups were similar in age, sex, martial status, and self-ranking of decision making ability. The majority of both groups also reported having previous computer experience (experimental group = 82%, control group = 71%). Fifty-two percent of the experimental group reported having other post-secondary education while 65% of the control group reported having other post-secondary education.

All participants were given the same pre-test at the beginning of the study which resulted in three scores: (1) DMS (score on decision making questionnaire); (2) FREQ (frequency of decision making); and (3) DIFF (difficulty with decision making). An ANOVA indicated that their was no significant difference between the two groups at time one testing for DMS, FREQ or DIFF (sig. level .081, .841, .466 respectively).

Students in the experimental group were required to complete eight computer simulations over a six week period while the control group received no treatment. All students were working in the clinical area during this time. At the end of the six week period both groups were given a post-test identical to the pre-test. Comparison of the means from time one testing to time two testing indicated an increase in DMS and FREQ and a decrease in DIFF for the experimental group. The mean score for the control group DMS remained the same from time one to time two testing while the FREQ mean increased and the DIFF mean decreased. An ANOVA test was used to compare the means for significant differences from time one to time two testing for each group. Results indicated no significant

changes in mean scores for DMS, FREQ, or DIFF in either the experimental or the control group ($P \leq .05$). However, when the two groups were compared on post-test scores alone using the ANOVA test, the experimental group DMS mean was significantly higher than the control group ($P = .023$). There was no significant difference in the FREQ or DIFF means on the post-test between the experimental group and the control group.

Discussion

Three hypothesis were formulated for this study in order to address the question - Is the decision making of nursing students affected by the use of computer simulations? This section will address each hypothesis in light of the results of the study, current literature and limitations.

Hypothesis one stated: There will be a significant difference in the decision making ability reported on Questionnaire B between those nursing students who receive exposure to the computer simulations and those who do not. The experimental group mean of DMS on the post-test was 20.66 while the control group mean of DMS was 18.85. An ANOVA test on post-test scores indicated there was a significant difference (.023) in the two group means on this variable. This significant difference between group DMS means was not present on the pre-test suggesting the groups were equal in their decision making ability before the treatment. These results allowed the researcher to accept hypothesis one.

Many authors agree that computer simulations are a valuable tool for assisting students with decision making (Jenkins, 1985; Field, 1987; Theile et al, 1986). DeYoung (1990) states "simulations of real-world experiences provide students with the opportunity to learn how to solve clinical problems and make sound decisions" (p. 246). However, to date there is an absence of research to support this belief. Results from testing hypothesis one could lend support to the claim that computer simulations are an effective tool in assisting nursing students with decision making.

Although results for hypothesis one are encouraging it is necessary to point out that an inherent weakness in pre-test post-test designs is that of the Hawthorne effect (Spector, 1981). That is, the dependent variable is affected by the subjects' awareness that they are in a special experiment. According to Spector (1989) "Hawthorne effects are especially problematic when the pretest is taken before the subjects know about the study" (p. 29). In this study all participants were aware of their participation before the pre-test was administered.

Another limitation of the findings with the DMS is that the Decision Making Questionnaire Part B was designed by the researcher and is being used for the first time to measure nursing students' decision making ability. Although interrater reliability was established prior to the study and the reliability of the questionnaire within the study was alpha = .7338, it is necessary to remain cautious when reviewing the results.

Hypothesis two and three will be examined together as both variables were measured using the same questionnaire, Decision Making Questionnaire Part A. Hypothesis two stated: students who utilize the computer simulations will report significantly higher increases in the frequency of their decision making in the clinical area than those students who did not use the simulations. Although both the experimental group and the control group increased in frequency of decision making from time one to time two testing (experimental group mean increased from 72.86 to 74.97 and control group mean increased from 73.44 to 76.21) there was no significant difference between the two groups. Hypothesis two was rejected.

Hypothesis three stated: students who utilize the computer simulations will report significantly less difficulty with their decision making than those students who did not use the simulations. Again both the experimental group and the control group reported a decrease in the self-perceived difficulty with decision making from time one to time two testing (experimental group decreased from 57.86 to 54.03 and control group decreased from 55.59 to 54.50). However, there was no significant difference between the two groups. Hypothesis three was rejected.

It was expected that both groups would report changes in frequency of decision making and difficulty with decision making after six weeks clinical experience. This is consistent with current literature. Field (1987) cites experience and knowledge as two key elements in improving clinical decision making. In this study both groups received six weeks of clinical experience between

testings. This clinical experience should have affected student decision making. It was also expected that the experimental group would have reported greater changes than the control group as they received additional experience with the computer simulations.

Although both groups reported increases in frequency of decision making and decreases in difficulty with decision making from time one to time two testing, these changes were not significant. There are several possible reasons for this. First the time between testing was six weeks. This time span may have been insufficient to show significant changes in decision making. An increase in time between testings would give the students more time to gain experience, therefore possibly increasing the changes in reported frequency and difficulty with decision making.

Students in the experimental group were asked to complete eight computer simulations during the six week period. Although the simulations were chosen because of their emphasis on decision making in clinical situations, their value in improving student decision making had not been previously established. It is possible therefore, that another set of computer simulations would have prompted more significant results. Perhaps, as well, eight computer simulations was not enough to illicit significant results. An increase in the number of computer simulations may have enhanced the findings.

Considering these findings two further questions can be asked. First, does an increase in clinical experience affect decision making? Second, can clinical experience be enhanced through the use

of computer simulations? It has been established in the literature that experience plays an important role in improving clinical decision making. In a study by Pardue (1987) experience was ranked as the number one influence in decision making. Many authors also agree that computer simulations can be used to augment clinical experience (Davis, 1987; Armstrong & deWit, 1985; Billings, 1984). Although this study failed to provide answers to these questions, considering the stated limitations results encourage further investigation.

Implications for Nursing Education

Beginning proficiency in the skill of clinical decision making is essential for graduating nurses. Nursing students must begin practising this skill early in their programs to increase the amount of experience they receive in decision making prior to graduation. Increased experience in the clinical area probably provides the best environment for students to practice decision making, however it is not easily accomplished for a number of reasons. First, the time constraints involved in a nursing program allows for a limited numbers of hours for experience in the clinical setting. Second, due to natural fluctuations in patient populations in various clinical areas it not always easy to provide a wide range of experience for the student. Third, legal and ethical issues guard the patient from inexperienced nursing students.

It is possible therefore that students may graduate with limited clinical experience and therefore limited experience in clinical decision making. It is the responsibility of the various nursing schools and nursing instructors to ensure that this does not occur. It is necessary to find alternate clinical experiences which provide students with the opportunity to practice clinical decision making in a wide variety of clinical situations. Well written clinical computer simulations could potentially augment students' clinical experiences. Verbal feedback received from students in this study who utilized the computer simulations was positive. They felt they had gained valuable experience by working their way through each simulation.

Recommendations

As a result of the findings of this study the following recommendations are made:

1. Data collection for a study of this type should start in the beginning of January and run until the end of April. This will increase the time interval between testing and allow students greater time to increase their clinical experience.
2. There will need to be an increase in the number of computer simulations utilized in a repeat of this study. This will ensure students in the treatment group will have received adequate additional decision making experience.
3. Decision Making Questionnaire Part B will need to be included

in additional studies of this nature to further estabish its reliability and validity.

4. The question of whether or not clinical computer simulations could be utilized as an effective adjunct to clinical experience warrants further investigation, as there are considerable implications for the future of nursing education.

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APPENDIX A
Correspondence

41 Thomas St.
St. John's, NF
A1E 2K4

368-9027

Feb. 25, 1989

Mr. John Bartlett
Booth Memorial High
Freshwater Road
St. John's, NF

Dear Mr. Bartlett,

I am a graduate student enrolled in the Learning Resources/Ed. Tech. graduate program at Memorial University. I am now beginning my thesis which is a study of the effects of computer simulation on the decision making abilities of senior nursing students. I plan to develop five clinical computer simulations and through a pretest-posttest, measure decision making abilities.

Dr. Mary Kennedy, who is my advisior, suggested I contact you and ask for your assistance as expert appraiser of the computer simulations. I would greatly appreciate yor input in this regard and I will attempt to make your involvement as painless as possible.

Please contact me at the phone number or address listed above with your response or for further information.

Thank You

Janet Curran

41 Thomas St.
St. John's, Nf
A1E 2K4
368-9027

Dr. Glenn Sheppard
Educational Psychology
Memorial University

Dear Dr. Sheppard,

I am enrolled in the Learning Resources/Ed. Tech. graduate program at Memorial University. I am now beginning work on my thesis which is a study of the effects of computer simulations on the decision making abilities of senior nursing students.

Presently, I am developing five clinical computer simulations which will be appraised by a group of professionals and pilot tested before administration. I plan to involve the three diploma schools of nursing in the city and through random sampling I will choose control and experimental groups. Students from both groups will be involved in clinical work at this time.

I will measure decision making abilities of both groups at the begining of the study. The experimental group will utilize the computer simulations over a three month period. The simulations will be available to the students from Monday to Friday and they can utilize them as often as they like when they have free time. Each simulation will take 15 - 45 minutes to complete depending on the student. At the end of the three month period I will again measure decision making ability and compare the results of both groups.

Please find attached a copy of the measurement tools. If you need any further information please contact me at the above number.

Sincerely,

Janet Curran

Janet Curran
41 Thomas St.
St. John's, NF
Canada
A1E 2K4

April 12, 1989

Dr. S. Pardue
Associate Dean/Professor
University of Texas School of Nursing
University of Texas Medical Branch
Galveston, Texas

Dear Dr. Pardue,

I am the Learning Resources Instructor with Memorial University School of Nursing. Currently I am on education leave to complete a masters degree in Learning Resources/Educational Technology.

I have started work on my thesis, The Effect of Computer Simulations on Senior Nursing Students Clinical Decision Making, and have come to a dead end in my search for an appropriate instrument to measure decision making. Having read the article published in Journal of Nursing Education, (November,1987) regarding your research work on decision making, I am sure you understand my frustration. The instrument developed for your study may be just what I am looking for. I have enclosed a brief description of my proposed study and would appreciate your consideration in allowing me to use your instrument.

I would like to begin my data collection at the end of May, 1989 and the only thing stopping me at the moment is an appropriate measuring instrument. I would prefer to utilize an instrument that has been previously validated as opposed to developing and validating a new one. I would appreciate any assistance you could offer in the regard.

Sincerely,

Janet Curran

September 1, 1990

School of Nursing
Memorial University
St. John's, NF
A1B 3V6

737-7006

Mrs. Francis Chaytor
Nurse Intern Coordinator
School of Nursing
St. Clare's Mercer Hospital
LeMarchant Road
St. John's, NF
A1C 5P8

Dear Mrs. Chaytor,

During June and July I attempted to gather data for my thesis The use of computer simulations in nursing education and its effect on clinical decision making. These two months proved to be very poor timing on my part. Students were busy with CNATS and graduation which decreased participation in the study.

I would like to attempt the study again with the new third year students. I feel that if I approach the students in November it would be easier to get them together as a group to complete the assessment tools which are required at the begining and the end of the study. If it is agreeable with you I would like to meet with the students near the end of October to explain the study. This should give students ample time to consider participating in November.

I look forward to hearing from you. Thank you.

Sincerely

Janet Curran

March 5, 1991

Dr. V. Ribeiro
Acting Director and
Associate Professor
Memorial University of Newfoundland
School of Nursing

Dear Dr. Ribeiro,

As you are aware I am presently working on my thesis: Use of computer simulations in nursing education and its effect on clinical decision making, and during last fall N500X students were involved in the pilot testing of my instruments.

March 20, 1991 through to April 30, 1991 I plan to do my data collection for my thesis. My population will include senior nursing students who are presently in the clinical setting and with your permission I would like to include the N500X class in the research study. I have approached Mrs. K. Hustins regarding this and she is in agreement.

For those students who choose to participate in the research it will involve approximately eight hours of their time spread out over a six week period. Students will be randomly divided into two groups, control and experimental, and both groups will be required to complete the same assessment tool at the beginning and end of the study. The experimental group will be required to complete a number of computer simulations which have been designed to improve decision making. These simulations can be completed at the convenience of the student. All collected data will be kept confidential and the students identity will not be disclosed during collection of the data or reporting of the findings.

If you require any further information please feel free to contact me.

Sincerely,

Janet Curran

School of Nursing
Memorial University
St. John's, NF
A1B 3V6

368-9027

April 19, 1991

Mrs. Francis Chaytor
Nurse Intern Coordinator
School of Nursing
St. Clare's Mercer Hospital
LeMarchant Road
St. John's, NF
A1C 5B8

Dear Mrs. Chaytor

Further to our conversation of January 15, 1991. I am now in the final stages of preparation for my research. I have submitted my proposal to the Ethics Committee and the study has been approved.

I anticipate being ready to introduce the computer simulations to the students during the second or third week of May. The simulations will be available to the students for a six week period and they may use them at their convenience. Each simulation takes approximately 20 minutes to complete and there will be a total of five simulations. I would like the students to run through each simulation at least three times. This would involve approximately five hours of their time over a two month period.

Initially I had intended to involve only those students going through a surgical rotation. I have since expanded the study and will include all students going through medical and surgical rotations. I will need to meet with the students to explain the purpose of the study and have them sign a consent form. Perhaps if you could arrange for me to have five or ten minutes at the end of a regular scheduled class this would be sufficient. I will also need a list of the students names so that I might divide them into a control and experimental group.

Please contact me at the address or phone number listed above if you need further information.

Sincerely Yours,

Janet Curran

August 10, 1990

Dr. Robert Crocker
Dean of Education
Memorial University of Newfoundland
St. John's, Nfld
A1B 3X8

Dear Dr. Crocker

I am a graduate student in the Learning Resources/Eduacational Technology Program. I have completed my course work and am presently working on my thesis: The use of computer simulations in nursing education and its effect on clinical decision making.

The sample group in my research includes senior nursing students from all four Schools of Nursing in St. John's. As part of the study participants are required to complete a number of computer simulations over a one month period. Unfortunately not all Schools of Nursing have the same make of computer. St. Clare's School of Nursing are using Apple computer hardware and software and the software used in my study is compatable with IBM machines only. This poses an obvious problem and requires that I rent at least two IBM compatable machines to place in St. Clare's School of Nursing so that these students might particpate in the study.

I have contacted several computer companies regarding types of machanes available and rental prices and Beothuck Data Systems has offered me the best arrangement. Rental of two IBM compatible machines for one month will cost $450.00. I am aware that monies may be available in a discretionary fund to assist me in this final research phase of my thesis. I am therefore contacting your office to request financial assistance in the amount of $450.00 to ensure that all Schools of Nursing may be included in my research data.

I look forward to hearing from you at your earliest convenience regarding this matter.

Sincerely,

Janet Curran-Smith

April 3, 1991

Dear Nurse Intern,

Several weeks ago you received a package concerning a research study on **Computer Simulations and its effect on clinical decision making.** As the deadline date has passed and you have not completed the questionnaire I would like to offer you another opportunity to participate in the study.

The research study will look at the value of using computer simulations in nursing education. I will also investigate the extent to which clinical decision making might improve with the use of these simulations.

If you choose to participate in the study you will be randomly assigned to a control or experimental group. Those students involved in the control group will be required to complete the questionnaire now and again in one month. Those students who are chosen for the experimental group will be required to complete the questionnaire in the same manner as the control group but they will also be asked to complete several computer simulations. The computer simulations take approximately fifteen to thirty minutes to complete and are designed to improve your decision making skills. The simulations are "user friendly" so you need not have any knowledge about computers to run them. The simulations will be placed in the computer room in your school and you can complete them at your convenience over the next month.

If you are interested in participating in the study please complete the questionnaire and return it to Mrs. Murphy or myself by April 20, 1991. If you have misplaced your questionnaire you can receive another one by contacting me at the phone numbers listed below.

Thank you for your time.

Janet Curran

Researcher

HSC room 2907
368-9027 (home)
737-7006 (work)

June 1, 1991

Dear Nurse Intern,

Several weeks ago you received a notice regarding a Decision Making study which you consented to participate in. You have been randomly assigned to the experimental group and therefore should complete the computer simulations which have been placed in the computer room in your school. You must complete all eight simulations to qualify for the study.

Time is running short. Please complete the simulations within the next two weeks. If you are having any difficulty feel free to contact me at the numbers listed below.

Thank you for your participation.

Janet Curran
368-9027 or 739-9318

APPENDIX B
Decision Making Tools

Consent Form for Pilot Test

I request that you participate in the pilot testing of five computer simulations and a Decision-Making Tool which will be used in a study to examine the use of computer simulations in relation to clinical decision making.

If you choose to participate in this study you will be assigned randomly to either a control or an experimental group. Both groups will be tested prior to and after experimental treatment. The experimental group will be required to complete a number of computer simulations over a three week period. Each simulation will take approximately fifteen to twenty minutes to complete. Your identity will not be disclosed as all participants will be assigned a number.

If you agree to participate in the pilot test and understand the above please sign below.

Date_____ Signature_____

Janet Curran
Researcher

Consent Form

I would like you to participate in a study which examines the use of computer simulation in relation to clinical decision making. Your participation in this study is completely voluntary.

If you choose to participate in this study you will be assigned randomly to either a control or an experimental group. Both groups will be tested prior to and after experimental treatment. The experimental group will be required to complete a number of computer simulations over a four week period. Simulations can be completed at the convenience of participants.

Your identity will not be disclosed, as all participants will be assigned a number, and data will be presented in summary form only. I will be available during the study at all times should you have any problems or questions about the study.

If you agree to participate in the study, and understand the above, please sign below as indicated.

Date _____ Signature_____

Janet Curran
Researcher

737-7006 (work)
368-9027 (home)

Demographic Data Sheet

Instructions: Please answer each question by selecting the response which is most descriptive of you and place the response in the blank provided. The data will be used only for purposes of describing research subjects. No individual identifying information will be used.

. 1. Age

. 2. Sex
1. Female 2. Male

. 3. Marital Status
1. Single 2. Married 3. Divorced 4. Widowed

. 4. Any post secondary education (other than nursing)
1. Yes 2. No

. 5. If yes to #4 number of years
1. 1 - 2 years 2. 2 - 4 years

3. greater than 4 years

. 6. Any previous computer experience
1. Yes 2. No

. 7. If yes to #6, how much experience
1. very little 2. Moderate amount

3. Great deal

. 8. Area of interest
1. Adult medicine 2. Adult surgery
3. Maternal/Child 4. Critical Care
5. Psychiatry 6. Pediatrics
7. Other (please specify)_____

. 9. How do you think you rank in Decision Making ability compared to other nursing students at your level.

1. Above average 2. Average 3. Below Average

Decision Making Questionnaire
Part A

Instructions: Please read each of the decision making situations described in Part A, and check the appropriate response under the column of "Frequency of Making Decisions" and "Difficulty with Making Decisions". For example, if you never make decisions about the situation described, check column (1) for never. Likewise, check (2) for occasionally, (3) for frequently and (4) for very frequently. In the second column, check the "degree to which you have difficulty making decisions" as described in each item. Check (1) for no difficulty, (2) minimal difficulty, (3) moderate difficulty, and (4) great deal of difficulty. BE SURE TO ANSWER EACH ITEM. Thanks

Decision Making Situations	Frequency of Making Decisions				Difficulty with Decision Making			
	Never	Occasionally	Often	Very Often	None	Minimal	Moderate	Great
I. THE HELPING ROLE								
1. Creating a climate for and establishing a commitment to the patient's healing.								
2. Preserving the patient's personhood and providing comfort measures in critical situations								
3. Presencing: Just being with the patient								
4. Maximizing the patient's participation and control in his/her own recovery								
5. Interpreting kinds of pain and selecting appropriate strategies for pain management and pain control								

Decision Making Situation	Frequency of Making Decisions				Difficulty with Decision Making			
	Never	Occasionally	Often	Very Often	None	Minimal	Moderate	Great
6. Providing communication and comfort through touch.								
7. Providing emotional and informational support to patient's families								
8. Guiding a patient through change by acting as a psychological or cultural mediator, using goals therapeutically, and/or working to build and maintain a therapeutic community								
II TEACHING-COACHING FUNCTION								
9. Timing: Understanding a patient's readiness to learn								
10. Assisting patients to integrate the implications of their illness and recovery into their lifestyles								
11. Eliciting and understanding the patient's interpretation of his/her illness								

Decision Making Situations	Frequency of Making Decisions				Difficulty with Decision Making			
	Never	Occasionally	Often	Very Often	None	Minimal	Moderate	Great
12. Providing interpretation of the patient's condition and giving a rationale for procedures.								
13. Making culturally avoided aspects of an illness (eg. disfigurement, pain, death etc.) approachable and understandable								
III. THE DIAGNOSTIC AND PATIENT MONITORING FUNCTION 14. Detection and documentation of significant changes in a patient's condition								
15. Anticipating patient breakdown and deterioration prior to explicit confirming diagnostic signs								
16. Anticipating future problems of the patient								
17. Understanding the particular demands and experiences of an illness: Anticipating patient care needs								

Decision Making Situations	Frequency of Making Decisions				Difficulty with Making Decisions			
	Never	Occasionally	Often	Very Often	None	Minimal	Moderate	Great
18. Assessing the patient's potential for wellness and for responding to various treatment strategies.								
IV EFFECTIVE MANAGEMENT OF RAPIDLY CHANGING SITUATIONS 19. Rapid grasp of a problem in extreme life threatening emergencies								
20. Rapid matching of demands and resources in emergency situations								
21. Identifying and managing a patient crisis until physician assistance is available								
V ADMINISTERING AND MONITORING THERAPEUTIC INTERVENTIONS AND REGIMENS 22. Starting and maintaining intravenous therapy with minimal risks and comlications								
23. Administration of medications with accuracy and safety monitoring untoward effects								

Decision Making Situation	Frequency of Making Decisions				Difficulty with Making Decisions			
	Never	Occasionally	Often	Very Often	None	Minimal	Moderate	Great
24. Combating the hazards of immobility								
25. Creating a wound management strategy that fosters healing, comfort, and appropriate drainage								
VI MONITORING AND ENSURING THE QUALITY OF HEALTH CARE PRACTICES								
26. Providing a backup system to ensure safe medical and nursing care								
27. Assessing what can be safely omitted or added to medical orders								
28. Getting an appropriate and timely response from a physician								
29. Recognizing a recurring event or problem that requires a policy change								

Decision Making Questionnaire
Part B

Read the following scenarios and select ONLY the appropriate interventions. Rank them in order of priority by placing the appropriate number in the space provided. For example, place the number 1 in the space next to the intervention you would carry out first.

Remember you need only choose the appropriate interventions.

Scenario 1

Mr. Graham is a 55 year old man who owns his own construction business. He lives at home with his wife and 26 year old son. His two daughters are married and live in the same community. All members of the family are involved in the business in some capacity.

Mr. Graham is a very active man who likes to jog and cross country ski. He also enjoys camping, fishing and hunting. He works with his business five days a week from 8:00 AM until 6:00 PM.

On arrival home from work one evening Mr. Graham experienced substernal chest tightness. He was aware of the signs of a heart attack but immediately dismissed his pain as indigestion. He took two Rolaids and went for a walk around the block. One hour later the pain had increased in severity and was radiating up to his neck and through his back. Mrs. Graham drove him to the hospital and he was admitted to CCU with a diagnosis of anterior lateral MI.

On the first night of admission Mr. Graham had one further episode of chest pain which was relieved with Nitroglycerin S/L and Morphine IV. He was also started on a Xylocaine infusion after the cardiac monitor showed four beats of Ventricular Tachycardia.

Three days later the Xylocaine infusion is discontinued and Mr. Graham is transferred to a medical floor. He has experienced no further episodes of chest pain since the night of admission and the cardiac monitor is showing normal sinus rhythm with no ectopics.

You are in charge of cardiac rehabilitation on this medical unit. During the first day on the medical unit it becomes obvious that Mr. Graham is quite anxious to be discharged. He states "I am not used to lying around like this. My business needs me." Mrs. Graham adds "I have tried to get him to slow down. I knew something like this would happen someday."

What will be your course of action in this situation? Choose ONLY the appropriate interventions in order of priority.

1. Notify the physician. ____
2. Administer sedation ____
3. Explain the Cardiac Regime Program to Mr. Graham. ____
4. Show Mr. Graham around the medical unit. ____
5. Question Mr. Graham regarding his understanding of the Heart and Heart Attack. ____
6. Provide literature/pamphlets on the Cardiovascular System and Heart Attack. ____

Scenario 2

Mrs. Bannister is a 48 year old housewife and mother. She has four children who are all healthy and living at home. Mrs. Bannister is 155 cm tall and weighs 68 kg. She has a four year history of Insulin Dependent Diabetes. She owns a glucometer and checks her blood glucose every day.

While vacuuming one morning Mrs. Bannister developed sharp right lower abdominal pain. When the pain didn't subside after 15 minutes she called her husband at work. Mr. Bannister brought her to the emergency department where she was diagnosed as acute appendicitis. Mrs. Bannister was scheduled for an appendectomy that afternoon.

Intraoperatively and immediately post-operatively there were no complications. Mrs. Bannister was transferred to your surgical unit.

Four days later you receive report from the nurse on the night shift regarding Mrs. Bannister. The night nurse states Mrs. Bannister spent a fairly good night. She was ambulating during the evening and medicated once for incisional pain. At 0600 hrs. Mrs. Bannister was nauseated and vomited 150 cc of greenish bile. She was given Gravol 25 mg IV through the heparin lock which is insitu in her right arm. Blood glucose levels were within normal limits. Vital signs overnight were as follows : BP 115/70 - 126/78 P 68 - 75 R 16 - 18 T 36.7 - 37.1.

After report you go to check on Mrs. Bannister and administer her insulin. You note she is pale and slightly diaphoretic. She is sitting in bed in a semi-fowlers position and states "I was just about to call for you. While I was coughing a few minutes ago I felt a ripping feeling where my incision is." The dressing contains a large amount of serosanguinous drainage. When the dressing is loosened you notice the wound edges of the lower portion of the incision have separated and a portion of the bowel is protruding.

Your IMMEDIATE nursing interventions would include which of the following? (Choose in order of priority)

1. Start an IV infusion through the heparin lock. ____
2. Place Mrs. Bannister in the supine position. ____
3. Have the charge nurse notify the physician. ____
4. Reinsert the bowel back into the abdomen and apply steri strips to approximate the wound edges. ____
5. Apply light pressure with an abdominal pad moistened sterile normal saline ____
6. Measure vital signs. ____
7. Call Mr. Bannister at work. ____

Scenario 3

Mrs. Dickinson is a 48 year old obese Social Worker who had a cholecystectomy three days ago. Intraoperatively there were no complications. Initially post-operatively she was hypertensive but this resolved with sedation.

Over the past three days Mrs. Dickinson's recovery has been unremarkable. Her vital signs have remained stable with no further episodes of hypertension. She has been tolerating solid food with no complaints of nausea or vomiting and her incision appears to be healing well. Her urine output has been adequate. She has refused to ambulate post-op, despite encouragement, for fear that her incision may rupture.

You enter Mrs. Dickinson's room on her fourth day post-op and find she is pale and diaphoretic. She is complaining of chest pain and left leg pain. She also states she is feeling short of breath. Her pulse is 110; her blood pressure is 145/88 and resp 34 and laboured.

You have the charge nurse notify the physician and continue your assessment. Mrs. Dickinson says her chest pain is sharp and hurts when she breaths in. Chest auscultation reveals left basal crackles. Apex is rapid and regular. Assessment of her legs reveals her left calf is edematous and warm to touch with a positive Homan's Sign. Right leg is normal. Her abdominal dressing contains a small amount of serosanguineous drainage.

Choose in order of priority the appropriate interventions.

1. Apply antiembolism stockings. ____
2. Administer Oxygen via mask. ____
3. Assembly equipment for IV insertion ____
4. Change the abdominal dressing. ____
5. Elevate the head of the bed. ____
6. Offer a leg massage to help relieve discomfort. ____

Scenario 4

Dereck Marshall is eighteen years old and lives at home with his parents and two sisters. At age 8 Dereck was diagnosed as having insulin dependent diabetes, six months after a severe episode of mumps. He is short in stature with a small frame for a man his age and his size has always been source of embarrassment for him.

Dereck arrives at the emergency department accompanied by his parents. He is very quiet, his face is flushed and his lips are dry and cracked. Mrs. Marshall appears very upset. She states "Dereck has not been himself lately, ever since he started hanging around with that wild bunch of kids. He has been staying out late and doing Gods knows what"

With Dereck in the examination room you begin your nursing history. B/P 100/60 P 98 and reg R 24 T 37. Dereck is sitting on the examination table with his shoulders hunched. He appears very lethargic. He states "I wish Mom would calm down and stop blaming this on my friends. She was the one who was always telling me to stop hanging around the house, to get out and meet people. Now that I have friends she is still complaining. This diabetes has really ruined my life."

Dereck states he has been quite thirsty for the past 24 hours and has been voiding frequently. He has also felt nauseated and tired. You note his mucous membranes are quite dry and his breath has an acetone odour. You start an IV of Normal Saline and draw blood for Glucose, Electrolytes, Ketones, Osmolarity, and CBC.

His urine is positive for ketones and proteins and 3+ glucose. The blood results confirm a diagnosis of Diabetic Ketoacidosis. Based on the overall assessment and clinical picture the physician orders 30 uts of Humulin s.c. stat. Dereck will be admitted to the medical floor special care.

Based on the information above your Nursing Actions would include which of the following? Arrange in order of priority.

1. Encourage Dereck to administer the Humulin insulin himself ____

2. Ensure consult to Diabetic Teaching Nurse ____

3. Provide emotional support and reassurance for Mrs. Marshall ____

4. Administer the insulin as ordered ____

5. Stress methods of care to prevent complications ____

6. Observe vital signs Q10 - 15 min. ____

APPENDIX C
Computer Simulations

Description of Medi-Sim Inc. Simulations

1. Diabetes

   This case study provides the student with experience in caring for a young client experiencing complications with diabetes. The student is responding to an emergency call for a young boy who has fallen unconscious. The student is responsible for assessment, care and transport of the boy to a hospital.

2. Cerebrovascular Accident

   This case study provides the student with experience in the care and diagnosis of a cerebrovascular accident. The focus is on the acute care.

3. Seizures

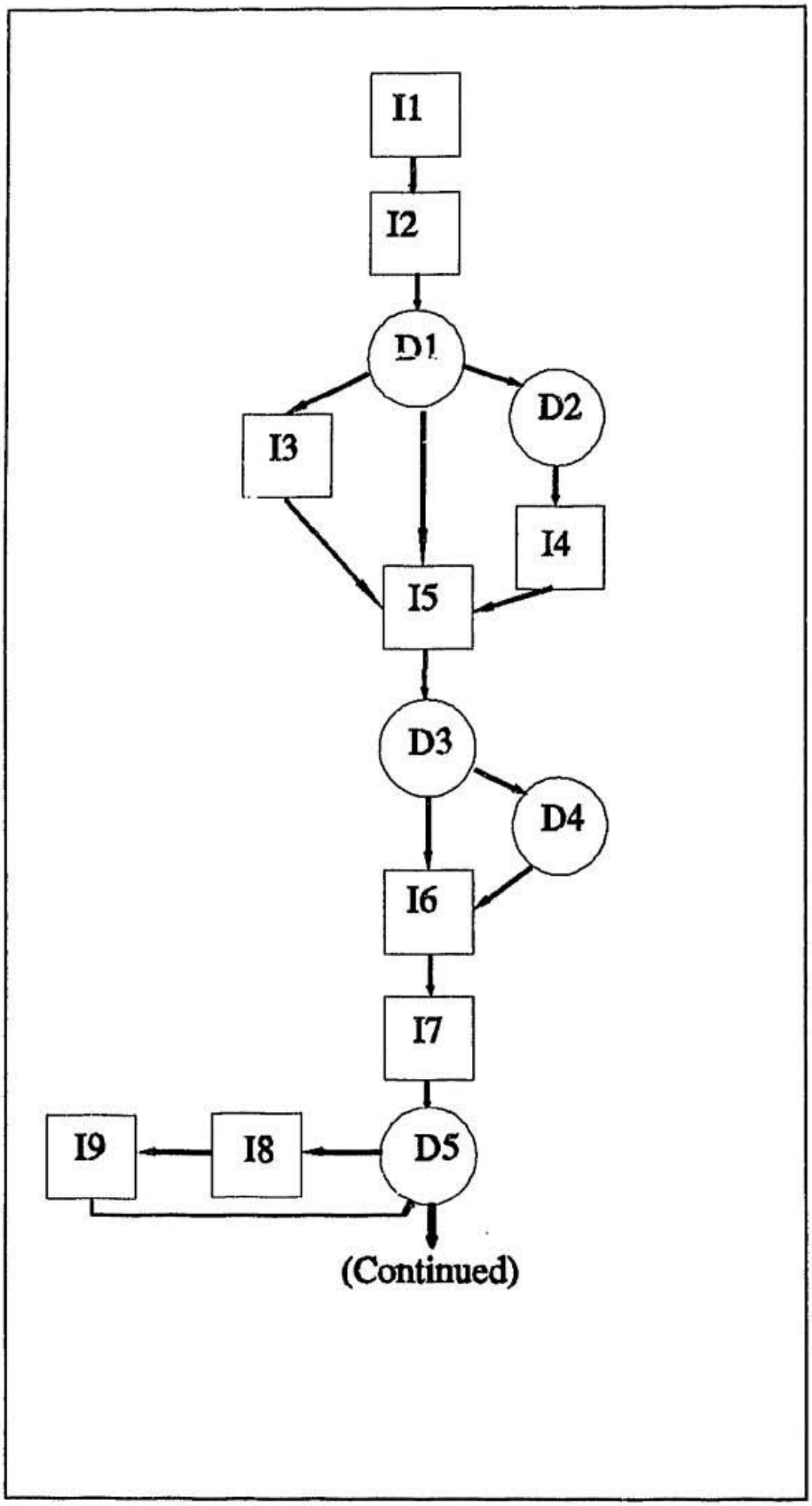
   This case study provides the student with experience in caring for a client experiencing seizure activity. The student is responding to a call for a woman who has fallen unconscious and begins to seizure. The student is responsible for assessing and stabilizing the woman prior to transport to a hospital.

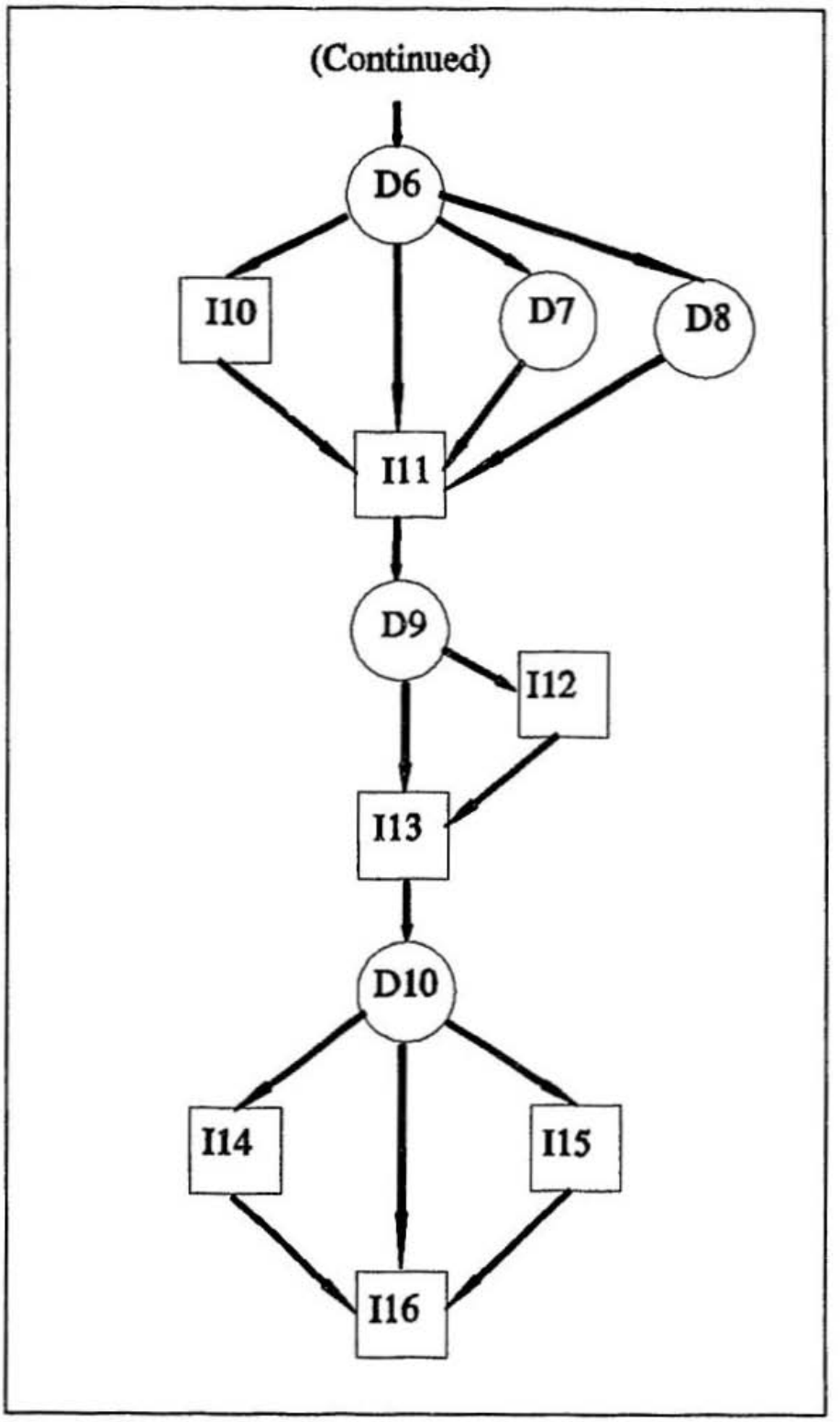
4. Myocardial Infarction : Long Term Care

   This case study provides the student with experience in caring for a client with a myocardial infarction. Its focus is on the post acute care and rehabilitation of the client. Patient education is also emphasized.

5. Developmental Concepts: Melinda George

   This case study provides the student with experience in assessing a school age child. Melinda, who is eight years old is brought to the clinic for a school-enrolment physical. The focus is on cognitive, social, and prepubescent sexual development.


I1
I2
D1
D2
I3
I4
I5
D3
D4
I6
I7
I9
I8
D5
(Continued)


(Continued)
D6
I10
D7
D8
I11
D9
I12
I13
D10
I14
I15
I16

Information Screen #1 (I1)

+----------+

Welcome to the world of Computer Simulations.

The author suggests you have a paper and pencil with you while completing the simulations. This will allow you to take notes as you proceed through the simulations.

A menu is provided at the bottom of each screen. Use the left and right arrow keys to move the cursor to the desired command. Press the ENTER key to activate the command.

+----------+

+---------- Next Screen ------- Exit ----------+

Information Screen #2 (I2)

+----------+

Mr. Brinston is a 38 year old man who presents to the emergency department accompanied by his wife with complaints of shortness of breath and right sided chest pain.

He is resting on two pillows holding his wife's hand. His skin is warm and color is pale.

+----------+

+---------- Next Screen ------- Exit ----------+

Decision Screen #1 (D1)

+----------+

Choose ONLY the appropriate nursing actions in order of priority.

A. Check vital signs
B. Give O2 at 8 L/min via nasal prongs
C. Assess previous history
D. Assess respiratory system
E. Ask Mr. Brinston if he is having any sharp pain

+----------+
Ans.....X
+----------+

A. BP - 130/80 RR - 24
P - 86 reg T - 37.4

+----------+

B. Mr. Brinston was not in any immediate distress however this high O2 flow makes him feel anxious.

+----------+

C. Mr. Brinston states he has had a flu and a cough for the past two weeks. His cough is productive of white mucous. He is taking a cough suppressant.

+----------+

D. Auscultation reveals decreased air entry to Right mid and lower lobes. A few coarse crackles over lung fields which clear with coughing. Percussion tones hyperresonant over Right mid and lower lobes.

+----------+

E. Mr. Brinston states he doesn't have any sharp pain.

Information Screen #3 (13)

+----------+

Mr. Brinston didn't appear to be in any distress. However 8 L/Min of O2 via nasal prongs does cause him discomfort. Such a high flow will dry mucous membranes.

The nurse in charge suggests you remove this source or lower to 4 L/Min.

+----------+

+---------- Next Screen ------- Exit ----------+

Decision Screen #2 (D2)

Which of the folowing is the best method for obtaining an accurate description of the clients symptoms? (Choose only one)

A. Ask Mrs. Brinston to describe the progression of symptoms over the past three days

B. Ask Mr. Brinston to rate his pain on a scale of 1 to 10

C. Ask Mr. Brinston to describe in his own words how he has felt over the past three days

Ans X

A. Mrs. Brinston states she has been out of town for the past few days and was not aware of her husbands illness!!

B. Mr. Brinston tells you he feels his pain is a 7 on a scale of 1 - 10.

C. Mr. Brinston states he has had flu like symptoms over the past two weeks and has felt increasingly more short of breath over the past few days. He also feels a stabbing pain over the right side of his chest.

Information Screen #4 (I4)

This method of questioning does not provide adequate information. The attending physician asks Mr. Brinston to describe in his own words how he has felt over the last few days.

Mr. Brinston states he has has the flu for about two weeks and has felt increasingly more short of breath over the past few days. He also feels a stabbing pain over the right side of his chest.

+---------- Next Screen ------- Exit ----------+

Information Screen #5 (I5)

During the physical examination Mr. Brinston becomes increasing more short of breath and there is evidence of cyanosis around his mouth and nail beds.

He appears restless and agitated.

+---------- Next Screen ------- Exit ----------+

Decision Screen #3 (D3)

+----------+

Considering Mr. Brinstons present condition which of the following actions would be appropriate? Choose in order of priority.

A. Insert oral airway
B. Place Mr. Brinston in semi-fowlers position
C. Transfer Mr. Brinston to radiology for a chest x-ray
D. Administer O2 at 4 L/min via nasal prongs

+----------+
Ans X
+----------+

A. Mr. Brinston becomes increasingly more anxious as you attempt to insert the airway. He begins to gag and spits out the airway.

+----------+

B. His breathing improves slightly but he remains tachypneic.

+----------+

C. As you are leaving the emergency department Mr. Brinston shortness of breath increases and he is showing signs of respiratory distress.

+----------+

D. OK Mr. Brinston's color improves slightly.

Decision Screen #4 (D4)

Which of the following actions would be appropriate now considering Mr. Brinston's worsening condition?

A. Administer a sedative to relieve anxiety
B. Call for portable Chest x-ray
C. O2 40% via HHM

Ans X

A. Your nursing supervisor prevents you from giving sedation for fear of suppressing Mr. Brinston's respirations.

B. Portable X-ray on the way

C. Mr. Brinston's color improves slightly and his breathing is somewhat less laboured.

Information Screen #6 (I6)

+----------+

Physician's Orders

STAT portable Chest X-ray
IV 2/3 + 1/3 to KVO
O2 at 4L/MIN via Nasal prongs
CBC, Lytes, ABG
EKG
Foley Catheter

+----------+

+---------- Next Screen ------- Exit ----------+

Information Screen #7 (I7)

+----------+

The Chest X-ray reveals air in the right pleural space indicative of pneumothorax.

EKG shows sinus tachycardia

ABG's reveal low PH and PO2, and high PCO2

+----------+

+---------- Next Screen ------- Exit ----------+

Decision Screen #5 (D5)

+----------+

An arterial blood gas with Low PH and PO2, and High PCO2 is indicative of:

A. Respiratory acidosis
B. Metabolic acidosis
C. Respiratory alkalosis
D. Metabolic acidosis

+----------+
Ans X
+----------+

A. Correct.

+----------+

B. Incorrect. Move to next screen.

+----------+

C. Incorrect. Move to next screen

+----------+

D. Incorrect. Move to next screen

Information Screen #8 (I8)

+----------+

Normal values for blood gases are as follows:

PH 7.35 - 7.45
PCo2 35 - 45 mmHg
PO2 80 - 95 mmHg
HCO3 21 - 28 mEq/L
O2 Saturation 95% - 98%

+----------+

+---------- Next Screen ------- Exit ----------+

Information Screen #9 (I9)

+----------+

PH < 7.35 = acidosis
PH > 7.45 = alkalosis

High PCO2 + Low PH = Acidemia of respiratory origin

High PCO2 + High PH = Respiratory retention ofCO2 to compensate for metabolic alkalosis

Low PCO2 + Low PH = Respiratory elimination of CO2 to compensate for metabolic acidosis

Low PCO2 + High PH = Respiratory alkalosis

+----------+

+---------- Next Screen ------- Exit ----------+

Decision Screen #6 (D6)

The physician is preparing for immediate insertion of a chest tube to remove the air from the pleural space. You assist in preparation by: (Choose in order of priority)

A. Placing a fenestrated drape over the patients tenth intercostal space area
B. Preparing the chest drainage apparatus
C. Assessing vital signs
D. Placing patient in supine position with right arm extended over his head

Ans X

A. Done.

B. You set up a pleuro-vac system with 20 cm of suction as ordered.

C. BP 138/80 P - 92 R - 30

D. Patient becomes increasingly more short of breath and states he is smothering.

Information Screen #10 (I10)

+----------+

The physician asks you to move the drape up to the second intercostal space. He explains that as air rises chest tubes are generally placed in the second intercostal space to remove air.

+----------+

+---------- Next Screen ------- Exit ----------+

Decision Screen #7 (D7)

+----------+

Mr. Brinston becomes increasing more anxious and distressed in the supine position. Your best action would include: (choose only one)

A. place in semi-fowlers position for insertion
B. increase O2 flow to 8 L/min
C. reassure him the procedure will not take long and he will be able to breath easier very shortly

+----------+

Ans X

+----------+

A. Mr. Brinston's breathing improves

+----------+

B. This high flow of O2 causes Mr. Brinston further anxiety. Your nursing supervisor suggests you place Mr. Brinston in the semi-fowlers position for insertion

+----------+

C. Mr. Brinston continues to experience dyspnea and refuses to listen to reassurance. Your nursing supervisor suggests you place Mr. Brinston in the semi-fowlers position for insertion

Decision Screen #8 (D8)

+----------+

The physician suggests you move the fenestrated drape to include the 2nd to 4th intercostal space. As air rises this is the most common place to insert a chest tube for pneumothorax.

Mr. Brinston becomes increasing more anxious and distressed in the supine position. Your best action would include:
(choose only one)

A. place in semi-fowlers position for insertion
B. increase O2 flow to 8 L/min
C. reassure him the procedure will not take long and he will be able to breath easier very shortly

+----------+
Ans X
+----------+

A. Mr. Brinston's breathing improves

+----------+

B. This high flow of O2 causes Mr. Brinston further anxiety. Your nursing supervisor suggests you place Mr. Brinston in the semi-fowlers position for insertion

+----------+

C. Mr. Brinston continues to experience dyspnea and refuses to listen to reassurance. Your nursing supervisor suggests you place Mr. Brinston in the semi-fowlers position for insertion

Information Screen #11 (I11)

A # 28F chest tube is inserted through the fourth intercostal space. It is secured in place and connected to low continuous suction.

One hour later Mr. Brinston's breathing has improved somewhat, although he finds the tube uncomfortable. His ABG's are within normal limits and he is ready for transfer to a medical special care unit.

Decision Screen #9 (D9)

+----------+

Choose in order of priority ONLY those actions which would be appropriate in preparing Mr. Brinston for transfer.

A. Clamp the chest tube
B. Secure the pleurovac below the level of the chest
C. Assess air entry
D. Take a 12 lead EKG

+----------+
Ans X
+----------+

A. Two clamps applied to the chest tube.

+----------+

B. The pleurovac is secured to the bottom bedrail and the system will drain by gravity until you reach the medical floor.

+----------+

C. Air entry remains decreased to the right mid and lower lobes with few coarse crackles throughout which clear with coughing.

+----------+

D. Mr. Brinston has already had an EKG done. There has been no change in his condition to suggest the need for a repeat EKG.

Information Screen # 12 (I12)

+----------+

As you are leaving the emergency room Mr. Brinston states that he is beginning to feel short of breath again.

The attending physician asseses the patient and removes the chest tube clamps. He tells Mr. Brinston to take a deep breath and exhale forceably. Mr. Brinston's begins to breath easier.

The physician explains that it is not necessary to clamp the chest tube while the patient is being transferred. In fact it can be detrimental to the patients condition to clamp the chest tube as air will be trapped in the pleural space with the possibility of a tension pneumothorax developing.

+----------+

+---------- Next Screen ------- Exit ----------+

Information Screen #13 (I13)

+----------+

Mr. Brinston is transferred to the medical floor and is assigned to your unit.

Three days after his admission your morning assessment reveals Mr. Brinston's air entry has improved however there is evidence of coarse crackles over his entire lung fields. Mr. Brinston states this AM he coughed up yellow sputum. He says that apart from his cough his breathing has improved however he does feel very tired.

V/S as follows : BP - 126/84, P - 82, RR - 20, T - 38.2

+----------+

+---------- Next Screen ------- Exit ----------+

Decision Screen #10 (D10)

+----------+

Considering your assessment which of the following would be included in your plan for the morning? Choose in order of priority.

A. Send a STAT sputum for culture and sensitivity
B. Ask the physician to order a cough suppressant.
C. Assess chest tube drainage
D. Encourage Mr. Brinston to use his inspirometer

+----------+
Ans X
+----------+

A. OK Initial results show growth of 4+ gram negative bacilli

+----------+

B. The physician refuses stating you should encourage Mr. Brinston to deep breath and cough to remove secretions

+----------+

C. Chest tube has been draining scant amounts of serosanguineous however there hasn't been any drainage for the past eight hours.

+----------+

D. Mr. Brinston uses his inspirometer for 10 minutes Q2H with your encouragment.

Information Screen #14 (I14)

+----------+

Use of an inspirometer will help Mr. Brinston move the secretions which are in his lungs. It is suggested by your team to encourage Mr. Brinston to use an inspirometer for deep breathing and coughing.

+----------+

+---------- Next Screen ------- Exit ----------+

Information Screen #15 (I15)

+----------+

During afternoon rounds Mr. Brinston's physician enquires about his patients condition. He asks if you sent a sputum for Culture and Sensitiviy for Mr. Brinston. He suggests you do so STAT.

The preliminary results from the sputum shows growth of 4+ gram negative bacilli

+----------+

+---------- Next Screen ------- Exit ----------+

Information Screen #16 (I16)

+----------+

Mr. Brinston is started on Cloxacillin 1G IV Q6H for his respiratory infection.

Three days later assessment of Mr. Brinston's respiratory system reveals bilateral air entry to bases with a few coarse basal crackles which improve with coughing. Chest X-ray reveals resolution of the pneumothorax and the chest tube is removed.

Mr. Brinston is discharged home at the end of the week on Cloxacillin 1G PO Q6H

+----------+

+---------- Next Screen ------- Exit ----------+