USE OF SEARCH STRATEGIES IN NURSING CLINICAL INFERENCE

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We hereby recommend that the prepared under

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be accepted as fulfilling this part of the requirements for the Degree of

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INTRODUCTION

The term nursing diagnosis and, more recently, clinical inference, has been used to describe a process by which the nurse verbalizes a perception of the state-of-the patient. Nursing diagnosis or clinical inference employs many minute judgments, a number of which are more than a simple binary yes-no process. Most of the minute judgments require intricate cognitive processes.

Some researchers (Kelly and Hammond, 1966; Gordon, 1975) believe that nursing clinical inferences are derived from the formation and testing of one or more hypotheses. However, nursing has not successfully examined the minor premise formation process required to arrive at each of the needed hypotheses. Hypothesis formation is dependent on accurate inferrer perceptions of client cues, using systematic search strategies and accurate taxonomic sorting, or instantiation of these cues against adequate knowledge bases.

Through systematic search strategies, nurses will be able to collect more data on the client and reduce the tendency to form a mind-set causing premature closure and inaccurate inference. Explicit and multiple cues will lead

to better taxonomic sorting and cue patterns in the knowledge base. Accurate hypothesis formation flows from better-assessed client cues. Precisely-assessed cues form better cue patterns, leading to improved pattern-fit with patterns in the nursing taxonomy.

Problem of Study

When presented with simulated clinical excercises, do nurses correctly and consistently use search strategies and instantiation activities in the formation of a minor premise (a step in the clinical inference model)? To seek the answer to this question, four specific questions will be investigated.

1. Do a majority of nurses make correct inferences on the Simulation Exercise?

2. Do nurses utilize structured search strategies in assessing client cues?

3. Do nurses who use structured search strategies also carry out instantiation activities?

4. Do nurses use search strategies and instantiation activities consistently?

Justification of the Problem

The major premise of this study is the belief that the inferential process and nursing diagnosis are central to the practice of nursing (Abdellah, 1960; Orlando, 1961;

Wiedenbach, 1964; Roy, 1970; Oren, 1971; King, 1971; Kritek, 1978; Gordon and Sweeney, 1979). Implicit in this belief is that the process of clinical inference is necessary to the achievement of precision in nursing diagnosis. In 1955, Lesnik reviewed court decisions and identified six independent functions of nursing from the judicial proceedings. One function identified was:

> The observation of symptoms and reactions, including symptomatology of physical and mental conditions and needs, requiring evaluation of application of principles based upon the biologic, the physiologic, and the social sciences. (p. 259)

Kelly (1966) stated, ". . . for the first time the making of a nursing diagnosis was recognized as an independent, essential, and legal function of the nurse" (p. 23).

So central to the practice of nursing had nursing diagnosis become that by 1975 many states had revised the definitions within their nurse practice acts to include the statement, ". . . make a nursing diagnosis of human response to . . ." ("Revisions in Practice Acts," 1975). Legally, the nurse is now required to make a nursing diagnosis of the state-of-the-patient.

Several years prior to legalization, the nursing profession recognized the importance of nursing diagnosis. In 1973 the American Nurses' Association in Standards of Nursing Practice developed four practice standards which spoke directly to the formation of a nursing diagnosis. The stan-

dards required nurses to collect client health status data, form and use a diagnosis to plan care, set nursing care goals, establish care priorities, and utilize personnel and resources to meet the care goals. More recently, Kritek (1978) criticized the profession for having failed to begin theory development at Dickoff, James, and Wiedenbach's "factor-isolating" (1968a, p. 423), or first level. She indicated that while ANA's Standards of Practice "reflect the profession's current level of theory" (1978, p. 35), a step was missing between Standard I, data collection, and Standard II, nursing diagnosis. Kritek stated that the missing step was the inference process. She continued by stating that the efforts of the National Conferences on Classification of Nursing Diagnosis were a step in the right direction identifying a taxonomy for nursing and thus developing the first level of nursing theory.

Adequate processes of nursing diagnosis will enhance the efforts in nursing research. Gordon and Sweeney (1979) feel that:

> Research is critically needed to identify and validate health problems, thereby organizing the body of clinical science in nursing . . . . Development and testing of research designs for identification and standardization of nursing diagnosis is critical . . . . The American Nurses' Association Standards of Practice, which require diagnosis, make it imperative that research in this area move forward (p. 14).

Gebbie and Lavin (1974) have indicated that three steps in

developing a classification or taxonomy of nursing diagnosis are required, but indicated that a fourth step would be forthcoming from the conferences on nursing diagnosis. This fourth step would include the standardization and validation of nursing diagnostic entities arrived at by Conference participants. Current diagnoses from the Conference on Classification of Nursing Diagnosis have been arrived at through an introspective identification model, which does not lend itself to standardization and validation of the categories and subcategories previously identified. Standardization of the proposed diagnostic classifications will be provided by the model under investigation.

The Logical Clinical Inference Model for Nursing (Figure 1) provides a location for a taxonomy or a nursing diagnosis classification system, such as the developing nursing diagnosis classification (Gebbie, 1975). Movement through the model would entail the collection of empirical referents (cues), using structured search strategies and the instantiation, or comparison, of empirical referents against the developed nursing classifications. Replicating the inference model many times using the proposed diagnostic classifications (Gebbie, 1975) will provide the required standardization. In addition, empirical referents could be weeded out or demonstrated to be essential to the recognition of a specific nursing diagnosis.

Finally, the model can be used in curriculums of schools of nursing to assist students in the development of structured search strategies and instantiation activities for arriving at correct nursing diagnoses. The model lends itself to use with every conceptual framework, since the postulate-system substructure within the model determines the framework of belief related to the client and his care. The nursing process has been used by nursing education for a number of years as the ideal way in which to arrive at a nursing diagnosis; however, the nursing process alone does not explain the manner in which an inferences is reached. Sarbin's theoretical formulations, on which the model is based, explain the inference process in terms of a logical argument. Sarbin does not claim that ". . . thought mirrors formal logic, only that it can be analyzed usefully in terms of logic" (1960, p. 34). The theoretical formulations on postulate-system development explain how students come to hold certain beliefs about persons and objects, and may offer ways in which these beliefs might be changed. Equally important is the formation of the minor premise section of the model, which causes the learner to develop an awareness of the manner in which data about clients should be collected and used.

Students have often been criticised for having poor judgments or making poor inferences without having ever been

taught a method of arriving at sound inferences. The model makes it possible to teach this process and evaluate the accuracy of student clinical inferences based on the use of the model. Because the profession believes that nursing diagnosis is central to nursing practice (both legally and professionally), and because the emerging nursing diagnostic classifications require standardization, nursing research needs a model with which to explain and predict clinical inferenences. The Logical Clinical Inference Model provides the structured overview of the process of clinical inference. Research, practice and education will benefit from the use of an explanatory model for making a clinical inference.

Theoretical Framework

The Logical Clinical Inference Model for Nursing is an adaptation of Theodore Sarbin's (1960) Theory of Clinical Inference and Syllogistic Model. Sarbin believes the clinical inference is both a logical inference and a statistical inference. Logical, because major and minor premises are derived from a postulate system or model and the conclusions flow "logically", or are deductively inferred, from the "collocation" (p. 48) of the major and minor premises. Sarbin feels that inferring the state-of-the-patient is an uncertainty-geared task, and that statistical probability can be used to account for the fact that not all possible

cues or signs and symptoms are present in every instance of a disease or class. While Sarbin is a clinical psychologist and is projecting the use of his theory for diagnosing mental problems, nursing shares this same uncertainty-geared task of inferring nursing problems in a probablistic environment (Hammond, 1966). Nursing needs a model to facilitate the collection of client data, formation of the cue patterns, and the classification of the cues into some hypothetical statement. The Logical Clinical Inference Model for Nursing may be useful as a guide to facilitate formation of an accurate nursing clinical inference.

Sarbin's Syllogistic Model of Clinical Inference

Sarbin identifies six steps in his Syllogistic Model of the clinical inference process:

1. The postulate-system of the inferrer serves as a model or guide for the inference process and orginates from the inferrer's constructions from past experience, teachings and examples from authorities, the inferrer's deductions, or from analogies drawn from the inferring person prior to the encounter with the person about whom the inference is to be made. For example, a nurse may postulate that stress in man can be a product of his environment and that stress can cause physiological disruptions in man. This postulation is based on the nurse's previous experience with stress-related

physiological disruptions and authority-derived knowledge from the literature and teachers. Some postulates are not communicable; rather, they may have their origins in prelinguistic experience or "non-verbal operations" in which relations, such as similarity, contiguity, opposition, cause and effect, part-whole relatedness, are operative (Sarbin, 1960, p. 53).

2. The inferrer constucts a major premise from the postulate-system. For example, gastrointestinal malfuctions are physiological disruptions caused by stress. The major premise is derived from the complex postulate-system of the inferrer, resembling deduction in formal inference, and is formed through colligation of two or more modules (Sarbin, 1969, pp. 54, 122). Sarbin indicates that major premises are necessary but not sufficient to produce new knowledge (1960, p. 55).

3. Observation for occurrences by the inferring person provides input which will eventually result in the development of one or more minor premises. For example, Patient A has intermittent epigastric pain which has its onset during work hours and is relieved by eating. Spicy and acid foods also bring on the pain. Patient A works as a tax consultant from January to May. An inferring person's inferences are probabilistically determined because he must rely on a sample of occurrences (Sarbin, 1960, p. 56).

4. The process of instantiation involves the taxonomic sorting of the input cues into an instance of a general class, resulting in the final formation of a minor premise. Patient A has signs and symptoms which are consistent with gastrointestinal malfunction and are characteristics found in the nurse's taxonomy. The act of instantiation can best be described as the achievement of a best fit or more efficient alignment between incoming sensory events and the unit of cognitive structure, the module (Sarbin, 1960, p. 125). Sarbin believed that instantiation of occurrences is always multiple (1960, p. 58). Degrees of instantiation (probabilities of instantiation) exist because the inferring person perceives some, but not all, of the existing attributes of another person or object (1960, p. 21).

5. The inferential product (nursing diagnosis or conclusion) attributes the characteristics of the general class to the instance. For example, Patient A has a gastrointestinal malfunction related to stress. Through collocation (placing together or juxtapositioning)of the major and minor premises, a diagnosis is being inferred. Sarbin stated that inferences mediated through taxonomic sorting, like all sign and symbol cognition, are subject to error because of incomplete knowledge (1960, p. 58).

6. The prediction is the probable outcome of the inferential product. For example, Patient A's physical

condition will grow worse unless intervention is directed toward assisting the patient to adapt to stress. The prediction might be spoken of as a prognosis which provides the impetus for intervention.

Sarbin gives detailed methods for achieving each step of the process. He identifies strategies of search for functionally relevant input for cue formations, as well as the factors that influence the acceptance of input as cues. He describes the process of instantiation as the formalization of cues into a general class to produce a minor premise.

Sarbin describes the ecological dimensions (environment or milieu) in which the observation of occurrences takes place. He notes that the inferrer-inferree encounter occurs in an action context and that the inferring person is constantly interacting with occurrences of many kinds (1960, p. 51). The ecology includes value systems and beliefs, both of society and of the individuals in the encounter. In addition, operational procedures, role structures and expectations, time and space, and any other constraints which may be said to exist in a relationship between two individuals who are engaged in the act of perceiving each other, are a part of the ecological dimension.

Sarbin outlines three search strategies used by the clinician when making an observation of an occurrence. These include:

1. Scanning, or the act of perceiving cues which stand out from the background and gain the attention of the inferring person.
2. Scrutinizing, or the act of taking a second look and questioning oneself as to the validity of the scanned perception.
3. Probing, or the act of gaining additional information from the client through questioning, touching, reading client records, smelling, and the like.

Scanning and scrutinizing are observable in the action context of the ecological dimension but must be inferred by inferrer movement to probing activities in the absence of the ecological dimension. For example, in a previous study (Fields, 1978), the researcher found a high correlation between expected and observed frequencies of nurse scanning activities in the actual clinical situation but no correlation of expected and observed frequencies of nurse scanning activity in a simulated clinical situation. Scanning and some elements of scrutinizing are visible in nurse behavior in the nurse-client situation but must be inferred as having occurred in a simulated nurse-client situation evidenced by the nurse's beginning and probing activities.

Sarbin states that three factors exist which enhance the acceptance of the perceived cues: potency of the cues,

relevancy of the cues, and multiplicity of the cues. The more potent or relevant the cue, the more likely the cue is to be accepted for use. Many cues of similar or like characteristics lead to acceptance of the basic cue for use.

Once the cues are gathered, they are taxonomically sorted against the existing classifications (patterns or clusters), and a minor premise is generated from this instantiation (instance of a class). The major and minor premises are then collocated and compared, and the conclusion (nursing diagnosis) or inference flows logically from this comparison. The prediction evolves from the conclusion, and is weighted by new major premises formed from postulates and combinations of conclusions from previous inference. Sarbin's Syllogistic Model provides a framework for the assessment step of the nursing process, and provides the missing step between standard I (data collection) and standard II (formation of a nursing diagnosis) of the Standards of Nursing Practice (1973).

Logical Clinical Inference Model for Nursing

In the following discussion of the proposed model, nursing concepts and terminology will be used as they compare to concepts in the Sarbin Model in an attempt to facilitate understanding.

Step 1. The concept of Sarbin's postulate-system is comparable to a nursing model, such as Neuman's Model (Riehl

and Roy, 1974, p. 100), which may be seen as a particular postulate-system in which the subconcepts and assumptions may be viewed as the major premises of this particular model.

Step 2. Sarbin states that major premises are formed by induction from the postulate system through the colligation of modules. Groups of modules (the molar structure) are already in existence when stimulation of the organism occurs and imposes some holistic imprint onto the perception of the occurrence (Sarbin, 1960, p. 28). In the instance of Neuman's Model, assumptions are the major premises formed from the colligation (joining together) of concepts (modules). For example, one of Neuman's assumptions states that ". . . each person has an internal set of resistance (lines of resistance) factors which attempt to stabilize and return him to his normal line of defense should a stressor break through it" [investigator's emphasis] (p. 100). The underscored words are concepts within the model and would be considered modules in Sarbin's Model. The concepts have been colligated to form an assumption or major premise. The major premise is located on the left side of the Logical Clinical Inference Model for Nursing (Figure 1).

Step 3. This step of the Logical Clinical Inference Model is the obervation of occurrences. As noted in the upper right structure of the model (Figure 1), the nurse and client are interacting and perceiving in an action context

within an ecology (ecological dimension) based upon their roles, values, beliefs, settings, constantly-revised perceptions, knowledge, expectations, and policies and procedures of the institutional setting. Within this milieu, the nurse uses structured search strategies to collect from the client data which will assist in forming a minor premise or premises about this client. The nurse will first scan the client to see if any one particular cue (sign or symptom) stands out from the client or his envirnoment. Should the nurse perceive any cue through scanning, then scrutinizing is employed by internal self-questioning by the nurse about what exactly is being seen, heard, smelled, or felt. For example, the nurse might ask, "I wonder if the client is as anxious as he appears?" or, "Is that a red rash on his arm?" The nurse will use probing to seek answers to these questions about initial observations. The nurse might choose to touch the red rash, or ask the client if he is anxious. Probing involves physical assessment of the client, asking questions, and generally probing in a number of ways to gain data or cues from the client.

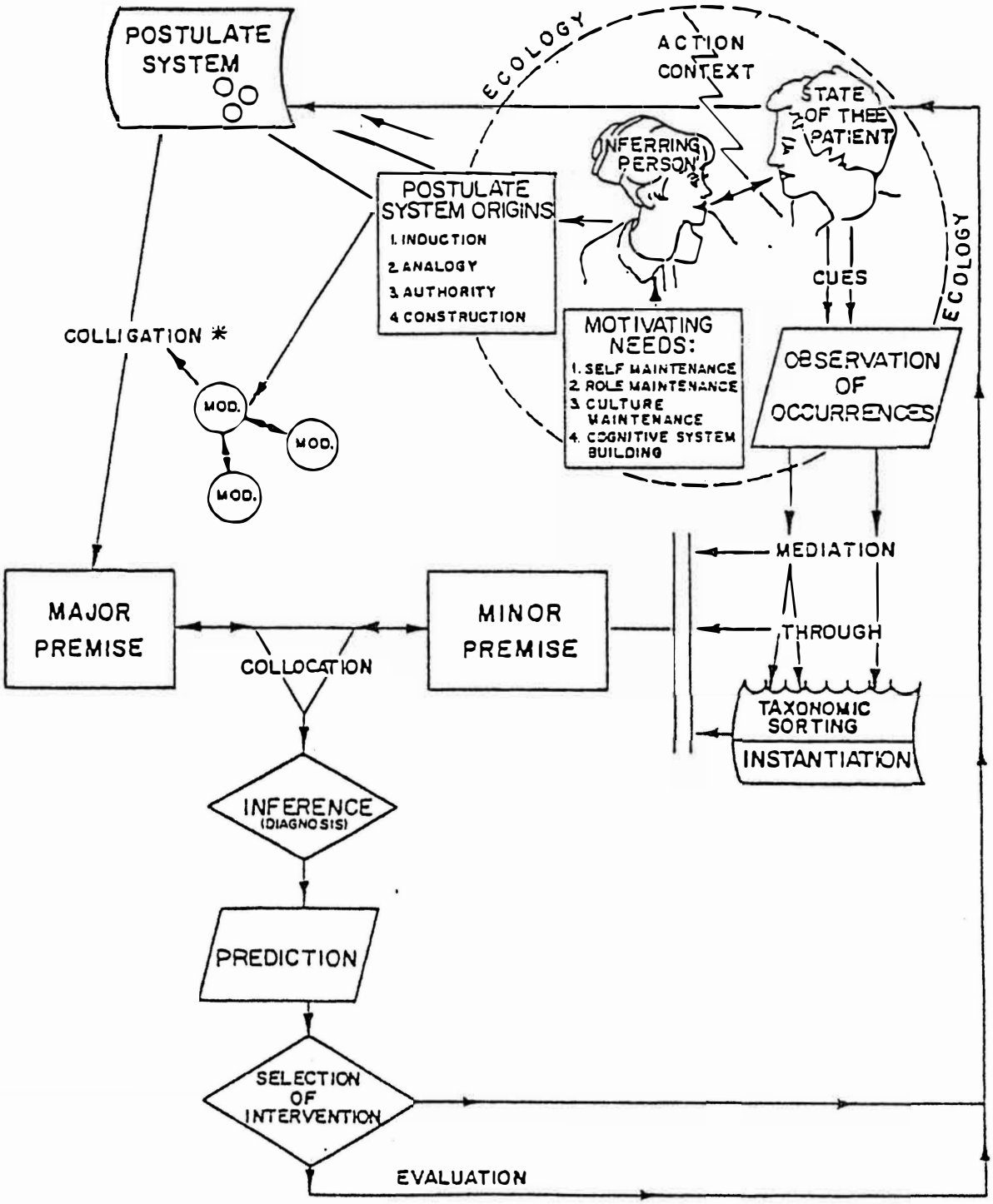
Before mediating the cues, some explanation of the taxonomy may be in order. A taxonomy is that organization of characteristics which define or describe a class. For example, the National Conference on Classification of Nursing Diagnosis has identified the characteristics of the taxonomic

classification of the diagnosis of "impairment of urinary elimination" as: "impairment of ability to control initiation or cessation of urine flow (incontinence or retention), inability to generate (produce) urine" (Gebbie and Lavin, 1975, p. 110). Therefore, the nurse would have in his/her knowledge base or postulate system a classification of "impairment of urinary elimination" which would contain all of the characteristics or cues just mentioned. When the client presented these cues, the nurse would taxonomically sort the perceived cues and would, through this process of instantiation (matching input cues to characteristics of the set in the taxonomy), form a minor premise. Utilizing the Neuman Model, the nurse might instantiate the client as being incontinent, and form a minor premise that the client has a break in the physiological line of defense.

The minor and major premises are then collocated (set side by side, or juxtapositioned) and compared. If the nurse has used the major premise, Neuman's assumption, that "When the cushioning, accordion-like effect of the flexible line of defense is no longer capable of protecting the individual against a stressor, the stressor breaks through the normal line of defense." (Riehl and Roy, 1974, p. 101). Then a comparison could be made between this major premise and the minor premise that the client has a break in the physiological line of defense. The resulting inference,

FIGURE I

LOGICAL INFERENCE MODEL FOR NURSING



* MODULAR COLLIGATION (LINKING OF TWO OR MORE MODULES)

conclusion or nursing diagnosis might be that the client has "urinary incontinence related to penetration of the normal line of defense by a physiological stressor."

Based on previous major premises and the combination of previous conclusions or inferences, the nurse may be able to predict that unless action is taken to keep the client dry, he will experience further breaks in the line of defense in the area of the skin barrier. Thus, the nurse is able to predict beyond the initial inference if there are previous inferences and major premises in the nurse's postulate-system.

Formation of the Minor Premise

Due to the complexity of the model, the investigator has chosen to limit this study to the investigation of search strategies and instantiation activities required in the formation of the minor premise. The formation of the Minor Premise Model (Figure 2) seeks to explain in greater detail steps 3 and 4 of the Logical Clinical Inference Model for Nursing (Figure 1). The Minor Premise Model has been designed with computer flowchart symbols to illustrate the movement through steps 3 and 4 as they might occur in the mind of the inferring person.

Step 3, observation of occurences, is symbolized by the computer flowchart symbol for input of data, for, in

truth, the nurse is inputting data from the client. Within the parallelogram, the search strategies have been identified with process rectangles. Since the input acceptance factors are generally thought of as a test, these factors have been symbolized as the test diamond.

As the cue is scanned, it is tested by the inferring person for its potency and relevancy. A very strong cue such as the sight of blood, could be said to be potent. If, through scanning, the nurse observes an arterial bleeder, then both the presence of blood and the arterial bleeder are relevant to each other. With the presence of both these cues and a decrease in blood pressure ascertained through probing, the cues have multiplicity, and the probability of their use in cue formation is greatly increased. Should the perceived cues not have potency, relevancy, or multiplicity, they are generally abandoned somewhere in the search. However, the case may exist in which cue is not relevant or multiple, but is potent enough to be retained by the nurse for later use. At times, the cue may be present but inaccessible; that is, not able to communicated, and the nurse will retain the cues for future use. For example, a child may not "look" just right and the cues are not strong enough to be verbally communicated. In these cases, the nurse may mentally label the child as looking as though something is wrong with him. Strange or unexpected deviations on the electrocardiogram

are frequently spoken of as "FLB - - funny little beats" until further cues are emitted by the client and perceived by the nurse.

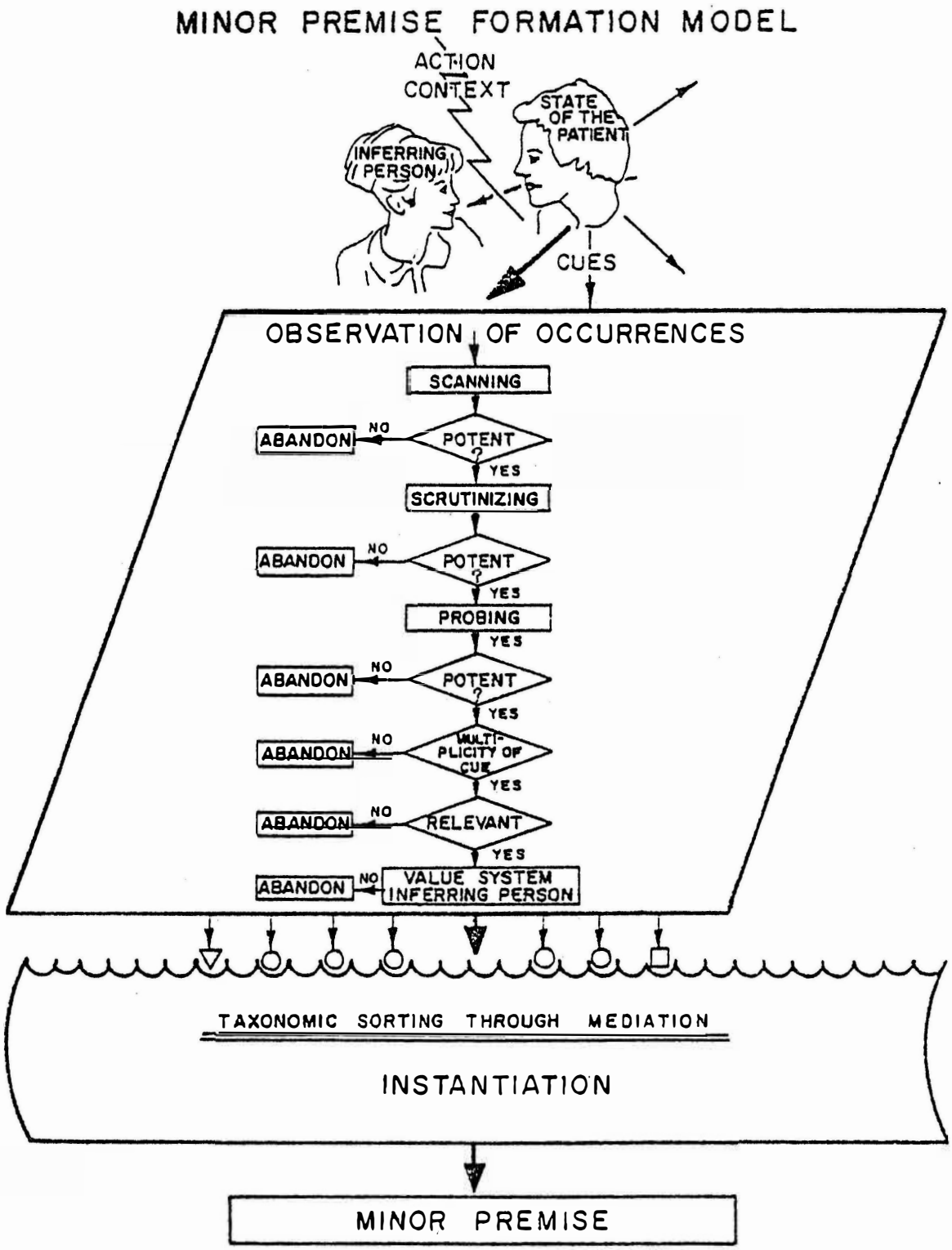
Nurse validation of cues with the client has not been mentioned to this point. Validation of cues is carried out as a part of the probing strategy since this strategy involves the questioning of the client relative to those cues which have been scanned and scrutinized.

The value system of the inferring person plays a part in "acceptance of cues" by the nurse (Sarbin, p. 160). For example, if the nurse believes that Italian women are emotional and do not respond well to pain, the nurse may choose, because of his/her value system, to ignore the verbal cues of pain in the Italian female client. The nurse will not proceed to probe for further cues because his/her value system has rejected the client's verbal cues. Due to the complexity of the subjects, the value system variable will not be examined in this study.

As stated earlier, the taxonomy is an organization of characteristics of a class, and the process of instantiation is the matching of cues with characteristics or instances of the class. A knowledge of the characteristics of the class is essential, and is acquired in the same way as is the postulate-system; that is, through induction, authority, construction, and analogy. Most current textbook signs and

symptoms have not been validated in the clinical area and are not the same in every textbook, according to Kelly and Hammond (1966c, p. 238). Textbooks, faculty, and experience are the major avenues nurses use for developing a knowledge of the characteristics of disease entities. However, in addition to nonvalidation of cues, no determination of the number of cues or identity of the critical cues has been made to assist in classifying cue patterns. Therefore, clinical inference is probabilistic in nature, since many of the cues do not occur every time in the specified state-of-the-patient. The probabilistic nature of clinical inference will not be examined in this study. Probability stems from the degrees of instantiation which is possible when matching cues with characteristics of the set within the taxonomy. At present, neither nursing nor medicine has determined through research which cues form a set or which critical cues are necessary to insure a correct inference in every instance of the set. In fact, the professions cannot yet determine with what frequency a correct inference can be made from the perceived cues. The future standardization and validation of cues in a particular diagnostic category by the National Conference on Classification of Nursing Diagnosis may help to reduce the current probabilistic nature of nursing clinical inference. Structured research strategies will decrease the pre-

FIGURE 2


MINOR PREMISE FORMATION MODEL
ACTION CONTEXT
STATE OF THE PATIENT
INFERRING PERSON
CUES
OBSERVATION OF OCCURRENCES
SCANNING
ABANDON
NO
POTENT ?
YES
SCRUTINIZING
ABANDON
NO
POTENT ?
YES
PROBING
YES
ABANDON
NO
POTENT ?
YES
ABANDON
NO
MULTI-PLICITY OF CUE
YES
ABANDON
NO
RELEVANT
YES
ABANDON
NO
VALUE SYSTEM INFERRING PERSON
TAXONOMIC SORTING THROUGH MEDIATION
INSTANTIATION
MINOR PREMISE

mature closure of a minor premise or hypothesis if the nurse must carry out a step-by-step search for cues.

Sarbin states that cues are merged during the process of instantiation and taxonomic sorting, and that a minor premise summing up the state of this particular client is formed. Since that nurse is gathering from a sample of one during the assessment of the client, the process of forming a minor premise is a deductive one and has to be spoken of as a probability.

The proposed Formation of the Minor Premise Model will be examined in the present study. An investigator-prepared tool will be used to look at nurses' use of search strategies and instantiation activities. The investigator believes that the formation of the minor premise can be taught and eventually used to assist in standardizing diagnotic categories. For the purpose of this study, the following assumptions were identified:

1. A major function of nursing is the formation of a clinical inference about the state-of-the-patient.
2. Accurate observations are essential to accurate clinical inference.
3. Client data is more effectively collected through the use of systematic search strategies.
4. The formation of a clinical inference requires a basic knowledge of cue clusters characteristic of client needs.

5. Clinical inference is a cognitive activity which can be described, taught and evaluated.
6. A clinical inference is the basis for formualation of nursing interventions.

Definition of Terms

1. Clinical inference is a conclusion or nursing diagnosis which follows from the collocation (placing together or juxtapositioning) of the major premise, derived from the clinician's postulate-system, and a singular minor premise achieved through observation (Sarbin, 1960, p. 83).
2. Taxonomic sorting is the processual aspect of instantiation in which an occurrence is sorted as a menber of a species or class (Sarbin, 1960, p. 58).
3. Taxonomy is ". . . a formal classification system for the effective sorting of persons for specific purposes . . ." (Sarbin, 1960, p. 56) through selection and utilization of defining characteristics previously determined to be an instance of a class.
4. Postulate-system is the ". . . interlocking dimensions, categorial systems, taxonomies, axioms, assumptions, concepts, schemata, expectancies, attitudes, rules syntax, primitive terms, and the like" (Sarbin, 1960, p. 48) held by the individual and originating from induction, construction, analogy, and authority.

5. Module is the combined influence of directive factors deriving from past experience and the present situation of the observer which function to produce the conditions of expectation in which the observer is alert and knows what to look for, classify, understand and name data, and draws from them the inferences that give the meaning to the percepts (Sarbin, 1960, p. 29).
6. Inference is the cognitive transformation of one set of events through another set of events which produces new knowledge about the first (Sarbin, 1960, p. 45). Inference involves a process whereby specific sensory events are transmuted to instances by being compared or collated with some form of residual, such as an exemplar, memory image, a trace, or a class (Sarbin, 1960, p. 45).
7. Search strategies are techniques used by the observer to collect data. Three types of search strategies are used: (a) Scanning is a technique of observation in which an observer's senses detect cues which stand out from the background, i.e., apparent age, sex, degree of nourishment, skin color and tone, posture, tremors, tonus, overt client emotional status, body position, and facial expressions. (b) Scrutinizing is a technique for gathering cues which requires a closer or second observation by the observer, i.e., was the tremor fine or course? Was the speech slurred? Was the bruise blue or black? Was the

face drawn? Was the client's behavior withdrawn?

(c) Probing is a technique which requires the observer to direct his attention to cues which must be uncovered. The observer is instrumental in producing cues, i.e., ask questions, auscultate, palpate or percuss the client's body (Sarbin, 1960).

8. Cue is an input information unit that serves as a critical link in the process of taxonomic sorting and instantiation (Sarbin, 1960).

9. Instantiation is the treatment by the observer of input information as if it were an instance of a class. Synonyms: perception, categorization, classification (Sarbin, 1960).

10. State-of-the-patient is the covert condition of a client which is not directly observable but which emits informational units about which inferences are made (Sarbin, 1960).

11. Input acceptance factors are special characteristics of informational units which will strengthen the probability for use in cue formation. The factors are: (a) Potency is a distinct or unusual informational unit which stands out from the background or the environment. Potency does not imply a higher validity in resultant judgments and decisions but has a higher probability in cue formation, i.e., a speech impediment in an otherwise quiet

and relaxed client, a dirty emesis basin in an otherwise clean room. (b) Relevancy is the relationship of the informational unit to the whole of cue formation, i.e., the size of the great toe is not relevant unless it has a relationship to a newly applied case. (c) Multiplicity is the presence of more than one informational unit which is received by the observer from more than one source or in rapid succession, i.e., a rapid pulse and pallor as opposed to just the presence of pallor. If informational units are inconsistent with each other, their use in cue formation is reduces (Sarbin, 1960).

Operational Definitions

1. Clinical inference is achieved by the subject if he/she selects a researcher-designated sequence of responses on each of the three problems in the Simulation Exercise. The expected sequence of responses for each of the problems is as follows: (a) Problem I: Pages 3, 8, 6, 11, 15, 17, or pages 9, 6, 16, 11, 15, 17. (b) Problem II: Pages 18, 26, 31, 32, 34, or pages 18, 26, 27, 31, 32, 34. (c) Problem III: Pages 35, 41, 39, 43, 45, 46 or pages 35, 39, 41, 43, 45, 46.
2. Inference consistency is measured by the frequency and percentage of subjects having correct clinical inferences across all three problems in the Simulation Exercise.

3. Non-inference is a response pattern on the Simulation Excercise, determined by item response analysis, which indicates that the subject fails to continue data collection and calls the physician early in the problem situation.
4. Search strategies are being used by the subject if he/she selects the identified responses which indicate data collection activities (responses pages 3, 9, and 6 or 9 and 6 of Problem I; 18 and 26 of Problem II; pages 35, 41, 39 and 43 or 35, 39, 41 and 43 of Problem III.
5. Taxonomic sorting is evidenced by the subject when, having completed the search strategies correctly, he/she reaches a correct conclusion or inference based on cue assessed from the search strategies. The following responses in the situation have been identified as inference or diagnosis choices and taxonomic sorting will be determined through analysis of these choices: (a) Problem I: Pages 16, 11, 15, and 17. (b) Problem II: Pages 31, 32 and 34. (c) Problem III: Pages 43, 45, and 46.

Limitations

Limitations imposed by the investigator in the proposed study which have an effect on the generalizability of the findings include: size of sample, setting, regional area of

the study, educational preparation of the subjects, character and written nature of the tool, and explicit nature of the clinical examples in the Simulation Exercise. The Simulation Exercise cannot directly measure scanning and scrutinizing due to its written form, but nurse probing activity indicates that scanning and scrutinizing have occurred. Variables which have not been controlled include: current knowledge level of the subjects relative to the subject material covered by the clinical examples used in the simulation tool and the effect of the value/belief system of the subject on cue selection and cue formation.

Summary

Chapter one demonstrates a need for the study and presents the Logical Clinical Inference Model for Nursing for the investigation of search strategies and input acceptance factors used by nurses to collect client data and to determine the correctness of nursing clinical inferences. The study is limited to the Formation of the Minor Premise Model for clinical inference due to the complexity of the total Logical Clinical Inference Model.

The theoretical framework for the models is drawn from Sarbin's Syllogistic Model and Cognitive Theory and most assumptions and terms are derived from Sarbin, Taft, and Bailey (1960). An explanation of the proposed models as

related to nursing is illustrated with examples from Neuman's Model (Reihl and Roy, 1974).

The nursing and psychological literature support the concepts of inference and diagnosis over a period of the last twenty-nine years and the investigator feels that the proposed model will act as a magnet to unite many of the previous concepts and research findings.

CHAPTER 2

REVIEW OF THE LITERATURE

An examination of the literature revealed that literature related to or speaking directly to clinical inference was minimal. Therefore, the literature review dealt mainly with research and articles concerned with nursing diagnosis, search strategies and instantiation, or nursing activities descriptive of search strategies the the diagnostic process. The following areas of the literature were reviewed: (a) Historical Development of the Problem. (b) Research Findings Related to the Problem. (c) Literature Related to the Problem.

Historical Development of the Problem

The concept of nursing diagnosis had its basic inception in 1950 when McManus (1950) focused on patient problems or conditions. Fry (1953) used the term nursing diagnosis in her concept of the "creative approach to nursing". In an effort to describe the responsibility assumed by the nurse in patient care, Nornung (1956) used the term nursing diagnosis and sought to end vague descriptions of patient conditions.

During the 1960's, emphasis was placed on clinical judgments which went beyond concrete signs and symptoms (Gordon,

1979, p. 487). The nursing process emerged as a methodology for identifying needs for clinical care and the assessment step was frequently viewed as a description of the symptoms. No step in the process was delineated for movement from signs and symptoms to a statement of the patient's need for nursing care.

Komorita (1963) used the term "nursing diagnosis" to denote the previously-used terms "problem" and "need" (p. 83). Durand and Prince (1966) stated that the diagnostic process was a conclusion reached after investigation of a patient and recognition of a pattern (p. 55). Rothberg (1967) advocated nursing diagnosis since it emphasized a focus on the whole person.

Clinical inference, as an alternative term for nursing diagnosis, was used by Kelly in 1964. In their research, Kelly and Hammond (1966) defined clinical inference as "a conclusion or judgment made in the ward situation when the inferrer (the nurse) is in a face-to-face relationship with the person-object, the patient" (1966d, p. 315). Kelly and Hammond based their research on the theoretical framework of Sarbin, Taft, and Bailey (1960) and Bruner (1956).

Research Findings Related to the Problem

The diversity of search strategies among registered nurses was documented by Kelly and Hammond (1966a) in their

research. Kelly (1-66a) reported that, "Nurses have their own unique systems" (p. 25). Kelly and Hammond were the first and only researchers to look specifically at the total nursing inference, its component parts of informational units, search strategies, hypothesis testing, and the reasons for problems in the accuracty of clinical inference.

In their findings, Kelly and Hammond stated that:

1. No single cue transmitted a significant amount of information by itself to substantiate an action (1966b, p. 137)
2. When cues were analyzed singly, the informational value to the nurse was small (1966c, p. 236).
3. No group of cues, whatever the arrangement, were found to be related to the inference made by the nurse subjects about the state-of-the-patient (1966c, p. 243).
4. Nurse subjects did not consciously discriminate between the usefulness of various cues nor did the nurses' confidence in their decisions vary over cases (1966c, p. 243).
5. The nurse did not pursue a perfect strategy (1966a, p. 332).
6. No two nurses used the same strategy and none of the nurses used the same strategies with each case with success (1966a, p. 335).
7. The nurse is faced with an "uncertainty-geared" task when she infers the state-of-the-patient (1966a, p. 29).

Gordon (1972) examined the strategies or methods individuals used to attain a concept when the information was associated with uncertainty. Basing her study on Bruner, Goodnow and Austin (1956), Gordon looked at the use of single and multiple hypothesis testing by nurses with high and low inferential abilities. She correlated the types of inferences which resulted in restricted and unrestricted information

trials, and the degree of confidence of the subject in the resulting inference.

Gordon's findings indicated that:

1. A mixed strategy combining single and multiple hypotheses testing was used in formulating an inference.
2. Multiple hypotheses testing was used with greater frequency and had greater predictive strategy component in the first half of each of the two tasks used to formulate an inference.
3. Subjects with higher inferential abilities did not use multiple testing more frequently, use more highly valid attribute tests, or have higher accuracy of and confidence in their inferences.
4. Cognitive strain increased the use of multiple hypothesis testing but did not increase the use of highly valid attribute tests, nor did it decrease accuracy of, or confidence in, the formulated inferences.

Gordon's findings appear to support those of Kelly and Hammond since no consistent search strategy was found to be used by nurses.

Aspinall (1966) examined the knowledge bases of 187 nurses for the presence of cue patterns necessary to identify twelve possible problems to be found in a hypothetical case study of a patient who suddenly exhibited an impairment in his ability to process thoughts. The subjects listed one to

nine of the twelve possible problems with a mean of 3.44; Master's degree graduates, a mean of 3.93; diploma graduates, a mean of 3.23; and associate degree graduates, a mean of 3.35.

A correlation of the results was carried out in which the nurses were divided into three groups: those with two years' or less experience, two to ten years' experience, and ten years' or more experience. There was no statistical difference between the number of problems identified by the group with two years' experience and the group with two to ten years' experience. When these two groups were compared with the group with ten or more years' experience, the differences in the mean number of problems they identified was significant at the .01 level. Aspinall concluded that:

> The results indicate that most nurses included in the study apparently lacked both the theoretical knowledge that could be responsible for physiological or psychological dysfunction, and a strategy that could enable them to evaluate the cues described in a case study and to focus on the pertinent problems (p. 436).

Aspinall further concluded that:

> Since all nurses had at least some theoretical education, it appears that many of them do not retain the theory or do not know how to apply it to the solving of a problem in nursing practice (p. 436).

She stated that the poor performance of the nurses with ten or more years' experience may have been due to the nurses' inability to stay abreast of new areas of knowledge and skill or to have benefited from clinical experience.

In a second study (1976), using a decision tree for specific behavior outlined in a written case study, Aspinall divided the subjects into thirty triads which were formed by matching the nurses on the basis of educational background, length of experience and performance in a previous study of problem identification. Group A was given only the case study. Group B was given the case study and a list of 18 disease states that could cause the behavior in a general population of similar patients. Group C was given the same information as the first groups plus a decision tree for each of the 18 possible diagnoses which enabled Group C subjects to systematically use the information to rule in or rule out the diagnosis.

Out of the six correct responses, Group C gave the highest number of correct diagnoses and the lowest number of incorrect ones. Nurses with less than two years' experience and those with more than ten years' experience profited most from the use of the decision tree, while nurses with two to ten years' experience had the highest number of wrong diagnoses. Aspinal concluded that the nurse with two to ten years' experience relied more on experience than on the decision tree. Those nurses who followed the decision tree had a higher number of correct diagnoses, four of the correct ones. Aspinall's findings appear to agree with the findings of Kelly and Hammond that nurses do not have a systematic

search strategy that would enable them to evaluate cues and focus on pertinent problems.

Fatzer (1979) examined the relationship between logical reasoning and nursing diagnosis using a simulated patient situation questionaire and a logical reasoning test. Seventy-two Master's level students were selected from a population of the five hundred students in a college of nursing by means of purposive sampling. Fatzer found that thirty subjects, forty-four percent, gave medical diagnosis, of which only twenty percent were valid. Twenty-nine subjects, or fifty-six percent of the sample, gave nursing diagnoses, with eighty-two percent of the nursing diagnoses being valid. Statistical manipulations to determine the relationships between clinical inference reasoning, valid diagnosis and logical reasoning were conducted and revealed that the relationship between clinical inferential reasoning ability and logical reasoning ability was the only significant correlation.

Matthews and Gaul (1979) compared the relationship between concept attainment and cue perception and the relationship between critical thinking and the ability to derive a nursing diagnosis. The study samples included senior level undergraduate nursing students and graduate students enrolled in a clinical nursing course. No overall relationship was found between the ability to derive nursing diagnoses and to

think critically. A strong relationship was found to exist between cue perception in nursing diagnosis and the scores on the Concept Mastery Test among undergraduate students. No relationship was found to exist for graduate students between concept attainment and cue perception.

Each of the studies (Fatzer, 1979; Matthews and Gaul, 1979) indicated the need for discriminative cues to be identified for every nursing diagnosis and implied that development of a nursing diagnostic taxonomy would reduce the ambiguity in making valid nursing diagnoses. One of the implications for nursing form Fatzer's (1979) study states that, "Full use of nurses' logical and inferential abilities in nursing diagnosis may require the abailability of clear diagnostic categories, classification schemes, and common frames of reference provided by nursing theories" (p. 22).

Literature Related to the Problem

Nursing Literature

During the 1960's and 1970's, nursing did not speak specifically of search strategies and cue formation, but many nursing leaders (Abdellah, 1960; Orlando, 1961; Weidenbach, 1964; Roy, 1970; Orem, 1971; and King, 1971) emphasized in general terms those same areas of the inference process when discussing the nurse's assessment or observation of the

patient. Comparisons have been made between statements in related literature and the proposed theoretical framework.

Abdellah (1960) described the general areas of scanning, scrutinizing, and probing, as well as the area of instantiation, when she discussed the five basic elements of nursing practice:

> The first element is the continuous mastery of human relations, including the mastery of technical and managerial skills needed to take care of patients.
>
> The second element is the ability to observe and report with clarity the signs and symptoms, and deviations from normal behavior, which a patient presents. This element would include the matery of basic communication skills.
>
> The third element is the ability to interpret the signs and symptoms which comprise the deviation from health and constitute nursing problems . . . .
>
> The fourth element requires the analysis of nursing problems which will guide the nurse in carrying out nursing functions and the selection of the necessary course of action which will help the patient attain a goal that is realistic for him, as she plans for total patient care.
>
> The fifth element is the organization of her efforts to assure the desired outcome . . . . This process may be referred to as nursing diagnosis and treatment (p. 26).

Elements two and three described the characteristics of scanning, scrutinizing, and probing - - components of the search strategy detailed by Sarbin (1960) in his description of the observation of occurrences, step three of the Logical Inference Model. The analysis of nursing problems in the fourth element corresponded to instantiation, the classification of cues or signs and symptoms into instances of a class or pattern. The classification of input data or cues into

cue clusters or patterns permitted the nurse to form and test hypotheses to arrive at a "nursing problem" in Abdellah's terminology.

Orlando (1961) alluded to the inference process when she stated:

> The observation of the patient and the almost infinite variety of activities which nurses carry out need to be studied in relation to one another; that is, as they affect the process of caring for the patient. Otherwise, there appears to be no professional justification for either the observation or the activity (p. 7).

Orlando further believed that, ". . . the natural consequence of observation is a decision to act or not to act in relation to what is observed" (p. 7). She described a "Deliberative Nursing Process" (p. 68) in which the process of arriving at an action was based on a process of ascertaining the patient's immediate need. Orlando demonstrated great concern for the practice of observing by stating that:

> A nurse's observations (observations comprise all the information pertaining to a patient which the nurse acquires while she is on duty) are the raw material with which she makes and implements her plans for the patient's care (p.6).

Chambers (1962) identified five actions by the nurse which resembled search strategies and instantiation in the making of a clinical inference. Observation (scanning and scrutinizing), communication and testing (probing) represented her search strategies. She advocated the use of the literature, conferring with peer groups on nursing problems,

and the stockpiling of experience from previous patient care to establish cue patterns. These nurse actions were the same activities which were a central focus in Sarbin's Clinical Inference Theory and described the same techniques used to instantiate a cue into a general class.

Wiedenbach (1964), in her book, Clinical Nursing: A Helping Art, discussed the relationship between deliberative action and the components of nursing practice. She identified three components of nursing practice: identification, ministration, and validation. Relative to identification of a patient's need-for-help, she explained four distinct steps in the identification process. Step one involved the nurse's use of the powers of observation; that is, going beyond simply looking and listening. The nurse was to look and to listen for inconsistencies in what the patient said, the way he said it, how he looked, and the nurse's expectations of how he should have looked. Wiedenbach felt that, ". . . recognition of inconsistencies does not mean that the need-for-help" (p. 53). The second step was a validation of the way a patient meant a cue; that is, the word, look, or gesture which had alerted the nurse to an inconsistency in patient behavior and verbalization. The third step was a determination of the cause of the patient's discomfort, which Wiedenbach felt included taking the patient's vital signs, inspecting the patient, palpating his body, and questioning

him relative to his discomfort. She stated that, ". . . such a search for cause may lead the nurse to the patient's problem, and thus to the gross need he is experiencing. It does not tell her, however, whether the need is a need-for-help" (p.54). The final step was the establishing of the patient's self-care powers of his need for help in meeting his own need.

Step one of Wiedenbach's identification of the patient's need-for-help component describes the scanning process. The cues obtained through scanning in the manner described must be followed by Wiedenbach's steps which correspond to the search strategy component of scrutinuzing. The strategy of probing is described well by Wiedenbach in the third step of the patient's need identification, since it demonstrates validation with the patient, which is part of the probing process.

While Wiedenbach did not go on at this point to describe the process of instantiation, she did list the concepts of the nurse's beliefs, values, knowledges, and skills as elements required for ministration of help needed. These concepts weigh heavily in the acceptance of cues during the formation of the minor premise in the Logical Inference Model.

Roy (1970) discussed a two-level assessment process which at the first level identified the patient's behaviors in each of the adaptive modes and placed the patient on a

health-illness continuum. Roy stated that the data required for first level assessment were both objective and subjective. Roy's description of a typical patient situation strongly suggests the scanning strategy, since some behavior, or lack of expected behavior, drew the attention of the nurse. The scrutinizing process was alluded to in the typical situation because the nurse apparently takes a second look to determine the need to proceed to second level assessment.

In the second level assessment, the nurse looked for focal, contextual, and residual factors which were influencing the patient's behavior. Again, the typical patient study involved questioning or examining the patient for further support information. These types of behavior on the part of the nurse were descriptive of the probing strategy found in the Logical Inference Model.

Specific value systems of the nurse are not described in the Roy Model, but four basic values are ". . . assumed to be manipulated by the nurse to assist the patient in the adaptation process.

Oren (1971) felt that a nurse might need assurance that the nursing actions selected and performed in some sequential relationship would be beneficial for the patient. She believed that this assurance was available to the nurse who recognized that foresight had been used in selecting the most appropriate nursing actions for the patient. Orem supported

this belief by stating:

> . . . the necessary foresight may be acquired by systematically determining why a person requires nursing. This information, after analysis and interpretation appropriate for obtaining a nursing perspective, enables the nurse to make judgments about the characteristics of the nursing care that will make a therapeutic contribution to the patient's achievement of health and self-care goals.
>
> Information about why a person needs nursing and a nurse's judgment about the kind of nursing required are the framework for designing a system of nursing assistance and a nursing plan (p. 156).

Orem devoted several paragraphs in her book to the nursing process in which she described nursing activities identical to those activities characteristic of Sarbin's observation of occurrences. Orem inferred nursing assessment when she stated:

> The nurse, in making observations of the patient or of records and reports on the patient, determines initially and continuously all the evidence that will enable her to understand the patient's health state (p. 159).

Orem's illustrations of the necessary information to be collected and its sources were typical of the information gained through the use of search strategies.

King (1971) described nursing as ". . . thinking, judging and acting relative to the health status manifested in the behavior of individuals and groups . . ." (p. 97). She believed that"

> One of the primary responsibilities of nurses is the objective assessment of functional abilitites and disabilities of individuals and groups in nursing situations and the planning of purposive, goal-directed care (p. 90).

King's nursing process diagram involved both the nurse's and patient's use of perception, resulting in a two-way activity with judgment:

Nurse <---> Perception <--> Judgment <---> Action
⇕ Reaction-Interaction-Transaction
Patient <--> Perception <--> Judgment <---> Action

(p. 92). King's term, perception, seemed to be the necessary technique for gathering information on which to base an inference; however, King inferred that a systematic approach to perception was to be used. King described perception as:

> . . . a means whereby individuals experience direct contact with the environment. Perception involves the transaction of the human organism with environmental stimuli. An act of perceiving is a function between the perceiver and the event, person, or object being perceived (p. 93).

She goes on to say:

> In many instances, nurses demonstrated intuitive cognition relative to perceptual cues in the situation . . . . The raw materials consist of the nurse's perception of the actions and reactions of the patient (p. 94).

King's use of the term "intuitive cognition" described a perceptive awareness of a previously inaccessible cue, possibly received through scanning, which made the nurse able to systematically gather further patient cues to support the initial perception.

Most nursing authors have spoken in general terms about the collection of patient data through the systematic use of observation. None have described the systematic process to

be used. None of the authors spoke, beyond the need for basic knowledge, to the need for specific cue clusters, patterns, or classes, and only very generally to the types of knowledge base required by the nurse.

Nursing has drawn very little from the social sciences in the area of the inference process where most of the research was conducted in the fifties and sixties. King (1971) was the first nursing author to discuss perception and its use. Kelly and Hammond's research has been available since 1966, but few nurses (Gordon, 1972; Doona, 1975; and Grier, 1975) have followed up on the findings. Hardy (1974) stated that:

> Unless nurses can asses the knowledge generated . . . they cannot use that knowledge wisely and constructively . . . . If nurses intend to direct their own actions in a responsible manner, they must become well informed on developing knowledge, they must be able to evaluate critically the knowledge developed, and they must make informed judgments based on this knowledge (p. 100).

Doona (1975) designed a fourteen-step judgment paradigm which she felt could be ". . . used by nursing as a working hypothesis situation (p. 34). She felt that:

> Nursing, if it is to continue in its development as a science, needs to understand how practical judgments are linked with knowledge in human intellectual functioning so that this linkage may be used consciously within the nursing situation (p. 33).

Doona believed that, "Judgment, as a cognitive skill, is seen by the profession as essential to a nurse's ability in

perceiving needs for nursing care and in providing that care" (p. 33).

Literature From Other Disciplines

The field of psychology, triggered by studies of perception during and following World War II, began to examine clinical inference and its component parts during the mid fifties and sixties. Bruner, Goodnow and Austin (1956) analyzed the sequence of decisions of individuals who were employed in solving a problem. They were able to describe search strategies used in hypothesis testing in concept attainment. Bruner and his associates described two types of strategies: selective scanning and simultaneous scanning. Selective scanning involved the use of one attribute or characteristic to test a single hypothesis. This strategy was time consuming and the subject might not select a valid attribute to test. One by one each hypothesis was tested and discarded if not confirmed.

Simultaneous scanning rapidly decreased the number of hypotheses but taxed the memory and produced cognitive strain. Bruner (1951), whose work was based on personality theory, described a hypothesis as ". . . an expectancy related to more integrated systems of belief or expectancy about the environmental events in general" (p. 94). He outlined and described five determinants of hypothesis strength: frequency

of past confirmation, monopoly, cognitive consequences, motivational consequences, and social consequences. He stated that a more frequently confirmed hypothesis would require less environmental information to confirm it.

When an individual had only two or three possible hypotheses to confirm in his environment, the greater was the monopoly of the hypotheses and the greater their strength would be. The larger the number of supporting hypotheses, the greater would be the strength of the hypothesis being tested.

Bruner stated that the more likely a hypothesis was to meet an individual's needs or carry out a goal-striving activity, the greater would be the strength of the hypothesis. Lastly, Bruner stated that hypotheses which were being tested by one individual were strengthened when it agreed with hypotheses of other observers to whom the perceiver may have turned.

Sarbin, Taft, and Bailey's work (1960) was the first to base the inference process on cognitive theory. Sarbin and his associates believed that clinical inference could be formulated by the use of both logic and statistics. Sarbin's Syllogistic Model was based on logical and statistical inferences, demonstrating that logic would give a base to the collection of patient data, and statistical inference could be used to account for the probabilistic nature of

clinical inference. Sarbin's Syllogistic Model of inference will be used as the theoretical framework for this descriptive survey study.

Paul Cutler, in Problem Solving in Clinical Medicine (1979), stated that, "Problem-solving is the process of transforming the patient's data base into known diagnoses - - finding out what is wrong" (p.8). Cutler then proceeded to design an eight-step diagram for medical problem solving and indicated that logic is preeminent in problem solving. "Logic", Cutler said, "invokes the thought processes, decisions, probabilities, unlikelihoods, and judgments which pervade and envelope every part of the diagram" (p. 7). Cutler felt that a good knowledge base or medical information base was central to the entire patient management process. In addition, certain skills and information, such as knowledge of a good history and a history format, physical examination techniques, knowledge of abnormalities and acquisition and interpretation of labortory data, were necessary to acquiring a patient data base. The physician must have the ability to select, group and label as problems certain pertinent clues from the data base. Cutler explained that, ". . . data processing requires the ability to pick out important clues, to know what is abnormal, and to process all data properly, separating the relevant from the irrelevant" (p. 8).

Cutler discussed clues and their relationship to ultimate diagnosis. He described the decisive clue as the clue most likely to point to a diagnosis or complete a diagnostic picture and may be gotten from the patient history, exam, lab results, X-ray or EKG strip. Primary clues were clues related to the disease process in situ, while secondary clues are those which usually appear at distant sites or which may seem unrelated physiologically to the disease process. Cutler stated that clues may be independent, interdependent, or mutually exclusive.

While the medical taxonomy has been more fully developed than that of nursing, Curler demonstrated that several of the same problems in probability and a similar need for a diagnostic model exist. Cutler described many common techniques for problem solving which are worthy of nurse investigation in the future.

Summary

Nursing diagnosis developed as a recognized term during the last twenty-nine years. For the last six years, the profession has worked at developing diagnostic classifications based on a problem/etiology/signs and symptoms format. Clinical standardization and validation has been recognized as the next step in the development of nursing diagnosis. Two research studies found that nurses did not use a perfect or

consistent search strategy. Aspinall (1976) determined that nurses lacked a systematic strategy to enable them to focus on pertinent problems. Numerous nursing leaders between 1960 and 1971 discussed techniques for data collection and nursing activities descriptive of Sarbin's search strategies and instantiation activities of inference.

Bruner, Goodnow, and Austin (1956) investigated two types of search strategies which were employed in solving a problem. Sarbin, Taft, and Bailey (1960) developed a logical inference process based on cognitive theory. A model based on Sarbin's inference process has been developed and a portion of that model, the formation of the minor premise, will be tested using Simulation Exercise tool. Cutler's (1979) work revealed a similar search for a logical diagnostic process and described the need for a physician to have the ability to select, group, and label certain pertinent clues from the data base as problems.

CHAPTER 3

PROCEDURE FOR COLLECTION AND TREATMENT OF DATA

The study was of a descriptive classification and a survey design. According to Brink and Wood (1978), a descriptive survey research has the following characteristics: (a) is level II research, (b) asks what are the differences or relationships between or among variables, (c) has a conceptual base, (d) has variables which cannot be predicted, (e) the purpose of the study is in question form, (f) has both situational and investigator control, (g) may have available written data, (h) is analyzed with correlational statistical measures, and (i) explains the relationships between or among variables in the conceptual framework.

Diers (1979) has suggested the use of Dickoff's, James' and Wiedenback's (1968) classifications when describing the type of nursing research pursued. Therefore, the proposed study was a factor-relating level II research using a relation searching design.

The aim of this factor-relating study was to explore the use of structured search strategies and instantiation activities by nurses in the formation of the minor premise in nursing clinical inference. A researcher-prepared simulation exercise tool had been field-tested and revised, and was administered to thirty baccalaureate-prepared registered nurses

to describe nurse use of search strategies in client data collection and the correctness of the subject's clinical inference or nursing diagnosis.

The following chapter will describe the setting of the research, the population and sample selected for use, measures for protection and the human subjects, instrument development and use, data collection techniques, and treatment of the data.

Setting

The study was conducted in a proprietary general hospital of 520 beds governed by a religious organization in a city of 200,000 population located in northwest Louisiana. The subjects were drawn from the adult health nursing units (Medical, Surgical, Oncology, Intensive Care, Cardiac Care, Dialysis, Cardiac Surgical Units and Emergency Room) of the institution and included individuals working on all three shifts. The collection of data occurred during the working hours of the subjects.

Population and Sample

The population for the study was limited to registered nurses with baccalaureate preparation who were employed full-time in an adult nursing setting in the aforementioned institution. The population covered all three shifts of the 24-hour work day. The sample of thirty subjects was randomly

selected from the population who meet the stated characteristics.

Protection of Human Subjects

Permission was gained from the hospital research committee, hospital administrator and the Director of Nursing Service to conduct the study in the confines of the hospital. Subjects were notified in writing that they had been selected to participate in the study. Those selected subjects who choose to come to the meeting place were given an oral explanation of the purpose of research, its benefits for nursing, confidentiality of their responses, and the use to be made of the findings. The subjects were allowed an opportunity to ask questions and were instructed that they might withdraw from the study while it was in progress without questions or consequences. The investigator indicated to the subjects that the only known discomfort from the research at the time was the possibility of embarrassment if the subjects disclosed their participation in the study and the results proved to be unfavorable to the research subjects as a group. The investigator indicated that the results would be published as group findings in the dissertation and any subsequent publications. The subjects were told that no individual would be identified in such a way as to reveal the identity of the subject. The subjects were further instructed that the

Nursing Service Department was aware of their participation in a research study so that release from work duties could be facilitated, but that no individual results would be shared with any individual in Nursing Service. The subjects were made aware that Nursing Service Administration would be informed of the overall study findings so that future inservice or continuing education offerings could be planned if the study results warrant such action.

Instrument

Two instruments were used in the collection of the data from the subjects in the proposed study: a Demograhic Information Sheet and an investigator-prepared Simulation Excercise.

Instrument Development

The Demographic Information Sheet requested background information about the subject to describe the obtained sample and to categorize subjects for the analysis of data. Information requested included: years of experience, continued learning experiences, and area of clinical practice. A sample of the Demographic Information Sheet is located in Appendix A. The requested information on years of experience and continued learning were based on Aspinall's (1976) findings related to the use of the decision tree for diagnostic purposes by groups specified by years of experience. In addition,

Aspinall's (1976) findings related to the use of the decision tree for diagnostic purposes by groups specified by years of experience. In addition, Aspinall questioned the effect of continued learning on decision making in her summary of findings.

The major tool used in the study was an investigator-prepared, branching, multiple-choice instrument based on the Logical Clinical Inference Model for Nursing adapted from Sarbin's Syllogistic Model. The tool, called "Simulation Exercise," was a three-part/or problem clinical simulation exercise recreating clinical experiences of the investigator. Each of the clinical problems was sequenced into vignettes which described presenting cues of the client to be perceived by the nurse and acted upon in some fashion called for in the multiple choices included in the vignette. The nurse arrived at the clinical inference by working through a sequence of vignettes guided by a choice of nursing action or verbalizations selected from four possible choices.

The actions and verbalizations within the four choices were designed around the following possible pattern of responses: (a) the nursing action which reflected either a search strategy or instantiation activity and represented the most desirable response by the nurse to the presenting cues, (b) a less desirable response which, though not incorrect, represented a less efficient and more time-consuming method

for data collection, (c) an action-oriented response usually carried out with insufficient data on which to base the action, and (e) negation of the responsibility for making an inference (usually involved calling the physician with insufficient data to report on the client's state). The subject was finally led out of the situation by the choices made and the final choice led the subject into the next problem. The first problem of the Simulation Exercise can be found in Appendix B.

Following development of the tool, five nurse judges were selected. These judges were selected for their knowledge of general adult health conditions and the nursing care required in such conditions. Each judge held the Master's of Science of Nursing degree and four of the judges taught in a National League for Nursing-accredited baccalaureate program of nursing. The fifth judge was a faculty member of an associate degree nursing program with National League for Nursing accreditation. In addition, these judges were selected because their employment in nursing education supported their familiarity with the symptomatology of the simulated clinical problems and their knowledge of test contruction and logical sequence

The judges were given instructions concerning the projected use of the Simulation Exercise, how to employ the answer sheet, how to work through the branching tool and to

report difficulty in working through every choice and possible pattern of choices within the tool. They were also asked to evaluate the printed instuctions which would accompany the Simulation Exercise. The judges reported back to the investigator on some eight to ten difficulties or suggested changes on which eighty percent of the judges had independently agreed. These difficulties were resolved and suggested changes were made in the tool. Content validity was established through the efforts of the judges and reliability was established by means of the instrument testing.

Instrument Testing

The Simulation Exercise was field tested to determine its reliability. A convenience sample of 20 registered nurses was selected from two area hospitals ranging from 150 to 250 beds in size. The subjects were graduates of a baccalaureate program in nursing and ranged in age from 21 to 46 years of age. They were employed on either the 7-3 or 3-11 shifts at their respective hospitals and completed the tool during work hours.

The methodology for the reliability study of the tool involved a test-retest administration of the tool on two separate occasions separated by two to four days. The subjects were given the usual explanation for protection of human subjects and verbal instructions on using the tool, in

human subjects and verbal instructions on using the tool, in addition to the written instructions. All consent forms, tool answer sheets and demographic sheets were coded. The testing period lasted three and one-half weeks.

The data was analyzed using the Spearman Rank Correlation Coefficient statistical measure as outlined by Seigel (1956). Responses to each of the three problems were ranked according to the desired pattern of responses. Since numerous ties existed in the number of responses, additional statistical manipulation was required to adequately rank the responses. The Spearman Rank Correlation Coefficients were found to be .927, .953, and .993 for problems one through three, consecutively. These coefficients were found to be significant at the .01 level of confidence with 18 degrees of freedom. It was concluded that the Simulation Exercise was a reliable tool and could be used to collect further data.

Data Collection

Following random selection, the subjects were notified in writing that they had been selected to participate in the proposed research study. The respondiing subjects were given an oral explanation of the research and their rights as research subjects and were asked to sign a consent form to participate in the study.

Demographic Information Sheets were distributed and code numbers assigned. When all Demographic Information Sheets had been collected, the Simulation Exercise Booklet and coded answer sheet were distributed. A full oral explanation on the use of the booklet and answer sheet were given in addition to the written set of instructions on the front of the booklet. The subjects were given one hour in which to complete the exercise; however, all subjects completed the tool in 30-45 minutes. Subjects were permitted to leave the conference room when they have completed the tool.

Treatment of the Data

Frequencies of responses on the Demographic Information Sheet were tallied, resulting in a quantitative description of the sample participating in the study. Simple tally of the ordinal data established categories for examining the data collected in the Simulation Exercise.

Simulation Exercise Treatment of Data

Each of the four problems in the Simulation Exercise tool were mapped to determine the expected frequencies of the desirable responses. Subject answer sheets were checked against the key for desirable responses and were marked according to the number of responses which reflected agreement with the researcher-identified correct responses. The

frequencies and percentage of subjects responding to a perdetermined level or better were designated as the high group. The low group consisted of subjects responding below the identified level on the Simulation Exercise.

The Kolmogorov-Smirnov One-Sample Test (Seigel, 1956) was carried out to determine the degree of Agreement between the observed frequency distribution and a theoretical frequency distribution. The theoretical distribution represented what would be expected under the null hypothesis. The theoretical distribution was determined by theorizing that an equal number of subjects would "fall-out" of the distribution at each decision point if search strategies and instantiation activities were not being used. The point at which the observed and theoretical distributions demonstrated the greater divergence was compared to the theoretical tabled value. The level of significance was set at the .05 level of confidence.

The determination of nurse use of search strategies was examined by applying the Kolmogorov-Smirnov One-Sample Test to the subject group selecting the desirable search strategy responses, that is; the first three responses of the Problem I response track, the first two responses of the Problem II response track, and the first three responses of the Problem III response track. To determine if nurses who used search strategies also used instantiation activity, a comparison was

made between subjects who reached correct inferences and those who used search strategies. The consistency of the nurses' inferences was examined by comparing the divergence value for each of the three problems.

The ordinal data was discreet in nature and was drawn from a sample of the same population, i.e., registered nurses with baccalaureate preparation, working on an adult health unit in the same institution.

Summary

Chapter III has prepresented the methodology employed in this study. The results of the analysis appear in Chapter IV and are presented in table and narrative form.

CHAPTER 4

ANALYSIS OF DATA

A factor-relating level II research was conducted to study the use of structured search strategies and instantiation activities used by nurses in the formation of the minor premise in nursing clinical inference. This chapter is concerned with an analysis of data collected from subject performance on the Simulation Exercise. Thirty full-time employed registered nurses holding baccalaureate degrees participated in the study. Findings are presented in terms of the research questions and the demographic categories.

Description of the Sample

The sample consisted of thirty randomly selected registered nurses with baccalaureate preparation who were employed full-time in an adult nursing setting in a proprietary general hospital. Demographic consisted of the years of experience, continued learning experiences and area of clinical practice. Subjects having zero to two years of experience represented 50 (15) percent of the sample and accounted for 49.9 percent of the continued learning experiences for the previous two year period. Subjects having two to five years of experience comprised 20 (6) percent of the sample and had 19.9 percent of the constituted learning experiences of the

continued learning experiences of the sample. Subjects with five to eight years of experience accounted for 6.6 (2) percent of the sample and 6.6 percent of the continued learning experiences. Nurses having nine to eleven years of experience represented 10 (3) percent of the sample and had attended 9.9 percent of the continued learning experiences. Nurses having more than eleven years of experience composed 13.3 (4) percent of the sample and 13.2 percent of the continued learning experiences. Table 1 describes the samples's demographic data for years of experience and continued learning experiences in percent.

Table 1

Nurses' Experience and Continued Learning Experience by Percent

		Continued Learning Activities									
Exper-ience	% of Sample	0	1	2	3	4	5	6	7	8	Total
0 - 2	50	20	10	13.3	3.3	3.3	0	0	0	0	49.9
2 - 5	20	0	0	3.3	3.3	0	0	10	0	3.3	19.9
5 - 8	6.6	0	0	0	0	0	3.3	0	0	3.3	6.6
9 - 11	10	0	0	3.3	3.3	0	0	0	0	0	6.6
11 +	13.3	0	3.3	3.3	0	0	6.6	0	0	0	13.2
Total	99.9	20	13.3	23.2	9.9	3.3	9.9	10	0	6.6	99.5

Table 1 illustrates that 49.9 percent of the sample had attended from one to four continued learning experiences in the previous two year period. Twenty percent of the sample had not attended continued learning experience while 80 percent had attended continued learning experiences ranging from one to eight within the last two years. The researcher noted that fifty percent of the sample were recent graduates, many of whom had actual experience from three to seven months in

duration and that the zero to two year group accounted for the twenty percent of the sample who had not attended any continued learning experience.

The subjects in the sample identified nine adult health nursing areas as their areas of clinical practice. Table 2 illustrates the distribution of the sample in the nine identifies clinical areas.

Table 2

Distribution of Subjects by Years of Experience as Related to Clinical Areas of Practice

	Clinical Areas of Practice								
Years of experi-ence	Med.	Sur.	On-col.	ICU	CCU	ER	DIAL Unit	CSU	Other
0 - 2	1	4	0	4	2	1	1	2	0
2 - 5	1	0	1	0	3	1	0	0	0
5 - 8	0	0	0	0	0	1	0	0	1
9 - 11	0	1	1	0	0	0	0	0	1
11 +	1	1	1	0	0	1	0	0	0
Totals	3	6	3	4	5	4	1	2	2
Percents	(10)	(20)	(10)	(13.3)	(16.6)	(13.3)	(3.3)	(6.6)	(6.6)

Subjects employed on the surgical nursing unit composed 20 percent of the sample with 66.6 percent of the subjects on the surgical unit having zero to two years of experience. The coronary care unit (CCU) had the second highest employment percent of 16.6 and the five subjects had five or less years of experience. The Emergency Room (ER) and Intensive Care Unit (ICU) each employed 13.3 percent of the sample. The four subjects from the Intensive Care Unit had worked less than two years. The Emergency Room had a range of years of experience employed with one subject each for zero to two, two to five, five to eight and over eleven years of experience. Those subjects employed on the Medical Nursing unit and Oncology unit represented 10 percent each of total sample. The Cardiac Surgical unit and the "other" category accounted for 6.6 percent each of the sample. One nurse in the zero to two years of experience was employed on the Dialysis Unit.

Instrument

The Simulation Exercise (Appendix B) was constructed by the researcher to determine if nurses used systematic search strategies and instantiation activities to formulate a minor premise. The Simulation Exercise was composed of three clinical problems. Each clinical problem was sequenced into vignettes which described presenting cues of the client to be

perceived by the nurse and acted upon in some fashion called for in multiple options or choices included in the vignettes. The nurse arrived at the clinical inference by working through a sequence of vignettes guided by a choice of nursing actions or verbalizations selected from four possible options.

Problem I portrayed a female client exhibiting cues characteristic of a post-operative wound infection. If the study subject used a series of systematic search strategies and instantiated the cues into a classification of wound infection, the subject would have used the most desirable track and would arrive at a clinical inference of elevated body temperature related to the release of toxins from a wound infection.

Problem II illustrated a male client who was receiving pre-operative preparation for a laminectomy. A subject's use of the desirable track would result in the nurse offering to explain the client's pending surgery based on the implied inference of client anxiety related to lack of knowlege of impending surgery.

Problem III portrayed a male client in severe diabetic acidosis. Using the most desirable track, the subject had an opportunity to revise the clinical inference as the client's condition changed and make inferred predictions of the client's needs should his condition deteriorate. These cognitive processes were reflected in the Simulation Exercise by

presenting clusters of cues of a change in the client's condition and listing three to four possible actions the nurse would take depending on the subject's clinical inference. Problem III was the most complex of the three problems in the Simulation Excercise and required a knowledge base of diabetes and the physiological basis and complications of the medical treatment. The most desirable track through Problem III would have indicated a client in extreme metabolic acidosis with severe potassium intra-intercellur shift and potential complications of cardiac arrhythmias. The subject's use of a systematic search strategy would have indicated the severity of the client's physical condition and adequate minor premises would have resulted in a clinical inference leading to preventive nursing care measures for potential complications in the client's physical state.

Based on investigator mapping of each of the problems in the excercise, the following number of choices of tracks were possible in each of the problems: Problem I -- fifty-three, Problem II -- twenty, and Problem III -- forty. (Appendix C) However, credit was given to a subject if he/she selected one of two tracks identified as the most desirable track and the alternate track in each of the problems.

Subject Performance

Five subjects of the sample made correct inferences on Problem I. Nine subjects made correct inferences on Problem II while none of the subjects made a correct inference on Problem III. Table 3 displays the distribution of correct inferences by years of experience.

Table 3

Distribution of Correct Inferences by Years of Experience

Years of Experience	0 - 2	2 - 5	5 - 8	9 - 11	11 +	Total
Number of Subjects	15	6	2	3	4	30
Problem I	1	2*	0	1	1	5
II	4	3*	1	0	1	9
III	0	0	0	0	0	0
	5 (35.7)	5* (35.7)	1 (7.1)	1 (7.1)	2 (14.2)	14

* One subject selected the most desirable track for Problems I and II.

The subject group with zero to two years of experience composed 50 percent of the sample and made 35.7 percent of

all correct inferences. The subject group with two to five years of experience composed 20 percent of the sample and made 35.7 percent of all correct inferences. Both the five to eight year group and the nine to eleven year group represented 3.3 percent of the sample each and accounted for 7.1 percent each of all correct inferences. The subject group with eleven or more years of experience composed 6.6 percent of the sample and accounted for 14.2 percent of all correct inferences.

Evaluating the subject's correct responses by their continued learning experiences revealed that 21.4 percent of the correct inferences were made by the subject group with two continued learning experiences within the last two years. While only two subjects had eight continued learning experiences, they accounted for one subject who made two correct inferences out of a possible three. Table 4 displays the distribution of correct inferences by the number of continued learning experiences.

Table 4

Distribution of Correct Inferences by
The Number of Continued
Learning Experiences

C. E. Experi-ences	0	1	2	3	4	5	6	7	8	Total
No. of Subjects	7	4	7	3	1	3	3	0	2*	30
Problems										
I	0	0	1	1	0	1	1	0	1*	5
II	1	1	2	0	1	1	1	0	2*	9
III	0	0	0	0	0	0	0	0	0	0
Totals	1	1	3	1	1	2	2	0	3	14
Percents	(7.1)	(7.1)	(21.4)	(7.1)	(7.1)	(6.7)	(6.7)	0	(21.4)	

* One Subject selected the most desirable track for Problems I and II.

Table 5 displays the distribution of correct inferences as related to clinical areas of practice.

Table 5

Distribution of Correct Inferences as Related to Clinical Areas of Practice and Years of Experience

Area of Practice	Med.	Sur.	On-col.	ICU	CCU	ER	Dial. Unit	CSU	Other
Number	3	6	3	4	5	4	1	2	2
Years of Experience									
0 - 2	1	4	0	4	2	1	1	2	0
2 - 11	2	2	3	0	3	3	0	0	2
Problem I	2*	0	0	0	1	0	0	1	1
Problem II	1*	1	0	2	3	2	0	0	0
Problem III	0	0	0	0	0	0	0	0	0
Total	3*	1	0	2	4	2	0	1	1

* One subject selected the most desirable track for both Problem I and II.

Twenty (6) percent of the subjects were employed in the adult surgical nursing practice area and represented the largest group in the sample. Four of the six subjects had zero to two years of experience and one of the six responded

correctly on Problem II of the Simulation Exercise. The Cardiac Care Unit (CCU) employed five of the subjects whose years of experience ranged from zero to five years. Four of the five subjects gave correct responses in one of the three problems of the Simulation Exercise. The areas of practice of Intensive Care Unit (ICU) and Emergency Room (ER) employed four subjects each. Two subjects in each area (4) gave correct responses to one of the problems in the Simulation Exercise. None of the subjects employed in the oncology unit gave a correct response on the exercise. Only one subject indicated the dialysis unit as an area of clinical practice. Two subjects indicated Cardiac Surgical unit as a practice area and both had two years or less experience. One subject made a correct inference. The category marked "other" for clinical experience was indicated by two subjects. One subject reported orthopedic nursing as the clinical area of practice while the second subject stated that the progressive cardiac care unit was her area of practice. Both subjects indicated more than two years of experience and one subject made one correct inference.

Subsequent to determining that none of the subjects gave correct inferences to Problem III, the researcher examined response tracks on all three problems to determine the presence of tracks previously overlooked by the researcher and the expert panel as being possible valid search strategy

tracks. One extra response was found on Problem I in the area of instantiation. The response did not add to, but also, did not detract from the subject reaching a correct inference. Therefore, total number of correct inferences on Problem I was revised to eight instead of five correct inferences.

Sample subjects did not use any discernable response tract different from the researcher-identified tracks in Problem II. The raw data of Problem III appeared to have some consistency in response patterns by the subjects but responses which did not match either of the researcher-identified response tracks. Following extensive evaluation of the two subject identified tracks, the researcher determined that search strategies had been used by the subjects and that correct inferences had been reached. The researcher-identified tracks called for the subjects to carry out a physician's verbal order first before collecting data. Ten subjects chose the data option first. These ten subjects, plus an additional eight subjects did not choose to have blood gases collected but made a correct inference based on the nurse-perceived cues given in the vignette. Therefore, eighteen subjects had reached correct inferences using subject-identified response tracks which called for using observed cues and instantiation activity. Table 6 presents the revised number of correct inferences using subject-

identified response tracks on Problem I and III. A total of thirty-eight correct inferences were made from a possible total of ninety, thus, representing 42.2 percent of the total possible. Correct inferences by area of practice included: medical nursing unit - four inferences from three subjects, surgical nursing unit - seven inferences from six subjects, oncology nursing - two inferences from three subjects, intensive care unit - five inferences from four subjects, coronary care unit - ten inferences from five subjects, emergency room - five inferences from four subjects, dialysis unit - zero inference from one subject, cardiac surgery unit- two inferences from two subjects and, "other" - three inferences from two subjects.

Correct inferences made by subjects from each of the grouped years of experience included: zero to two years of experience - sixteen inferences from 15 subjects, two to five years of experience - ten inferences from six subjects, five to eight years of experience - three inferences from two subjects, nine to eleven years of experience - three inferences from three subjects, eleven plus years of experience - two inferences from four subjects.

Table 6

Revised Number of Correct Inferences Using Subject-Identified Response Tracks for Problems I and III on the Simulation Exercise as Related to Years of Experience And Practice Areas

	Med	Sur.	Oncol.	ICU	CCU	ER	Dial Unit	CSU	Other	Total
Number of Subjects	3	6	3	4	5	4	1	2	2	30
Years of Exper.										
0 - 2	1	4	0	4	2	1	1	2	0	15
I	0	0		1	0	0	0	1		3
II	0	1		2	1	1	0	0		5
III	0	3		2	2	0	0	1		8
2 - 5	1	0	1	0	3	1	0	0	0	6
I	1		0		2	0				3
II	0		0		2	0				2
III	1		0		3	1				5
5 - 8	0	0	0	0	0	1	0	0	1	2
I						0			0	0
II						1			0	1
III						1			1	2
9 - 11	0	1	1	0	0	0	0	0	1	3
I		1	0						1	2
II		0	0						0	0
III		1	1						1	3
11 +	1	1	1	0	0	1	0	0	0	4
I	1	0	0			0				1
II	0	0	0			1				1
III	1	0	1			0				2
Total Correct Inferences	4	7	2	5	10	5	0	2	3	38*

* Total Inferences Possible - 90

Visual scanning of the data demonstrated that subjects from the coronary care unit made more correct inferences for each subject than did subjects from other practice areas. The two to five year experience group made more correct inferences for each subject than did any other age groupings.

Statistical analysis was conducted for correct inferences and search strategies for both research-identified response tracts and subject-identified tracts.

Table 7

Revised Number of Correct Inferences Using Subject-Identified Response tracks for Problems I and III on the Simulation Experience as Related to Continued Learning Experiences

	Continued Learning Experiences									
Correct Inferences	0	1	2	3	4	5	6	7	8	Total
Number of Subjects	7	4	7	3	1	3	3	0	2	30
Problem										
I	1	1	4	1	0	1	1	0	1	10
II	1	1	2	1	1	1	1	0	2	10
III	3	1	5	1	1	2	3	0	2	18
No Correct Inferences	2	2	0	1	0	0	0	0	0	5

When examining the revised correct inferences by the number of continued learning experiences, the researcher noted that all seven subjects who had attended two continued learning activities in the past two years made a least one correct inference. Of the eleven correct inferences, one subject made three correct inferences and two subjects made two correct inferences each. Two subjects who had attended eight continued learning experiences made a total of five correct inferences, one subject made three correct inferences.

Findings

The findings of the study will be reported in terms of the research questions. The Kolmogorov-Smirnov One-Sample Test (Seigel, 1956) was used on each of the Simulation Excercise problems to determine the degree of agreement between the observed scores of the sample distribution and the theoretical distributionof correct inferences and search stategies. The point at which the observed distribution and theorectical distribution show greatest divergency by chance for a specified degree of freedom and is obtained from a table of theoretical values. The interpretation of the Kolmogorov-Smirnov One-Sample Test allows for the rejection of a null hypothesis if the greatest degree of divergence or the calculated D is equal to or less than the corresponding p of the set level of significance (alpha). The research

questions were treated as alternative hypotheses in the interpretation of data.

Research Question One--Correct Inferences

Question One asked if the majority of nurses made correct inferences on the Simulation Excercise. Eight of thirty subjects selected the desirable track of responses indicating correct inferences on Problem I. The Table 8 illustrates the distribution of subjects along the options where subjects last recorded a correct option. It also displays the theoretical and observed cumulative distributions of options or choices where subjects should have randomly "dropped out" and where subjects actually dropped out. Theoretically, 3.75 subjects should randomly have dropped out at each option.

Table 8

The Kolmogorov-Smirnov One-Sample Test demonstrating the Observed and Theoretical Cumulative Distribution of Subject Option "Drop Out" from the Problem I Response Tracks

	Number of Options							
	0	1	2	3	4	5	6	7
Number of Subject Drop Outs	0	3	3	4	3	9	0	8
Theoretical Cumulative Distribution	$\frac{3.75}{30}$	$\frac{7.5}{30}$	$\frac{11.25}{30}$	$\frac{15}{30}$	$\frac{18.75}{30}$	$\frac{22.5}{30}$	$\frac{26.25}{30}$	$\frac{30}{30}$
Observed Cumulative Distribution	$\frac{0}{30}$	$\frac{3}{30}$	$\frac{6}{30}$	$\frac{10}{30}$	$\frac{13}{30}$	$\frac{22}{30}$	$\frac{22}{30}$	$\frac{30}{30}$
Deviation	$\frac{3.75}{30}$	$\frac{4.5}{30}$	$\frac{5.25}{30}$	$\frac{5}{30}$	$\frac{5.75}{30}$	$\frac{.5}{30}$	$\frac{4.25}{30}$	$\frac{30}{30}$

D_{cal} Maximum Deviation = $\frac{5.75}{30}$ = .1917*

* D_{th} = .20 at p = .15

Based on the table value of D of .20 at a corresponding p value of .15 and since the level of confidence set for this study was the .05 level, a majority of the subjects did not make a correct inference on Problem I.

Nine of thirty subjects selected the desirable track of responses indicating correct inferences on Problem II. The

theoretical random "drop out" distribution of subjects across all five options of the desirable track would have been five subjects for each option. The D (maximum deviation) occurred at the second option resulting in a D of .20. The theoretical D was .22 at the corresponding p of .10. Since the D of .20 was greater than the p of .1 at the .05 level of significance, the majority of the subjects did not make correct inferences.

None of the subjects selected the most desirable or alternate tracks identified by the panel of experts and the researcher for Problem III. Fourteen subjects did not select the first correct option; five subjects selected the first but not the second correct option, and eleven subjects the first and second correct option but did not select the third correct option. All subjects had "dropped out" of the response track by the third correct response option. Statistical analysis revealed that the calculated D was .57 and, therefore, greater than the theoretical D of .29 at the corresponding .01 level of significance. Since none of the subjects completed the desirable or alternate tracks, the statistical analysis was misleading.

Previous testing of Problem III had not revealed these results. Upon reexamination of the raw data, it became apparent that eighteen subjects had selected two response tracks which were different from those identified by the

researcher and the expert panel. Upon examination of subject-identified tracks, it became apparent that ten of the subjects had made a choice not to carry out the physician's order to begin an infusion of Ringer's Lactate and insulin and ten to make client observations but had chosen to make observations first and had not option to start the infusion at a later period in the vignette. No option was given to the subjects to start the infusion and make observations at the same times. The researcher determined by following these subject-identified tracks, that subjects arrived at correct inferences by using the cue clusters in the second vignette of Problem III and had never elected to obtain the chemical analysis of the blood gases.

The researcher had previously determined that Problem III was more complex than Problems I and II, and that the cue clusters being emitted by the client required a base knowledge of fluid and electrolyte imbalance. The researcher had to infer that the eighteen subjects had such a knowledge base and, even without support of the laboratory findings, were able to make an inference based simply on the client cues presented earlier in the situation. The researcher was forced to conclude that a total of four correct response tracks existed on the subject-identified tracks. Analysis of subject-identified tracks revealed that the calculated D was .4 which was significant at the .01 level of significance

with a corresponding tabular value of .27. The researcher concluded that a majority of the subjects did not make a correct inference using the researcher-identified response tracks in Problem III, but did make a correct inference using subject-identified response tracks. Table 9 illustrates that calculated D, the theoretical D at the corresponding p, and the level of significance for each to the three problems in the Simulation Exercise used to determine correct inferences by the study subjects. Based on the data analysis using researcher-identified response tracks, the majority of nurses do not make correct inferences. Two additional tracks were identified by subjects on Problem III and based on use of the subject-identified response tracks, the majority of nurses made correct inferences on Problem III.

Table 9

The Kolmogorov-Smirnov One-Sample Test Calculated D and Theoretical D Values for Correct Inferences on the Three Problems in the Simulation Exercise

Problem	D_{cal}	D_{th}	Alpha for D	Level of Significance
I	.1917	.20	.15	.05
II	.20	.22	.10	.05
III-R-I*	.57**	.29	.01	.05
III-S-I***	.4	.29	.01	.05

* Statistical results of Researcher-Identified Response tracks for Problem III.

** Statistical results cannot be accepted since none of the Subjects Selected Researcher-Identified response tracks for Problem III.

*** Statistical results of Subject-Identified Response tracks leading to a correct inference in Problem III.

Research Question Two--
Use of Search Strategies

To examine the question "Do nurses utilize structured search strategies in assessing client cues?", the responses indicating the use of search strategies were identified for each of the three problems. On Problem I, the first three responses were identified as search strategies. The first two responses on Problem II and the first four responses on Problem III were identified as search strategy responses.

Twenty-four of the thirty subjects selected the options identified as search strategies in Problem I. The Kolmogorov-Smirnov One-Sample test revealed a calculated D (Maximum divergence) of .55. The theoretical D value at the .01 level of significance was .29. The significance of the finding supports the inference that nurses used search strategies to assess client cues in Problem I.

Fourteen of the thirty subjects selected the options identified as search strategies in Problem II. The calculated D of .47 was significant at the .01 level of significance which had a corresponding theoretical D value of .29. The significance of the finding supports the conclusion that nurses used search strategies to assess client cues in Problem II.

Using the researcher-identified search strategies, eleven of thirty subjects selected the most desirable and alternate search strategies. The calculated D of .25 was significant at the .05 level of significance where the theoretical D was .24 for 30 subjects. Based on the subject-identified search strategies, twenty-four of thirty subjects selected the subject-identified search strategies. The calculated D of .46 was significant at the .01 level of significance for thirty subjects. Therefore, it must be concluded in either set of identified search strategies, that nurses used search strategies to assess client cues.

As demonstrated in Table 10, the calculated D's for all three problems were significant at the .05 level of confidence. This means that nurses utilized search strategies to assess client cues.

Table 10

Calculated and Theoretical D values of the Kolmogorov-Smirnov One-Sample Test for Use of Search Strategies in the Simulation Exercise

Problem	D_{cal}	D_{th}	Alpha for D_{cal}	Level of Significance
I	.55	.29	.01	.05
II	.47	.29	.01	.05
III-RI*	.25	.24	.05	.05
III-SI**	.46	.29	.01	.05

* Statistical results of Researcher-Identified Response tracks for Problem III.

** Statistical results of Subject-Identified Response tracks for Problem III.

Research Question Three--
Instantiation Activities

In response to "do nurses who use search strategies also carry out instantiation activities?", findings indicate that 37.5 percent of the subjects who used search strategies on Problem I also reached correct inferences. Sixty-four

percent of the subjects on Problem II and 75 percent of the subjects on Problem III who used search strategies also reached a correct inference and, thus, used instatiation activities. These findings indicate some inconsistency in taxonomic sorting required in the instantiation activity.

Research Question Four--Consistency in use of Search Strategies and Instantiation Activities

The fourth question was: "do nurses use search strategies and instantiation activities consistently?", the reevaluation of Problem III based on subject-identified response tracts and search strategies had to be considered. Table 11 demonstrates the number of subjects making correct inferences across all three problems in the Simulation Exercise.

Table 11

Number of Subjects Making Correct Inferences Across All Problems in the Simulation Exercise

Correct Inferences	Researcher-Identified	Percentage	Subject-Identified	Percent of Sample
For 1 inference	13	43.3	14	46.66
For 2 inferences	1	3.3	9	30.00
For 3 inferences	0	0	2	6.66
No inferences	16	53.3	5	16.66

Only eleven subjects made correct inferences on two or more of the problems when subject-identified response tracks were considered in the data analysis. With researcher-identified response tracks for all tracks being the criteria for a correct inference, only one subject made two correct inferences, thirteen subjects made one correct inference and sixteen subjects made no correct inferences. Considering that consistency was interpreted to mean making correct inferences on all three problems, then one subject or 3.33 percent of all subjects used search strategies and carried out instantiation activities consistently.

Summary of Findings

1. A majority of nurses do not make correct inferences on the Simulation Exercise.
2. A majority of nurses utlized structured search strategies in assessing client cues.
3. Nurses who use structured search strategies do not consistently carry out instantiation activities.
4. Nurses do not use search strategies and instantiation activities consistently, that is, do not make correct inferences consistently.

Additional Findings

1. Nurses with zero to two years of experience made the greatest number of correct inferences in the study.
2. Nurses with two and eight continued learning experiences within the last two years made the highest number of correct inferences.
3. Nurses identifying the coronary care unit as their area of practice had the greatest number of correct inferences.

CHAPTER 5

Summary, Conclusions, and Recommendations

Chapter V deals with three areas: a summary of the study, conclusions drawn from the data, analysis and recommendations evolving from the study. Five conclusions are discussed and twelve recommendations are offered for consideration.

Summary

This study was conducted to study the use of systematic search strategies and instantiation activities used by nurses in the formation of the minor premise in nursing clinical inference. The theoretical framework for the study was Sarbin's Clinical Inference and Cognitive Theory (1960). The following research questions were formulated for investigation:

1. Do a majority of nurses make correct inferences on the Simulation Exercise?
2. Do nurses utilize structured search strategies in assessing client cues?
3. Do nurses who use structured search strategies also carry out instantiation activities?
4. Do nurses use search strategies and instantiation activities consistently?

The study was conducted in a 520-bed proprietary general hospital governed by a religious organization in a city located in Northwest Louisiana. Thirty subjects in the investigation were randomly selected from registered nurses with baccalaureate preparation who were employed full-time on an adult nursing setting. Data were collected on subject performance by using the Simulation Exercise which was constructed by the researcher.

The Simulation Exercise presented three clinical problems. Each clinical problem was sequenced into vignettes which described presenting cues of the client to be perceived by the nurse and acted on in one of three or four ways called for in the multiple options included in the vignettes. The nurse arrived at a clinical inference by working through a sequence of vignettes guided by a choice of nursing actions or verbalizations selected from three or four possible options. Correct inferences were made by 16.6 percent of the Problem I, by 30 percent of the sample on Problem II and by 0 percent of the sample on Problem III.

The Kolmogorov-Smirnov One-Sample Test was utilized to determine the degree of agreement between observed and theoretical cumulative frequency distribution of correct inferences and search strategies. The level of confidence was set at the .05 level.

Conclusion

1. The Simulation Exercise tool requires further validation and/or modification. Additional response tracks were identified by the subjects in the study on two of the three problems.
2. Nurses have been taught to use the nursing process. Contrary to the finding of Kelly and Hammond (1966a) that no two nurses used the same strategy (p. 335), the majority of nurses in the study used search strategies. The teaching of the nursing process has been in effect for several years and seventy percent of the sample had five years or less experience. Half of the sample had graduated between three and seven months prior to the study.
3. The nurses' knowledge base may lack cue clusters. The study findings may support Aspinall's (1966) conclusions that the nurse's knowledge base may lack cue clusters, however, further testing of nurse knowledge bases as related to the problems in the Simulation Exercise is required.
4. No conclusion can be made on the basis of this study related to the lack of consistency in making correct inferences. The instrument did not afford the opportunity to test for factors relative to

consistency between responses to each problem.

5. No conclusions could be made related to years of experience, continued learning experiences or area of practice because the sub-samples were too small to demonstrate tendencies. The zero to two years of experience group had graduated from the basic educational program from three to seven months prior to the data collection and had attended few continued learning activities. The sample was too small to conclude that area of practice affected clinical inferences.

Recommendations

The following recommendations are offered:

1. A study should be conducted to further validate or modify the Simulation Exercise.
2. Further study should be conducted utlizing a modified tool to permit observation of the type of data which would be sought independently by subjects. Did subjects have all options they would or could have used when presented with a written branching situation or vignette?
3. A similar study should be conducted using a larger sample matched for years of experience, continued learning experience and areas of practice.

4. Further study should be conducted using a tool to: (a) correlate the knowledge base of the subjects for cue clusters and correct clinical inferences in the Simulation Exercise and (b) correlate knowledge base of the subjects and consistency in selecting correct clinical inferences.
5. Further study should be conducted to determine the factors that are related to consistency in making correct clinical inferences.
6. Further studies should be conducted to determine the input acceptance factors of cues and the effect of the value/belief system of the subject on cue selection and cue formation.
7. A study should be conducted to identify nurse use of search strategies based on efficiency of cue-use by the nurse.
8. A study should be conducted to determine: (a) the number and type of cues required by subjects to form a minor premise and (b) the critical values of cues to the nurse.
9. A study should be conducted to test the the entire Logical Inference Model for Nursing.
10. A study should be conducted to test the effectiveness of the use of the Minor Premise Formation

Model following instruction on the model's use.

11. Further research should be conducted to determine nursing inferences and the cue clusters characteristic of each inference category.

12. A systematic examination of nursing curricula should be conducted to determine the manner in which cue clusters defining nursing inferences are taught.

APPENDIX A

Code # _____

DEMOGRAPHIC INFORMATION

Circle the one item under each topic which most closely applies to you.

I hold a B.S.N. Yes ___ No ___

Years of Experience:

1. 0-2 years
2. 2-5 years
3. 5-8 years
4. 9-11 years
5. More than 11 years

Continued Learning:

I have attended ___ (number) of continuing education workshops during the past two years in my clinical area of practice.

My Area of Clinical Practice is:

1. Medical Unit
2. Surgical Unit
3. Oncology Unit
4. I.C.U.
5. C.C.U.
6. E.R.
7. Dialysis Unit
8. Cardiac Surgical Unit
9. Other _____

APPENDIX B

SIMULATION EXERCISE

You are about to work through an exercise to examine the Nursing Process. You are requested to work straight through the exercise and to use your first impression as your answer. You have one (1) hour to complete the exercise. You as an individual may not require that much time and you may turn the exercise in when you have completed.

In selecting your answers, assume that any of the actions or verbilizations in the choices are a valid nursing function and are not restricted either by hospital policy or procedures or by physician's orders.

You will note that you are given a situation with either three or four choices of action or verbilization which you as a nurse might use. At the end of each of the choices is the statement "Go to page ___." You are to select your answer from among the choices and write the number of the "Go to Page ___ to which you will turn as your answer on an answer sheet. (Example: "Go to page 43---Write 43 on the answer sheet.) Since the answers do not proceed consecutively through the booklets, you will have page numbers which are both near the back and near the front of the booklet. This is correct. More answer spaces are provided than you will probably need on the answer sheet. Please turn to page 2 and begin.

Thank you,

Anita Fields, RN, MSN

PROBLEM I

On morning rounds following two days off, you find that Mrs. Green, a patient who is two days post-operative, has a flushed face, parched lips, a hot, dry skin, and rapid pulse. She has an IV going at a to keep open rate.

YOUR FIRST ACTION WOULD BE TO:

a. ask Mrs. Green how she feels and place her bedside thermometer in her mouth. Go to page 3
b. leave the room to call the doctor for orders for an elevated temperature. Go to page 8
c. pat Mrs. Green on the arm and leave the room to consult her chart at the nurse's station. Go to page 9
d. get a pan of cool water and begin to sponge Mrs. Green's body. Go to page 12

On finding that Mrs. Green's temperature is 102.2°F., her pulse is 110 and her respirations are 42 per minute and on hearing Mrs. Green state that she is thirsty, slightly nauseated and has a headache, you pinch a fold of skin to find a loss of turgor. When lifting the covers to check the skin, a slightly foul odor wafes forth.

YOUR NEXT ACTION WOULD BE TO:

a. tell the nursing assistant, who is straightening up the room, to bring a deoderizer to Mrs. Green's room and then increase the flow rate of Mrs. Green's I.V. Go to page 11
b. rush from the room to call the physician for an order for antibiotics. Go to page 8
c. lift back Mrs. Green's dressing and look at the condition of the skin, sutures, and colorations, sniff for foul odors and ask Mrs. Green how her incision feels as you palpate for tendernees around the outside areas. Go to page 9
d. turn up the IV drip rate and leave the room to secure a dressing tray to clean the infected wound and change the dressing. Go to page 15

Changes in the wound odor, secretions or consistency of wound drainage would not be made in the early stages of the patient's response. A culture and sensitivity requires 48-72 hours before growth occurs in the culture, so confirmation of your diagnosis using this criteria is also not an early response of the patient.

Go to page 17

You really have insufficient information to determine that Mrs. Green has a wound infection. Your assessment involved only immediate visual objective signs. You made some assumptions. You really needed to take her temperature and talk to her yourself. It is also better to have looked at her wound.

Go to page 17

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The physician orders ASA gr X for a temperature above 101.4°F., vibramycin. 500 mgm q 12 hrs x 2 doses and then 500 mgm q.d. in addition to 3,000 cc D5W q 24 hrs. with 40 meq KCL added to each 1,000 cc D5W. You administer the medications and increase the IV drip rate as ordered. You then culture, cleanse and redress the wound. You use which of the following criteria to evaluate as early as possible your diagnosis of the patient's response to her treatment:

1. a drop of at least 2-4 degrees in temperature in the next hour.
2. an increase in urine output in the next hour of at least 30 cc.
3. a decrease in pulse rate of at least 5 beats per minute.
4. a decrease in odor and secretions from the wound.
5. lips and skin become more moist.
6. patients' statement that she's feeling better, i.e., less nausea and headache.
7. positive results of culture and sensitivity of wound drainage.

a. 1, 3, 5, and 7 Go to page 10
b. 1, 2, 3, and 6 Go to page 16
c. 2, 4, 6, and 7 Go to page 4
d. 3, 4, 5, and 6 Go to page 11

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Go to page 17

You dial Mrs. Green's physician and he orders ASA gr X and an increased fluid intake as you request. However, when he asks about the appearance of her wound, you respond that you didn't check on that because her elevated temperature seemed significant since she was two days post op.

Go to page 17

You decide to check Mrs. Green's past progress. The following vital signs were charted on Mrs. Green's chart:

Time	Temp.	Pulse	Resp.	B/P	Urine Output	Intake
12 N	98.6	80	15	120/80		
4 P	99.4	86	18	120/82	600 cc.	800ccIV, 200PO
8 P	100.2	92	24	130/86		
12 MN	100.8	96	28	140/88	400 cc.	600ccIV, 50PO
4 A	101.4	100	32	144/88		
8 A	101.8	104	36	152/90	350 cc. 50 cc. emesis	600ccIV, 0PO

It is now 9:30 AM and no note has been made for the administration of ASA for an elevated temperature. Glancing at the physician's orders, you note that there are no orders for ASA or antibiotics. The IV is ordered "to keep open" and Mrs. Green is allergic to penicillin. Atropine, Demerol and Phenergan was given on call 2 days ago. Phenergan was given for nausea twice over the last 2 days.

YOU DECIDE:

a. that Mrs. Green is having a normal inflammatory reactions to surgery and plan to mention her S/S to the doctor on his rounds this afternoon. Go to page 14
b. to call Mrs. Green's physician and tell him of her elevated temperature, decreasing intake and output and penicillin allergy. Go to page 8
c. to give Mrs. Green 25 mgm of Phenergan as ordered on her chart for nausea and have the nursing assistant begin giving her cool sponge baths. Go to page 12
d. to make a nursing diagnosis that Mrs. Green has an elevation of body temperature related to the release of toxins from a wound infection and call the physician for ASA, antibiotics and IV orders, including Mrs. Green's allergy. Go to page 6

Her first responses to the rendered treatments should be to have an increase in urine output and decrease in temperature. An increase in skin and lip moisture is a more delayed response. The culture and sensitivity results will give you the bacteria responsible for the infection but that is 48-72 hours away and you need to determine any positive responses very early.

Go to page 17

The basis for your action to increase the IV flow stems from your nursing diagnosis that:

a. Mrs. Green's elevated temperature flushed face, elevated pulse rate and nausea are related to dehydration. Go to page 13.
b. Mrs. Green probably has an infection some place which is giving her a temperature and other related signs and symptoms. Go to page 14.
c. bacterial toxins in Mrs. Green's body are being promoted by dehydration and the elevated temperature is a sign of the body's response to a bacterial concentration. Go to page 15.

Based on your action to give Mrs. Green a sponge bath, your nursing diagnosis appears to have been that Mrs. Green has an elevated temperature. You expect that sponging Mrs. Green's body will

a. reduce her temperature to a lower level to permit you time to call her physician. Go to page 8
b. relieve her dry, hot skin and promote her comfort. Go to page 7
c. reduce her temperature more slowly to prevent shocklike symptoms sometimes caused by more rapidly acting methods of reducing temperature. Go to page 5

By increasing Mrs. Green's IV flowrate, you expect to

a. increase her fluid intake and thus increase her urine output, skin turgor and reduce her dry skin. Go to page 15
b. decrease her temperature, her flushed face, her pulse rate, and her headached. Go to page 14
c. reduce her thirst, nausea and increase urine output. Go to page 7
d. increase body fluids to flush the toxins out and liquify the wound secretions to promote drainage. Go to page 17

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Go to page 17.

Your actions, increasing the IV drip, cleaning the wound and changing the dressing, imply that your nursing diagnosis includes:

a. an inadequate fluid intake and an infected wound. Go to page 14
b. an elevated temperature and dehydration related to a wound infection. Go to page 17

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Your diagnosis is based upon which of the following signs and symptoms

1. elevated temperature
2. elevated pulse rate
3. elevated respirations
4. flushed face
5. parched lips
6. hot, dry skin
7. thirst
8. loss of skin turgor
9. foul odor
10. nausea
11. headache

a. 1, 2, 3, 6, 7, 8, and 9 Go to page 7
b. 1, 5, 7, 8, 9, and 11 Go to page 14
c. All of the above Go to page 11

PROBLEM II

Mr. Ben Snow is a 44 year old male who is scheduled for a laminectomy at 11:30 a.m. When you enter his room to give him morning care at 9:30 a.m., he refuses to shower and shave because he states he is in too much pain. You note that his brow is wrinkled in a frowning anxious expression and has the appearance of having had little sleep. He appears somewhat withdrawn, and makes few responses when you tell him the purpose of your visit to his room. When you ask if he received his sleeping medicine last night, he responds, "yes, but it didn't do much good."

YOUR NEXT COMMENT MIGHT BE:

a. "that's too bad! But you will have to take a shower because your doctor wants you to use a special soap to cleanse your skin." Go to page 23
b. "It's not easy to sleep on the night before you have surgery." Go to page 18
c. "I'll check with your doctor to see if you can have a pain shot earlier than your on-call medication." Go to page 29
d. "Did you sign your consent for surgery, last night?" Go to page 33

Mr. Snow responds, "I told you that I just don't feel like taking a shower right now because it hurts for me to stand. Maybe I'll feel beter if I lay here a little longer."

YOU RESPOND:

a. "You appear to be upset! Want to talk about it?" Go to page 19
b. "All right. You can rest for an hour and then we'll have to get you ready for surgery." Go to page 24
c. "I'll try to get an order to give your on-call shot early." Go to page 29
d. "Can you show me where the pain is located?" Go to page 26

Mr. Snow responds, "Not really! I just hurt and I want to lay down a little longer."

YOUR RESPONSE MIGHT BE:

a. "If you're hurting that badly, you should have called us sooner." Go to page 20
b. "Do you think a back rub will ease your back a little? We can't give you a pain medicine just yet." Go to page 21
c. "You really don't have time for that. Maybe the nursing assistant can give you a bedbath and shave." Go to page 23

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Mr. Snow shouts: "Now listen, I really just want to be left alone." Go to page 34

"Well, maybe a back rub will help some," says Mr. Snow.
"Let me get the lotion," you say, "and maybe it will relieve your back for your bath."
Go to page 34

You may not have enough evidence that he is really concerned about surgery. You probably made an assuption about his concern at this point. Go to page 34

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"Lady," Mr. Snow said, "I really don't think you believe me about my back pain. I'm really not trying to be uncooperative, so I guess you can send in that fellow to wash me."
Go to page 34

"I think an hour's rest will help me." said Mr. Snow. You respond "Okay then, you rest and I'll send the nursing assistant in to bathe and shave you in about an hour."
Go to page 34

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It is better to discuss Mr. Snow's surgery with him first to relieve his concern or need to know about surgery. Having this need met will very probably relieve some of his pain and depression. Go to page 34

Mr. Snow responds "You should have all that on my chart, but its right here!" He indicates an area in the lumbar section with pain down the back of his left leg.

YOU RESPOND:

a. "Pain in that area can sure cause a problem in sleeping." Go to page 27
b. "I feel you are concerned about your surgery. Has anyone spoken to you about your surgery?" Go to page 22
c. "Yes, its on your chart, but I wanted to check your pain area myself. Surgery will take away most of your pain. Has anyone explained your surgery to you?" Go to page 31

Mr. Snow responds, "Oh, I don't usually have a problem sleeping, but last night I just couldn't close my eyes. My back kept hurting and neither the pain shot or my sleeping pill helped. Then they came in at midnight and got my water. It made me remember I was going under the knife today."

YOU RESPOND:

a. "Worrying about surgery can sure keep you awake." Go to page 34
b. "I think your doctor needs to run by and discuss your surgery with you. "I'll go call him." Go to page 28
c. "I was wondering if your doctor or anyone else had discussed your surgery with you. For example, what's going to be done and what you can expect after surgery." Go to page 31
d. "Most people have trouble sleeping before surgery because it's a stressful event, but you could have had a second sleeping pill." Go to page 30

Mr. Snow said "Okay, if you want to, but he said he'd come by just before I went to surgery."

Nurse: "Well, okay. Maybe he plans to talk to you then."
Go to page 34

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The physician patiently explains that its too close to the time for surgery for an injection but that you can give him on-call medication 30 minutes early. That still leaves an hour-and-a-half til the on-call can be given. You still have to get Mr. Snow cleaned. What are you going to do?
Go to page 34

Mr. Snow: Yah! I guess it is hard to sleep before surgery, but I felt goofy from the first pill. I just couldn't quit thinking about work and my family, but I didn't want to be spaced out just to sleep.

Nurse: Well, I'm glad you know that you could have a second sleeping pill.
Go to page 34

Mr. Snow states that no one has explained anything about his surgery and that he had been wondering about it.

YOU RESPOND:

a. "Would you like for me to explain your surgery and what you can do to help us and yourself?" Go to page 32
b. "Let me call your doctor so that he can come by and talk to you about your surgery." Go to page 28
c. "I'll get the head nurse and let her explain your surgery and she will show you how you can help yourself." Go to page 34
d. "Well, let me clean you up first and then we will discuss what's going to happen to you." Go to page 25

You explain a laminectomy in simple terms. While drawing a picture on a paper towel. You explain that the suture line is fairly strong and that the back muscles will give strength to the area where the lamina and disc were removed. You show Mr. Snow the way he will be log-rolled after surgery and explain the reason for keeping his head flat for eight hours after surgery. After teaching him to turn, cough and deep breathe, you explain that he will be permitted to have pain medication every 3-4 hours and that his pain should not be unbearable.

With this explanation, Mr. Snow states, "You know, I feel better now. I feel like a bath and shave." Go to page 34

Mr. Snow says, shortly, "Well, I guess I did. I signed a mess of papers yesterday!" The nurse responds I'd better get your chart ready and let you rest awhile," she says as she heads out the door. Go to page 34

PROBLEM III

Mark Jakes, age 23, was brought to your unit from the emergency room with the diagnosis of diabetic acidosis. He is vomiting copious amounts of clear fluid over the bed and floor. You are told that he went on a binge last evening and has been "sick" for about 3 hours. He is conscious and lucid. He starts to give you his mother's phone number but directs his girlfriend to complete the number when he becomes ill again. You have verbal orders to start an IV of 1,000 cc Ringer's Lactate with 50 units of regular insulin and to give him 30 units of regular insulin IV push.

YOUR FIRST MOVE WOULD BE:

a. Call for the housekeeping staff to clean the room to prevent an accident. Go to page 46
b. Call for help from the other nursing staff to assist the patient while you start the IV and IV push of insulin. Go to page 35
c. Observe his color, skin for perspiration, breath for acetone and estimate his fluid loss. Go to page 41
d. Call his physician for an order for an antiemetic. Go to page 37

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After the IV with regular insulin has been started and the IV push of Regular insulin has been given, you will first:

a. Collect a urine specimen for a sugar and acetone and a blood sample for a stat fasting blood sugar. Go to page 36
b. Draw an arterial blood specimen for blood gas analysis. Go to page 39
c. Observe the patient's breath, skin, vital signs and estimate the fluid loss. Go to page 41
d. Estimate Mr. Jake's fluid output and report the amount of loss to his physician. Go to page 43

You find Mr. Jake's urine sugar to be 4+ and his urine acetone to be large amount. His stat fasting blood sugar is 400 mgm%.

YOU WOULD TAKE WHICH OF THE FOLLOWING ACTIONS:

a. Phone the physician for an order for regular insulin sliding scale. Go to page 42
b. Speed up the IV and do a second urine sugar and acetone determination in another hour. Go to page 40
c. Observe the patient's breath, skin, vital signs and estimate fluid loss. Go to page 41
d. Estimate Mr. Jake's fluid loss and urine output and report the amount to the physician. Go to page 43

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An antiemetic will not stop Mr. Jakes' vomiting since it is caused by the body's attempt to compensate for too much acid as the result of keytone body buildup. Go to page 46

Mr. Jakes is having neurological changes and doing neuro checks is not a bad idea to assess his level of consciousness. However, a decision relative to his current condition is required and he is in need of immediate treatment. Go to page 46

When the arterial blood gas analysis is returned to the unit, you find Mark Jakes has a pH of 7.0, the serum bicarbonate is 4 mEq/L and the serum carbon dioxide is 16 mEq/L.

YOUR NEXT MOVE WILL BE THE:

a. administration of oxygen by nasal cannula at 24 minutes. Go to page 40
b. observation of the patient's vital signs, skin (color, temperature, moisture level), muscle tone, breath odor, and level of consciousness. Go to page 41
c. get ready for the doctor to administer 100 mEq sodium bicarbonate IV push and hook Mr. Jakes to a cardiac monitor. Go to page 43

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Neither giving Mr. Jakes oxygen nor breathing into a paper bag will help at this point. Oxygen will wash out his remaining carbon dioxide while his need for sodium bicarbonate to correct the acid-base imbalance is greater than what could be saved from saving carbon dioxide in the paper bag.
Go to page 46

You note that Mr. Jakes' breath has a fruity or acetone smell and his skin is dry and has poor turgor. His eye balls are sunken and he has vomited 2,000 cc clear fluid and has urinated 200 cc of urine in 30 minutes. He complains of muscle weakness and fatigue, twitching, restlessness, irritability and headache. His vital signs are: pulse 120, rapid and thready; respirations 52 deep and air hungry (Kussmaul type). The IV is placed and set to run at 15 drops per minute.

YOUR NEXT MOVE WILL BE TO:

a. call the lab for a state arterial blood gas analysis. Go to page 39
b. chart all findings and administer O_2 at 2 L/m by nasal cannula. Go to page 40
c. speed up the rate of the IV flow and check Mr. Jakes level of consciousness, urine output and respiratory rate. Go to page 38
d. tape a padded tongue blade on the head of the bed and connect Mr. Jakes to a cardiac monitor. Go to page 44
e. call the physician reporting all observations because his latest signs and symptoms suggest fluid and electrolyte imbalances related to prolonged vomiting and bicarbonate losses. Go to page 43

Mr. Jakes does not need further insulin at this time. He has an uncompensated metabolic acidosis which requires sodium bicarbonate and potassium chloride to replace potassium loss from vomiting. Go to page 46

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The physician orders you to give Mr. Jakes 100 mEg of sodium bicarbonate and put the patient on a cardiac monitor.

Forty-five minutes following the administration of the bicarb, you observe that Mr. Jakes' respirations are down to 30 per minute, he responds sluggishly to your voice when you call his name and his eyeballs are sunken in. You note that his grip is less strong than earlier and he is having fine muscle twitching around his mouth, shoulders and hands. You note that Mr. Jakes' EKG is displaying a spiked P wave, a flat T wave and a depressed S-T segment.

YOUR FIRST ACTION WOULD BE:

a. call the physician requesting an order for potassium chloride for the IV after you have described Mr. Jakes' change in condition. Go to page 45
b. tape a padded tongue blade on the head of Mr. Jakes' bed. Go to page 46
c. carry out a neuro check now and again in 15 minutes. Go to page 38

You have hypothesized that Mr. Jakes may soon either have a convulsion or a heart problem. Based on these signs and symptoms, the probable causes of his symptoms include a high glucose blood level resulting in ketone bodies, a low insulin blood level and movement of potassium chloride out of the cell resulting in cardiac and neurological changes.

In addition, the body is attempting to compensate for the metabolic acidosis through increasing respiratory and cardiac rates to throw off carbonic acid as CO_2, increasing urin output to lose ketone bodies and vomiting to lose hydrochloric acid and retain bicarbonate ions.

You have given the insulin as ordered and the patient's potassium is shifting back into the cell. The patient's S/S persist.

YOUR NEXT ACTION WOULD BE:

a. to call the physician for IV orders for sodium bicarbonate and potassium chloride. Go to page 45
b. give an additional 15 units of regular insulin based on sliding scale for 4+ urine sugar and a large amount of acetone. Go to page 42
c. Have Mr. Jakes breath into a paper bag to save CO_2 and give him PO fluids to drink. Go to page 40

You have just determined that Mr. Jakes may experience hypokalemia due to his previous loss of KCL in vomitus and the fact that insulin will cause serum potassium chloride to move back into the cell during treatment of diabetic acidosis resulting in dangerous EKG changes. You have to observe for polyuria in the hyperglycemic state and note any signs of dehydration and loss of KCL also. Headache, restlessness, and irritability are early signs of changing levels of consciousness toward stupor and possible coma. He has lost high levels of sodium bicarbonate through polyuria and prolonged vomiting, thus requiring its replacement to stabilize the electrolyte balance. Go to page 46

THE END.

You have completed this research tool for the evaluation of the Nursing Process. You will turn in both the booklet and the answer sheet to the researcher.

Thank you for your assistance.

ANSWER SHEET

Problem I - Page 2

1. ___
2. ___
3. ___
4. ___
5. ___
6. ___
7. ___
8. ___
9. ___
10. ___
11. ___

Problem II - Page 17

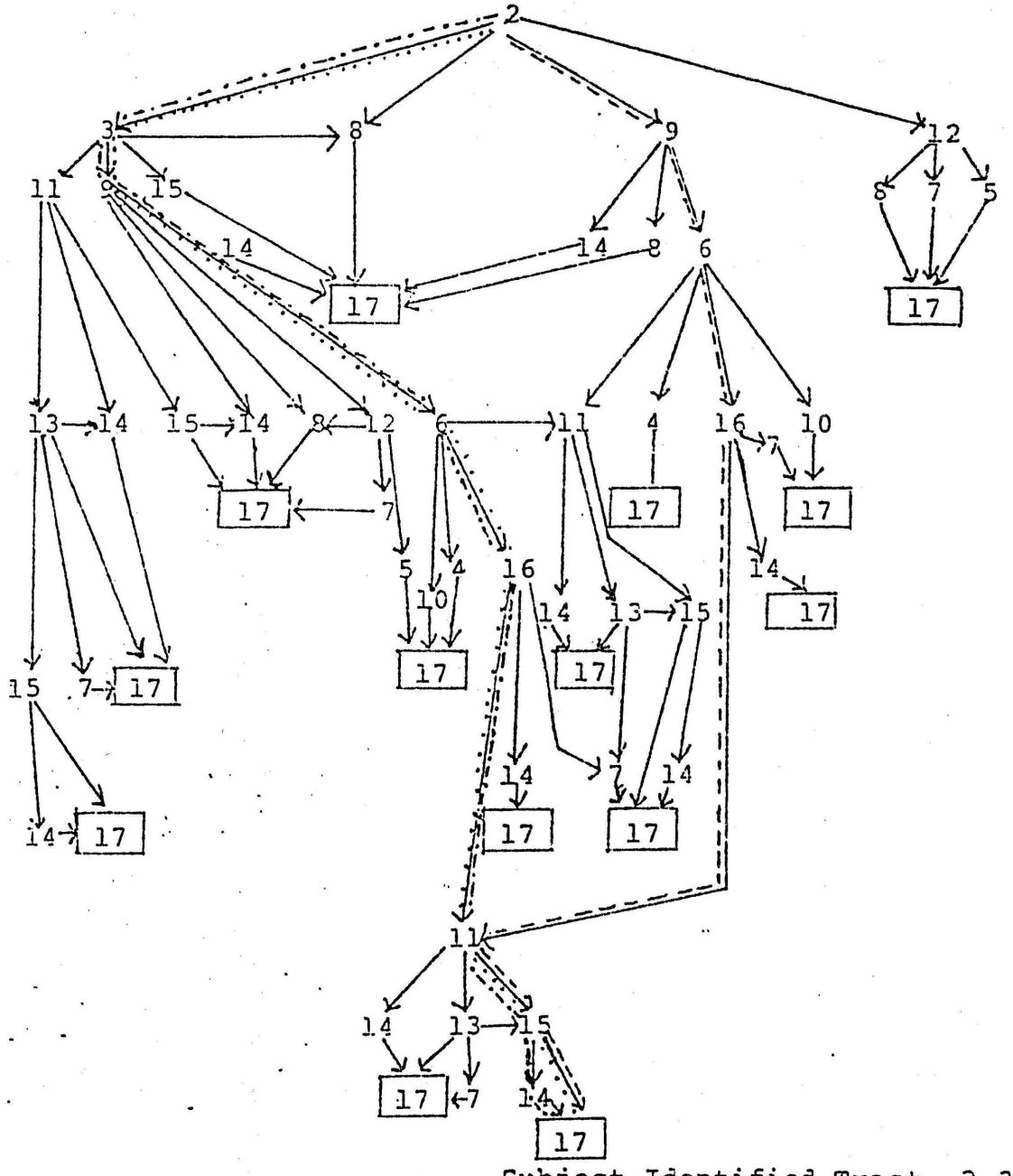
1. ___
2. ___
3. ___
4. ___
5. ___
6. ___
7. ___
8. ___

Problem III - Page 34

1. ___
2. ___
3. ___
4. ___
5. ___
6. ___
7. ___
8. ___

APPENDIX C

PROBLEM I MAPPING



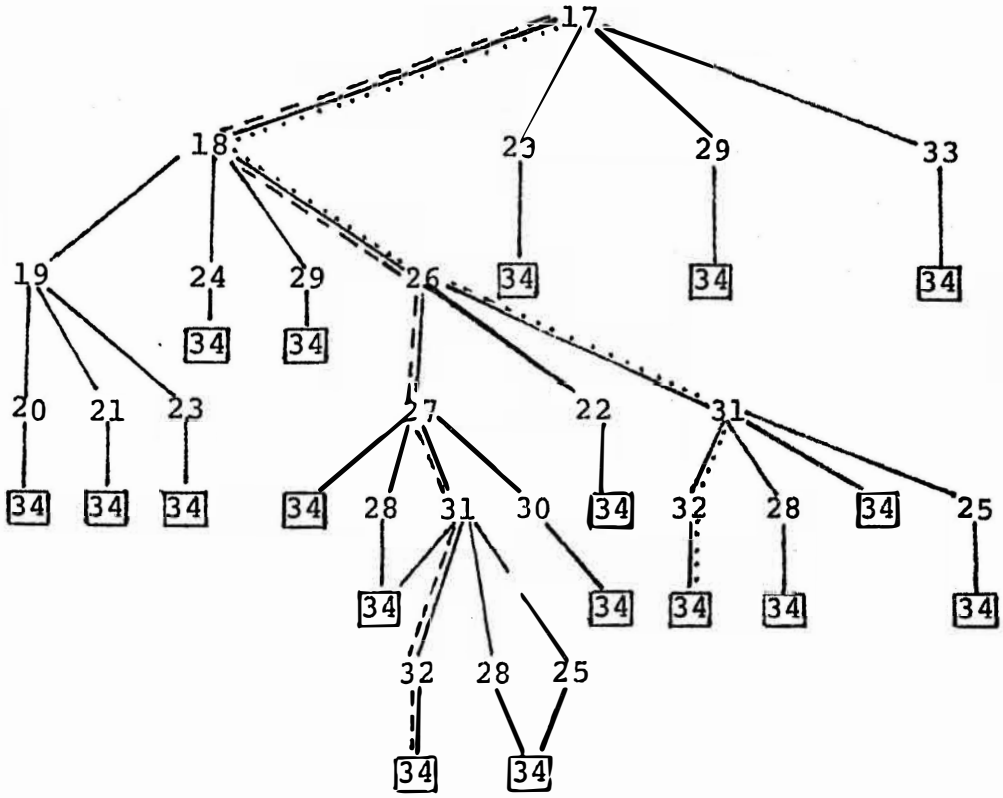
....Subject-Identified Tract..2-3-9-6-16-11-15-14-17

....Most Desirable Tract.. 2-3-9-6-16-11-15-17

----Alternate Tract.. 2-9-6-16-11-15-17

Number of 17's on tract - 53

PROBLEM II MAPPING

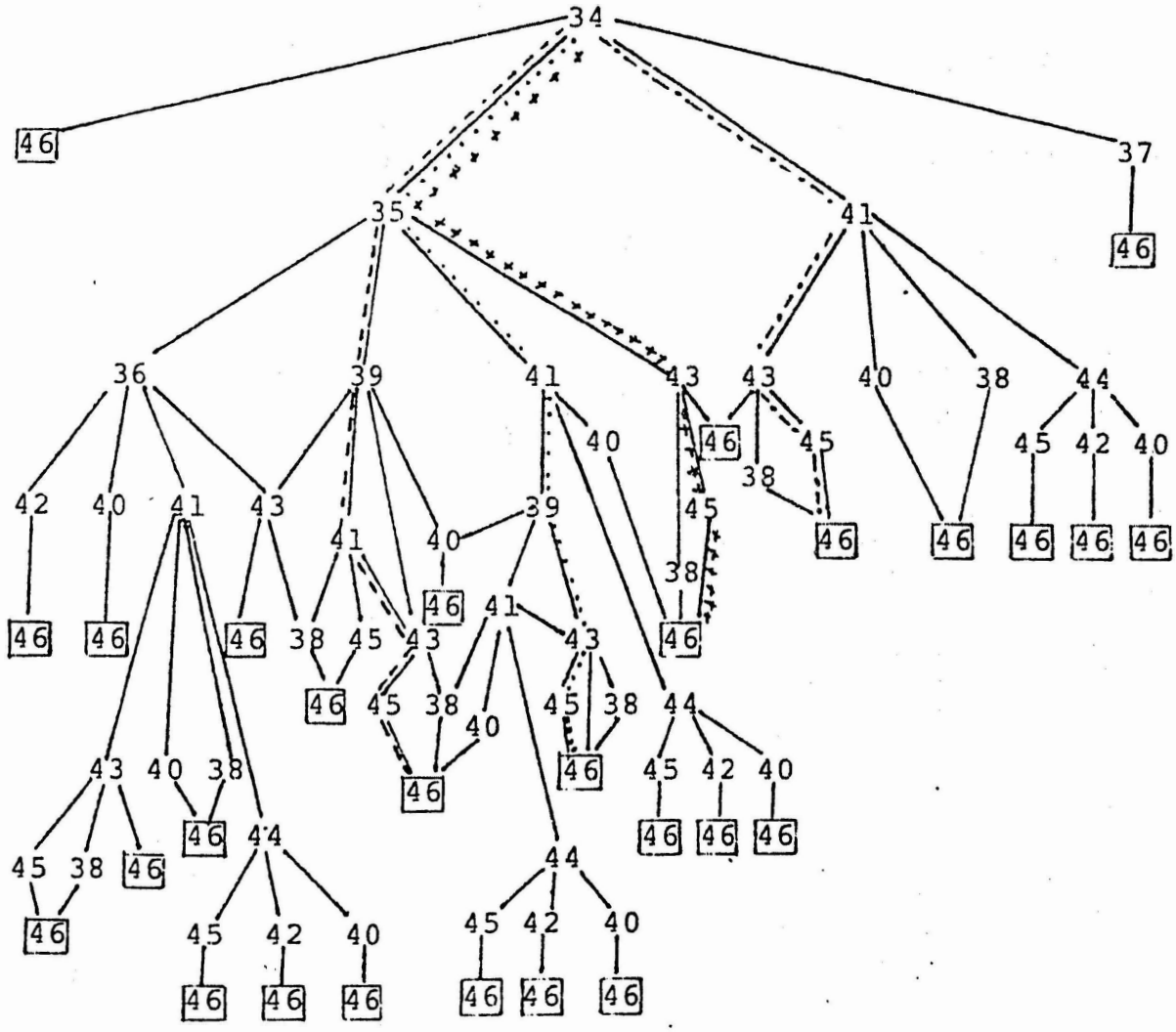


..... Most Desirable Tract.. 17-18-26-31-32-34

-----Alternate Tract .. 17-18-26-27-31-32-34

Number of 34's on tract- 20

PROBLEM III MAPPING



++++ Subject-Identified #1 Tract..34-35-43-45-46

.-.-.Subject-Identified #2 Tract..34-41-43-45-46

..... Most Desirable Tract .. 34-35-41-39-43-45-46

----- Alternate Tract ..34-35-39-41-43-45-46

Number of 46's on tract- 40

APPENDIX D

TEXAS WOMAN'S UNIVERSITY
COLLEGE OF NURSING

AGENCY PERMISSION FOR CONDUCTING STUDY

THE _____

GRANTS TO ANITA MAY FIELDS, RN, M.S.N.

a student enrolled in a program of nursing leading to a Doctor's Degree at Texas Woman's University, the privilige of its facilities in order to study the following problem.

SEARCH STRATEGIES IN NURSING CLINICAL INFERENCE

The conditions mutually agreed upon are as follows:

1. The agency (may) (may not) be identified in the final report.

2. The names of consultiative or administrative personnel in the agency (may) (may not) be identified in the final report.

3. The agency (wants) (does not want) a conference with the student when the report is completed.

4. The agency is (willing) (unwilling) to allow the completed report to be circulated through interlibrary loan.

5. Other _____

_____

_____

Date: _____ _____
Signature of Agency Personnel

_____ _____
Signature of Student Signature of Faculty Advisor

Consent Form
TEXAS WOMAN'S UNIVERSITY
HUMAN SUBJECTS REVIEW COMMITTEE

Title of Projects: SEARCH STRATEGIES IN NURSING CLINICAL INFERENCE

Consent to Act as A Subject for Research and Investigation:

I have received an oral description of this study, including a fair explanation of the procedures and their purpose, any associated discomforts or risks, and a description of the possible benefits. An offer has been made to me to answer all questions about this study. I understand that my name will not be used in any release of the data and that I am free to withdraw at any time. I further understand that no medical service compensation is provided to subjects by the university as a result of injury from participation in research. I UNDERSTAND THAT THE RETURN OF MY QUESTIONAIRE CONSTITUTES MY INFORMED CONSENT TO ACT AS A SUBJECT IN THIS RESEARCH.

Signature _____ Date _____

Witness _____ Date _____

Certification by Person Explaining the Study:

This is to certify that I have fully informed and explained to the above named person a description of the listed elements of informed consent.

Signature _____ Date _____

Doctoral Candidate
Position

Witness _____ Date _____

BIBLIOGRAPHY

Abdellah, Faye G. Patient-Centered Approaches to Nursing. New York: The Macmillan Company, 1960.

Aspinall, Mary Jo. Nursing Diagnosis - The Weak Link, Nursing Outlook, 1976, 24, 433-437.

Aspinall, Mary Jo. Use of a Decision Tree by Nurses to Improve the Accuracy of Diagnosis. Unpublished manuscript presented to the Council of Nurse Researchers, American Nurses' Association, Las Vegas, Nevada, August, 1977.

Bruner, Jerome S., Goodnow, Jacqueline J., & Austin, George A. A Study of Thinking. New York: John Wiley and Sons, Inc., 1956.

Bruner, Jerome S. Personality Dynamics and the Process of Perceiving. Beyond the Information Given, Anglin (Ed.), New York: W. W. Norton and Company, 1971.

Chambers, Wilma. Nursing Diagnosis. American Journal of Nursing, 1962, 62, 102-104.

Cutler, Paul, M.D. Problem Solving in Clinical Medicine. Baltimore: The Williams and Watkins Company, 1970.

Dickoff, James, James, Patricia, & Wiedenbach, Ernestine. Theory in a Practice Discipline, Practice Oriented Theory. Nursing Research, 1968, 17, 415-435.

Diers, Donna. Research in Nursing Practice. Philadelphia: J. B. Lippencott, 1979.

Doona, Mary E. The Judgment Process in Nursing. Image, 1976, 3, 42-44.

Durand, M., & Prince R. Nursing Diagnosis: Process and Decision. Nursing Forum, 1966, 4, 50-64.

Fatzer, Carol. The Relationship Between Logical Reasoning and Nursing Diagnosis. Nursing Diagnosis, Monograph. Denton, Texas: Texas Woman's University, College of Nursing. Fall, 1979, 17-23.

Fields, Anita. The Use of Scanning Techniques by Nurses in the Presence of a Prior Mind Set. Unpublished study for Nursing 6453, Texas Woman's University, Denton, Texas, July, 1978.

Fry, V. The Creative Approach to Nursing. American Journal of Nursing, 1953, 53, 301-302.

Gebbie, Kristine, & Lavin, Mary. Proceedings of the First National Conference on Classification of Nursing Diagnosis. St. Louis: Mosby, 1975.

Gordon, Marjory. Strategies in Probabilistic Concept Attainment. Dissertation for Ph.D., Boston College, 1972.

Gordon, Marjoty. The Concept of Nursing Diagnosis. Nursing Clinics of North America, 1979, 14, 487-495.

Grier, Margaret R. Investigation of the Quantification of Selected Patient Care Decisions Made by Registered Nurses. Dissertation for Ph.D., Texas Woman's University, Denton, Texas, 1975.

Hammond, Kenneth R. An Approach to the Study of Clinical Inference in Nursing, Part II, Clinical Inference in Nursing: A Methodological Approach. Nursing Research, 1964, 13, 315-322.

Hammond, Kenneth R. Clinical Inference in Nursing: Analyzing Cognitive Tasks Representative of Nursing Problems. Nursing Research, 1966b, 15, 134-138.

Hammond, Kenneth R. Clinical Inference in Nursing: Information Units Used. Nursing Research, 1966c, 15, 236-243.

Hammond, Kenneth R. Clinical Inference in Nursing: Psychologist's Viewpoint. Nursing Research, 1966a, 15, 27-38.

Hammond, Kenneth R. Clinical Inference in Nursing: Use of Information-Seeking Strategies by Nurses. Nursing Research, 1966d, 15, 330-336.

Hardy, Margaret E. Theories: Components, Development, Evaluation. Nursing Research, 1974, 15, 106.

Kelly, Katheryn J. An Approach to the Study of Clinical Inference in Nursing: Part I, Introduction to the Study of Clinical Inference in Nursing. Nursing Research, 1964, 13, 314-315.

Kelly, Katheryn J. An Approach to the Study of Clinical Inference in Nursing: Part III, Utilization of the "Lens Model" Method to Study the Inferential Process of the Nurse. Nursing Research, 1964, 13, 322-324.

Kelly, Katheryn J. Clinical Inference in Nursing: A Nurse's Viewpoint. Nursing Research, 1966a, 15, 23-26.

Komorita, Nancy. Nursing Diagnosis. American Journal of Nursing, 1963, 63, 83-86.

King, Imogene M. Toward A Theory for Nursing. New York: John Wiley and Sons, Inc., 1971.

Kritek, Phyllis B. The Generation and Classification of Nursing Diagnosis: Toward a Theory of Nursing. Image, 1978, 2, 33-40.

Lesnik, J. J., & Anderson, Bernice E. Nursing Practice and the Law (2nd Ed.). Philadelphia: J. B. Lippincott Co., 1955.

Matthews, Carol Ann, & Gaul, Alice LeVeille. Nursing Diagnosis: Viewed From the Perspective of Concept Attainment and Critical Thinking. Nursing Diagnosis, Monograph, Denton Texas: Texas Woman's University, College of Nursing. Fall, 1979, 7-15.

McComb, Margaret D. Validation Study of Nursing Diagnosis. Thesis Research Proposal, Unpublished Manuscript, University of Oregon, 1979.

McManus, R. L. Assumption of Functions of Nursing. Regional Planning for Nurses and Nursing Education, New York: Bureau of Publications, Teachers College, Columbia University, 1950.

Orem, Dorthea E. Nursing: Concepts of Practice. New York: McGraw-Hill Book Company, 1971.

Orlando, Ida Jean. The Dynamic Nurse-Patient Relationship. New York: G. P. Putnam's Sons, 1961.

Revisions in Practice Acts Expand Role of Nurse, Special Report, RN, 1975, 38, 18-19.

Riehl, Joan P., & Roy, Callista. Conceptual Models for Nursing Practice. New York: Appleton-Century-Crofts, 1974.

Rothberg, J. S. Why Nursing Diagnosis? American Journal of Nursing. 1967, 67, 1040-1042.

Roy, Callista. A Diagnostic Classification System for Nursing. Nursing Outlook, 1975, 23, 90-93.

Sarbin, Theodore R., Taft, Ronald, & Bailey, Daniel E. Clinical Inference and Cognitive Theory. New York: Holt-Rinehart and Winston, Inc., 1960.

Siegel, Sidney. Nonparametric Statistics for the Behavioral Sciences. New York: McGraw-Hill Book Company, 1956.

Standards of Nursing Practice. New York: American Nurses' Association, Inc., 1973.

Wiedenbach, Ernestine. Clinical Nursing: A Helping Art. New York: Springer Publishing Company, Inc., 1964.