● 招聘講演 ●

Decision Making During Planning by Expert and Novice Nurses

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Decision making in the planning phase of the nursing process was studied in this investigation. Textbooks on nursing process include only sketchy descriptions of the planning phase. Such descriptions are based on little empirical evidence; instead, they are based on logically developed steps, because few investigators have studied how nurses actually develop plans under conditions of uncertainty.

In the present study, an information processing approach was used to describe and compare the decision-making processes used and the final decisions made by hospice nurses who had varying amounts of experience in developing drug administration plans to control patients' pain.

Background

Background information is given on: (a) information processing theory which provided a theoretical basis and a methodology for the study; (b) literature on the planning phase of the nursing process; and (c) hospic programs as settings where nursing decisions are made under conditions of complexity and uncertainty.

Information Processing Theory

Information processing theory is one theory used to describe and explain decision making. It is a descriptive theory of human cognetive processes based on the work of Newell and Simon (Newell and Simon, 1972; Simon, 1979). The theory describes problem solving behavior as an interaction between a problem solver and a problem task. Humans are viewed as information processing systems operating in a complex environment. A major assumption of this theory is that humans have limitations in the capacity of their working memories. The focus of research based on information processing theory is on how humans adapt this limited capacity to the complex demands of their environment.

Recent research on information processing has been extended from the study of naive subjects and simple tasks to the study of: (a) the nature of expertise; and (b) problem solving in semantically rich domains, that is, domains which require specific knowledge as well as general problem solving skills (Simon, 1979). Nursing is an example of such a domain.

A question of concern in information processing research is the extent to which the processes used by individuals to make decisions are invariant across tasks. Research findings indicate that the task itself is a major determinant of behavior; that is, information processing in decision making is highly contingent on the demands of particular tasks, rather that on a person using consistent processes for all tasks (Newell & Simon, 1972; Simon, 1979; Payne, 1976, 1982). Payne (1976) found task complexity to be one of the variables which influence information process-

ing.

One method used to study information processing in specific tasks is verbal protocols. With this method a subject is given a problem and asked to think aloud while solving it. The subject's verbalizations are tape recorded and later transcribed. The transcriptions (verbal protocols) provide the primary data for analysis. Verbal protocols are rich in detail and preserve the sequence of steps used by subjects.

Planning Phase of the Nursing Process

Decision making is involved in two parts of the nursing process: (a) identifying the nursing diagnosis at the conclusion of the assessment phase, and (b) choosing the best alternatives(s) in the planning phase (Grier, 1981). Once a nursing diagnosis has been identified, then plans for nursing interventions can be made. Little description of the planning phase is given in textbooks on nursing process. However, several authors (Bailey and Claus, 1975; and Bower, 1982) suggest that during the planning phase, all alternatives should be generated before any of them are evaluated. In addition, those authors, as well as Lancaster and Beare (1982) and Yura and Walsh (1983) suggest that all alternatives which are generated should be evaluated.

In a study of planning which did not involve nursing, Hayes-Roth and Hayes-Roth (1979) developed a cognitive model of planning based on their finding that people used opportunitic, rather than systematic, hierarchial approaches to complex planning tasks. An opportunistic approach to planning is one in which a person jumps about addressing whatever seems opportune or promising at the time.

Decision Making Tasks in Hospice Programs

The hospic movement is a relatively new and rapidly growing development within the United States. The territory for such a new reform is often unfamiliar and unspecified. Consequently, nurses and other members of the interdisciplinary hospice team confront many complex decisions under conditions of risk and uncertainty (Wald, Foster, & Wald, 1980). Such a setting provides an opportunity for studying nurses' decision making.

When several hospice nurses were interviewed by this investigator to identify recurring, troublesome decisions they faced, all of them identified decisions concerning pain control. One major form of intervention to control pain is drug therapy.

While nurses cannot prescribe drugs, they do administer a wide variety of them and directly observe their multiple and interacting effects on patients; consequently, nurses frequently recommend drug administration plans to physicians, Seven hospice nurses indicated to this investigator that they carried out this task either daily or at least several times per week.

The Present Research

The research described here was a descriptive study of nurses' decision making using an information processing approach and verbal protocol methodology. The decision making was limited to the planning phase of the nursing process. The setting selected was the hospic setting. The planning task was to develop a drug administration plan to recommend to a physician. The goal of the plan was to control a patient's pain.

The major question addressed in this research was:

> How do the decision-making processes and final decisions of experts in hospice nursing compare with those of novices when developing drug administration plans to control patients' pain?

The independent variables were: (a) expert and novice subjects, and (b) planning problems at three levels of complexity. The dependent variables were: (a) decision-making processes, and (b) final decisions.

Method

Subjects

There were two groups of subjects for this study, experts and novices in hospice nursing. The criteria for inclusion in each group were as follows:

1. An expert in hospice nursing was one who:
   a) Was a registered nurse;
   b) Was currently employed in a leadership position in a hospice program (e.g. director or the program or head nurse);
   c) Had at least 18 months of experience in a hospice program;
   d) Had minimal education of baccalaureate degree; and
   e) Met at least one of the following characteristics of an expert:
      - published articles on hospice nursing;
      - made presentations on hospice nursing to professional groups;
      - offered continued education programs on hospice nursing; or
      - labeled as an expert in hospice nursing by at least five hospice hurses when they were asked to identify an expert.
2. A novice in hospice nursing was one who:
   a) Was a registered nurse;
   b) Was currently employed as a staff nurse in a hospice program;
   c) Had associate degree, diploma, or baccalaureate degree education; and
   d) Had less than six months experience in a hospice program.

Subjects were selected from three hospice programs within one metropolitan area. All hospice nurses in the three programs who met the criteria for either an expert or a novice volunteered to participate in the study. One expert dropped out of the study at a later point, leaving a sample of five experts and five novices. The sample included at least one expert and one novice from each of the three hospice programs.

A small sample size was necessary because of the chosen methodology. As mentioned earlier, verbal protocols are rich in detail; a few subjects are studied intensively. The use of verbal protocols requires considerable time commitments from subjects to complete the tasks, as well as extensive investigator time to analyze the data from verbal protocols. For example, in this study a verbal protocol from one subject on one case was 33 pages in length, requiring hours of analysis. Also, the intent of the study was to describe the processes used by subjects; it was not the intent to generalize findings to other subjects or other tasks.

Materials

The materials for this study included three patient cases and a criterion measure for judging the quality of subjects' drug administration plans.

Cases. Three written cases were developed. They were representative of (a) three types of severe pain experienced by hospice patients, and (b) three levels of complexity for decision making. (See Table 1.) Each written case contained information on 20 pre-established categories for describing a patient. (See Appendix A for the information categories.) The case descriptions were three to five double-spaced, typed pages.

While the patients in all three cases had multiple sources of pain, three primary types of pain were

CASE	PRIMARY TYPE OF PAIN	COMPLEXITY
A	Associated with Pathology which Produces Prostaglandin	Moderately Complex
B	Caused by Pressure	Least Complex
C	Aggravated by Severe Psychological Sources of Pain	Most Complex

Table 1. Primary Type of Pain and Level of Complexity of Each Case

represented by the cases: (a) pain associated with pathology which produces prostaglandin, a potentiator of pain; (b) pain caused by pressure; and (c) pain aggravated by severe psychological sources of pain.

In levels of complexity for decision making, Case B was the least complex because the treatments for that patient's pain could be the ones usually used in a hospice setting. Case A was of moderate complexity because the patient was reportedly sensitive to all central nervous system depressants; that included most of the drugs usually used in a hospice setting. Case C presented the most complex cases because no clear form of treatment would control the patient's pain; this patient had many physical and psychological sources of pain, and many sensitivities to drugs.

A fourth case was developed as a sample case. Subjects were allowed to practice with the sample to become familiar with the tasks and the procedure in the study.

Criterion. In complex situations, such as the three cases in this study, no one drug administration plan can be identified as the right one for controlling a patient's pain. There could be many combinations of actions which would be effective in achieving the goal of pain control.

A consultant to the study, who was a recognized expert in hospice nursing and in pain control, developed a drug administration plan for each case. The consultant's plans served as general standards against which subjects' written plans were compared. Subject's plans were judged to be in one of four quality categories:

1. Consistent with the consultant's plan;
2. Appropriate for the case, but not consistent with the consultant's plan;
3. Incomplete; or
4. Erroneous.

Two experts in hospice nursing independently judged the quality of the subjects' plans. If the two experts disagreed on the quality category, they discussed the decision until there was mutual agreement.

Procedure.

Procedure for data collection. Data were collected from individual subjects in two sessions, each lasting approximately two hours. Each subject was given the General Instructions which described the study and the tasks. The tasks for each case were to: (a) read the case description aloud, (b) develop a drug administration plan, and (c) write a plan. Also, each subject was instructed to think aloud while performing all tasks.

The task of writing the plan was included in this study to separate the planning process from the final decisions in a subject's thinking and in the analysis of data. A subject could change a decision about drugs to recommend as long as the plan was being developed, but the written plan indicated final choices.

No time constraints were placed on the tasks. All cases were presented in the same order. The Sample Case and Case A were given in the first session with each subject, and Case B

and then Case C were given in the second session. All sessions were tape recorded.

Procedure for analysis of data. Rules were developed for coding and scoring the planning processes and the final plan of each subject in each case. Rules were developed for coding and scoring the verbal protocols for the following components of the planning process:

1. Overt recognition of major pain-related problems presented by the patient;

2. Approaches to planning; coding was done for two types of Approaches, Initial and Overall:

a) Initial Approaches were either Broad or Narrow:

- A Broad Initial Approach was one in which a subject gained an overview of the patient's situation before focusing on one pain-related problem for decision making.
- A Narrow Initial Approach was one in which a subject immediately focused on one pain-related problem for decision making.

b) Overall Approaches were either Opportunistic or Systematic:

- An Opportunistic Overall Approach was one in which a subject jumped about addressing single pain-related problems at non-adjacent points in the planning process;
- A Systematic Overall Approach was one in which a subject addressed single pain-related problems at adjacent points in the planning process.

3. Generation of alternative actions to be used for pain control; coding was done for the:

a) Number of alternatives generated;

b) Types of alternatives, either drug or non-drug;

c) Problems addressed by the alternatives were generated.

d) Sequence in which the alternatives were generated.

4. Intermediate decisions about the alternative actions; intermediate decisions are verbal statements evaluating alternatives; they were coded for:

a) Number of intermediate decisions;

b) Problems addressed by intermediate decisions; and

c) Sequence in which the intermediate decisions were made.

A sequence diagram was made to represent each subject's planning process in each case. Figure 1 is an example of a simple sequence diagram. The second column shows the alternatives generated in the order in which they were generated by one subject. The first column shows the problem addressed by each alternative. The upper right section shows the intermediate decisions about alternatives in the order in which they were made. Finally, the lower right section shows the relationship of the sequence of intermediate decisions to the sequence in which the included alternatives were generated. For example, the number 1 in the lower right section indicates that the first intermediate decision, "To stop Percocet," was made about the first alternative generated, "Percocet," which addressed the problem of generalized pain. Also, the diagram revealed whether or not all alternatives were overtly evaluated in intermediate decisions. For example, Figure 1 shows that the last alternative generated was not evaluated. In addition, the sequence diagram revealed whether intermediate decisions were made about alternatives as they were generated, or in some other order or pattern. For example, Figure 1 shows that the sequence of intermediate decisions was not the same as the sequence in which the included alternatives were generated. Finally, Figure 1 illustrates the use of an opportunistic overall approach because

Figure 1. A sequence diagram which shows the relationship of the sequence of intermediate decisions to the sequence in which the included alternatives were generated.

Problems Addressed	Sequence of Alternatives	Sequence of Intermediate Decisions
		Stop Percocet / Go back to OMS / OMS at 2.5 mg q t hr / Increase by 2.5 mg in 12 hr / Stop Vistaril and Ascription / Emotional Support
Generalized Pain	Percocet	1※
Bone Pain	Ascriptin	
Anxiety	Vistaril	2
Generalized Pain	Oral Morphine Solution	3
Anxiety	Emotional Support	4
Anxiety	Minister Visit	5 / 5 / 6

※ The numbers represent each successive intermediate decision

the problem of generalized pain was addressed by the first and fourth alternatives generated, and anxiety was addressed by the third, fifth, and sixth alternatives. The subject represented in Figure 1 addressed single sources of pain at non-adjacent points in the planning process.

Rules were developed for coding and scoring the following components of the final written plan:

1. Number of alternatives chosen;
2. Types of alternatives chosen; and
3. Quality of the plan.

To test the reliability of the coding and scoring of data, two judges independently applied the coding and scoring rules to a sample of ten of thirty verbal protocols and written plans. The proportion of agreement between the two independent judges was determined. (See the middle column of Table 2.) Cohen's coefficient of agreement for nominal scales, (k), was used to determine the proportion of joint judgments in which there was agreement, after chance agreement was excluded (Cohen, 1960). (See the right column of Table 2.) Overall, the average Cohen's k was .77. That was an acceptable level of interjudge agreement for the type of data in this study.

After each verbal protocol and final plan was coded and scored, then findings were compared between the expert and novice groups for each case. Next, comparisons were made of subjects' planning processes and final plans across the three cases to test for interactions between subjects and cases.

Non-parametric statistics were used to compare quantitative data because the sample size was small, the data were either nominal or ordinal in nature, and the data were often skewed by one subject. The Mann Whitney U Test, Fisher's Exact Probability, and Cochran's Q Test

COMPONENTS	PROPORTION OF AGREEMENT (N=10)	MEAN COHEN'S COEFFICIENT (N=10)
PLANNING PROCESS:		
Initial approach	.90	.78
Overall approach	.80	.58
Alternatives	.82	.81
Intermediate Decisions	.76	.76
FINAL PLAN		
Choices	.89	.85
Quality of Plans	.90	.86

Table 2. Proportion of Agreement and Mean Cohen's Coefficient for Coding and Scoring of Components of Planning Processes and Final Plans

were the statistics used (Siegel, 1956). The significance level was established at $p=.05$. Since the sample size in the study was small, statistically significant differences were difficult to achieve at the .05 level. Therefore, where p values were more than .05, but less than .15, the differences were reported at trends which might be pursued in further study.

Findings

The findings will be reported in two sections. First the similarities in decision making by experts and novices will be reported and then the differences.

Similarities

The Cochran Q test indicated that experts' and novices' recognition of patients' pain related problems did not differ across cases, $Q(2)=.667$, $p<.8$. Four experts and three novices overtly recognized all of the patient's major pain-related problems in all cases.

A second similarity was that all experts and novices generated drug and non-drug alternatives, despite the instructions to develop a drug administration plan. As one expert stated, "I can't limit my thinking to drugs to provide pain control." The range for the number of alternatives generated was from 4 to 35, with a median of 14.

A third similarity was that all experts and novices made intermediate decisions about alternatives as they were generated. That is, no subject generated all alternatives before making intermediate decisions about any of them. The range for the number of intermediate decisions made was from 4 to 22, with a median of 11.

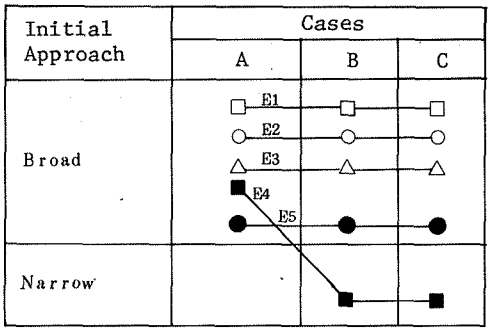
A fourth similarity was that experts' and novices' intermediate decisions about all, or a portion of their alternatives varied significantly across cases, $Q(2)=6.5$, $p<.05$. In the case where subjects generated the most alternatives (Case C, the most complex case), no subject evaluated all alternatives. In the case where subjects generated the fewest alternatives (Case B, the least complex case), one expert and four novices evaluated all of their alternatives; they had generated few alternatives and evaluated all of them.

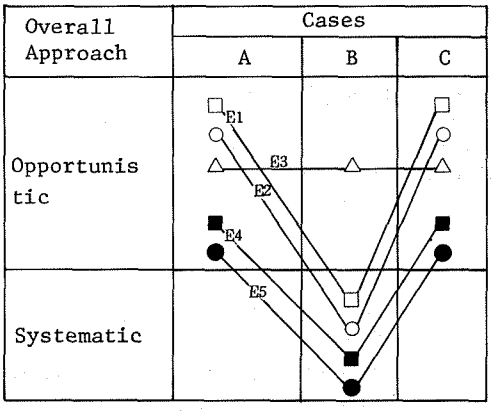
Differences

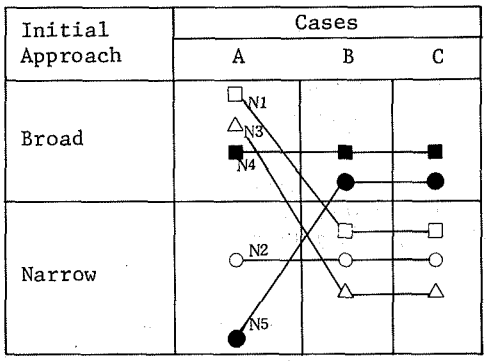
There was a trend for more experts than novices to use broad, rather than narrow initial approaches to the planning problems, Fisher's exact p=.0922. (See Figures 2 and 3.) Figure 2 shows that four experts consistently used broad initial approaches, obtaining an overview of each patient's condition before focusing on one pain-related problem for decision making. In contrast, Figure 3 shows three novices varied their initial approaches; no pattern was evident.

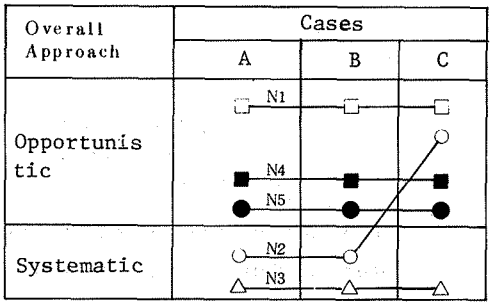
The second expert-novice difference involved the major finding that subjects' overall approaches differed significantly across cases, $Q(2)$=7.6 p=7.6 p=0.5. There was an interaction between cases and overall approaches. Experts contributed most to this variance. There was a trend for more experts than novices to vary their overall approaches across cases, Fisher's exact p=.0992. (See Figures 4 and 5.) Figure 4 shows that all experts used opportunistic overall approaches in the more complex cases, Cases A and C, and most used systematic overall approaches in the least complex case, Case B. In contrast, Figure 5 shows that most novices used opportunistic overall approaches across cases.

A third expert-novice difference was that experts generated significantly more drugs than did novices in two of the three cases, U=4, p=.048 in both Cases A and B.









A fourth expert-novice difference was that experts developed more final plans consistent with the consultant's plans than did novices. Also, novices developed more erroneous plans than did experts. (See Table 3.)

	QUALITY OF PLAN			
	Consistent	Appropriate	Incomplete	Erroneous
EXPERTS	3	7	5	1
NOVICES	0	7	5	5

Note. One expert and two novices developed plans which were both incomplete and erroneous.

Table 3. Number of Experts' and Novices' Plans in Quality Categories

Finally, the basis for incomplete or erroneous plans differed somewhat for experts and novices. Table 4 shows that:
(a) recognizing, but then overtly dismissing a problem was a basis for incomplete plans unique to experts;
(b) lack of knowledge and oversimplification of a planning problem were bases for incomplete and/or erroneous plans unique to novices;
(c) both experts and novices wrote incomplete plans based on failure to recognize a pain-related problem, or forgetting a recognized problem; and
(d) both experts and novices wrote erroneous plans because they failed to combine information about an alternative with information about the patient.

QUALITY OF PLANS	EXPERTS	NOVICES
INCOMPLETE PLANS	*Dismiss a problem (2)	*Lack of knowledge (2)
	Not recognize a problem (1)	Not recognize a problem (1)
	Forget a problem (2)	Forget a problem (1)
ERRONEOUS PLANS		*Lack of knowledge (3)
		*Oversimplified problem (1)
	Fail to combine information about drug and patient (1)	Fail to combine information about drug and patient (1)

* Represents bases unique to one group

Note: Numbers in parentheses represent the number of subjects.

Table 4. Bases on Incomplete and Erroneous Plans Developed by Experts and Novices.

Discussion

The findings demonstrate that hospice nurses who participated in this study did not implement the planning phase of the nursing process as prescribed in textbooks on the topic (Bailey & Claus, 1975; Bower, 1982; Lancaster & Beare, 1982; Yura & Walsh, 1983). For example, subjects neither generated all alternatives before evaluating any of them, nor did they consistently evaluate all alternatives. Since individual subjects generated from 4 to 35 alternatives in a single case, perhaps alternatives were evaluated as they were generated to reduce the cognitive strain on the limited capacity of working memory. The few subjects who evaluated all alternatives were those who had generated the least number. Therefore, the number of alternatives generated was a variable which influenced the decision making strategies which followed.

One encouraging finding was that most subjects overtly recognized the patients' major pain-related problems. Another was that subjects generated both drug and non-drug alternatives. The consideration of multiple types of treatments to control pain was consistent with recommendations of authors on pain control (Geltman & Paige, 1983; McCaffery, 1979). However, doing so made the planning process more complex, rather than simpler.

Findings of this study support the conclusion of Payne (1982) and others that information processing in decision making is contingent on the demands of the task. In the more complex cases (Cases A and C), most subjects used opportunistic, rather than systematic overall approaches; that is, they addressed single problems at non-adjacent points in the planning process; they jumped about from problem to problem. In contrast, for the least difficult case (Case B), most subjects (particularly experts) used systematic overall approaches; that is, they addressed each problem at adjacent points in the planning process.

The use of opportunistic overall approaches for the more complex cases was consistent with the findings of Hayes-Roth and Hayes-Roth (1979). However, it was surprising that subjects (primarily experts) used systematic overall approaches in Case B. Hayes-Roth and Hayes-Roth (1979) provided a possible explanation for this finding. They indicated that a systematic approach might be used by an experienced planner working with a familiar, constrained, though complex problem. Case B in this study, while a complex case, provided a rather typical hospice patient situation, one more familiar to experts than were the other cases.

It was not surprising that experts generally developed better plans than did novices. The finding that experts and novices had differing bases for incomplete or erroneous plans suggests that some different corrective measures are needed by each group.

Summary

This was a study of decision making by nurses in the planning phase of the nursing process. An information processing approach with verbal protocol methodology was used.

Major findings were that subjects: (a) did not implement the planning phase of the nursing process as suggested by textbooks on the topic; and (b) varied their decision making processes as a function of task complexity and of the number of alternatives generated. Expert-novice differences included: (a) more experts than novices used broad initial appraoches to planning; (b) experts used opportunistic overall appraoches in the more complex cases and systematic ones in the least complex case, while most novices used opportunistic overall approaches in all cases; and (c) experts and novices had differing bases for incomplete or erroneous plans.

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