1996

The elicitation of experience-based knowledge from expert PICU nurses

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THE ELICITATION OF EXPERIENCE-BASED KNOWLEDGE

FROM EXPERT PICU NURSES

A Thesis

Presented to

The Faculty of the School of Nursing

San Jose State University

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

By

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May, 1996

UMI Number: 1379333

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ABSTRACT

THE ELICITATION OF EXPERIENCE-BASED KNOWLEDGE
FROM EXPERT PICU NURSES

by Helen K. Daley

This study examined the clinical judgment processes
that expert pediatric intensive care unit (PICU) nurses use
in the assessment and care of critically ill infants and
children. A qualitative design was used to identify and
describe categories of experience-based knowledge from
expert PICU nurses. The critical decision method was used to
interview the nurses (N = 5).

Content analysis revealed that the most frequently
mentioned categories were perceptual cues (m = 20.4), domain
knowledge items (m = 13.3), and other information (m =
25.2). These three categories suggest that expert PICU
nurses rely on this kind of information in addition to
assessment parameters when making clinical judgments.

ACKNOWLEDGMENTS

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Chapter 1

INTRODUCTION

Pediatric intensive care unit (PICU) nurses are

constantly making clinical judgments when caring for

critically ill infants and children. These clinical

judgments can mean the difference between life and death in

critical situations. The clinical research in this area is

limited and much of the literature related to the subject is

in the form of case studies presented as exemplars, or

stories of nurses experiences. By identifying the cues and

assessment parameters from this knowledge, more can be

learned about the clinical judgment processes surrounding

the assessment and care of critically ill infants and

children. In the future, these processes can be documented

and used to assist less experienced PICU nurses.

Problem

Experience-based knowledge forms the basis for nurses'

intuitive clinical judgments, enabling them to assess and

attend to clients' needs quickly and with accuracy (Crandall

& Getchell-Reiter, 1993). The nurse's impression of how the

patient looks is often more important than any particular

vital sign number (Hazinski, 1992). This is particularly

important when nursing sick children, especially those whose

condition can deteriorate very quickly because of their

small size, immature organ systems, fast metabolic rate, and

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low reserves (Hazinski). Therefore, pediatric nurses must be able to perform a rapid visual assessment of a child's color, skin perfusion, level of activity, responsiveness, and position of comfort, and determine at a glance if a child <u>looks good</u> or <u>looks bad</u> (Hazinski).

"As the nurse gains experience, clinical knowledge becomes a blend of practical and theoretical knowledge" (Alexander & Keller, 1994, p. 165). Expert nurses are often unaware of the clinical knowledge they have gained over time (Benner, 1984). This clinical knowledge needs to be made available in a form that is observable, so that it can be extended and refined (Benner). "When experts can describe clinical situations where their interventions made a difference, some of the knowledge embedded in their practice becomes visible" (Benner, p. 36). Benner states that the knowledge embedded in the clinical expertise of nurses is central to the advancement of nursing practice and the development of nursing science.

The significance of this study was to make this clinical knowledge visible and documented, so that it could be analyzed and thus contribute to our understanding of the clinical judgment processes involved in expert clinical practice. This documented experience-based knowledge will later provide a tool for less experienced nurses to care for critically ill patients.

Purpose

The purpose of this study was to identify and describe categories of experience-based knowledge of nurses with experience in the care of children in a PICU.

Research Question

Given that every clinical situation is unique, and that critically ill infants and children can present differently for the same condition and respond differently to the same treatment, expert PICU nurses know intuitively which course of action to take in each case. Expert PICU nurses are able to provide quality care to this group of patients in a myriad of clinical situations. How do these nurses decide what is the best course of action to take in a particular situation? More specifically, what are the clinical judgment processes that surround nurses' assessment and care of critically ill infants and children?

Definition of Terms

For the purpose of this study, the following definitions applied:

1. <u>Experience-Based Knowledge</u> is the tacit embodied know-how that allows for instantaneous pattern recognition and intuitive responses (Tanner, Benner, Chesla, & Gordon, 1993). It is highly personal, subjective, and idiosyncratic (Tanner et al.).

2. <u>Knowledge Elicitation</u> is the means by which tacit

knowledge is made explicit, that is, knowledge which is
otherwise difficult to access, characterize, or communicate
to others is made in a form that can be examined (Crandall &
Getchell-Reiter, 1993).

    3. Expert refers to ". . . individuals who have over
ten years experience and would be recognized as having
proficiency in their domain" (Klein, Calderwood, &
MacGregor, 1989, p. 462).

    4. Expert Nurse refers to a nurse with an enormous
background of experience and ability of pattern recognition,
and who no longer relies on analytical principles such as
rules, guidelines or maxims to approach and act on a
situation (Benner, 1994, p. 32).

    5. Pediatric Intensive Care Nurse refers to a
registered nurse who cares for critically ill infants and
children from birth to 18 years of age.

    6. Critical Decision refers to a decision made during a
nonroutine incident under time pressure (Klein et al.,
1989).

<center>Summary</center>

    Pediatric nurses need to be able to perform rapid,
accurate assessments on children, especially those who are
critically ill, because their condition can deteriorate
quickly, thus requiring skilled emergent care. This study
aimed to categorize experience-based knowledge of expert

PICU nurses by identifying the cues and assessment parameters from this knowledge. The use of this information will add to our understanding of how expert PICU nurses make clinical judgments, and provide a tool for assisting less experienced nurses to care for critically ill infants and children.

Chapter 2

CONCEPTUAL FRAMEWORK AND REVIEW OF LITERATURE

This chapter describes Benner's novice to expert model, which formed the conceptual framework for the study. The framework focused on the expert level in the context of the PICU nurse. The review of literature focuses on concepts of expertise and research studies on nursing expertise.

Conceptual Framework

Expertise has been described in many ways. Benner's model provided a description of an expert in terms of nursing practice, thus providing an applicable framework to guide this research study on the clinical judgment processes of expert PICU nurses. The model also helped to identify the different stages of nursing skill attainment, so that nurses at the expert level could be distinguished from the other levels when selecting the sample for the study. Benner (1984) has studied extensively clinical nursing practice in an attempt to identify and explain this knowledge embedded in the clinical expertise of nurses.

Benner describes in her book, From Novice to Expert, the results of research aimed at determining whether there were any distinguishable differences between the descriptions of the same clinical incident made by novice nurses compared to expert nurses. Five levels of competency in clinical nursing practice were identified: (a) novice,

(b) advanced beginner, (c) competent, (d) proficient, and (e) expert (Benner). These levels were found to fit well with the five stages of skill acquisition, a common pattern observed in the studies by Dreyfus and Dreyfus (1986) on ". . . the skill-acquisition process of airplane pilots, chess players, automobile drivers, and adult learners of a second language" (p. 20). These levels are briefly described as follows.

Novice

The .\ :st level is the novice, who is considered to have no background experience of the situations, which he or she will perform in (Benner, 1984, p. 20). Context-free rules and objective attributes guide practice at this stage (Benner, p. 21).

Advanced Beginner

The second level is the advanced beginner, who is able to recognize aspects of a situation based on a limited experience of similar situations (Benner, 1984, p. 22). Practice at this level is guided by rules and task-completion (Benner, p. 24).

Competent

The competent level is characterized ". . . by considerable conscious, deliberate planning" (Benner, 1984, p. 292). The competent nurse is able to prioritize care, and focus on time management and organization (Benner, p. 27).

Proficient

The fourth level is the proficient nurse, ". . . who perceives situations as wholes rather than in terms of aspects, and practice is guided by maxims" (Benner, 1984, p. 27). The proficient nurse recognizes the most salient aspects of the situation based on a deep background understanding (Benner, p. 29).

Expert

The fifth and final level is the expert, which is achieved when the nurse stops relying on analytical principles such as rules, guidelines, or maxims to approach and act on a situation (Benner, 1984, p. 31). The expert nurse is said to have an intuitive grasp of the situation; that is, an understanding without a rationale (Benner & Tanner, 1987). The expert nurse has ". . . an enormous background of experience . . ." and the ability of pattern recognition (Benner, p. 32). "The expert operates from a deep understanding of the total situation . . ." (Benner, p. 32).

A nurse may be reasonably expected to perform at the expert level in situations that are familiar ". . . and at the competent or even advanced beginner level in less familiar ones" (Benner, 1984, p. 179). This means, that if an expert PICU nurse is transferred to work in for example an adult intensive care unit, the nurse may perform at the

competent level rather than the expert level in this setting.

Review of Literature

The Knowledge Held by Experts

Experts have two kinds of knowledge, experience-based knowledge and theoretical knowledge (Hampton, 1994). Expert nurses do not rely on conscious reasoning based on theoretical knowledge to the same extent that novice nurses do (Hampton). Instead, expert nurses bypass the sustained, systematic thought processes used by the novice and use his or her intuition, which is a sophisticated form of reasoning, that is gained by experience over time (Hampton). The knowledge base of the expert contains not only bigger chunks of information, but also better organized and interrelated information, than that of novices (Hampton). Experts approach problems with perceptions of a situation as a whole rather than consisting of a mix of elements, bits, and cues (Benner & Tanner, 1987).

Benner (1994) describes experience as ". . . the refinement of preconceived notions and theory through encounters with many actual practical situations that add nuances or shades of differences to theory" rather than simply the passage of time or longevity (p. 36). Experience-based knowledge is the tacit embodied know-how that allows for instantaneous pattern recognition and intuitive

responses (Tanner et al., 1993). "This form of knowledge cannot simply be passed along through perception or by didactic teaching" (Downey, 1993, p. 374). Experience-based knowledge is highly personal, subjective and idiosyncratic (Tanner et al.).

Clinical Expertise

Conceptually, expertise in operation is always specific to its content area. In their field, experts compared to novices always have greater automaticity of basic processes, more knowledge of information and strategies, and more organized knowledge. The cognitive activities that support expertise are domain-specific almost by definition. But the developmental processes that lead to the acquisition of expertise often cut across content domains. (Keating, 1990, p. 258)

Benner's conceptualization of the expert nurse agrees with Keating's conceptualization of expertise. The content area of the expert nurse is the clinical world, which is a practical world made up of commonalities and patterns, product of shared clinical wisdom and experience in a clinical world, that is not a total or uniform theoretical system (Benner, Tanner, & Chesla, 1992).

Clinical expertise is highly influenced by experience caring for similar patient populations (Benner, 1984, p. 179). Taking care of patients in a particular clinical

specialization such as the PICU facilitates ". . . the nurses' monitoring and assessment function [which] requires graded qualitative distinctions that can be made only by someone who has an experiential basis for comparing similar and dissimilar cases" (Benner, p. 180). Clinical specialization also permits "nurses [to] acquire ways of understanding, interpreting, and coping with illnesses by taking care of many different patients with a range of comparable adjustment and coping demands" (Benner, p. 180). Clinical specialty nurses gain flexibility and wisdom by caring for patients during all phases of their illness (Benner, p. 180).

Much of the literature on the subject of nursing expertise consisted of case studies of clinical exemplars by specialty nurses. For example, two pediatric perioperative nurses, Anastasio and Foldy (1995) wrote a paper discussing how clinical exemplars have been useful in peer review for clinical recognition and advancement at a large metropolitan children's hospital. The clinical exemplars enable the nurses to illustrate clinical knowledge development and provide the experts the opportunity ". . . to communicate the unique knowledge they have acquired through practical experience" (Anastasio & Foldy, p. 55). This paper presented two exemplars described by two expert pediatric perioperative nurses. One of the clinical exemplars was

about a 3-year-old girl undergoing a complicated repair of a congenital heart defect. The expert nurse was able to sense the special needs of the parents when it became evident that the girl was not going to be weaned off the heart-lung machine and death was imminent. The nurse's established relationship preoperatively with the parents enabled her to see beyond the immediate needs of her patient and respond quickly to coordinate various resources to initiate support to the parents during this emotional crisis. This exemplar illustrates well the conceptualization of nursing expertise by Benner.

English (1993) criticizes Benner's model for not clearly defining how one becomes an expert, that simply working through the stages of development does not guarantee expert status. Benner (1984) states that "not all nurses will be able to become experts" (p. 35). English critiques Benner's model from a cognitive psychologist's view, emphasizing the need for empirical testing of the concept, intuition, and defining it in terms of cognitive models to validate its applicability to the nursing profession. Benner and Tanner (1987) support the view that intuition is a legitimate aspect of clinical judgment.

Darbyshire (1994) wrote a paper in response to English's critique to illustrate how one can misinterpret Benner's model. Darbyshire argues more strongly in favor of

the Heideggerian phenomenologist's view, that expertise and intuition cannot be explained simply as formalized objective and empirical knowledge. The dichotomy of viewpoints in the area of intuition and expertise is illustrated well by these two authors.

Research Studies on Nursing Expertise

Benner's work has subsequently been used as a framework on which to base further research in clinical nursing practice. Although, most of the literature consists of case studies of nurses' exemplars which support Benner's conceptualization. Clinical research done to back up Benner's model is limited.

One such study by Reed (1994) used Benner's model, together with a phenomenological approach to investigate the expertise in nurses working in long-term care settings for the elderly. This study was curtailed by an apparent difficulty of the three participants to identify any significant incidents (Reed). This raised the question, were the nurses who were interviewed really experts (Reed)?

Another two studies based on Benner's work used the critical decision method (CDM) to elicit the intuitive, experience-based knowledge of expert neonatal intensive care unit (NICU) nurses (Crandall & Getchell-Reiter, 1993). The CDM complements Benner's work by providing a novel strategy for eliciting additional experience-based knowledge from

expert nurses that may not be otherwise revealed in the
nurses' exemplars. The CDM will now be briefly discussed. A
more detailed explanation of the CDM methodology is provided
in chapter 3.

Critical decision method. The CDM, described by Klein
et al. (1989) is a knowledge elicitation technique developed
from Flanagan's critical incident technique (CIT) (Flanagan,
1954). The CIT consists of a set of procedures for
collecting certain important facts concerning observed
incidents of human behavior in defined situations
(Flanagan). Flanagan defined an incident as
". . . any observable human activity that is sufficiently
complete in itself to permit inferences and predictions to
be made about the person performing the act" (p. 327). A
critical incident is an incident occurring in a situation
where the purpose of the act is fairly clear to the
observer, and where the effects are sufficiently definite
and obvious (Flanagan).

The CDM is a semi-structured interview strategy that
". . . builds on CITs by using a set of cognitive probes to
determine the bases for situation assessment and decision
making during nonroutine incidents" (Klein et al., 1989, p.
462). "It is a theory-driven strategy that is based on the
assumption that expertise emerges most clearly during
nonroutine events and focuses on these as the prime source

of information" (Klein et al., p. 471). An advantage of the
CDM is the ability to examine skilled performances under
time pressure, where there is little time available for
conscious decision making (Klein et al.); hence, the CDM is
applicable to the PICU setting, where many critical
incidents occur. The CDM has been used in a variety of
settings to elicit knowledge from experienced personnel,
such as fireground commanders, structural engineers, tank
platoon leaders, computer programmers, paramedics (Klein et
al.), and critical care nurses (Crandall & Getchell-Reiter,
1993).

The first study by Crandall and Getchell-Reiter (1993)
examined the utility of the CDM in the nursing profession,
and found that there was a significant increase in the
information elicited in CDM interviews compared to non-CDM
interviews (Crandall & Getchell-Reiter). The second study
used CDM interviews to extract cues, indicators, and
exemplars from incident accounts of NICU nurses caring for
infants with sepsis. A guide to early sepsis in the NICU was
developed from the information obtained from the incident
accounts (Crandall & Getchell-Reiter).

Expert systems. Fonteyn and Grobe (1994) described
their current research study using the think-aloud technique
to obtain information from expert critical care nurses to
learn how they reason and make decisions when caring for

critically ill unstable patients. The think-aloud method enables collection of data at the time the care is being given (Fonteyn & Grobe). In comparison, the CDM uses a retrospective method of data collection (Klein et al., 1989).

The expert nursing knowledge obtained in the study by Fonteyn and Grobe (1994) will be used to develop an expert system representing experienced critical care nurses' knowledge and reasoning processes. Expert systems are computer programs consisting of a knowledge base and an inference engine (Fonteyn & Grobe). The knowledge base is made up of factual information about a specific domain. "The inference engine accepts external information (input) about a problem and then uses the knowledge base to provide a solution to the problem (output)" (Fonteyn & Grobe, p. 80). The future application of expert systems will provide less experienced critical care nurses with a means of accessing the expert nursing knowledge preserved in the knowledge base to solve patient problems and plan nursing care (Fonteyn & Grobe). Expert systems may also be useful in education as a learning tool to assist less experienced nurses to improve their reasoning skills and strategies (Fonteyn & Grobe). Fonteyn and Grobe propose that as the development of expert systems progresses they could be made to integrate with other systems to recognize hemodynamic and electrographic

data about critically ill patients, and thus function as early warning mechanisms and provide suggested interventions ". . . to assist less experienced nurses to maintain patient stability and prevent decompensation" (p. 81).

Summary

This chapter provided the conceptual framework for this study by outlining Benner's model, From novice to expert. The knowledge held by experts was discussed from many perspectives. Intuition and expertise from the Heideggarian phenomenologist's view and the cognitive psychologist's view were illustrated in relation to Benner's model.

Clinical research studies on the area of nursing expertise were discussed including other studies using Benner's model as a framework. The CDM was discussed as a novel strategy for eliciting experience-based knowledge from experts in a variety of fields. Expert systems were described and examples provided of how they may be utilized in the future to assist less experienced personnel in their respective domains.

Chapter 3

METHODOLOGY

This chapter describes the research design, subjects and setting, human subjects approval, instrument, data collection, and analysis of the data for this research.

Research Design

The purpose of this study was to identify and describe categories of experience-based knowledge from expert PICU nurses. A qualitative design was chosen for this study to examine the clinical judgment processes used in the assessment and care of critically ill infants and children. Qualitative research involves the examination of general questions, which focus on naturalistic human experiences. This design allows the investigator to understand the depth and breadth of the phenomena being studied. This study aimed to extend on the studies by Crandall and Getchell-Reiter (1993) by studying a different population of nurses, for example, PICU nurses instead of NICU nurses.

Subjects and Setting

A convenience sample of 5 nurses was recruited from the PICU of a major teaching hospital in northern California. Criteria for inclusion and exclusion of subjects was based on years of experience as registered nurses in the specialty of PICU nursing. Gender, age, level of education, and ethnic background of the subjects were not considered relevant in

selecting subjects for this study. However, these
demographic characteristics were included as part of the
data collection. In consultation with the nurse manager of
the PICU, a seniority list of nurses was obtained and the
nurses with extensive PICU experience (at least 10 years of
experience) were invited to volunteer to take part in the
study.

<center>Human Subjects Approval</center>

Permission and approval to conduct this study was
obtained from (a) the hospital by gaining written permission
from the nurse manager of the PICU (Appendix A), where the
nurses were recruited, (b) the hospital's Human Subjects
Committee (Appendix B), and (c) the Human Subjects-
Institutional Review Board at San Jose State University
(Appendix C).

<center>Instrument</center>

Critical Decision Method

The CDM technique was used for probing the desired
information from expert PICU nurses. This technique has been
successfully applied in the elicitation of knowledge from
expert NICU nurses (Crandall & Getchell-Reiter, 1993). This
method consists of 5 steps (a) select incident, (b) obtain
unstructured incident account, (c) construct incident
timeline, (d) decision point identification, and (e)
decision point probing. Permission to use the CDM was

obtained from Klein Associates Inc. (Appendix D).

The CDM was well suited for this study for two reasons. Firstly, expert knowledge is tacitly held and the clinical judgments made by experienced nurses reflect a fusion of discrete elements in a meaningful gestalt, which nurses may find difficult to spontaneously articulate (Crandall & Calderwood, 1989). CDM is an effective technique for eliciting detailed information from this gestalt by using critical decision interview probes (Crandall & Calderwood). Secondly, this study aimed to extend on the studies by Crandall and Getchell-Reiter (1993) by studying the elicitation of experience-based knowledge from expert PICU nurses.

Step 1: Select incident. The participant is asked an open question that generates an account of a specific incident. For example, select an incident in which they thought their clinical skills had been particularly challenged and where the presence of an experienced nurse may have made a difference to the patient's outcome. This incident might be one in which a "gut feeling" or hunch led them to intervene in some way. This incident then provides the structure for the interview that follows. "Avoid cases in which a death or unusual episode made the incident a memorable one but one in which the [nurse] may not have played a key decision making role" (Klein et al., 1989, p.

466).

Step 2: Obtain unstructured incident account. The
participant gives a recount of the incident in its entirety,
with no interruptions from the interviewer (Klein Associates
Inc., 1995). During this step the interviewer assumes the
role of an active listener, allowing this account to proceed
without interruption, except for minor points of
clarification (Klein et al., 1989). "By requesting personal
accounts of a certain type of event, and structuring the
interview around that account, potential interviewer biases
are minimized" (Klein Associates Inc., p. 2).

Step 3: Construct incident timeline. The interviewer
reconstructs the incident by repeating ". . . it back to the
participant, asking her to identify any errors in the
interviewer's comprehension of the content and sequence of
events" (Crandall & Calderwood, 1989, p. 4). "The timeline
[serves] to establish a shared awareness of the "facts of
the case" from the [participants] perspective" (Klein et
al., 1989, p. 466).

Step 4: Decision point identification. Specific
decisions identified during the timeline in step 3 are noted
for further probing (Klein et al., 1989). Of particular
interest are decision points where the nurse would agree
that other reasonable courses of action could have been
taken, or that a less experienced nurse might have chosen

differently (Klein et al.).

Step 5: Decision point probing. Critical decision interview probes (refer to Appendix E) are questions aimed at eliciting more specific information from the identified decision points in the incident account. Different probes are used depending on the objectives of the research study (Klein et al., 1989).

The reliability and validity of the CDM has been tested by assessing the intercoder reliability of the method. The agreement between two coders was found to range from 81 to 100 percent (Klein et al., 1989). In addition, Crandall and Getchell-Reiter (1993) conducted a pilot study to test the adaptation of incident selection procedures and the CDM probes to the nursing domain before conducting their study proper.

Data Collection

The nurses with extensive PICU experience (at least 10 years of experience) were contacted by the investigator at home by phone, rather than at work so as to not identify participants with colleagues and maintain anonymity. The study was explained to the prospective participants and they were invited to volunteer to take part in the study. Those who agreed to take part, then arranged an appointment for an interview to take place. Each interview took place during the subject's free time (not during working hours) at the

subject's own home in a quiet room, where a taped interview could take place without distraction.

The interviews were conducted by the investigator; no research assistants were used. Background information about the study and instructions regarding the interview were provided for the participants. Each participant was required to sign a written consent form (Appendix F) before taking an active part in the study. The interviews were taped so as to record all of the information provided by the interviewees and minimize note taking errors. No names of participants were recorded to assure confidentiality. The interviews were conducted according to the five steps of the CDM.

Analysis Procedures

Confidentiality was maintained by assigning each subject a code number during transcription of the tapes. The tapes were transcribed by the investigator onto a computer and printed out for analysis. The tapes were erased after transcription.

In the study on clinical assessment skills of experienced NICU nurses, Crandall and Calderwood (1989) used the content of the interviews to guide the choice of coding parameters. This same procedure was followed to analyze the data generated in this study. Each incident account was examined separately for discrete assessment categories and clinical judgment parameters. These categories identified

from the individual accounts were then compared to each other to identify common patterns and differences.

Summary

This chapter described the qualitative research design of this study. The five steps of the CDM were described. The subjects and setting, human subjects approval, data collection, and data analysis were also discussed.

Chapter 4

FINDINGS AND INTERPRETATION

This chapter presents the results of the analysis of the data collected. The purpose of this study was to identify and describe categories of experience-based knowledge of expert PICU nurses. Characteristics of the sample and the incidents they discussed are also described.

Characteristics of the Sample

A convenience sample of 5 PICU nurses agreed to be interviewed. All 5 participants were female. Four of the nurses were Caucasian and one was Filipino. Their ages ranged from 37 to 49 years, with a mean age of 43.6 years.

Nursing Experience

The participants had 16 to 28 years of nursing experience, with a mean of 22.2 years. Experience as a PICU nurse ranged from 14 to 23 years, with a mean of 17.6 years. One of the subjects (20%) reported an additional two years as a NICU nurse.

The highest professional nursing qualification gained by each of the nurses in the study ranged from a diploma, one subject (20%); baccalaureate degree in nursing, three subjects (60%); and master's degree in nursing, one subject (20%). One of the subjects (20%) with a baccalaureate degree reported having a master's degree in an unrelated field and had partly completed a master's degree in nursing. One nurse

(20%) was certified as a critical care nurse and another (20%) reported having a trauma certification.

Description of Data

Critical Decision Method

The data was obtained by interviewing the nurses about an account of an incident (step 1). Each nurse was then allowed to recount the incident without any interruption (step 2). Immediately following the recount of the selected incident, the interviewer reviewed the incident for clarification of the sequence of events and content (step 3). During the clarification process the nurses often thought of something else, which they had omitted and would add that in detail to the account. At this point during the interview, additional probing was made regarding critical points in the incident where the nurse made decisions to do something (step 4). Finally, all of the critical decision interview probes were asked to elicit more specific information (step 5).

The five incidents selected by the nurses involved children admitted for the treatment of respiratory syncytial virus (RSV), cleft palate repair surgery, and renal problems, including two cases of hemolytic-uremic syndrome (HUS) and one case awaiting a kidney transplant. The critical incidents centered around serious complications which these children developed.

Each of the transcribed interviews was coded individually for assessment categories guided by the content analysis technique used by Crandall and Getchell-Reiter (1993). There were eleven assessment categories, (a) other information, (b) perceptual cues, (c) domain knowledge items, (d) specific features, (e) medical history, (f) general indicators, (g) normative comparisons, (h) ipsative comparisons, (i) cue discrepancies, (j) diagnostic information, and (k) telemetry. Each category was coded once, even if the same item, or a similar statement describing the same piece of information was mentioned more than once during the particular incident account. The data of the five incident accounts were grouped and are presented in Table 1.

Assessment Categories

Analysis of the data revealed that the nurses' assessment categories mentioned the most were in the areas of perceptual cues, domain knowledge items, specific features, medical history, general indicators, and other information.

Examples of the assessment categories from the incident accounts include: (a) other information referred to statements which were considered or seemed relevant, but did not fit into any of the established categories; (b) perceptual cues were statements representing the nurses'

Table 1

Assessment Parameters Reported by Expert PICU Nurses in

Critical Incidents (N = 5)

Assessment Category	Frequency of mention	
	Mean	Range
Other information	25.2	13 - 53
Perceptual cues	20.4	12 - 37
Domain knowledge items	13.2	7 - 29
Specific features	9.2	4 - 16
Medical history	8.8	6 - 11
General indicators	8.0	6 - 12
Normative comparisons	6.4	4 - 8
Ipsative comparisons	5.0	1 - 11
Cue discrepancies	4.4	1 - 8
Diagnostic information	3.2	0 - 7
Telemetry	2.0	0 - 6

perceptions of the situation; (c) domain knowledge items

included rationales the nurses gave for their perceptions or

the treatments the child was receiving, or explanations of

what the doctors were thinking; (d) specific features

included examples such as "no bowel sounds" and "breath

sounds had scattered rales"; (e) medical history consisted

of confirmed medical conditions, any previous surgeries, and

pertinent medical information. For example, "They had been

having troubles with her feedings on and off."; (f) general

indicators were broad nonspecific statements, such as

"septic look" and "acute episode"; (g) normative comparisons

were statements about the child compared to similar cases

the nurses had seen in the past, for example, ". . .

patients I had seen with ileus before."; (h) ipsative

comparisons referred to changes in the child's condition

compared to the child's own previous state, for example,

". . . I noticed significant improvement. He would always

diurese a large amount, and his lungs sounded so much better

after each dose of Lasix."; (i) cue discrepancies referred

to cues perceived by the nurse which did not make sense when

matched with other information. For example, "He had gotten

a transfusion the night before and then his hematocrit was

continuing to drop."; (j) diagnostic information included

procedures such as X-rays, blood gases, and microbiology

cultures; and (k) telemetry descriptors were identified as

monitor readings such as, "he was flat line" (meaning he was

asystolic), or "His carbon dioxide level rose to something

like 114 on the transcutaneous monitor." A full discussion

of all the identified categories is beyond the scope of the

analysis, therefore only the three most frequently mentioned categories will be discussed in detail.

Perceptual cues. A large proportion of the incident accounts consisted of statements made by the nurses regarding what they were thinking or feeling was happening during the critical incident. Many of these perceptions were gut feelings. Statements such as: (a) "But what I was looking at was, what the kid looked like, how the kid was acting, and the fact that he was not calming down. There was something wrong."; (b) "I guess gut feeling, it didn't feel right, that that was all there was, because those are manageable conditions, and I didn't feel this child was managed yet, or she wouldn't be this sick."; and (c) "So my thoughts were that something else was going on, that maybe he had some kind of secondary infection."

Other kinds of perceptions were statements made by the nurses which indicated a sense of confidence that they really knew what was going on, compared to the gut feeling statements, which indicated some uncertainty. For example: (a) "This child was very unstable and no one seemed to be buying into how unstable she was."; (b) ". . . I felt like my experience was what led me to facilitate forcing the issue."; (c) "And the reason why this happened was because the doctors had been ignoring me all afternoon as to what was going on with this kid. And worst of all, they ignored

what the parents were saying . . ."; and (d) "You know, they were listing all these different things we had to go up on and I said this is ridiculous. This child is very labile and the last thing you want to do is challenge her more, you know."

Examples of the other kind of perceptual cues included: (a) visual, ". . . and I look at the kid and he is starting to change color."; (b) auditory, "What I was hearing were the sounds of the desat and the deceleration of his pulse." (These sounds were from the monitor the child was attached to); (c) olfactory, "When you took the dressing off it smelled of stool."; and (d) tactile, "Her abdomen was enlarged, and it was hard feeling and tense."

Domain knowledge items. Many of these statements were to justify what the nurse was thinking. For example, ". . . maybe he was shunting, maybe there was some underlying cardiac disease going on there, that will often present itself at this time with the baby." Other statements gave explanations for the nurse's actions, such as "Then I turned around and I said, you better get the fiberoptic scope, because that is the only way they are going to get him intubated." Some of the domain knowledge items were the nurse's attempt to explain the treatments. For example a nurse caring for a baby boy with RSV said, "He was RSV positive by the way, but they were not treating him for this

problem with Ribavirin. So essentially he was getting no treatment for his bronchiolitis, except he was on the ventilator . . . and he was also on Vecuronium. So we were letting him rest as far as his respiratory status goes." One of the nurses who took care of a girl with a severe case of HUS explained a possible reason for the girl's seizures. "The neurologists were not really sure what was causing the seizures, although lots of times there are with very bad HUS cases, the veins in the head are also affected, and so there has been a history of seizures with it."

Other information. This information included nursing actions, doctors' consultations, parent's input, and treatments. Some examples of nursing actions were: (a) "I did abdominal girths and marked it on her and this was the first time this had been done."; (b) "In the meanwhile, I had elevated the leg . . ."; and (c) the respiratory therapist (RT) was assisting with putting a mask of continuous positive airway pressure (CPAP) on a boy post palate repair surgery, when the nurse noticed he stopped breathing, and his heart rate stopped. "So, I leaned over, ripped off the CPAP and grabbed the bag, gave it to the RT and said, 'Bag him!' and started doing chest compressions."

Statements relating to consultations with doctors included: (a) a response by the anesthesiologist to the nurse telling him that the parents thought that the kid was

air hungry, he said, "Oh it's nothing to worry about, his airway is fine, and I had a terrible time intubating him in the first place."; (b) ". . . no one wanted to do anything for it, because the surgeons in particular felt it was just an ileus and it would pass with time."; and (c) "The attending had to come in from home and ended up having to put lines into this child."

Interactions with parents were also coded in this category. Some examples of this descriptor were: (a) "And the father is saying to me, this is the way he acts when he is having trouble breathing."; (b) "The mom had said he wasn't looking good and had sort of this 'gut feeling' that something was going on."; (c) "I asked the resource nurse (charge nurse) if she would at least stay in my room while I could at least introduce myself to the parents."; and (d) when the nurse caring for the baby boy with RSV went to talk with the mother, she found out that the resident had failed to tell the mother that her son was on Vecuronium, which is a paralyzing agent that is reversible. "So she didn't understand that and was wondering why he wasn't moving anymore. So I was able to clear up some of these minor questions."

Summary

This chapter described the characteristics of the participants and the assessment categories. The three most

frequently mentioned categories were in the areas of perceptual cues, domain knowledge items, and other information. Descriptors of these categories were presented as part of the analysis of the data.

Chapter 5

DISCUSSION

This chapter examines the results presented in the previous chapter. Limitations of this study are addressed. Recommendations for the uses of the findings presented in this study and recommendations for future research are also discussed.

Conclusions

The analysis revealed that nurses relied on much more than just the assessment cues of the child. Additional information was used, for example, the treatment the child was receiving, consultations with doctors, interactions with parents, past experiences caring for similar cases, and the nurse's own knowledge base. This wealth of information was revealed in the incident accounts and was found to influence the nurses' perceptions of the situations being described.

Critical Incident Selection

The nurses all selected incidents in which they had perceived required immediate medical intervention. However, these perceptions were not equally shared by the doctors, resulting in the nurses having to be persistent in their efforts to get the doctors to take them seriously. The nurses' perceptions in each case were validated and were later found to be correct in the end. This type of scenario was not intended, but it perhaps reflects how expert PICU

nurses interpret an incident where they had a gut feeling
that something was not quite right with a particular child
or infant, and where they felt that their expertise made a
difference to the patient's outcome. For example, take the
incident where the nurse was taking care of the boy who had
undergone palate repair surgery and was extubated early. The
nurse and the parents were concerned about how the boy was
acting, his noisy breathing, and the fact that he was
inconsolable. The nurse perceived that the child needed to
be reintubated, but the doctors said that the child's airway
was fine and told her not to worry. The child ended up
having a respiratory and cardiac arrest requiring
resuscitation and intubation. This kind of incident is
probably one that sticks in the minds of experts, when their
expert judgment of the situation ended up being correct
after all. Such incidents were therefore easy for them to
recall, since the CDM is a retrospective method (Klein et
al., 1989).

The Most Frequently Mentioned Categories

Table 1 shows that the greatest amount of information
was obtained in the categories of perceptual cues, domain
knowledge items, and other information. In comparing this
study's data with the studies by Crandall and Getchell-
Reiter (1993) on expert NICU nurses, all of the categories
in their study had a frequency of mention less than the

frequency of mention in this study. Reasons for this difference may be explained by the multi-system complexities of sick children compared to neonates, thus resulting in more multi-system data and the added number of different medical services the children were receiving. Take for example, the incident about a girl with severe HUS. This girl was being followed by: (a) the renal doctors for her primary illness, HUS; (b) the PICU medical team for her respiratory status and because she was in the PICU; (c) the endocrinology team for her diabetes, secondary to the HUS; and (d) the neurology team for her seizures, which were also secondary to the HUS. The nurse had to consider all the organ systems affected and her perceptions as to how one affects the others, the treatments being given, and consult with all of the medical teams. She then had to integrate all of this information, process it, make clinical judgments, and then act on her judgments. Statements made include, "So it was everything in general, it's knowing who to call and who was there, and that sort of thing." "You have to make the decision at the time that you are standing there and you've got to do what is the best." This finding suggests that it is important for nurses to know the pathophysiology of multiple and diverse diseases, so they can recognize the stages and changes taking place; that is, monitor trends in the patient's condition.

The PICU nurse is with the critically ill child all the time. Therefore, the PICU nurse can be aware of the child's condition deteriorating and alert doctors to intervene before the child gets really sick, or develops the next phase of a disease. Clinical specialty nurses gain flexibility and wisdom by caring for patients during all phases of their illness (Benner, 1984, p. 180). The nurse caring for the girl with HUS made the comment, "Each of the attendings was looking at it from purely their organ, you know, this is what would be best here for the kidneys, you know, sort of overlooking the whole big picture here." The nurse taking care of the baby with RSV who also developed an arterial clot in his right leg said, "I guess they were at least focusing on his lines, but I think they weren't kind of looking at his entire system as closely as they should have." The nurses were able to look at the child's whole system, rather than just focus on one specialized sub-system like the doctors.

The information in the most frequently mentioned categories, perceptual cues, domain knowledge items, and other information was the greatest in all five nurses' incident accounts, irrespective of the type of incident. This was also the case irrespective of the number of years the nurse had worked in a PICU, her age, or level of nursing qualifications. Other common features in all five cases were

the scenarios of the incidents described, and the fact that all of the nurses had 14 or more years of PICU experience.

These three most frequently mentioned categories reflect the thought processes that were going through the minds of the nurses as they interpreted all the other assessment parameters that they were noting, including the interactions with doctors and parents. The perceptual cue was the nurse questioning that something was different or wrong with the child. The domain knowledge items represent the nurse trying to reason as to what was going on and what could be done. Other information indicates the actions the nurse took, the consultations sought with doctors to have something done, and interactions with parents to find out if this was normal behavior for their child or to reassure them of what was going on with their child. Benner and Tanner (1987) stated that experts approach problems with perceptions of a situation as a whole rather than consisting of a mix of elements, bits, and cues. "The expert operates from a deep understanding of the total situation . . ." (Benner, 1984, p. 32).

Clinical Expertise

This may also be evident by the role the expert nurse plays in being a patient advocate. In the incident accounts, the nurses made statements which indicated that they had a deep understanding of the situation at hand. Take for

example the case of a girl awaiting a kidney transplant who
also had an acute abdomen. The nurse noted the unusual shape
and color on one side of her abdomen, and the smell of stool
coming from an old wound. The nurse had repeatedly asked the
surgeons for something to be done, but the reply was always,
that it was just an ileus and she would be fine. On the
night shift the PICU attending was called and the nurse said
to the charge nurse "You tell him to come in, it's time for
somebody to come in. This is not something you know, this
kid is sick, this kid needs attention and we need somebody
to make some decisions . . . . And eventually, she did go to
surgery that day, and her whole bowel was necrotic, and
needed to be removed."

The clinical expertise of specialty nurses such as PICU
nurses is highly influenced by their experience in taking
care of similar patient populations (Benner, 1984, p. 179).
The data obtained in the normative comparisons and cue
discrepancies lend support to this statement. From the
incident accounts examples included: (a) "When we suctioned
him, the secretions didn't even seem like RSV secretions,
you know, they weren't thick white and tenacious like they
usually were."; (b) "Her blood pressure couldn't tolerate
you doing anything to her and that wasn't strictly a renal
picture, that was more septic shock to me."; and (c) "Well
her abdomen was big, it was enlarged, tense, shiny, and red.

But what was unusual, in one particular area, it was like
more indurated . . . sort of protruding and bulging outward.
That little area looked different than the other part of the
abdomen, which is not typically what I have ever seen with
an ileus."

Nurses use their experience (anecdotal evidence) to
guide them on actions to take in various incidents which
appear similar to previous cases. This relates to the
normative comparisons and cue discrepancies categories in
this study. These similarities may or may not be recorded in
the literature as being recognizable signs or symptoms of a
particular condition. Nurses may be recognizing additional
cues (signs) or vague signs, which are not disease specific
from their own empirical (anecdotal recollection) to deduce
what is happening or predict what is going to happen. When
the nurse recognizes that the patient's condition is
changing, the nurse may have this gut feeling that something
is not quite right, that something is going on. This can be
considered a gray area, because the nurse does not know what
is developing, or whether the patient may switch back to
being all right again. In children, this change phase from
stable to critical can happen rather quickly, especially if
the child's condition is already compromised with another
disease; this is particularly true for children in the PICU
(Hazinski, 1992). The expert nurse is able to piece together

all the information obtained on assessment (which is an ongoing process during the care the nurse is giving the patient) compared to the particular information the specialized doctors use. According to Benner (1984) the expert nurse has ". . . an enormous background or experience . . ." and the ability of pattern recognition (p. 32). This points to the importance of the information expert nurses have to contribute to doctor's assessments in determining medical diagnoses and treatment plans, and that doctor's need to recognize and take note of the expert nurse's assessments. This experience-based knowledge needs to be somehow ". . . recycled so that less experienced nurses can benefit from . . ." it (Crandall & Getchell-Reiter, 1993, p. 51). Expert systems, as proposed by Fonteyn and Grobe (1994) offer a possible solution to this problem.

<div align="center">Limitations</div>

This study was conducted with a convenience sample of PICU nurses at one hospital and thus was not representative of all expert PICU nurses. Generalizability of the findings is precluded due to the small sample size. The interviews were conducted by the investigator, which may result in interviewer bias, even though this ensured consistency of interview technique.

Another limitation was the fact, that the CDM relies on verbal report methods, which is a retrospective method of

data collection (Klein et al., 1989). Verbal reports do not represent a direct window into people's cognitive processes and people may misrepresent their own decision making and objectives (Klein et al.).

Implications and Recommendations

Given that experience plays a big part in how expert nurses think through situations and make clinical judgments, the implication for nursing education is that clinical experience is very important. This suggests that clinical experience in prelicensure nursing programs should be increased, rather than decreased as in the case with the establishment of college and university nursing programs.

Experts have two kinds of knowledge, theoretical knowledge and experience-based knowledge (Hampton, 1994). This theoretical knowledge base that can be taught formally, plus the experience-based knowledge that the nurses gain during their careers could be recorded on computer databases such as expert systems (Fonteyn & Grobe, 1994). These expert systems can then be used by less experienced nurses to assist with making decisions when caring for critically ill patients (Fonteyn & Grobe). A separate expert system that is developed specifically for pediatric nursing could be a possibility. Alternatively, expert systems could be developed for each of the different body-organ sub-systems, then refined in such a way that they interact with one

another. These refined expert systems could be used to assist nurse educators in the education of novice nurses caring for children with complicated multi-system problems. The ability of the nurse to see the patient as a "whole system" and understand the interaction between the sub-systems was also evident as being an important part of being an expert PICU nurse.

There is a need for a formal clinical-educational model which would provide clinical educators and nurse managers to help staff nurses become experts. Nurses cannot achieve this goal on their own. Assistance from the management level is required so that nurses gain experience caring for a broad spectrum of patient assignments with diverse conditions within the specialty domain. In addition, clinical educators assist with both the theoretical and clinical education of staff nurses and probably play an important role in the process of assisting staff nurses to attain expert status. This study supports the need for clinical nurse educators as an essential member of clinical nursing staff. Unfortunately, clinical nurse educators are often amongst the first to have their jobs eliminated in staff reductions in hospitals.

Future studies may be done to address outcome measures of nursing expertise by determining how long it takes nurses to attain expert status where particular staff development

programs aimed at promoting expertise are offered. For example, do the nurses who receive varied patient assignments develop nursing expertise sooner than those who do not? Do nurses working at hospitals with a smaller ratio of clinical nurse educator to staff nurses develop nursing expertise sooner than those with larger ratios or no clinical nurse educators on staff? Possible measurements of these outcomes may be done using nurses' exemplars as demonstrated by Anastasio and Foldy (1995) and Benner's model From Novice to Expert to determine the level of nursing attained.

Patient outcomes may provide an indirect means of measuring the effect of programs aimed at promoting the development of nursing expertise. Such studies may provide the evidence hospital administrators need to justify the employment of registered nurses in preference to hiring less qualified staff, who do not have the theoretical knowledge necessary to achieve nursing expertise to care for patients. Registered nurses have a sound theoretical knowledge base, and with experience, have the potential to develop nursing expertise and improve patient outcomes. Whereas, certified assistant personnel lack this knowledge base and therefore do not have the potential to develop the same expert level of patient care. It would also be interesting to conduct a comparative study between associate degree nurses and

baccalaureate degree nurses to see if there is any difference in the attainment of nursing expertise between the two groups. Although this study didn't show any difference between the nurses with varying levels of nursing qualifications, the nurses had in excess of 14 years of PICU experience. A comparative study would best target a sample of nurses with 0 to 5 years experience to determine if one group develops expertise sooner than the other.

Assessment cues are important for nurses to make clinical judgments. This study however, illustrated that other parameters such as the medical history, doctor's consultations, treatments, family interactions, and nurses' perceptual cues are also used by expert nurses to make clinical judgments. Future studies on nursing expertise need to consider this holistic picture when obtaining information from expert nurses. This will assist nurses to understand more about the clinical judgment processes surrounding the assessment and care of critically ill infants and children.

This study could be repeated with a larger sample of nurses from more than one hospital to obtain a more representative sample and decrease the threat to external validity. Perhaps studying expert nurses from a different specialty that is not as complex as PICU nursing may make it easier to understand the principle characteristics of nursing expertise and how expert nurses make clinical

judgments.

Summary

This chapter discussed the findings of the study. The assessment categories perceptual cues, domain knowledge items, and other information were found to be the most frequently mentioned assessment parameters in this study. Implications and recommendations for possible uses of this information and future studies were also discussed.

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KLEIN ASSOCIATES INC.

582 E. Dayton-Yellow Springs Rd.
Fairbom, Ohio 45324-3987
Phone: 513/873-8166
FAX: 513/873-8258

November 6, 1995

Helen K. Daley
672 Chiquita Avnuee, #5
Mountain View, CA 94041

Dear Ms. Daley:

Yes, you have my permission to copy the table "Critical Decision Interview Probes" in the paper by Klein, Calderwood, and MacGregor (1989).

Sincerely,

Gary Klein, Ph.D.
Chairman & Chief Scientist

GK:mja

E-Mail: gary@klein.mhs.compuserve.com

APPENDIX A

Permission From PICU Nurse Manager

LUCILE SALTER PACKARD
CHILDREN'S HOSPITAL AT STANFORD

September 26, 1995

Helen Daley, RN
Graduate Student
School of Nursing
San Jose State University
San Jose, CA 95192-0057

Dear Helen:

I give you permission to recruit nurses from the Pediatric Intensive Care Unit at
Lucile Salter Packard Children's Hospital at Stanford for your thesis study on:
The elicitation of experience-based knowledge from expert pediatric intensive care
nurses. This permit is pending subject to clearance from the Human Subjects-
Institutional Review Board, San Jose State University, and the Administrative
Panel On Human Subjects In Medical Research, Stanford University.

I wish you good luck on your study.

Sincerely,

Editha Aninao, RN, MN
Nurse Manager, PICU
L. Packard Children's Hospital at Stanford

APPENDIX B

Human Subjects Approval--Stanford University

STANFORD UNIVERSITY
Stanford, California 94305
(415) 723-5244

CERTIFICATION OF HUMAN SUBJECTS APPROVAL

DATE: October 3, 1995

TO: H.K. Daley, R.N.
            Department of Nursing/PICU

FROM: Chairman, Administrative Panel on
            Human Subjects in Medical Research

PROTOCOL ENTITLED:
The Elicitation of Experience-based Knowledge from Expert Pediatric Intensive
Care Unit (PICU) Nurses.

The Panel approved human subject involvement in your research project on
October 3, 1995.

The expiration date of this approval is October 2, 1996. If this project is
to continue beyond that date, please submit an updated proposal in advance for
the Panel's re-approval. If this proposal is used in conjunction with any other
human experimentation or if it is modified in any way, it must be re-approved
for these special circumstances. In addition, the Panel requests prompt
notification of any complications which may occur during any experimental
procedure.

All continuing projects and activities must be reviewed and re-approved at
least annually by the Panel. Panel approval of any project is for a maximum
period of one year. It is the responsibility of the investigator to resubmit
the project to the Panel for annual review.

Alice Haslett

/*James Theodore, M.D., Chairman

Funding Agency: (Unsponsored)(N)
Period of Time: 10/03/95 through 10/02/96
Investigational New Drugs: N
Investigational New Device: N
Cooperating Institution: Y
Expedited Review
Assurance Number: M1272
IRB #01

APPENDIX C

Human Subjects Approval--San Jose State University

SJSU SAN JOSE STATE UNIVERSITY

TO: Helen K. Daley, R.N.
        672 Chiquita Ave., #5
        Mountain View, CA 94041

FROM: Serena W. Stanford
        AAVP, Graduate Studies & Research

DATE: October 24, 1995

The Human Subjects-Institutional Review Board has approved your request to use human subjects in the study entitled:

"The Elicitation of Experience-based Knowledge from Expert Pediatric Intensive Care Unit (PICU) Nurses."

This approval is contingent upon the subjects participating in your research project being appropriately protected from risk. This includes the protection of the anonymity of the subjects' identity when they participate in your research project, and with regard to any and all data that may be collected from the subjects. The Board's approval includes continued monitoring of your research by the Board to assure that the subjects are being adequately and properly protected from such risks. If at any time a subject becomes injured or complains of injury, you must notify Serena Stanford, Ph.D., immediately. Injury includes but is not limited to bodily harm, psychological trauma and release of potentially damaging personal information.

Please also be advised that each subject needs to be fully informed and aware that their participation in your research project is voluntary, and that he or she may withdraw from the project at any time. Further, a subject's participation, refusal to participate, or withdrawal will not affect any services the subject is receiving or will receive at the institution in which the research is being conducted.

If you have any questions, please contact me at (408) 924-2480.

APPENDIX D

Permission to Use Critical Decision Method

KLEIN **ASSOCIATES** INC.

582 E. Dayton-Yellow Springs Rd.
Fairborn, Ohio 45324-3987
Phone: 513/873-8166
FAX: 513/873-8258

March 28, 1996

Helen K. Daley
672 Chiquita Avenue, #5
Mountain View, CA 94041

Dear Helen:

I am pleased that you have chosen to use the Critical Decision method in your thesis
research. In regard to your request for permission, the Critical Decision method is not
copyrighted, nor do we intend to pursue copyrights in the future. Please feel free to use the
CDM in your research, and good luck.

Cordially,

Beth Crandall
Vice President, Research Operations

BC/th

Enclosure

APPENDIX E

Critical Decision Interview Probes

Table 2

CRITICAL DECISION INTERVIEW PROBES

Probe Type	Probe Content
Cues	What were you seeing, hearing, smelling . . . ?
Knowledge	What information did you use in making this decision, and how was it obtained?
Analogues	Were you reminded of any previous experience?
Goals	What were your specific goals at this time?
Options	What other courses of action were considered by or available to you?
Basis	How was this option selected/other options rejected? What rule was being followed?
Experience	What specific training or experience was necessary or helpful in making this decision?
Aiding	If the decision was not the best, what training, knowledge, or information could have helped?
Time Pressure	How much time pressure was involved in making this decision?
Situation Assessment	Imagine that you were asked to describe the situation to a relief officer at this point, how would you summarize the situation?
Hypotheticals	If a key feature of the situation had been different, what difference would it have made to your decision?

From "Critical Decision Method for Eliciting Knowledge," by

G. A. Klein, R. Calderwood, and D. MacGregor, 1989, IEEE

Transactions On Systems, Man, and Cybernetics, 19(3), p. 466.

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APPENDIX F

Consent Form

AGREEMENT TO PARTICIPATE IN RESEARCH

RESPONSIBLE INVESTIGATOR: Helen Daley, RN

TITLE OF PROTOCOL: The Elicitation of Experience-Based Knowledge From Expert
Pediatric Intensive Care Nurses

1) I have been asked to participate in a research study that is investigating the elicitation of experience-based knowledge from expert pediatric intensive care nurses. The results of this study should further our understanding of the clinical judgment processes that surround nurses' assessment and care of critically ill infants and children.

2) I will be asked questions utilizing the Critical Decision Method developed by Klein Associates Inc. and these questions will be in the form of an interview. A tape recorder will be used during the interview so that no information I give will be omitted, and that the tapes will be erased once transcribed.

3) There are no reasonably foreseeable risks or discomforts to the subjects in participating in this study.

4) Neither I nor others will receive specific benefits for my participation in this study. However, the research results may benefit nursing education or practice in general.

5) Alternative procedures included are none, for inclusion in this study.

6) The results of this study may be published, but any information from this study that can be identified with me will remain confidential and will be disclosed only with my permission, or as required by law; i.e. subject information may be provided to Federal and regulatory agencies as required.

7) Neither I nor my institution will be compensated for participation in this study. There is no cost for participating in this study.

8) Any questions about the research may be addressed to the principal investigator, Helen Daley, RN, at (415) 691-0824. Complaints about the research may be presented to the graduate coordinator, Coleen Saylor, RN, PhD, at (408) 924-1321, or the Department Chair, Bobbye Gorenberg, RN, DNSc, at (408) 924-3130. Questions or complaints about research, subject's rights, or research-related injury may be presented to Serena Stanford, PhD, Associate Academic Vice President for Graduate Studies and Research, at (408) 924-2480, or call (415) 723-5244 or write the Administrative Panel on Human Subjects in Medical Research, Administrative Panels Office, Stanford University, Stanford, CA 94305-5532.

9) No service of any kind, to which a subject is otherwise entitled, will be lost or jeopardized if I choose to "not participate" in the study.

10) My consent is given voluntary without being coerced. I may refuse to participate in this study or any part of this study, and I may withdraw at any time, without prejudice to my relations with my place of employment or San Jose State University.

11) I have received a signed and dated copy of this agreement.

MY SIGNATURE INDICATES THAT I HAVE READ THE ABOVE INFORMATION AND THAT I HAVE DECIDED TO PARTICIPATE IN THE STUDY:

_____   _____
subject's signature   date

_____   _____
investigator's signature   date