The Application of Clinical Judgment and Decision Making of Critical Care Nurses in Intensive Care Units (ICUs)

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ABSTRACT

Intensive Care Unit (ICU) is the hospital setting in which applied the specific practice of clinical decision-making and judgment. The study aimed to explain how to apply clinical decision-making in the Intensive Care Unit (ICU). Four databases CINAHL, MEDLINE, PUBMED and DISCOVERED were used to extract Twenty-two relevant articles. Suitable articles were systematically reviewed and analyzed. The results described eight themes of clinical judgment including; 1) application of Tanner's clinical judgment model in ICU, 2) Types of decisions in ICU, 3) Theoretical approach: implementation of decision-making in ICU, 4) Case illustration of decision-making scheme in ICU, 5) Influencing factors of decision-making in ICU, 6) Supporting tools for clinical decision-making in ICU, 7) Understanding of attributes and concepts may enhance the quality of the clinical decision-making process in ICU, 8) Implications for nursing education and practice regarding the clinical decision making in ICU. Critical care nurses usually combine different techniques in making decisions; analytical methods including the hypothetic-deductive method, pattern recognition, intuition, narrative thinking, and decision analysis theory are potentially applied.

Keywords: clinical decision-making, critical care nurse, ICU

1. Introduction

Currently, increasing awareness among critical care nurses is needed to improve the knowledge and skill including decision-making and professional judgment for managing the essential cases and life-threatening in the intensive care unit (1). The mortality rate of affairs in the ICU unit is remained to increase compared to another unit in the hospital. A study showed that almost 26% of patients were death during receiving intensive care in the ICU unit (2). Furthermore, the Scottish Intensive Care Society Audit Group (SICSAG) has also reported 19% of patients died before their fully discharge from hospital in 2014 (3).

The complexity of the patients' situation in the ICU encourages nurses to improve clinical decision making and clinical assessment abilities; Furthermore, nurses may need to apply the skill in the clinical decision-making models (4). The lack of sensitivity to recognize important cues and signs could lead to inaccurate judgment such as unnecessarily prolonged weaning, which not only could result in inefficient treatment cost and increase mortality rate (5) but also could rise respiratory tract infection incidence (6). Nurses require comprehensive knowledge with broad range

attributes used during assessment and evaluation to support the decision-making process (7).

Previous studies have shown that the complex factors encountered by critical care nurses may influence the type and method of their clinical decision-making and professional judgments (7-9). There is, however, limited information about the process of clinical decision-making in ICUs.

2. Objective

The study aimed to describe the decision-making and professional judgments in intensive care units and faction ICU that influence the clinical decision in ICUs.

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Identification    Study Records identified          Additional records
                  through database searching        identified through other
                  (n =  338 )                       sources

Screening         Records screened      ───────▶    Papers excluded by
                  (n = 86  )                         abstract

Eligibility       Full-text articles    ───────▶    Articles excluded
                  assessed for                      for not meeting
                  eligibility                       eligibility criteria as
                                                    technical
                                                    implementation
                                                    CDM in critical

Included          Studies included in
                  study synthesis
                  (n =  22 )
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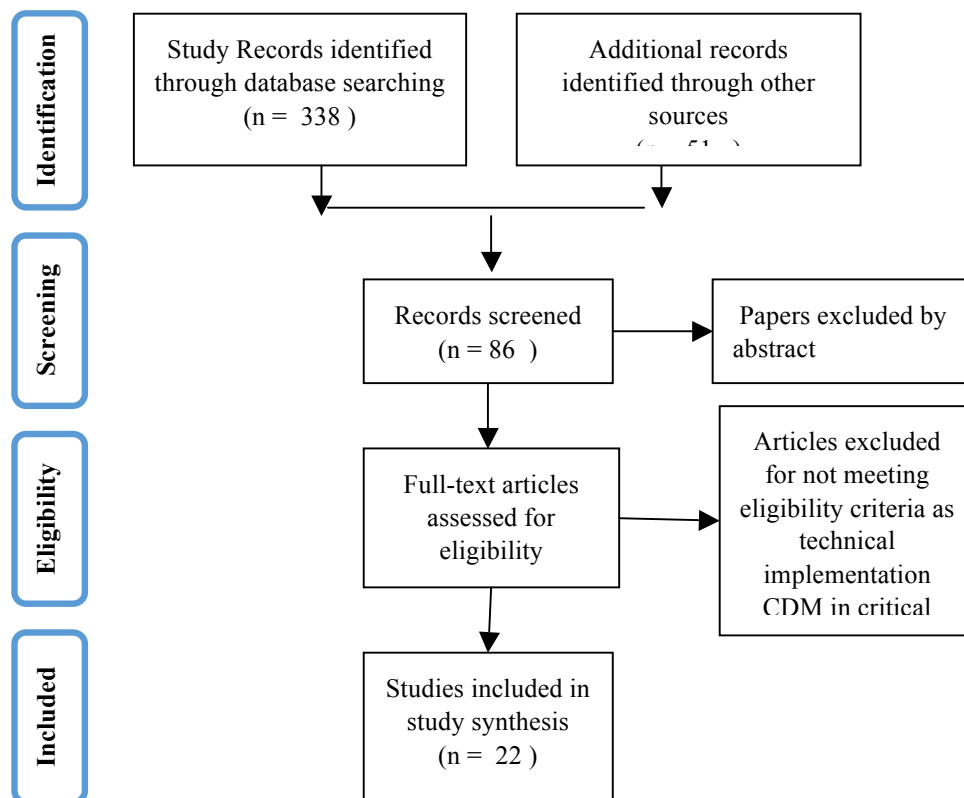
Figure 1. Search strategy

3. Search strategies

Four databases, namely CINAHL, MEDLINE, PUBMED, and DISCOVERED were used to obtain the most relevant articles. The search was combined several specific terms, including "clinical decision," "decision-making," "judgment," "critical care," "intensive care," and "nurse" to guide the search process. Detailed information on the literature searching strategy is depicted in Figure 1. Selected literature was filtered by the eligibility criteria, and then further examined to reject duplication; eventually, 22 articles were reviewed. Furthermore, additional sources were found in the references cited in the reviewed literature.

4. Results
4.1   Understanding theories of judgment and decision-making
4.1.1 Overview of clinical judgment

Tanner (10) developed a clinical judgment model (CJM), as an applicable approach in the clinical settings where nurses mostly need to make rapid judgments. The CJM is comprised of four fundamental components: noticing, interpreting, responding, and reflecting. The model is exemplified in Figure 2.

Noticing

Nurses noticing a change mean they have expectations of a patient's condition, and the expectations are guided by the comprehension of results based on their knowledge and experience in managing similar cases. For example, an experienced nurse in the post-surgical ward will notice if a patient is in pain, and if the pain is typical (10).

Interpreting and responding

Nurses understand and analyze data collected from the initial process of noticing, they find the pattern which leads them to make their judgment. Nurses also may respond intuitively and implicitly after they obtain the model (10).

Reflection

Tanner (10) outlines "Reflection-on-action and subsequent clinical learning complete the cycle; showing what nurses gain from their experiences contributes to their ongoing clinical knowledge and ongoing clinical knowledge development their capacity for clinical judgment" (p.209).
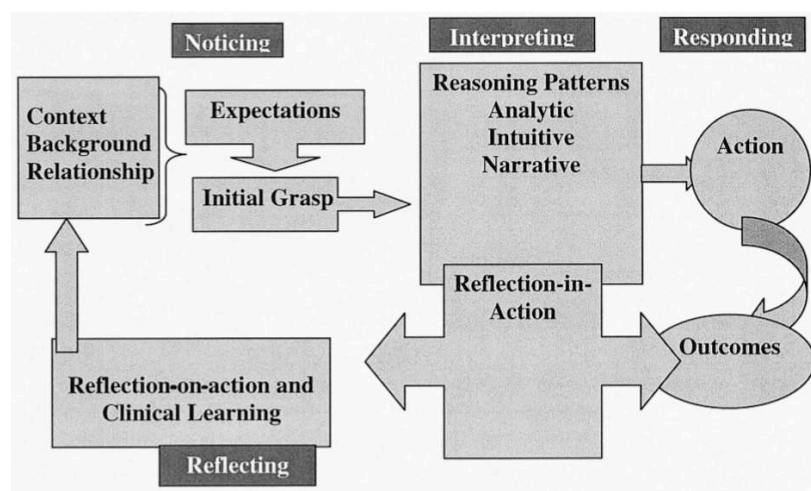

Figure 2. Clinical judgment model (10).

4.1.2   Overview of clinical decision-making

There are several theories about the decision-making processes that may be used by nurses in clinical practice, and some of those processes have been explored further in several studies.

Tanner (10) reviewed approximately 200 studies about professional judgment and clinical decision-making, and she concluded that, in making decisions, experienced nurses generally use three interconnected methods, which are:

Analytic processes

This method commonly used in a situation where there are some possibilities of diagnosis and interventions and individuals have to decide which one will be the best fit (10).

Intuition

Intuition describes an individual recognizing something without any evident or obvious conscious use of reason (10, 11).

Narrative thinking

This refers to an individual's interpretation of their experiences regarding a specific case (10)

In the UK, Offredy (12) undertook a study used retrospective verbalization and observation (n=20) of nurse practitioners working together with general practitioners to investigate decision-making issues. The study finding showed that practitioners were using several concepts in formulating their decisions, which were:

a) Hypothetico-deductive method

The hypothesis of diagnosis or treatment is a result of the multistage assessment and diagnostic test as illustrated in Figure 3. This method usually begins from a known starting point, such as a patient's chief complaint; the initial hypothesis made and followed by further tests and assessments to formulate radditional hypotheses. The ultimate decision is the result of final hypothesis testing (12).
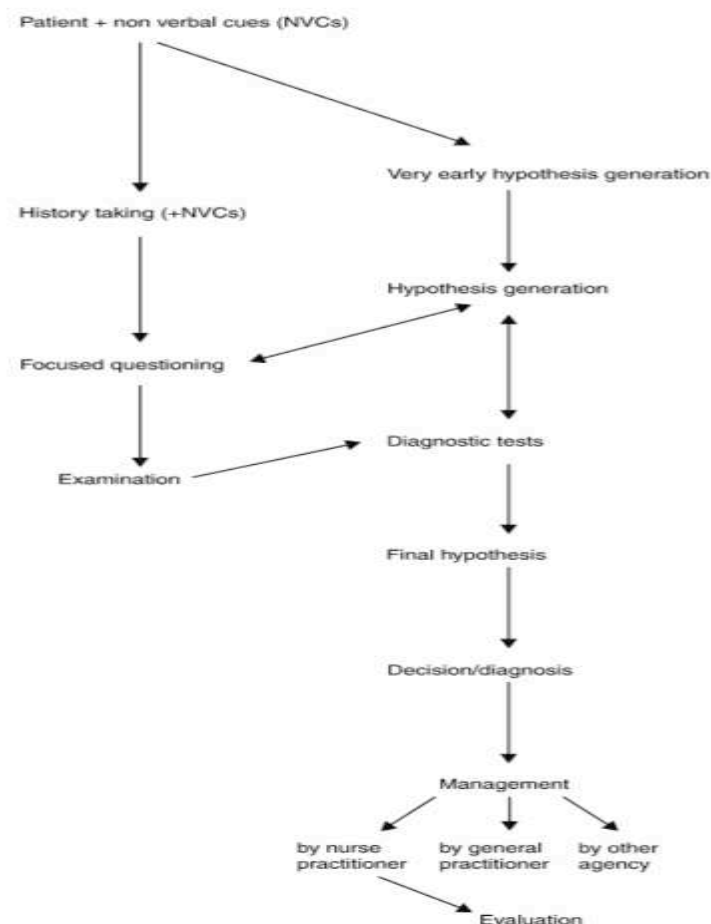
b) Pattern recognition

Nurse practitioners identify, classify and interpret data; then they analyze it to find the pattern which guides them to decide on diagnosis or treatment. One of the main differences between novice and expert is the ability to recognize patterns or similarities in a patient. An expert can identify the similarities of cases earlier and easier than a beginner because their experiences inform them in handling similar cases previously (12).

c) Intuition

The study found that nurse practitioners and general practitioners commonly depended on intuition to make their decisions. This process is similar to pattern matching, but intuition happens at the subconscious or unconscious levels (12).

d) Decision analysis theory

A decision tree generally describes this method. Making decisions via a decision tree means that the nurse practitioner has a broad understanding of possible treatments to offer (12).

The description of clinical decision-making methods by Offredy (12) was being adopted by Taylor (4) while studying the decision-making process of doctors and nurses in weaning patients with ventilators. Taylor (4) argued that the similarity between weaning and general practice is that nurses and doctors are dealing with the same problems.

4.1.3 Professional judgments and clinical decision-making in the intensive care unit (ICU)

Having discussed the theoretical background of analysis and decision-making in practice, this section will explore more about judgments and clinical decisions specifically pertinent to the intensive care unit (ICU) context and environment.

4.1.3.1 Application of Tanner's clinical judgment model in ICUs

Adopting the clinical judgement model (CJM), which is illustrated in Figure 2 above in an ICU setting, Wøien and Bjørk (8) conducting exploratory qualitative research to investigate the influence of systematic tools on nurses' judgments and to describe how critical care nurses employed the four critical acts of noticing, interpreting, responding and reflecting when performing clinical judgments concerning a patient's pain and sedative requirements. The researchers further explained every component:

a) Noticing

Nurse expectations are shaped by the recognition of a patient's pattern of response to pain, and the patient's need for treatment, such as analgesic and sedative (8). Systematic assessment, using tools, may allow nurses to clarify a patient's symptoms and to identify their response to the treatments.

b) Interpretation

Evaluation of the effect of prior treatment, pain level, and sedation score may construct the nursing interpretation to administer an analgesic instead of sedative.

c) Response and reflection

Assessment results, using a scoring system, encourage nurses to respond objectively to different scores, to distinguish changes in patients' pain and confusion levels, and to confirm nurses' intuitive responses. During their reflection, after applying the new scoring system, nurses feel that their opportunity to discuss and to evaluate patients with their health care team is a part of the clinical decision process. They

believe that systematic assessments allow early identification of patient problems; followed by initial treatment of pain and confusion.

4.1.3.2 Types of decisions in the intensive care unit (ICU)

The nursing care process is generally unvarying in every group because it is standardized; however, the most frequent choices made in the ICU may be different with other units, when taking into account the specific nature of both patients and environment. A recent study (13) suggested there are three types of clinical decision activities made by critical care nurses: intervention, communication, and evaluation. These three categories of clinical decision activities will initiate nurses either to formulate a new decision or to maintain the existing decision

a) Intervention decisions

In the ICU patients are generally total-cared patients; therefore intervention decisions may be one of the most common decisions made by nurses. Bucknall (13) discovered the intervention decisions made by critical care nurses involved issues such as positioning, suctioning, and some other aspects of direct patient care. Nurses could decide a new intervention when they initiate a new therapy or modify existing patient care, or they might continue with the 'old' interventions. Intervention decisions are nursing activities to modify patient (14).

b) Communication decisions

Communication is one of the central components in a critical care unit: essential nurses of care communicate with colleagues, other health professionals, patients and their families. Bucknall (13) explains that various types of communication are evident in the ICU, involving investigating a patient's condition by the health care team, offering support, and delivering information about that patient's updated condition to other staff and family members. Bucknall (13) argued that nurses make new communication decisions if they initiate communication with other team members or family members, while only old communication decisions will happen if they follow up existing communication decisions.

c) Evaluation decisions

Evaluation is another type of judgment, which appears to be frequently made in the ICU, while dominantly caring for unconscious patients. As Bucknall (13) asserts, critical care nurses continually observe a patient's status, categorizing data based on its relevance and importance; they validate and organize data, identify patterns and correlations, make inferences, formulate a hypothesis and evaluate it. Similarly to Benner (15), one of the leading roles of nurses is to assess patient changes, and it is followed by managing the changes.

4.1.3.3 Theoretical approach: implementation of decision-making in ICUs

Critical care nurses encounter complex situations associated with the patient's condition, advanced devices and the necessity of collaboration between team members; such a complex context may drive them to be able to make vigorous decisions. Aitken (16) argues the decision-making approach taken by nurses depends on the clinical situation, and that their understanding of the basic knowledge on decision-making may potentially improve the nurses' decision-making skills. Thus, it is essential for critical nurses to thoroughly comprehend the *what, when, how* of the clinical judgment and decision-making processes needed in an ICU.

Judgments and clinical decision-making methods employed by critical care nurses may be varied; the plans could be used as a single approach, but are mostly they used as a combination of several ways. Nurses usually combine different techniques in making a decision; it is rare that they only use one single approach (4). However, the nature of a specific ICU may influence critical care nurses to use one particular decision-making method rather than another.

4.1.3.3 The case illustration of decision-making scheme in ICU

Nurses assess the patient to investigate the patient's current condition rigorously and analyse identified cues to make a decision. However, expert critical care nurses' ability to grasp the cues will almost certainly differ from that of a novice. Hoffman et al. (17) conducted a study using serial processes based on a 'think aloud, retrospective interviewing' model to identify the determinants of cue collecting between expert and novice, in a decision-making process while caring for patients with post abdominal aortic aneurysm surgery in ICU. They discovered that expert nurses could collect nearly 90 cues, while novices only reached 49 signals in 2 hours.

After collecting the cues, participant nurses clustered the prompts and analysed them to make a decision, which is exemplified in Table 1 below. Experts recognized the patient's blood pressure (BP) was lower than previously. As they identified the patient' blood loss from the intraoperative report, they continue the recheck the BP manually to obtain an accurate result; a cautious action was taking into account the possibility that the arterial line could be inaccurate. Pain management using epidural infusion was reviewed as it might affect BP. The nurses also considered the patient's general appearance and history, which might reveal information about factors that could influence the patient's heart rate and BP. Then, they assessed the patient's pain level, as feedback for further consideration regarding changing doses of the epidural medication rate. The patient's temperature was low, and the patient was on intravenous glycerol trinitrate (IV GTN); they started to turn down the GTN rate, although the BP value was not changed. They did that because they believed that as the patient 'warmed up' BP might drop even further. Experts further found the central venous pressure (CVP) and urine outputs were low. Thus they considered the probability of all of the cues being caused by fluid depletion. Furthermore, as predicted the BP did begin to fall while the patient 'warmed up.' The nurses continued to consult with the medical team, and they all came up with the decision to administrate a fluid bolus.

It can be seen in the illustration above, that nurses used the mixed method of the hypothetical-deductive model and pattern recognition. The step by step assessments to collect the cues, following with clustering the signals, and finally making a decision, was an illustration of the hypothetico-deductive method as the explanation Offredy (12) about this method in Figure 3. However, it is also noticeable that the expert nurses used pattern recognition while they decided to turn the rate of GTN infusion down, although the further alteration of the patient's BP had not happened yet. Their decision was triggered by them noticing the pattern similarity with their experiences when caring for previous patients with the same condition. Pattern recognition is a nurse's ability to perceive organization and relationships between identified information (18). It can also be noticed that novice nurses did not take the same actions (see Table 1); perhaps because novice nurses could not recognize the patterns as the experts had done.

Furthermore, the action taken by the experts may also have been driven by intuition, if the experts decided to change the GTN infusion rate during the brief period and without 'awareness.' In other words, the pattern recognition was captured

subconsciously. Pattern recognition and similarity recognition are part of the components of intuition, together with commonsense understanding, skilled know-how, and sense of salience (19). It does not mean that novices could not be able to use intuition, but experts could use intuition more proficiently (20).

It can be concluded that clinical judgments and decision-making processes used by critical care nurses vary as they are informed by the hypothetic-deductive method, pattern recognition, and intuition or a combination of any two or three.

Table 1. List of collected cues and decisions by nurses (adopted from Hoffman et al., 2009) (15)

Novice			Expert		
Decision task-description	Cues collected	Decision task outcome	Decision task-description	Cues collected	Decision task outcome
Monitor alarm altered novice to patient's low BP	BP, GTN rate, Fluid lost intra-operatively	Changed GTN rate (rate was changed up or down each time BP dropped or increased and monitor alarm sounded), no further actions taken	Expert turned the rate of GTN infusion down, even though there was no change in the patient's BP	Temperature, fluid lost intra-operatively, BP manual and arterial, HR, CVP, MAP, output and input, epidural medication rate, pain	Decided to monitor the patient closely as the nurse predicted that the patient's BP could drop as the patient warmed up after theatre and as a number of factors could impact on BP such as the medications for pain, the patient's anxiety and pain and the patient's current fluid status, a fluid bolus was then administered after consultation with medical officer and on further assessment the patient's blood pressure had risen
Reactive			Proactive		

4.1.3.4 Influencing factors of decision-making in the Intensive Care Unit (ICU)

There are various aspects believed to be controlling factors for judgment and clinical decision. Several studies investigated those factors, which are: nurses' experience, patient's condition, personnel resources, shift work, the layout of the ICU, technology in the ICU, inter-professional collaboration (13, 21), accountability, and authority (22)

a) Nurses' experience

In most clinical settings, nursing experience seems to be a significant influencing factor in the decision-making process, and this appears to be true in the ICU. Bucknall (13) conducted a study using a natural design which found that nurses' experience influenced their decision-making processes. The researcher pointed out that nurses with more than five years' experience tended to communicate their decisions to others. It is probably because experienced nurses are more likely to be allocated to patients with more complicated conditions than less experienced nurses, and experienced nurses are generally responsible for mentoring less experienced nurses. Thus, experienced nurses are required to communicate more frequently through arranging treatment options, examining the patients' progress, and teaching the options for patient management. Conversely, nurses with less than five years' experience tended to make evaluative decisions. This outcome might be caused by their difficulties in identifying whether the data was important and relevant, or was neither important nor relevant, so they continued to focus on finding trends at the patients' monitors.

Nurses' experience is believed as the most influential factor in their decision-making process, especially while using intuition. Bjørk et al. (9) argued that education, gender, age, and area of practice might affect using an intuitive-interpretative CDM;

however, the main influencing factor is an experience. Less experienced Nurses differ from experienced nurses in term of ability to analyze data and to make decisions (23, 24).

Discussing experience was influential factor, it is important for nurse managers to take this factor into account while arranging nursing shifts. Bucknall (21) argued it is crucial to make a decent combination of personnel in every shift, based on their experience; thus effective clinical decision-making could be maintained at all times, 24 hours a day. Bucknall (21) also pointed out that experienced nurses may find it a challenge to deliver adequate information and opinion sharing, to support novices on deciding if they were responsible for too many novices at the time.

b) Nurses' knowledge

Nurses' knowledge may contribute to decision-making in ICUs. Nurses' knowledge may influence their performance in decision-making (25). Aitken et al.(7) Pointed out several factors such as knowledge, attitude, and belief about sedation, previous experiences, and clinical judgment skills could all influence nurses' judgments and decision-making. They argued that nurses' knowledge about a wide range of contents and attributes related to issues such as assessment, physiology, and treatment influence their ability in clinical judgment and decision-making in sedation management. They further assert nurses take little account of physiological factors before making a clinical decision; this 'blind spot' may indicate a lack of understanding of physiology, or it may reflect that before making an intervention decision, experts do not need conscious consideration related to physiology.

c) Patients' conditions

The complexity of a patient's situation may affect the type of decision and decision was created. As Bucknall (21) asserts, nurses' clinical decision-making is generally influenced by patients' health status. The complication of a patient's condition affects the rapidity, form, and intricacy of decisions. She argues that nurses may experience a lack of confidence while taking care of a patient presenting a rare situation; a self-perception, which could affect the speed of the decision-making process. Furthermore, she also pointed out that nurses could gain self-confidence while a deciding if they have the opportunity to discuss their cases with other more experienced nurses. Bucknall (13) claims that a patient's situation may affect the type of nurse decisions; it could be intervention decisions, communication decisions, evaluation decisions, or a combination of any of these.

Aitken et al. (7) state that contributing factors of decision-making for sedation management in ICUs include health history, current health status, anxiety, sedation level, patient' responses to therapies, family influences, and the outcomes of sedation management for each patient. They also point out that sedation assessment and management are greatly driven by the patient's neurological status; which is more influential in sedation assessment and management than pain and comfort. This may be because data collected from the neurological status assessment was found to be more objective than the evaluative results of comfort status. However, the objective of pain assessment was enhanced by using measurement tools such as the numeric rating scale (NRS), or behavioural pain scale (BPS). Studies discovered the positive effect of the application of the devices in the field of clinical judgment and decision-making (26). Using their background knowledge and experience nurses may be able to transcript the result of assessment tools to make a robust clinical judgment.

d) *The layout of the intensive care unit*

The design of an intensive care unit may influence nurses' clinical decision-making. Bucknall (21) considered that nurses who worked in critical care units with closed room layouts were likely to communicate less with other team members, compared to nurses who worked in an open design. She argued that a final plan might improve the autonomy of nurses while deciding because they tend to communicate with another team member only if it is needed. Nurses working in the final layout tend to make fewer communication decisions than other types of decisions (13). Furthermore, Bucknall (21) pointed out that open-plan critical care units can accommodate both patients and health care providers, whereas a confined and less convenient layout may trigger stress of nurses and it may work against the quality of the decision-making process.

e) *Shift work*

The type and process of clinical decisions made by nurses are also influenced by shift work. Previous studies discovered that decisions made by nurses working on night duty were mostly evaluation-type decisions: there were fewer interventions and communications during night hours, to maintain patients' quality of sleep. Another reason why nurses did not make many communication decisions during a night shift was that of the reduced participation of other health care professionals during that time (13, 21).

f) *Interprofessional collaboration*

Multidisciplinary collaboration may influence a nurse's clinical decisions in many ways; a nurse's attitudes towards inter-professional collaboration may depend on their assurance to play a role in the decision-making team. Bucknall (21) argues a definite mutual relationship among multi-disciplines is fundamental in making effective inter-professional decisions. She maintains that nurses with adequate knowledge feel more confident to enter discussions with other health professionals; furthermore, physicians rely more on nurses continuing evaluations during non-regular working hours; especially if they decide to follow up treatments based on nurses' information.

g) *Physical and personnel resources*

The nurse resources and advanced technology equipment in an ICU may affect the clinical decision-making process. Nurses' ability in using advanced technology may support them in making effective clinical decisions, according to Bucknall (21). It is also frequently suggested that staffing resources are a significant influence on decision-making; nurse shortages could increase workloads, and it may affect the time available for making decisions (13, 21).

4.1.3.5 Supporting tools for clinical decision-making in ICU

Measurement tools for assessing and evaluating patients may help nurses in making clinical judgments and decisions in an ICU through an analytical process; may also support the decisions made that were based on intuition.

Wøien and Bjørk (8) undertook an exploratory qualitative study based on values from Tanner's clinical judgment model on nurses (n=14) in an intensive care unit. The researchers aimed to investigate nurses' experiences of implementing clinical judgments about patients' pain and sedative requirements after application of assessment tools.

Wøien and Bjørk (8) identified that nurses had a positive attitude toward assessment tools because such tools helped them to maintain appropriate standards of clinical judgment and to determine patients' needs and their fundamental alterations.

The researchers argued that as patients in ICUs are mostly unconscious, immobilized or difficult to communicate with, they are a lot different compared to those in other wards. Nurses' experiences were needed, as clinical judgments based only on the tools, were feeble. It was also pointed out that the tools potentially improve nurses' clinical decision-making, but it does not mean that the tools can or should replace a nurse's clinical judgment.

A robust method to assess patients in an ICU may increase the effectiveness of clinical judgment and decision-making, which may lead to improving the quality of patient care. Wøien and Bjørk (8) argue that assessing patients, by using systematic scoring, supports nurses in delivering effective interventions and it may also help to shorten patients' lengths of stay in ICUs. There is an association between applications of systematic measurement tools with a decline in episodes of pain and agitation, as well as the duration of mechanical ventilation and nosocomial infections (27). This finding is supported by Fraser and Riker (26) who noted using assessment tools to validate a patient's condition allows healthcare professionals to choose appropriate types and doses of sedative and analgesic medication, while consequently, their use improves patient outcomes.

Using systematic assessment tools may enhance the possibilities for nurses to make reliable and valid judgment and decisions. As Wøien and Bjørk (8) assert, nurses' aims of achieving continuity and reliability in the management of pain, sedation, and delirium in ICU have been supported by the application of systematic scoring measurement tools. Such an approach can lead to minimizing the variability in decision-making.

Critical care nurses may use the hypothetic-deductive method to make initial decisions based on their assessment, which includes the data gathered from assessment tools; however, they may also use pattern recognition and intuition in making further decisions. Wøien and Bjørk (8) discovered nurses find that the measurement tools were beneficial, especially during the primary process of assessments, which were followed by intervention decisions. They further argued that scoring systems encourage nurses to distinguish specific levels and to manage patients according to their current score. Although nurses believe that measurement tools enhance their objectivity on assessment, those nurses still prefer to rely more on personal judgments, when making clinical decisions on analgesic and sedative treatment.

The assessment tools could probably be adopted as a guideline or a protocol, which may help nurses in formulating their decisions. Standard care using protocols or guidelines may assist nurses in making judgment and decisions (28). However, there may also be several barriers in using protocols, for instance, Tanis et al., (29) research finding showed that potential respiratory problem, the lack of nursing acceptance and patient-initiated device removal appeared to be general barriers on applying protocol of sedation management.

4.1.3.6 Understanding of attributes and concepts may enhance the quality of the clinical decision-making process in ICU

Clinical decision-making in ICUs may be influenced by nurses understanding the concepts and attributes related to this area of care. Aitken et al. (7) argue that clinical decision-making in critical care is complex and integrates "a wide range of attributes." The dominant attributes are related to assessment aspects, compared to physiological and treatment aspects. Expert nurses use a wide range of attributes in making their decisions. The researchers further explained that the difference could be noticed, especially post-implementation of a sedation protocol, while knowledge about concepts

may also affect a nurse's decision-making on sedation assessment and management. Aitken et al. [7] stated "Decision-making concentrated on a small number of concepts, including sedation and sedatives, anxiety and agitation, pain and comfort and neurological status. Additional concepts were identified for individual patients, suggesting common patterns that are augmented by unique requirements in each patient" (p.44). This may be true for other schemes in the ICUs because the typical cases in ICUs are generally the same. For instance, understanding concepts and attributes about physiological monitoring, ventilation weaning, infection control, and fluid management may well enhance the analytical thinking of nurses while performing clinical decision-making and making professional judgments. As Corriere et al. [30] argue, decision-makers' knowledge related to disease management has affected the care decisions and patients' quality of life.

5 Implications for nursing education and practice of understanding clinical decision making in ICU

The information about clinical decision-making and judgment may support critical care nurses to gain their potential as qualified clinical decision makers, and it may lead to improving the quality of care. Furthermore, considering concepts and attributes that may influence clinical judgments and decision-making regarding particular schemes in ICUs, it is essential for nursing students and novice nurses to learn the identified concepts and characteristics which are frequently used in clinical settings, particularly ICUs. As Aitken et al. [7] argue, one of the most challenging processes in clinical decision-making, especially for a novice nurse, is how to incorporate data from multiple sources. They further suggest it is crucial for educators to take this challenge into account in developing learning strategies that are as close to the real situation found in clinical practice as possible. Concept maps of the clinical decision-making process, in the specific area of practice, may be useful for students in developing their knowledge and skills. It is also important to consider the background knowledge which influences clinical decisions, such as knowledge on physiology, pathophysiology, and treatments.

Identified types of decisions, as well as clinical judgment and decision-making processes in ICUs, may support educators and nurse managers to develop learning systems in formal education, as well as for continuing professional training in the clinical setting.

6. Conclusion

This paper has provided an overview of clinical decision-making and professional judgments in nursing practice. It has also presented a discussion of the review and clinical decision-making process evident in intensive care units and has further discussed the process in sedation assessment and management.
The following points summarise the key elements presented in this paper:
1. Tanner's clinical judgment model has four key features: noticing, interpreting, responding, and reflecting.
2. In making decisions, nurses use several analytical methods such as the hypothetic-deductive method, pattern recognition, intuition, narrative thinking, and decision analysis theory.
3. Critical care nurses usually combine different techniques in making decisions.
4. Clinical decision activities in an intensive care unit appear in many forms, such as intervention decisions, communication decisions, and evaluation decisions.

5. Several factors are influencing clinical decision-making in intensive care units, including nurses' experience, the patient's situation, the layout of the ICU, shift work, inter-professional collaboration, physical and personnel resources.
6. Systematic assessment tools may help nurses in making clinical judgments and decisions in ICUs.
7. Nurses' understanding of the concepts and attributes used in ICUs affect their clinical decision-making abilities.
8. Identified concepts and attributes, and also knowledge of the types of clinical judgments and decision-making processes which are generally applied in ICUs, may encourage educators and nurse managers to develop learning systems in formal education, as well as for continuing professional education in the clinical setting, which incorporate that knowledge.

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