

Intensive Care Unit Nurses: Critical Thinking Skills and Caring Behaviors

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Abstract

Background: Intensive care unit (ICU) nurses must think critically in order to identify and deal with patients' problems and thus provide better care. Currently, however, no existing research has explored ICU nurses' critical thinking skills and caring behaviors.

Purpose: To investigate the associations among the personal characteristics, critical thinking skills, and caring behaviors of ICU nurses in Taiwan.

Methods: A cross-sectional correlational study was conducted. A convenience sample of 352 ICU nurses was recruited from three hospitals in southern Taiwan. Data were collected using self-report measures including a Personal Characteristics Questionnaire, the Critical Thinking Skills Scale, and the Caring Behaviors Scale.

Results: (a) The critical thinking skills and caring behaviors of the ICU nurses were found to be "moderate", with index scores of 52.5 and 65.6, respectively. (b) The nurses' overall critical thinking skills were associated by their clinical ladder, with their "Inference skills" being affected by their seniority and their "Interpretation skills" being affected by their position titles. (c) Their caring behaviors were affected by their age, marital status, clinical ladder, hospital work seniority, and ICU work seniority. (d) Their critical thinking skills and caring behaviors were not associated.

Conclusions: In the healthcare sector, managers should seek to enhance ICU nurses' critical thinking skills and teach them specific behaviors to help them better care for ICU patients.

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Introduction

Intensive care unit (ICU) nurses are direct caregivers for critically ill patients. They must be capable of assessing all of the relevant forms of information presented, making decisions, and providing appropriate and feasible treatments in a timely manner during patient care [1]. When examining problems and making decisions, effective critical thinkers can usually identify reliable and reasonable solutions based on the available evidence. Moreover, effective critical thinkers can engage in self-reflection and discuss a given situation in realistic terms [2]. ICU nurses must make prompt decisions when caring for critically ill patients, whose disease conditions often change unexpectedly [1]. Therefore, such nurses must have both the professional clinical knowledge and the critical thinking skills to make appropriate decisions and provide the highest quality care for patients.

Caring is considered a universal need, the essence of nursing, and an important component in the delivery of nursing care [3]. Through their interactions with patients, nurses care for them, attempt to understand and satisfy their needs, and provide patient-centered holistic care [4]. However, because ICU nurses generally have busy schedules, they typically focus on solving their patients' physiological problems, usually the more pressing ones, and are often forced to overlook their patients' emotional needs. Consequently, patients may sometimes feel neglected and lose their trust in ICU nurses [5].

Regardless of the specific nursing paradigms in which they work, ICU nurses must have both critical thinking skills and caring skills [5]. Past studies have shown that there is a positive relationship between overall critical thinking skills and caring behaviors in nursing students [6-8]. However, no research has simultaneously investigated the skills needed for critical thinking and the caring behavior of nurses working in ICUs specifically. Therefore, the present study was conducted in order to examine the critical thinking skills and caring behavior of ICU nurses.

Literature Review

Critical thinking skills

Critical thinking is a goal-oriented high-level thinking activity that involves knowledge, attitudes, and analysis [9]. Critical thinking skills entail carefully assessing a client's problem, confirming and generalizing relevant evidence, evaluating the accuracy of evidence through logical inference, and determining the appropriate way to solve the problem [10]. Similar to the nursing process, critical thinking uses a systematic approach to solving problems. It is a patient-centered assessment mechanism through which nurses integrate the collected data, apply professional knowledge to identify crucial clues, and then propose an optimal problem-solving strategy. Critical thinking skills are fundamental skills that nurses use when making independent judgments [11,12]. At the same time, the personal characteristics of nurses, e.g., age, education, position title, and seniority, have been confirmed to affect their critical thinking skill.

Caring behaviors

Caring is a specific simultaneous manifestation of thoughts and behaviors that enable nurses to regard others as independent entities and to care for them during interactions [15,16]. From the perspective of human science, caring is the essence of nursing and a type of moral concept that emphasizes the importance of nurse-patient interactions

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[17]. Leininger [18] and Nelson [19] stressed that cultural care exhibits universality and diversity and that individualized care should be provided from a patient-centered perspective in order to conform to the concept of culturally congruent care. Caring refers to the behavior that nurses exhibit at various levels after making assessments and judgments based on their professional knowledge and skills. For example, nurses show caring behavior as they assist patients throughout the trajectories of their illnesses. In addition, caring requires nurses to be sensitive when identifying the potential and immediate needs of patients. Moreover, nurses must emphasize the importance of patients' rights, satisfaction, and needs, and they must have problem-solving skills that promote patient health. Meanwhile, it has previously been observed that nursing care is influenced by the specific characteristics of individual nurses [20]. Studies from around the world, in fact, have confirmed that the personal characteristics of nurses, such as their level of education [3,21], religious beliefs [22], marital status [21], age [17], position title [21], and job seniority [3,23] affect their caring performance.

The correlation between critical thinking skills and caring behaviors

Critical thinking is widely accepted as being associated with the provision of quality care [24]. Thayer-Bacon [25] indicated that without caring, an individual cannot hope to be an effective critical thinker. ICU nurses must be capable of critical thinking and of demonstrating the effectiveness of their caring behavior [5]. However, prior research regarding both critical thinking skills and caring behaviors has generally focused on nursing students only. For example, the past literature has reported a positive relationship between overall critical thinking skills and caring behaviors in nursing students [6-8]. Relatedly, Chen, Chang, and Pai [26] found that caring behaviors directly and indirectly affect nursing students' critical thinking.

Meanwhile, other researchers who have explored critical thinking skills have focused exclusively on clinical nurses [2,13]. These studies report a significant relationship between critical thinking and demographic characteristics such as age, years of nursing experience, experiences in other hospitals, and clinic ladder etc. No studies have addressed both ICU nurses' critical thinking skills and caring behaviors. Moreover, even though we know that critical thinking skills and caring behaviors are correlated in nursing students, the association between critical thinking skills and caring behaviors in ICU nurses remains unclear. Therefore, the current study was conducted in order to provide nursing administrators with advanced information and to enable ICU nurses to more actively develop the skills needed for critical thinking and caring behavior. The specific aims of this study were to: (1) describe the critical thinking skills and caring behaviors among ICU nurses in Taiwan, (2) study whether the personal background characteristics of such nurses have any impact on their critical thinking skills and caring behaviors, and (3) explore the correlation between critical thinking skills and caring behaviors among ICU nurses in Taiwan. The findings of this study might thus serve as a reference to nursing managers for planning in-service educational courses.

Methods

Design, setting and subjects

This cross-sectional correlational study was conducted from August 25, 2014, to September 22, 2014. Convenience sampling was

used for the study. With the exclusion of head nurses and physicians' assistants, the participants in this study consisted of ICU nurses from three foundation hospitals (one medical center, one regional hospital, and one district hospital) in southern Taiwan. All of the participants were licensed practical nurses (2.6%) or registered nurses (97.4%) with at least 3 months of ICU experience. Four hundred thirty-six questionnaires were distributed to ICU nurses, of which 390 (89.45%) were returned. After the incomplete questionnaires had been eliminated, 352 valid questionnaires remained, for a response rate of 80.73%.

Main Outcome Measures

Personal Characteristics Questionnaire

The Personal Characteristics Questionnaire was designed to elicit information on the participants' gender, age, level of education, religious beliefs, marital status, position title, work unit, hospital level, total clinical seniority, total ICU seniority, and clinical ladder (N = lowest ranking; N4 = highest ranking). The clinical ladder system was designed to meet the professional needs of nurses, bring stability for nurses in the workplace, ensure nurses are assigned to proper positions and promote nursing quality.

Critical Thinking Skills Scale

The Critical Thinking Skills Scale revised by Zheng et al. [9] is divided into five parts: Inference, Recognition of assumption, Deduction, Interpretation, and Evaluation of argument. This scale, with its five subscales, was shown to be effective in measuring the critical thinking skills of clinical nurses in a study conducted by Chang et al. [2]. Each part of the scale is comprised of 12 questions (total: 60 questions). Each question on "Inference" asks the given respondent to select one of five possible answers; the questions in the other four parts ask the respondent to select one of two answers. Each correct answer receives a score of 1 point, so the maximum possible score is 60. Higher scores indicate greater critical thinking skills. The Cronbach's α of this scale was found to be .71 in the aforementioned study by Chang et al. [2] and .78 in the present study. Both scores indicated that the scale is sufficiently reliable.

Caring Behaviors Scale

The present study also used the Caring Behaviors Scale (CBS) [27], which contains three dimensions: "knowing patients' needs", "helping patients through the illness trajectory", and "serving as a patient advocate". In a 2011 study by Lin, these dimensions were shown to be significant in measuring the caring behavior of clinical nurses. The CBS includes 28 questions, each of which is scored on a 4-point scale, where 3 = always (performance frequency > 80%); 2 = often (performance frequency > 50%); 1 = occasionally (performance frequency > 20%); and 0 = never (performance frequency = 0%). The total score ranges from 0 to 84, with higher scores indicating better caring behaviors. The Cronbach's α for this scale was found to be .96 in the aforementioned study by Lin [21] and .95 in the present study, which indicated that the scale was acceptably reliable.

Ethical considerations

Before the present study was conducted, official permission was obtained from the administrators of the hospitals in which the study was conducted and from our own hospital's Hospital Ethics

Committee (Document No.: 10212-016). The nurses who answered the questionnaires did so anonymously and gave their written consent to participate in the study.

Data analysis

SPSS 20.0 for Windows was used for all analyses. Descriptive statistics (percentage, mean, and standard deviation), t tests, analysis of variance (ANOVA), and Pearson's product-moment correlation tests were also used.

Results

Personal characteristics of ICU nurses

As shown in Table 1, the analysis of the personal characteristics of the 352 ICU nurses showed that 93.8% (n= 330) were female, their average age was 29.2±4.86 years, and more than one-third (34.4%) were aged between 26 and 30 years. A great majority (97.2%) had graduated from university or received a higher level of education, 63.6% were Taoist, and 69.9% were unmarried. Most (76.7%) were non-managers, and some were N3 nurses (28.4%). More than half were currently working in an internal medicine ICU (52.0%) and were employed at a medical center (59.7%); 38.1% had 1-5 years of clinical experience, and 44.9% had worked for 1-5 years in ICUs.

Critical thinking skills and caring behaviors

The means and standard deviations for each of the five critical thinking skills and the overall mean score are presented in Table 2. The overall critical thinking skill of ICU nurses was found to be “moderate”, with a mean score of 31.51±7.33, and an index score of 52.5 (31.51/60 × 100=52.5). Among the subscales, the mean subscore was highest for Recognition of assumption (7.36) and lowest for Inference (5.31). The nurses had moderate perceptions of caring behaviors. The average overall score for caring behavior was 55.07±11.65, with an index score of 65.6 (55.07/84 × 100=65.6) (Table 2). Among all the subscales, the average value as highest for “knowing the patient's needs” (1.99) and lowest for “helping patient through the illness trajectory” (1.95).

Relationships between personal characteristics and critical thinking skills, caring behaviors

Statistical analysis was performed to determine whether the personal characteristics of the nurses had any impacts on their critical thinking skills and caring behaviors. As shown in Table 3, the N2 and N3 nurses were found to have greater critical thinking skills than the N4 nurses. Meanwhile, the non-managers showed stronger Interpretation skills than did the managers (group leaders, associated head nurses, and nurse practitioners). Furthermore, the ICU nurses who had worked for 1-5 and 6-9 years exhibited greater Inference skills than did those who had worked for less than 1 year or more than 10 years.

| Variable | Mean±SD | n(%) | Variable | Mean±SD | n(%) |
|---------------------------|-----------|-----------|--|-----------|-----------|
| Gender | | | Clinical ladder | | |
| Male | | 22(06.3) | N | | 55(15.6) |
| Female | | 330(93.8) | N1 | | 79(22.4) |
| Age (years) | 29.2±4.86 | | N2 | | 67(19.0) |
| ≤25 | | 79(22.4) | N3 | | 100(28.4) |
| 26-30 | | 121(34.4) | N4 | | 51(14.5) |
| 31-35 | | 106(30.1) | Work Unit | | |
| 36-40 | | 40(11.4) | Internal medicine | | 183(52.0) |
| ≥41 | | 6(01.7) | Surgery | | 145(41.2) |
| Level of education | | | Pediatrics | | 24(06.8) |
| College | | 10(02.8) | Hospital level | | |
| University and higher | | 342(97.2) | Medical center | | 210(59.7) |
| Religious beliefs | | | Regional hospital | | 110(31.3) |
| Buddhism | | 57(16.2) | District hospital | | 32(09.1) |
| Taoism | | 224(63.6) | Total clinical seniority (yrs.) | 7.28±5.10 | |
| Christian | | 21(05.8) | <1 | | 21(06.0) |
| Others | | 52(14.8) | 1 -5 | | 134(38.1) |
| Marital status | | | 6-9 | | 89(25.3) |
| Single | | 246(69.9) | ≥10 | | 108(30.7) |
| Married | | 106(30.1) | Total ICU seniority(yrs.) | 6.24±4.60 | |
| Position title | | | <1 | | 26(07.4) |
| Non-managers | | 270(76.7) | 1 -5 | | 158(44.9) |
| Managers | | 82(23.3) | 6 - 9 | | 91(25.9) |
| | | | ≥10 | | 77(21.9) |

Table 1: Personal characteristics of ICU nurses (N=352).

The results presented in Table 4 demonstrated that the caring behavior performances of the ICU nurses who were married and aged 31-40 years old were better than those of the nurses who were single and who were younger than 25 years old. The N4 nurses showed better caring behavior performances than the N and N1 nurses. The N3 nurses showed better caring behavior performances than the N1 nurses. The nurses who had been involved in clinical work for over 10 years showed better caring behavior performances than those who had worked for less than 1 year, 1-5 years, or 6-9 years. Those who had worked for 6-9 years scored higher on this dimension than those who had worked for less than 1 year or 1-5 years. In addition, the nurses who had worked in ICUs for over 10 years showed higher caring behavior performances than those who had worked for less than 1 year or 1-5 years.

Correlation between critical thinking skills and caring behaviors

The results presented in Table 5 illustrated that there was no significant correlation between the critical thinking skills and caring behaviors of the ICU nurses.

Discussion

Analyzing critical thinking skills and caring behaviors of ICU nurses

We found that the mean score for critical thinking skills (31.51) in this study was lower than the 40.16 mean reported by Chang et al. [2]. Hospitals of different types and levels have distinct organizational

| Variable (Item) | Domain Range | Mean±SD | Average Value | Order |
|---|--------------|--------------------|---------------|-------|
| Critical-thinking skills (60) | 12-59 | 31.51±7.33 | | |
| Inference (12) | 0-12 | 5.31±2.58 | | 5 |
| Recognition of assumptions (12) | 1-12 | 7.36±2.30 | | 1 |
| Deduction (12) | 1-12 | 6.97±1.89 | | 2 |
| Interpretation (12) | 1-12 | 6.23±2.47 | | 3 |
| Evaluation of argument (12) | 1-12 | 5.65±2.23 | | 4 |
| Caring behaviors (28) | 28-84 | 55.07±11.65 | 1.97 | |
| Knowing the patient's needs (9) | 8-27 | 17.87±3.96 | 1.99 | 1 |
| Helping patient through the illness trajectory (10) | 9-30 | 19.53±4.27 | 1.95 | 3 |
| Serving as a patient advocacy (9) | 7-27 | 17.67±4.31 | 1.96 | 2 |

Table 2: Descriptive analysis: critical thinking skills and caring behaviors scale (N=352).

| Variable | n | Critical-Thinking | | Inference | | Recognition of Assumptions | | Deduction | | Interpretation | | Evaluation of Argument | |
|----------------------------|------------------------------------|-------------------|----------|-----------|--------|----------------------------|-------|-----------|-------|----------------|--------|------------------------|-------|
| | | Mean±SD | t/F | Mean±SD | t/F | Mean±SD | t/F | Mean±SD | t/F | Mean±SD | t/F | Mean±SD | t/F |
| Position title | | | 2.444 | | 1.872 | | 1.986 | | 1.512 | | 1.683* | | 0.641 |
| Non-managers | 270 | 32.04±7.43 | | 5.45±2.61 | | 7.49±2.31 | | 7.06±1.94 | | 6.35±2.58 | | 5.69±2.18 | |
| Managers | 82 | 29.79±6.78 | | 4.84±2.45 | | 6.91±2.25 | | 6.70±1.72 | | 5.83±2.04 | | 5.51±2.41 | |
| Clinical ladder | | | 4.981*** | | 2.136 | | 3.128 | | 1.776 | | 3.690 | | 1.512 |
| (1)N | 55 | 31.84±7.56 | | 5.61±2.57 | | 7.16±2.40 | | 7.35±1.76 | | 6.44±2.45 | | 5.42±2.19 | |
| (2)N1 | 79 | 31.25±6.82 | | 5.22±2.60 | | 7.25±2.46 | | 6.90±2.16 | | 6.33±2.64 | | 5.71±2.18 | |
| (3)N2 | 67 | 33.06±7.86 | | 5.89±2.74 | | 7.77±2.18 | | 7.07±1.94 | | 6.60±2.33 | | 5.88±2.21 | |
| (4)N3 | 100 | 32.04±6.74 | | 5.16±2.57 | | 7.70±2.19 | | 7.04±1.76 | | 6.33±2.41 | | 5.88±2.16 | |
| (5)N4 | 51 | 27.37±7.18 | | 4.60±2.20 | | 6.49±2.20 | | 6.41±1.89 | | 5.02±2.21 | | 4.92±2.30 | |
| Scheffe's test | (3)>(5), (4)>(5) | | | | | | | | | | | | |
| Total ICU seniority | | | 2.187 | | 3.474* | | 1.501 | | 1.857 | | 1.264 | | 0.591 |
| (1)<1 | 26 | 30.50±8.17 | | 4.35±2.21 | | 7.31±2.83 | | 6.96±2.16 | | 6.50±2.58 | | 5.38±2.23 | |
| (2)1 - 5 | 158 | 32.27±6.70 | | 5.56±2.55 | | 7.34±2.10 | | 7.22±1.79 | | 6.47±2.52 | | 5.68±2.19 | |
| (3)6 - 9 | 91 | 31.92±8.21 | | 5.63±2.75 | | 7.73±2.40 | | 6.80±2.10 | | 5.92±2.44 | | 5.85±2.37 | |
| (4)≥10 | 77 | 29.83±7.02 | | 4.74±2.42 | | 6.97±2.38 | | 6.66±1.71 | | 6.01±2.33 | | 5.44±2.16 | |
| Scheffe's test | (2)>(1), (3)>(1), (2)>(4), (3)>(4) | | | | | | | | | | | | |

Table 3: Differences in critical thinking skills according to personal characteristics (N=352).

*p<.05, ***p<.001

Note: ICU = Intensive Care Unit

cultures. The case hospitals sampled in the present study were foundation hospitals (including one medical center, one regional hospital, and one district hospital), which differ from the affiliated university hospital sampled by Chang et al. [2]. Therefore, the

differences in the organizational cultures of the hospitals investigated in the two studies might explain the lower critical thinking scores attained by the nurses in the present study.

| Variable | n | Caring Behaviors Scale | |
|---------------------------------|----------------|---|-----------|
| | | Mean±SD | t/F |
| Marital status | | | -3.397*** |
| Single | 246 | 53.71±11.32 | |
| Married | 106 | 58.24±11.82 | |
| Age (years old) | | | 4.789*** |
| (1)≤25 | 79 | 50.97±10.97 | |
| (2)26- 30 | 121 | 54.42±11.34 | |
| (3)31- 35 | 106 | 57.74±11.96 | |
| (4)36- 40 | 40 | 58.08±11.42 | |
| (5)≥41 | 6 | 55.00±06.10 | |
| | Scheffe's test | (4)>(1),(3)>(1) | |
| Clinical ladder | | | 7.426*** |
| (1)N | 55 | 51.56±11.50 | |
| (2)N1 | 79 | 51.25±11.50 | |
| (3)N2 | 67 | 55.60±10.72 | |
| (4)N3 | 100 | 56.80±11.64 | |
| (5)N4 | 51 | 60.69±10.39 | |
| | Scheffe's test | (5)>(1),(5)>(2);(4)>(2) | |
| Total clinical seniority | | | 5.385*** |
| (1)<1 | 21 | 50.05±14.02 | |
| (2)1 - 5 | 134 | 52.82±10.51 | |
| (3)6 - 9 | 89 | 56.52±11.54 | |
| (4)≥10 | 108 | 57.65±11.90 | |
| | Scheffe's test | (3)>(1), (3)>(2); (4)>(1), (4)>(2), (4)>(3) | |
| Total ICU seniority | | | 5.937*** |
| (1)<1 | 26 | 51.62±13.84 | |
| (2)1 - 5 | 158 | 53.02±10.46 | |
| (3)6 - 9 | 91 | 56.26±11.44 | |
| (4)≥10 | 77 | 59.04±12.31 | |
| | Scheffe's test | (3)>(2);(4)>(1),(4)>(2) | |

Table 4: Differences in caring behaviors scale according to personal characteristics (N=352).

*** $p<.001$

Note: ICU = Intensive Care Unit

| | Critical- Thinking | Inference | Recognition of Assumptions | Deduction | Interpretation | Evaluation of Argument |
|--|--------------------|-----------|----------------------------|-----------|----------------|------------------------|
| Caring Behaviors | -.010 | -.020 | -.039 | .019 | .004 | -.001 |
| Knowing the patient's needs | -.023 | -.007 | -.062 | .023 | -.018 | -.002 |
| Helping patient through the illness trajectory | -.015 | -.039 | -.005 | .005 | .000 | -.002 |
| Serving as a patient advocacy | .008 | -.010 | -.043 | .025 | .027 | .032 |

Table 5: Correlation among critical thinking skills and caring behaviors scale (N=352).

The average overall score for the caring behaviors of the ICU nurses in this study was 55.07 (with an index score of 65.6), which was lower than the 79.49 average overall score (with an index score of 73.6, out of a possible total mean score of 108) reported by Lin [21] for nurses working at a regional teaching hospital. Meanwhile, most of the participants in the present study had less than 9 years of clinical experience (69.3%; 244 nurses), whereas nearly half of the participants in the study by Lin [21] had at least 10 years of clinical experience (49.6%). This difference in the seniority and educational level of the participants in the two studies might have caused the difference in the quality of their caring behaviors. Among the subscales of the CBS, the score for the “Knowing the patient’s needs” subscale was the highest while that for the “Helping patients through the illness trajectory” subscale was the lowest, suggesting that the more observable aspects of care received the higher ratings. These results were consistent with those of Li et al. [17] and Lin [21] but differed from those of Lee et al. [28]. This difference might have been because most of the critically ill ICU patients in the present study were intubated and, therefore, unable to directly express their needs. Relatedly, because of the unique characteristics of ICU patients, ICU nurses must be able to detect the needs of patients, ascertain the focus of care according to their nursing experience, and quickly satisfy the patients’ needs.

Analyzing the relationships among personal characteristics and critical thinking skills and caring behaviors

The N2 and N3 ICU nurses showed better critical thinking skills than did the N4 nurses, results which differed from the findings of Chang et al. [2] and Feng et al. [13]. In exploring the decision-making skills of head nurses from the perspectives of nurses, Lin et al. [29] reported that intuitive decision-making skills stem from accumulated experience and professional knowledge. Moreover, higher-level nurses often make decisions intuitively. Because the participants in the present study were from different work units, most of the N4 ICU nurses had considerable specialized care experience, which enabled them to intuitively analyze their patients’ problems and quickly formulate potential solutions. Consequently, the critical thinking skills of N2 and N3 ICU nurses were greater than those of the N4 nurses.

Among the subscales of the Critical Thinking Skills Scale, the score for the “Recognition of assumption” subscale was the highest, which indicated that the ICU nurses’ had greater skills for identifying evidence to assist physicians in assessing changes in the conditions of patients’ problems than they had in the other four skill areas. Similar to the findings reported by Chang et al. [2], the nurses in this study scored the lowest for the “Inference” subscale, which suggested that the inference skills of these ICU nurses were unsatisfactory. This might be because each of the “Inference” questions had five possible answers, whereas those for the other four subscales had only two possible answers each. This difference in the number of available answers might have caused the “Inference” scores to be the lowest. In addition, the low “Inference” scores might also have been attributable to a lack of instruction in how to make reasonable inferences in clinical settings; relatedly, clinical case conferences were rarely held in these nurses’ workplaces. The non-manager ICU nurses showed better Interpretation skills than did the managers, possibly because managers generally focus on administrative work and rarely participate in direct patient care. Furthermore, because ICU work is patient- and situation-centered rather than mechanical, non-managers can continually think critically and formulate new interpretations when they provide patient care. Similar to the findings

reported by Chang et al. [2] and Feng et al. [13], the Inference skills of the ICU nurses in this study varied significantly with their total ICU seniority, which indicated that the nurses with more seniority were better at thinking critically when providing patient care in the ICU.

The age of the ICU nurses in the present study had a significant effect on their caring behaviors, a finding which was consistent with the findings of Li et al. [17], Lin [21], and Lee et al. [28]. Specifically, the results indicated that the older nurses typically had more extensive clinical experience and that they could provide care based on their professional skills, promote patient health, and offer better caring behavior. Meanwhile, the past literature suggested that married people generally have a stronger sense of responsibility in caring for their families compared with those who are unmarried. In our study, relatedly, nurses who were married had caring behaviors that were better than those of unmarried nurses, which is consistent with Ma’s [30] findings.

A previous report suggested that caring behavior is associated with working experience. This study found that the N4 nurses demonstrated better caring behaviors than did the N and N1 nurses, and that the N3 nurses showed better caring behavior than did the N1 nurses, findings which were consistent with the findings of Chi et al. [31]. These results also revealed that the nurses working at higher clinical levels exhibited more satisfactory caring behavior. Moreover, this study found that overall clinical and ICU seniority had a significant effect on the caring behaviors of the nurses: those with higher seniority showed better caring behaviors than did those with lower seniority. These results support those of a study by Lee et al. [28], but differ from those of Lin [21]. This might have been because the ICU nurses in the present study were continually learning and accumulating caregiving experience during work and appropriately performing their care functions, which could have improved their caring behavior performances.

Previous studies have reported that there was a significant relationship of educational background with critical thinking skills and caring behaviors [2,3,13,21]. However, our results were not consistent with those findings of similar previous studies, as the results of this study suggested that education level was not correlated with the critical thinking skills and caring behaviors of the ICU nurses. This difference might have been because only 10 nurses (3.8%) in this study not had university certification or a higher level of education. The number of ICU nurses in two compared educational groups varies widely. Therefore, there was no significant difference shown in the results. The nurses’ overall critical thinking skills were associated by their clinical ladder, seniority and position titles. That said, the overall results of this study did suggest that the ICU nurses’ critical thinking skills and caring behaviors were influenced by their personal characteristics.

Association between critical thinking skills and caring behaviors

Previous reports have advocated the view that more satisfactory caring behaviors indicated better critical thinking skills in nursing students [6,8,26], but the results of this study indicated that the critical thinking skills of the ICU nurses and their caring behaviors were not significantly correlated. The reason for the contrast between these results and those of previous reports might be that, firstly, the participants in the present study were ICU nurses, whereas those in the studies by Arli et al. [6], Chen et al. [26], and Pai et al. [7] were nursing students. Secondly, caring behavior in this study included knowing patients’ needs, helping patients through the trajectories of their illnesses, and serving as a patient advocate. Our results

were consistent with those of a previous study by Lin [21] using the same indicators. However, the relevant behaviors were not routinely performed by the ICU nurses in daily practice. Previous studies have shown that the caring behavior of nurses is significantly influenced by the personal characteristics of nurses [20,32]. Moreover, caring behavior and critical thinking skills are different abilities. The caring behavior of nurses is one of the humanistic literacy. But today, many nurses' humanistic quality is declining and a lot of colleges don't pay much attention to the humanity cultivation of the university's nursing students. On the other hands, critical thinking skill is concerned about problem-based learning and to learning logical reasoning as well as being able to improve problem-solving abilities [33]. It is difficult to improve ICU nurses in the critical thinking skill and the humanistic quality at the same time.

Finally, the Critical Thinking Skills Scale revised by Zheng et al. [9] and used in the present study differed from the Critical Thinking Disposition Inventory, Chinese Version (CTDI-CV) adopted by Pai et al. [7]. The concepts within these two instruments are not identical. Pai et al. [7] intended to measure the critical thinking characteristics of the participants in their study in terms of seven dispositions: truth-seeking, open-mindedness, analyticity, systematicity, self-confidence, inquisitiveness, and maturity. In contrast, the Critical Thinking Skills Scale used in the present study includes five parts: the Inference, Recognition of assumption, Deduction, Interpretation, and Evaluation of argument subscales. Thus, the differences between the two scales might have had an influence on the aforementioned contrasting results and require further investigation and comparison.

Conclusions

We found that the ICU nurses investigated in this study had only moderate-level critical thinking skills and showed only moderate-level caring behaviors. The N2 and N3 ICU nurses showed better critical thinking skills than did the N4 nurses. The non-manager nurses had better "Interpretation" skills than did the managers, and the ICU nurses who had worked for 1-5 years or 6-9 years had better "Inference" skills than those who had worked for less than 1 year or over 10 years. The ICU nurses who were older, married, working at higher clinical levels, and had worked in clinics and ICUs for a longer time showed better caring behaviors. There was no significant correlations, meanwhile, between the critical thinking skills and caring behaviors of these ICU nurses.

For clinical practice, ICU nurses could improve their critical thinking ability by attending clinical case discussion meetings. During those meetings, nurses can share their experience and discuss their case in group discussions and it will help to enhance their critical thinking ability. In order to present caring behavior with patient-center attitudes, nurses can arrange cross-disciplinary teamwork meetings to understand the patients' multi-level care and needs. In nursing education, healthcare managers should seek strategies to enhance ICU nurses' critical thinking skills and teach them specific behaviors to help them better care for ICU patients. Nursing teachers can use problem-based learning teaching tactic to let nursing students learn from clinical practice. This can cultivate and improve nursing student critical thinking as well as problem-solved ability.

Limitations

Because of geographical considerations, sampling methods, and selection conditions, only ICU nurses from a medical center, regional

hospital, and district hospital in southern Taiwan were included in the sample. Therefore, the results of this study are relevant only to the ICU nurses who participated in this study and cannot be generalized to all ICU nurses in Taiwan.

Recommendations

In line with the findings of the present study, we suggest the following:

1. Because caring behaviors can best be researched using qualitative research approaches, it is recommended that qualitative methods be used in similar future studies to better understand the individual differences in ICU nurses' perceptions of caring behaviors [32]. Relatedly, further studies of the caring behaviors of ICU nurses working in private hospitals, university hospitals, and specialized units are necessary.
2. In future studies, a broader variety of participants should be sampled to clarify the effects of the hospital type and level on the critical thinking skills and caring behaviors of ICU nurses.

Competing Interests

The authors declare that they have no competing interests.

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