

Discriminant Factors of Clinical Competence in New Graduate Nurses

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Abstract

Background: The purpose of this study was to identify the discriminating factors of clinical competence in new graduate nurses.

Methods: A self-report survey was conducted with 222 new graduate nurses from 13 general hospitals. The data were collected from August 5 to August 31, 2009. Descriptive and stepwise discriminant analyses were utilized.

Results: Nurses were grouped into three groups (GP) by their clinical competence: low competency GP (N=32), medium competency GP (N=140), high competency GP (N=50). With three GPs, two functions were produced and only one was significantly discriminating low and high competency GPs. Additional discriminant analysis with only low and high GPs produced the function classified 82.9% of participants correctly into two GPs. Intellectual integrity and truth-seeking dimensions in critical thinking were most significant factors in discriminating high and low competency GP.

Conclusion: The study suggests that recruiting nurses with high intellectual integrity, truth-seeking, inquisitiveness, and creativity promise the possibility of having nurses with high clinical competency. Further research is required to remodel work environment and to provide new educational program focusing on intellectual integrity, truth-seeking, inquisitiveness, and creativity to improve nurses' competence.

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Introduction

New graduate nurses are defined as nurses who have worked at hospitals for less than 12 months after college graduation [1]. Based on the study [2], new graduate nurses require certain time to adjust to their new job; sometimes it takes at least several months or years. During the initial transition period from student to registered nurse, the new nurses often confront many challenges [3]. Willemssen-McBride [4] insists that new graduate nurse has not yet reached sufficient levels of professional preparedness to deliver quality of care to the patients. Nurse administrators argue that only 10% of new graduate nurses are fully prepared to provide safe and effective care to the patients [5]. Many new graduate nurses frequently feel helpless and are overwhelmed by the fact that they are expected to provide independent nursing care to their patients. New graduate nurses' perception of unpreparedness can induce high levels of stress, which results in high turnover rates in new graduate nurses [6]. Increased turnover rates in new graduate nurses are great burden to the hospitals in terms of staffing and maintaining consistent high quality of care [3, 6-8]. By increasing clinical competence levels in new graduate nurses, they may not feel as stressed and overwhelmed. Therefore, assessing clinical competence of new graduate nurses and identifying related factors of competence levels are essential first step to develop practical learning strategies for promoting their clinical competence.

Critical thinking disposition has been highlighted because of its high correlation with the clinical competence and continuous quality improvement initiatives in nursing [9]. Our previous study [10] identified critical thinking disposition as the most significant predictor of clinical competence. Nurses who have higher levels of critical thinking disposition tend to have higher levels of clinical competence [11]; and they are more likely to consider various alternatives and to make logical conclusion when solving problems [12]. Critical thinking disposition has various sub-dimensions: intellectual integrity, creativity, challenge, open-mindedness, prudence, objectivity, truth seeking, and inquisitiveness [13]. Even though critical thinking can be

considered as one concept, understanding the role of sub-dimensions would provide better insight for developing educational program for new graduate nurses and developing better recruiting strategies for the hospital.

Practice environment plays an important role in motivating and enhancing nursing abilities [14]. It is closely related with quality of care, nurse satisfaction, and turnover rates [15]. Supportive and favorable practice environment maximizes the outcomes of nursing student's clinical practice [16]. Identifying the correlation between practice environment and clinical competence could provide better insight to develop more sensitive administrative environment.

Nurses' previous clinical experience and characteristics were also related to the levels of clinical competence among nurses. Nurses with previous clinical experiences at the same hospital [17], longer duration of work experiences [18], bachelor degrees [19], higher grade point average (GPA) [20], job orientations and instructions by preceptor [21] tend to have high levels of clinical competence. In this study, we aimed to examine the levels of clinical competence and to identify the discriminant factors of clinical competence groups, among critical thinking disposition, practice environment, previous clinical experience, and characteristics of new graduated nurses.

Discriminant analysis is applied to determine the factors that differentiate nurses into low, medium, and high competence groups.

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Categorizing groups according to the levels of clinical competence and identifying discriminating factors between groups will help develop strategies to enhance their clinical competence and better screen nurses who could have high clinical competence. Specific aims are as follows; (1) to examine the levels of clinical competence, critical thinking disposition, and practice environment; (2) to identify the discriminant factors of clinical competence in new graduate nurses.

Method

Study design

We performed a secondary analysis of baseline data collected in a descriptive study [10] to identify the discriminant factors of clinical competence in new graduate nurses.

Setting and samples

This study was conducted in 13 general hospitals from two cities of South Korea. The data were collected from August 5 to August 31, 2009. Female nurses (N=222) who worked less than 12 months after their college graduation were included in this study.

Ethical considerations

Approval The Institutional Review Board (IRB) of XXX University Hospital approved the study. Because the rest of the hospitals did not have an IRB, their administrative departments permitted data collection and accepted the approval of the XXX University Hospital's IRB. The purpose of the study was explained to the participants and the maintenance of anonymity, confidentiality with regard to their responses, and the freedom of withdrawing from the study at any time were assured. Written consent to the study was obtained from all participants.

Measurements

Clinical competence

Clinical competence was assessed with the clinical nursing competence instrument developed by Son et al.[18]. This instrument consists of 64-items with a 4-point scale (1=not at all, 4=very well) and has seven sub-dimensions (e.g., data collection, basic nursing care, communication, critical thinking, teaching and leadership, nursing management, professional development). A higher score represents a better clinical competence in each sub-dimension. Cronbach's α at the time of development was ranged from .78 (communication) to .93 (basic nursing care), and Cronbach's α in this study was ranged from .63 (data collection) to .87 (basic nursing care). We classified clinical competence of new graduate nurses into three groups of high, medium, and low according to the proportion of competent responses. Participants who answered 'well' or 'very well' less than 60.0% classified in the low clinical competence group, between 60.0% and 89.9% in the medium group, and more than 90.0% in the high group.

Critical thinking disposition

Critical thinking disposition was measured with the Critical Thinking Disposition Scale for Nursing Students developed by Kwon et al.[13]. This instrument composed of eight-dimensions (e.g., intellectual integrity, creativity, challenge, open-mindedness, prudence, objectivity, truth seeking, and inquisitiveness) consist of 35-items with 5-point scale (1=strongly disagree, 5=strongly agree). In this study,

we used 4-point scale and deleted the response 3 ('medium') in order to avoid the centralized responses. A higher score represents a better critical thinking disposition. Cronbach's α in this study was ranged from .42 (objectivity) to .81 (creativity).

Practice environment

Practice environment was measured with the Nursing Work Index-Revised (NWI-R) developed by Aiken and Patrician[15] and translated into Korean [22]. This is the 15-item questionnaire composed of three-dimensions (e.g., autonomy, registered nurse-physician collaboration, control over practice) with 4-point scale (1=strongly agree, 4=strongly disagree). The higher score represents that the nursing practice environment tends to be autonomous, supportive, and collaborative. Cronbach's α in this study was ranged from .64 (autonomy) to .86 (nurse-physician relationship).

General characteristics and job-related characteristics

General and job related characteristics were collected with structured questionnaire. General characteristics included educational background and grade point average from college. Job related characteristics included duration of employment, duration of job orientation provided by the institute, instruction by preceptor, and previous clinical experience as a student nurse in the current employed hospital.

Data collection procedure

General hospitals with >500 beds that were located in "B" city and "D" city, South Korea were contacted for data collection. Questionnaires were distributed to the potential participants, about 20 nurses from each institution, and they were asked to return their completed questionnaires in sealed envelopes to the researcher. We either included all new nurses or conveniently selected nurses depending on the numbers of new nurses in the institution. Total 252 questionnaires were distributed and 238 questionnaires were returned, showing a 94.4% response rate. We eliminated 3 incomplete questionnaires and 13 responses from male nurses and 222 questionnaires were included in the final analysis. On the basis of power analysis, the sample size of this study was considered to be appropriate (effect size $f^2=.12$, $p=0.05$, $u=30$, $v=316$, $\lambda=41.64$, power=.97) [23].

Data analysis

Data were analyzed by the SPSS 18.0. Descriptive statistics were used to present characteristics of the participants and the levels of clinical competence, critical thinking disposition, and practice environment. To determine the significant predictors of clinical competence in new graduate nurses, discriminant analysis was performed.

Results

Characteristics, clinical competence, critical thinking disposition, and practice environment of the participants

Characteristics of the participants are showed in table 1. There were three times more nurses who graduated from 3 year junior college (76.1%) than who graduated from 4 year university (23.9%). One fourth of the nurses had 4.0 GPA and higher. Majority of nurses (87.3%) in the study had clinical experience for less than 6 months. Average duration of job orientation that new nurses received from the institutes was 1.72 weeks of theory and 2.83 weeks of practice. 85% of the nurses had instructions by preceptors and 50.0% had previous

Variables	Classification/ Numbers of items	n(%)	M±SD (range)	Potentialrange
Education	Junior college	169(76.1)		-
	University	53(23.9)		
GPA	< 4.0	170(76.6)		-
	≥ 4.0	52(23.4)		
Duration of working (month)	1-3	61(27.5)		-
	4-6	133(59.8)	4.63± 2.28 (1.00-12.00)	
	7-9	13(5.9)		
	10-12	15(6.8)		
Duration of job orientation	Theory (week)	0-<1	42(18.9)	
	1-<2	85(38.3)		
	2-<3	47(21.2)	1.72±1.20 (0-4.00)	-
	3-<4	12(5.4)		
	≥ 4	36(16.2)		
	Practice (week)	0-<1	28(12.6)	2.83±1.90 (0-12.00)
	1-<2	17(7.7)		-
	2-<3	46(20.7)		
	3-<4	73(32.9)		
	≥ 4	58(26.1)		
Instructor by preceptor	Yes	189(85.1)	-	-
	No	33(14.9)		
Previous clinical practice experience in the hospital	Yes	111(50.0)	-	-
	No	111(50.0)		
Clinical competence	64		181.27±14.12 (143.00-234.00)	64-256
Basic nursing care	24		2.94±0.24 (2.42-3.75)	1-4
Communication	4		2.84±0.37 (2.00-4.00)	
Data collection	5		2.81±0.30 (2.20-4.00)	
Professional development and legal implementation	5		2.79±0.36 (1.80-4.00)	
Critical thinking	6		2.76±0.32 (2.00-4.00)	
Teaching and leadership	9		2.74±0.29 (1.67-3.89)	
Nursing management	11		2.74±0.29 (1.73-3.55)	
Critical thinking disposition	35		94.46±7.99 (72.00-125.00)	35-140
Openness	3		3.01±0.42 (2.00-4.00)	1-4
Intellectual integrity	6		2.86±0.32 (1.83-4.00)	
Truth-seeking	3		2.77±0.41 (1.33-4.00)	
Inquisitiveness	5		2.72±0.36 (1.80-4.00)	
Challenge	6		2.63±0.40 (1.67-4.00)	
Objectivity	4		2.63±0.31 (1.50-3.50)	
Prudence	4		2.59±0.38 (1.50-4.00)	
Creativity	4		2.43±0.45 (1.50-4.00)	
Practice environment	15		41.10±5.50 (25.00-57.00)	15-60
Registered nurse-physician collaboration	3		2.94±0.43 (2.00-4.00)	1-4
Autonomy	5		2.88±0.39 (2.00-4.00)	
Control over practice	7		2.55±0.48 (1.00-4.00)	

Table 1: Characteristics, Clinical Competence, Critical Thinking Disposition, and Practice Environment of the Participants (N=222).
Note. GPA=Grade Point Average.

clinical practice experience in the hospital when they were student nurses. Mean clinical competence of the new graduate nurses was 181.27 with standard deviation of 14.12. For the sub-dimensions, clinical competence levels in teaching and leadership (2.74 ± 0.29) and in nursing management (2.74 ± 0.29) were the lowest and basic nursing care (2.94 ± 0.24) was the highest. Total score of critical thinking disposition was 94.46 ± 7.99 . For the sub-dimensions, openness (3.01 ± 0.42) was the highest and creativity (2.43 ± 0.45) was the lowest. In Perceived practice environment by new graduate nurses (41.10 ± 5.50), control over the practice setting (2.55 ± 0.48) was the lowest and nurse and physician collaboration (2.88 ± 0.39) was the highest Table 1.

Discriminant factors of clinical competence

According to the clinical competence scores, participants were divided into three groups, high (n=50), medium (n=140), and low (n=32). To identify the predictors that could differentiate the levels of clinical competence of new graduate nurses, characteristics of the nurses, critical thinking disposition, and practice environment were compared among three groups and discriminant loadings were analyzed along with cross-validation of the group membership.

Mean comparison of the predictor variables among groups

Table 2 shows mean differences in variables among groups. The levels of clinical competence were significantly different in groups.

Nurses in high group showed higher GPA and had longer period of theory orientation from the hospitals, however the differences among groups were weakly significant. Nurses in high competence group reported higher critical thinking disposition than those in medium and low competence groups ($F=24.60$, $p<.001$). In sub-dimensions of critical thinking disposition, intellectual integrity ($F=23.51$, $p<.001$), truth-seeking ($F=13.66$, $p<.001$), inquisitiveness ($F=14.35$, $p<.001$), creativity ($F=11.06$, $p<.001$) were significantly different among the groups. However, there were no statistically significant differences in openness, challenge, objectivity and prudence among the three groups. For practice environment, there were no significant group differences in total scores and in sub-dimensions: nurse-physician collaboration, autonomy, and control over practice. Total scores of practice environment were included in the following analysis.

Discriminant loadings and standardized canonical discriminant coefficient

Multiple discriminant analysis was utilized to identify the factors that differentiate group membership. Discriminant analysis included variables that were significantly different in groups in Table 2: intellectual integrity, truth-seeking, inquisitiveness, and creativity. Even though GPA, theory orientation, challenge, objectivity, prudence, creativity, and total score of practice environment were found to be weakly significant ($p<.05$), it was included in the discriminant analysis. Initial analysis with three groups produced two discriminant

Variables	LG(n=32)	MG(n=140)	HG(n=50)	F	p
	M(SD)	M(SD)	M(SD)		
Clinical Competence	159.69 (6.99)	180.68 (7.59)	196.74 (12.47)	171.99	<.001
Bachelor degree+	0.25(.44)	0.24 (.43)	0.24(.43)	0.02	.985
GPA>4.00+	0.16(.37)	0.19 (.39)	0.42(.50)	6.56	.002
Duration of working	4.09 (1.33)	4.71(2.46)	4.73 (2.22)	1.02	.362
Duration of job orientation Theory (week)	1.57 (1.19)	1.63 (1.16)	2.09 (1.26)	3.09	.047
Duration of job orientation Practice (week)	2.49 (1.39)	2.74 (1.84)	3.31 (2.26)	2.30	.103
Instruction by preceptor+	0.84(0.37)	0.84 (0.37)	0.90(0.30)	0.61	.547
Previous clinical experience in the employed hospital	0.38(0.49)	0.51 (0.50)	0.56(0.50)	1.37	.256
Critical thinking disposition	88.06 (7.12)	94.12 (6.65)	99.48 (8.80)	24.60	<.001
Openness	2.86(0.38)	3.05 (0.41)	3.00(0.44)	2.70	.070
Intellectual integrity	2.61(0.38)	2.85 (0.28)	3.07(0.27)	23.51	<.001
Truth-seeking	2.52(0.38)	2.75 (0.41)	2.97(0.34)	13.66	<.001
Inquisitiveness	2.50(0.31)	2.71 (0.32)	2.90(0.40)	14.35	<.001
Challenge	2.48(0.30)	2.64 (0.37)	2.70(0.51)	3.06	.049
Objectivity	2.53(0.31)	2.61 (0.31)	2.73(0.29)	4.25	.015
Prudence	2.45(0.40)	2.58 (0.36)	2.73(0.37)	6.25	.002
Creativity	2.23(0.46)	2.39 (0.43)	2.66(0.41)	11.06	<.001
Practice environment	39.53 (5.47)	40.91 (5.37)	42.64 (5.64)	3.42	.035
Registered nurse-physician collaboration	2.79 (0.41)	2.94 (0.42)	3.02 (0.43)	2.87	.059
Autonomy	2.81 (0.43)	2.88 (0.38)	2.96 (0.38)	1.53	.219
Control over practice	2.45 (0.42)	2.53 (0.49)	2.69 (0.48)	2.87	.059

Table 2: Mean Differences in Variables among Low, Medium, and High Clinical Competence Groups (N=222).

Note: LG=Low Group; MG=Medium Group; HG=High Group; GPA=Grade Point Average; + dummy coded 1=had a bachelor degree, GPA>4, had instructions by preceptors.

functions and only one function was significant. Figure 1 represents the group centroid with two functions. Function 1 distinguish group 1 and 3 ($\chi^2=73.20$, $p<.001$) while function 2 does not distinguish any ($\chi^2=6.53$, $p=.686$). Additional discriminant analysis was conducted with two groups, high and low competence groups. Table 3 shows discriminant loadings and standardized canonical discriminant coefficient. Even though there is no consensus in interpreting significant discriminant loadings, we followed the cut-point of $\pm .30$ suggested by Hair, Anderson, Tatham, and Black [24].

Table 3 presents the discriminating factors between two groups. Overall, 45.4% (Canonical correlation=.674, $\chi^2=45.36$, $p<.001$) of variance were explained with the included variables. Most sub-dimensions in critical thinking disposition significantly discriminated groups. Especially, intellectual integrity and truth-seeking, creativity were most significant factors in discriminating the groups.

Predictors	Discriminant loadings	Standardized weights
CTD (Intellectual integrity)	.77	.51
CTD (Truth-seeking)	.69	.49
CTD (Inquisitive)	.60	.07
CTD (Creativity)	.53	.23
CTD (Prudence)	.40	.11
CTD (Objectivity)	.36	-.07
GPA>4	.32	.23
Practice Environment	.30	.25
CTD (Challenge)	.27	-.20
Duration of theory orientation	.23	-.02

Table 3: Discriminant Loadings and Standardized Canonical Discriminant Coefficients.

Note: Canonical correlation=.674, Wilk's λ =.546, $\chi^2=45.36$, $p<.001$; CTD= Critical thinking disposition; GPA= Grade Point Average

Cross validation of the discriminant function

Table 4 presents cross-validation of the function with holdout sample. Overall classification accuracy was 85.4%. Ninety percent of high competence group and 78.1% of low competence group classified correctly. To verify the external validity, cross-validation were conducted using hold-out sample. Eighty four percent of high competence group and 75.0% of low competence group were classified correctly, producing 80.5% of hit ratio.

	Group	Predicted Group Membership		Total (n=222)
		Low Group n(%)	High Group n(%)	
Original	Low Group	25 (78.1)	7 (21.9)	32
	High Group	5 (10.0)	45 (90.0)	50
			Hit ratio	85.4%
Cross-validation	Low Group	24 (75.0)	8 (25.0)	32
	High Group	8 (14.0)	42 (84.0)	50
			Hit ratio	80.5%

Table 4: Cross-Validation of Function with Holdout Sample (N=222).

Discussion

This study was conducted to identify factors discriminating group membership according to the levels of clinical competence among new graduate nurses. When the sub-dimensions of clinical competence were considered, 'basic nursing care' was the highest clinical competence for new graduate nurses, which was consistent with the findings of Jung [17]. Clinical competence of new graduate nurses in this study was 2.83 (70.8 out of 100), which is slightly higher than experienced nurses' clinical competence (69.0 out of 100) in the study of Sung and Eum[25]. Experienced nurses reported the sub-dimension of 'interpersonal relationship /communication skills' as the highest[25], indicating the differences of clinical competence in sub-dimensions between new and experienced nurses. According to this review, we can infer that new graduate nurses need improvement in overall competence levels (70 out of 100) and also needed much improvement in teaching and leadership, and nursing management. More attention is needed to improve clinical competences in these areas among new graduate nurses.

High and low competence groups were significantly discriminated by a discriminant function. All except one sub-dimension (openness) of critical thinking disposition were significant discriminating factors. Intellectual integrity and truth-seeking sub-dimensions were two most important predictors and showed higher mean scores among subscales. This may indicate the unique characteristics of new graduate nurses as a novice in the clinical setting. Nurses need to develop their thinking and reasoning skills in order to meet the patients and families' caring needs in collaboration with other healthcare professionals[26] and nurses who have comprehensive knowledge could effectively make reasonable decision and provide high quality of nursing care to the patients[27], ensuring high clinical competence. In order to prepare nursing students to have higher levels of intellectual integrity, enhancing knowledge levels of nursing students and promoting proactive learning behaviors are essential. Problem based learning is often recommended to improve critical thinking for nursing students [28].

Truth seeking is a tendency to make a right decision with a process of repeated thinking [29]. Nurses who continuously pursue truth tend to reevaluate new information and perform clinical nursing intervention based on the validated evidences, not on habits alone[30]. Professional judgment develops and matures with the acquisition of greater contents of knowledge, reflective analysis and evaluation of actual experience[31]. Nurses with truth seeking trait can be beneficial for the organization for better practice based on evidences.

Inquisitive nurses are continuously developing themselves by acquiring up-to-dated knowledge in their specialty areas, which is essential to become professional nurses. Nurses with high levels of clinical knowledge, inquisitiveness, and higher education tend to have higher levels of clinical competence[30,32]. Hospitals could facilitate the opportunity of further education as retaining strategies of nurses with high clinical competence. Supporting nurses' further education could be beneficial for both nurses and the organization.

In this study, creativity sub-dimension of the critical thinking disposition also contributed to discriminate memberships between high and low groups of clinical competence. Creativity is essential to perform the holistic nursing care and is an essential aspect for being an artistic and scientific health professional in unpredictable health care situation[9]. Interventions that involve creativity are offering nurses a new perspective on caring for patients[33]. In

these days, it is highlighted that the importance of humanities in nursing to generate the creative and innovative interventions and nursing care. Teaching innovations such as song composition, poetry writing and role-play creation impact on creative and critical thinking of nursing students[34]. Nursing education should include various activities to develop creativity of students and a permissive culture which encourages new creative ideas should be pursued.

Even though the discriminating power of GPA and challenge sub-dimension between groups were minimal, these variables are indispensable basis of the intellectual integrity and truth-seeking. New nurses reported difficulties due to the discrepancies between acquired knowledge from the school and actual knowledge required in nursing practice[2]. More than half of the experienced nurses (53.6%) chose nursing knowledge and skills are the most important condition that new nurses should be prepared. Knowledge accumulation during nursing student could be a foundation of being expert nurses, which could facilitate possible prompt adaptation to the new job.

There are several limitations in this study. Due to the nature of study design, causal relations among concepts cannot be assumed. Since the study conducted in 13 general hospitals from the southern areas of South Korea, cautious interpretation of the result is necessary. Further study which includes subjects from broader geographic area and utilizing random sampling would improve the generalizability of the study findings. Long term observation may enhance the possible causal relationship between concepts.

Conclusion

In this study, intellectual integrity, truth seeking, inquisitiveness, and creativity in the critical thinking disposition were the discriminating factors of high level of clinical competence in new graduate nurses. New nurses are expected to be prepared to solve the problem with unified knowledge and consistently pursue up-to-date knowledge. New educational methods such as implementing case studies, debates, decision-making pathways, and problem based education may increase competence levels of new graduate nurses. Supportive environments, allowing time to make decisions with more responsibilities and encouraging further education, would enhance nurses' competence levels, which would also benefit for the organization. Further research is warranted to examine the effects of remodeling work environment and developing new educational programs, targeted on intellectual integrity and truth-seeking, on the competence levels of nurses and the retention rates of the more competence nurses in the organization.

Competing Interests

The authors declare that they have no competing interests.

Author Contributions

Study conception and design: HL
Acquisition of data: YS
Analysis and interpretation of data: HJ
Drafting of manuscript: JY
Critical revision: JH
Overall responsibility: HL

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