

Comparison of Achievement of Clinical Skills in Seventh and Eighth Semester Nursing Students in Hamadan, West of Iran

Abstract

Background: Identifying the status of clinical education helps to improve the achievement of educational goals. This study aimed to compare the achievement of clinical skills in the final year nursing students. **Materials and Methods:** In this descriptive analytical study, 157 nursing students in the seventh and eighth semesters were selected through a census method, who were compared with each other. Data were collected using a researcher-developed questionnaire that included 111 clinical skills in 7 dimensions of primary nursing care, vital signs control, oxygenation and airway management, medication administration, laboratory samples collection, infection control, and cardiopulmonary resuscitation skills. Students scored each skill on a scale ranging from 0 to 5. The acceptable skills level in this study was the third level, which observes skills performed by the instructor or the nurse. Data were analyzed using the Kolmogorov–Smirnov test, descriptive statistics, and multiple linear regression. **Results:** In the seventh semester students, except for the vital signs skills, other skills were at lower than expected levels. In the eighth semester students, except for the laboratory samples collection and infection control skills which were at a lower than expected level, other skills were reported at expected levels. Multiple linear regression showed that the eighth semester students had more total score than the seventh semester students ($t = 3.19, p = 0.002$). **Conclusions:** The provision of sufficient opportunity to develop clinical skills in the eighth semester was observed in this study; therefore, it is recommended that the internship course be increased in the dimensions in which students can independently perform clinical skills.

Keywords: Clinical competence, nursing, self-assessment, students

Introduction

Nursing education as a part of medical education has developed very rapidly in 2 recent decades with regard to the number of general undergraduate and specific postgraduate courses and has caused some concerns about the quality of education.^[1] Nursing education takes place in both theoretical and clinical fields, and aims to create a good level of knowledge and skills in nursing students and to improve the level of clinical decision-making by students. The most important factor in achieving this goal is to improve the level of clinical education in nursing.^[2] Clinical education is a process in which students gradually gain experience by attending the patient's bedside and prepare their minds to solve problems using their experiences and logical thinking.^[3]

Internship courses play a key role in shaping the basic skills and professional

capabilities of nursing students, and about 50% of the curricula of these disciplines are allocated to these courses.^[4] Identifying the status of clinical education helps to correct the weaknesses and can improve the achievement of educational goals, improve the education of skilled individuals, and provide high quality care services.^[5] One of the methods for the assessment of the clinical skills of nurses is the use of self-assessment which is assessment by the nurses or nursing students themselves which allows them to take into account their clinical performance in the environment in which they work and to improve it.^[6] Therefore, students' ideas and opinions, as an important element of education, can be the basis for the future program.^[7]

Despite the importance of learning in the clinical environment, many researches in this regard have shown that students have not been able to gain valuable experience in this environment.^[8] In this

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regard, the results of a study in Shiraz showed the lack of an appropriate clinical teaching environment from the viewpoint of nursing students.^[9] Another study about senior nursing students' opinions in Tehran indicated the failure to acquire the skills necessary for effective and safe nursing practices.^[10] Other study in Kurdistan showed that the results of some competencies have not been achieved in nursing students.^[11] Also, a study in Shahroud revealed that senior nursing students had significant deficits in their clinical skills.^[12]

Therefore, there is no study on the comparison of achievement of clinical skills in the seventh and eighth semester nursing students in internship course. The research question is what is the contribution of the internship period overall and the contribution of each of seventh and eighth semesters specifically on achieving clinical skills? Therefore, considering the possibility of defect in learning clinical skills, and the importance of evaluating clinical education and its role in improving the quality of education, the researcher conducted a study to assess clinical skills in nursing students in the seventh and eighth semesters and to compare the clinical skills obtained in these two groups.

Materials and Methods

This descriptive analytical study was performed in 2015 on 157 final year undergraduate nursing students of Hamadan University of Medical Sciences, Iran. In this study, 86 nursing students in their seventh semester and 71 nursing students in their eighth semester in the 2015 academic year were selected through census method from different departments of hospitals affiliated to Hamadan University of Medical Sciences. In the seventh and eighth semesters of nursing, students are being trained in the field. Their goal is to acquire appropriate professional skills under the supervision of hospital nursing authorities. The inclusion criteria included being in the seventh and eighth semesters of nursing, not having previously undergone the assistance course, and willingness to participate in the study.

To collect data, a self-administered questionnaire was used in this study which was designed based on questionnaires by Roghani *et al.*^[10] This questionnaire included items related to demographic characteristics and 111 nursing skills in 7 nursing care dimensions: primary nursing care (20 skills), vital signs (15 skills), oxygenation and airway management (16 skills), medication administration (19 skills), collecting laboratory samples (9 skills), infection control and wound care (14 skills), and cardiopulmonary resuscitation skills (18 skills). The questionnaire's validity was approved using face and content validity by 10 experts, and its reliability was approved using internal consistency, with a Cronbach alpha of 83%.

The range of the nursing skills questionnaire is from 0 to 5 points. The first to sixth levels, respectively, signified

the lack of knowledge of the principles of performing the skills (first level), knowledge of the principles of performing the skills (second level), observing the performance of skills by another person (third level), performing skills under supervision (fourth level), performing independent skills correctly (fifth level), and excellence in performing skills (sixth level). Acceptable skill level in this study was the third level, which observes the performance of skills by another person. The scores for each skill dimension were calculated for analysis based on 100. Thus, the scores 0–16.66 were at the zero level, 16.67–33.33 at the first level, 33.34–50 at the second level, 50.1–67.66 at the third level, 67.67–84.33 at the fourth level, and 84.34–100 at the fifth level.

The questionnaire was filled at the end of the seventh and eighth semesters by students. Data were analyzed using the Kolmogorov–Smirnov test, descriptive statistics, and multiple linear regression. All the statistical analyses were performed at the 0.05 confidence level using SPSS software (version 16; SPSS Inc., Chicago, IL).

Ethical considerations

The study was approved by the Research Ethics Committee of Hamadan University of Medical Sciences, Hamadan, Iran (approval code: UMSHA. REC.1394.43). The research method was explained to the participants, they were ensured of the confidentiality of their information, and an informed consent was obtained from them. Participation in the study was completely voluntary and did not affect the students' assessment and scoring.

Results

In this study, the majority of students were 22 years old (36.94%), men (51%), single (93%), and residents of the dormitory (56.10%) [Table 1]. Pearson correlation coefficient showed that clinical skills were correlated together in the seventh and eighth semester students ($p < 0.001$) [Tables 2 and 3]. Descriptive statistics for clinical skills in the seventh and eighth semesters are shown in Table 4.

Primary nursing care

In the dimension of primary nursing care, in both groups, skills of oral feeding, placing of and caring for urinary catheter, and nasogastric tube (NGT) feeding were at expected and higher than expected levels. In both groups, skills of bathing, bed making, eyes and mouth care in unconscious patients, gastric lavage and gastrostomy feeding, transference of patients from bed to stretcher, total parenteral nutrition, nephrostomy tube care, enema administration, and stoma care were reported below the expected level. Moreover, the skills of using warm and cold compress, inserting an NGT, changing the patient's position on the bed, and controlling the intake and output were only achieved in the eighth semester students.

Table 1: Demographic characteristics of the nursing students

Variables	Seventh semester (86), n (%)	Eighth semester (71), n (%)	Total of the two semesters (157), n (%)
Age (years)			
≤21	15 (17.44)	2 (2.80)	17 (10.82)
22-24	64 (74.43)	57 (80.29)	121 (77.08)
≥25	7 (8.13)	12 (16.91)	19 (12.10)
Gender			
Male	42 (48.80)	35 (49.30)	80 (51.00)
Female	44 (51.20)	36 (50.70)	77 (49.00)
Housing status			
Dormitory	47 (54.70)	41 (57.75)	88 (56.10)
House	37 (43.00)	26 (36.62)	63 (40.10)
Other	2 (2.30)	4 (5.63)	6 (3.80)
Marital status			
Single	83 (96.50)	63 (88.70)	146 (93.00)
Married	3 (3.50)	8 (11.30)	11 (7.00)

Table 2: Correlation of clinical skills in seventh semester students

Clinical skills	Primary nursing care	Vital signs control	Oxygenation and airway management	Medication administration	Laboratory samples collection	Infection control and wound care	Cardiopulmonary resuscitation
Primary nursing care	1						
Vital signs control	0.41 ($p<0.001$)	1					
Oxygenation and airway management	0.73 ($p<0.001$)	0.45 ($p<0.001$)	1				
Medication administration	0.61 ($p<0.001$)	0.59 ($p<0.001$)	0.67 ($p<0.001$)	1			
Laboratory samples collection	0.66 ($p<0.001$)	0.36 ($p<0.001$)	0.77 ($p<0.001$)	0.700 ($p<0.001$)	1		
Infection control and wound care	0.68 ($p<0.001$)	0.55 ($p<0.001$)	0.69 ($p<0.001$)	0.69 ($p<0.001$)	0.68 ($p<0.001$)	1	
Cardiopulmonary resuscitation	0.66 ($p<0.001$)	0.55 ($p<0.001$)	0.82 ($p<0.001$)	0.71 ($p<0.001$)	0.81 ($p<0.001$)	0.75 ($p<0.001$)	1

Table 3: Correlation of clinical skills in eighth semester students

Clinical skills	Primary nursing care	Vital signs control	Oxygenation and airway management	Medication administration	Laboratory samples collection	Infection control and wound care	Cardiopulmonary resuscitation
Primary nursing care	1						
Vital signs control	0.59 ($p<0.001$)	1					
Oxygenation and airway management	0.79 ($p<0.001$)	0.66 ($p<0.001$)	1				
Medication administration	0.59 ($p<0.001$)	0.80 ($p<0.001$)	0.66 ($p<0.001$)	1			
Laboratory samples collection	0.64 ($p<0.001$)	0.61 ($p<0.001$)	0.73 ($p<0.001$)	0.68 ($p<0.001$)	1		
Infection control and wound care	0.63 ($p<0.001$)	0.69 ($p<0.001$)	0.71 ($p<0.001$)	0.74 ($p<0.001$)	0.79 ($p<0.001$)	1	
Cardiopulmonary resuscitation	0.74 ($p<0.001$)	0.68 ($p<0.001$)	0.80 ($p<0.001$)	0.70 ($p<0.001$)	0.77 ($p<0.001$)	0.74 ($p<0.001$)	1

Vital signs

In the dimension of vital signs, skills of radial, brachial, carotid, femoral, and dorsalis pedis pulse control; upper extremity blood pressure control; respiratory rate and rhythm control;

oral, rectal, and subaxillary temperature control; Apgar score assignment; and central venous pressure reading were higher than expected levels in both groups. The apical pulse control skill was only achieved in the eighth semester students.

Table 4: Mean (standard deviation) of clinical skills levels in the seventh and eighth semesters

Skills	Group			
	Seventh semester		Eighth semester	
	Mean (SD)	Achieved level	Mean (SD)	Achieved level
Primary nursing care	42.83 (17.36)	2	53.67 (19.10)	3
Vital signs control	59.87 (10.06)	3	61.88 (14.37)	3
Oxygenation and airway management	41.77 (15.87)	2	51.61 (17.46)	3
Medication administration	68.98 (15.80)	4	72.88 (17.48)	4
Laboratory samples collection	22.88 (9.00)	1	29.46 (10.50)	1
Infection control and wound care	36.52 (11.15)	2	44.71 (13.45)	2
Cardiopulmonary resuscitation	45.17 (16.83)	2	54.22 (18.65)	3
Total	318.06 (80.90)		368.48 (96.76)	

SD: Standard deviation

Oxygenation and airway management

In the dimension of the oxygenation and airway management, skills of oxygen delivery using a nasal catheter, and simple mask and Ambu bag use were beyond expected levels in both groups. In both groups, skills in oxygenation using an oxygen tent, respiratory physiotherapy, and chest bottle replacement were below the expected level. However, the skills of oral airway; tympanostomy tube (T-tube); venturi oxygenation; mouth and nasal intratracheal and tracheostomy suctioning; and intratracheal, tracheostomy, and chest tube care were obtained in the eighth semester students.

Medication administration

In the dimension of medication administration skills, skills of oral administration of medication; NGT; inhalation of medications; administration of dermal drugs, eye drops, and ointments; suppositories; intradermal, intramuscular, subcutaneous, and Z-track injection; intravenous administration using peripheral venous catheter; and calculation of the dose and amount of serum drops were higher than expected in both seventh and eighth semester students. The skills of eye washing and blood product transfusion only were achieved in the eighth semester students.

Collecting laboratory samples

In the dimension of collecting laboratory samples, in both groups, skills of venous blood samples and blood culture collection were higher than expected. In both groups, skills of preparation of cultures from tracheal tube and ulcer and gastric secretion were reported below the expected level. However, the skills of arterial blood samples and urine sample collection for analysis, culture preparation, and 24-hour urine collection were obtained in the eighth semester students.

Infection control and wound care

In the dimension of infection control and wound care, in both groups, skills of hand washing with a clean method and surgical technique, sterile gloves wearing method, and wet and dry dressing were beyond expected levels.

Skills of respiratory isolation, inverse isolation, and wound debridement were below the expected level in both groups. However, the skills of gastrointestinal isolation, wound suturing, and burn wounds and bed sores care were achieved only in the eighth semester students.

Cardiopulmonary resuscitation

In the dimension of cardiopulmonary resuscitation, in both groups, skills of carotid and femoral pulse control, airway secretion suctioning, cardiac monitoring, heart rate and rhythm determination, consciousness level control, electrocardiography (ECG) recording, and oxygenation using Ambu bag were at expected and higher than expected levels. In both groups, skills of placement of airway, airway opening through jaw thrust, backward, finger, and the Heimlich maneuver, help for endotracheal tube insertion, cardiac defibrillation, and mouth-to-mouth resuscitation were below the expected level. The skill of cardiac massage was achieved only in the eighth semester.

In general, in the seventh semester, skills related to the dimensions of primary nursing care, oxygenation and airway management, medication administration, laboratory samples collection, infection control and wound care, and cardiopulmonary resuscitation were reported at below the expected level, and only skills related to the dimension of vital signs management were at the expected level.

In the eighth semester, skills related to the dimensions of primary nursing care, vital signs management, oxygenation and airway management, medication administration, and cardiopulmonary resuscitation were reported at the expected level. Nevertheless, laboratory samples collection, and infection control and wound care were lower than the expected level.

The multiple linear regression showed a significant effect of semesters on the skills score in the dimensions of primary nursing care ($t = 3.43, p = 0.01$), oxygenation and airway management ($t = 3.50, p = 0.01$), laboratory samples collection ($t = 3.94, p < 0.001$), infection control and wound care ($t = 3.68, p < 0.001$), and cardiopulmonary resuscitation ($t = 3.19, p = 0.05$) [Table 5]. There was no

Table 5: The adjusted relationship between clinical skills scores and demographic characteristics of students using multiple regression model*

Dependent variable (clinical skills)	Independent variable (demographic)	Unstandardized coefficients		Standardized coefficients	<i>t</i>	<i>p</i>
		<i>B</i>	SE	Beta		
Primary nursing care	Constant	-5.26	11.59	-	-0.45	0.65
	Semester	9.82	2.86	0.26	3.43	0.001
	Age	1.87	0.60	0.29	3.13	0.002
	Gender	3.57	2.90	0.095	1.23	0.22
	Marriage	-9.18	6.59	-0.12	-1.39	0.17
Vital signs control	Constant	45.29	8.02	-	5.65	0.000
	Semester	1.48	1.98	0.06	0.75	0.46
	Age	0.83	0.41	0.20	2.00	0.05
	Gender	-1.86	2.00	-0.08	-0.93	0.36
	Marriage	-2.83	4.56	-0.06	-0.62	0.54
Oxygenation and airway management	Constant	4.96	10.71	-	0.46	0.64
	Semester	9.25	2.65	0.27	3.50	0.001
	Age	1.25	0.55	0.21	2.28	0.02
	Gender	4.61	2.68	0.13	1.72	0.09
	Marriage	-7.53	6.09	-0.11	-1.24	0.22
Medication administration	Constant	40.27	11.17	-	3.61	0.00
	Semester	2.98	2.76	0.10	1.08	0.28
	Age	1.17	0.57	0.20	2.04	0.04
	Gender	0.86	2.80	0.03	0.31	0.76
	Marriage	-2.10	6.36	-0.03	-0.33	0.74
Laboratory samples collection	Constant	-0.01	6.25	-	-0.00	0.10
	Semester	6.07	1.54	0.30	3.94	0.00
	Age	0.48	0.32	0.14	1.49	0.14
	Gender	3.53	1.56	0.17	2.26	0.03
	Marriage	0.69	3.55	0.02	0.19	0.85
Infection control and wound care	Constant	3.39	7.86	-	0.43	0.67
	Semester	7.13	1.94	0.28	3.68	0.000
	Age	1.20	0.40	0.28	2.98	0.003
	Gender	-0.52	1.97	-0.02	-0.26	0.79
	Marriage	-0.61	4.47	-0.01	-0.14	0.89
Cardiopulmonary resuscitation	Constant	-11.63	10.87	-	-1.07	0.29
	Semester	7.65	2.68	0.21	2.85	0.005
	Age	1.96	0.56	0.32	3.51	0.001
	Gender	6.92	2.72	0.19	2.55	0.01
	Marriage	-5.65	6.19	-0.08	-0.91	0.36
Total	Constant	77.01	56.36	-	1.37	0.17
	Semester	44.38	13.91	0.24	3.19	0.002
	Age	8.76	2.90	0.28	3.02	0.003
	Gender	17.11	14.11	0.09	1.21	0.23
	Marriage	-27.21	32.07	-0.08	-0.85	0.40

* $R^2=0.16$, $F=6.99$, $p<0.001$. SE: Standard error

significant effect of semester on the skills score of students in the dimensions of vital signs control ($t = 0.75$, $p = 0.46$) [Table 5] and medication administration ($t = 1.08$, $p = 0.28$). Multiple linear regression model ($R^2 = 0.16$, $F = 6.99$, $p < 0.001$) showed that the eighth semester students had more total scores than the seventh semester students ($t = 3.19$, $p = 0.002$) [Table 5].

Discussion

Based on the results of this study in the dimension of

primary nursing care skills, although students in the eighth semester had more skills than the seventh semester students, both groups assessed their health and nutritional skills at a level lower than expected. In this regard, in the study by Hakimzadeh *et al.*,^[13] the ability of nursing students to provide care and services to the patient was reported at a moderate level. In the study by Roghani *et al.*,^[10] most senior nursing students reported their skills in maintaining their personal health and in meeting patients' nutritional needs at the level of supervised competence. This probably

indicates that nursing students are less interested in simple skills and skills that they are less likely to perform. In this regard, Zehni *et al.* and Forouzi *et al.*^[11,14] found that the type of skill, its simplicity, the opportunity to perform it, and practice and repetition are effective in the level of learning.

In the dimension of vital signs skills, although in the seventh semester students the skills of pupal and apical pulse control were lower than the expected level, the eighth semester students reported all the skills in this dimension as higher than expected. In this regard, the study by Roghani *et al.*^[10] showed that most of the senior nursing students had reached the level of mastery of skill in this dimension, and in the studies by Sabeti *et al.* in Ahvaz and Forouzi *et al.* in Kerman all the students in the eighth semester reported full skill in this dimension.^[14,15] This finding probably reflects the fact that these students have had many opportunities in the clinical environment to gain these skills.

In the dimension of oxygenation and airway management, despite the fact that students in the eighth semester had more skills than the seventh semester students, they still had low levels of skills in oxygenation using an oxygen tent, respiratory physiotherapy, and chest bottle replacement. In this regard, in the study by Roghani *et al.*, the skills level of most of the senior nursing students in this dimension was at the fourth level. However, a small percentage of students were at the level of unawareness in oxygenation with oxygen tent and T-tube, and chest bottle replacement.^[10] According to Zehni *et al.*,^[11] the majority of graduate nursing students were at a moderate level in this field. However, in the study by Sabeti *et al.*,^[15] most undergraduates in the eighth semester reported their skill at full level in the dimension of oxygen therapy methods.^[15]

In the dimension of medication administration skills, although some of the skills of the seventh semester students were below the expected level, the eighth semester reported all of the skills in this dimension above the expected level. In this regard, Sabeti *et al.*^[15] in Ahvaz showed that the highest level of nursing skills in the eighth semester is related to the dimension of medication administration. In the study by Roghani *et al.*,^[10] in Tehran, most of the final year nursing students were proficient in the skills related to this dimension. In the study by Forouzi *et al.*,^[14] most graduate nursing students assessed themselves at a good level in this dimension. These results probably indicate that the skill of medication administration is performed in different parts of the hospital and doing so repeatedly can be a reason for students' self-assessment at a level that is higher than expected.

In the dimension of laboratory samples collection skills, although students in the eighth semester had more skills than the seventh semester students, they were below the expected level in skills of preparation of cultures from tracheal tube and ulcer and gastric secretion. Since the

collection of laboratory samples is one of the duties of the nurse and taking appropriate measures plays a significant role in correct diagnosis as well as patient comfort,^[16] students are required to reach higher levels. In this regard, in a study by Roghani *et al.*, most senior students reported their skills in this dimension at the level of supervised skills. However, a low percentage of students were at the level of unawareness in the skills of preparation of cultures from tracheal tube and ulcer and gastric secretion.^[10] In the study by Moercke and Eika,^[17] 51% of medical students did not reach the expected level of urine culture preparation. These results can be related to the transfer of some of the skills in this dimension to other medical team, although they may also be due to other reasons, such as individual differences and the scope of tasks and learning objectives.

In the dimension of infection control and wound care, although students in the eighth semester had more skills than the seventh semester students, they still evaluated themselves below the expected level in skills such as respiratory isolation, reversal isolation, and wound debridement. In this regard, in the study by Dadvar *et al.*,^[12] most of the senior nursing students reported their skills in this dimension at the level of mastery of skill. The results obtained in this study probably indicate that precautions for isolation are used in certain departments that have infectious diseases or illnesses related to immune system weakness. Thus, due to the short duration of internship courses and the rapid change in apprenticeship environments, it is not possible to have a long-term student presence in one department and this may be the cause of students' less familiarity with the concept of isolation and its types.

In the dimension of cardiopulmonary resuscitation skills, the students of both groups evaluated themselves lower than expected in the skills of defibrillation and help for endotracheal tube insertion, and higher than expected in cardiac monitoring. In this regard, in the study by Zehni *et al.*,^[11] students assessed their skills as desirable in heart monitoring, ECG recording, and external cardiac massage. Also in the study by Forouzi *et al.*,^[14] in Kerman, most nursing students in the eighth semester were well placed to work with defibrillators and heart monitoring systems and to record ECG at a very desirable level.

In the study by Old *et al.*,^[18] on procedural skills of first-year postgraduate doctors, the subjects assessed their skill in placing the tracheal tube at the under supervision skill level which was not desirable for graduate doctors. Moerck and Eika^[17] found that the cardiac decompression, cardiac defibrillation, chest secretion suctioning, and tracheal tube placement skills were below the expected level. Although the importance of cardiopulmonary resuscitation skills is recognized by all, this study showed that students had acquired these skills at a lower level than expected. Perhaps this is because of less courageous

students to enter the cardiopulmonary resuscitation skills and that the resuscitation teams are defined and students are not allowed to do these skills.

The results of this study indicated a significant relationship between semesters and the skills score in terms of primary nursing care, oxygenation and airway management, laboratory samples collection, infection control and wound care, and cardiopulmonary resuscitation skills. This can be related to the appropriate training planning in the eighth semester, students' greater exposure to these skills, and the opportunity to perform these skills independently for the first time during the eighth semester internship. Furthermore, the statistical tests showed that there is no significant relationship between semesters and the skills score in terms of the medication administration and vital signs skills. This could be due to the higher rate of observation and repetition of these procedures in the second–sixth semesters and in medical–surgical nursing units.

The limitation of this research may be related to the individual and emotional differences of students in answering questions. Therefore, students' self-assessment of complex nursing skills is not sufficient. The accurate and precise assessment of the students by the trainer, in addition to self-assessment at the end of the course, is necessary in future studies.

Conclusion

Considering the importance of clinical education and its impact on improving the quality of nursing care, the results of this study showed that common training programs provide enough opportunity to improve clinical skills in the eighth semester. Therefore, it is recommended that the internship course be increased in dimensions where students work independently, and clinical skills workshops and skill laboratories be used in the skills that cannot be assessed in the clinical setting.

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Conflicts of interest

Nothing to declare.

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