

Knowledge of Intern Nursing Students on the Crash Cart and Emergency Response Sets: A Descriptive Study

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ABSTRACT

Purpose: The aim of this study was to examine the knowledge status of intern nursing students about crash cart and emergency response sets.

Method: This descriptive and cross-sectional study was conducted during the fall semester of the 2021-2022 academic year at the Faculty of Health Sciences, Department of Nursing of a university in Türkiye, with a total of 147 students. Data were collected using an 'Introductory Information Form' and a 'Knowledge Form on Crash Carts and Emergency Response Sets,' and analyzed with a statistical software package.

Results: The students' mean CC knowledge score was 8.39 ± 2.09 (Cronbach's Alpha: 0.816). Significant knowledge gaps were identified: students were unaware that CC arrangements vary by department (e.g., pediatrics) and institutional standards, and they held incorrect information regarding the plastic security seals of the CC. Specifically, 24.5% did not know if the tamper-evident security seal should be made of easily breakable, single-use plastic, while 14.3% had incorrect knowledge. Female students and those who showed interest in CCs during internships achieved significantly higher knowledge scores. A significant, positive, and weak relationship was found between taking an emergency care nursing course and CC interest; similarly, a low-level significant correlation was observed between taking the course and CC knowledge scores.

Conclusion: It was determined that while students' knowledge scores regarding crash carts were at a good level, they possessed some incomplete and incorrect information.

Keywords: Emergency; crash cart; nursing students; code blue; resuscitation

ÖZET

Amaç: Hemşirelik son sınıf öğrencilerinin acil müdahale arabası ve setlerine ilişkin bilgi durumlarını incelemektir.

Yöntem: Tanımlayıcı ve kesitsel olarak gerçekleştirilen bu araştırma, Türkiye'de bir üniversitenin Sağlık Bilimleri Fakültesi Hemşirelik Bölümü'nde, 2021-2022 Eğitim-Öğretim yılı güz döneminde, toplam 147 öğrenci ile yürütülmüştür. Tanıtıcı bilgi formu ve 'Acil müdahale arabası ve setleri hakkında bilgi formu' kullanılarak veriler toplanmış, bir istatistik paket programı ile analiz edilmiştir.

Bulgular: Hemşirelik son sınıf öğrencilerinin acil müdahale arabaları ve setleri hakkında ortalama bilgi puanlarının $8,39 \pm 2,09$ olduğu ve Cronbach's Alpha değerinin 0,816 olduğu belirlendi. Acil müdahale arabası düzeninin, pediatri klinikleri gibi bazı bölümlerin özelliğine ve kurumun belirlediği standartlara göre değiştiğini bilmedikleri, acil müdahale arabasının kilitli (plastik güvenlik mühürlü) tutulmasına ilişkin yanlış bilgiye sahip oldukları saptandı. Öğrencilerin %24,5'inin acil müdahale arabasının kilidinin (güvenlik mührünün) kolay kırılabilir ve tek kullanımlık plastik malzemeden olup olmaması gerektiğini bilmediği ve %14,3'ünün de yanlış bildiği saptandı. Kadın cinsiyete sahip öğrencilerin bilgi puanının daha yüksek olduğu, yapılan stajlarda acil müdahale arabasına ilgi gösteren öğrencilerin bilgi puanı sıra ortalamasının ilgi göstermeyenlere göre anlamlı düzeyde daha yüksek olduğu belirlendi. Acil bakım hemşireliği dersi alma ile acil müdahale arabasına ilgi gösterme arasında anlamlı, pozitif ve zayıf bir ilişki; acil bakım hemşireliği dersi alma ile acil müdahale arabası bilgi puanları arasında düşük düzeyde anlamlı bir ilişki olduğu belirlendi.

Sonuç: Öğrencilerin acil müdahale arabasına ilişkin bilgi puanlarının iyi düzeyde olduğu ancak eksik ve yanlış bazı bilgilerinin bulunduğu saptandı.

Anahtar kelimeler: Acil; acil müdahale arabası; hemşirelik öğrencileri; mavi kod; resüsitasyon

Emergencies are clinical conditions that develop suddenly and carry a direct risk of mortality; therefore, rapid, effective, and organized medical intervention is of vital importance. In hospitals, the “Code Blue” protocol is utilized for situations requiring emergency intervention (1). Code Blue is an emergency alert code established to ensure that intervention is carried out in the fastest and most effective manner during respiratory or cardiac arrest situations encountered in the hospital (2,3). Hospitals maintain an alert system for Code Blue management; in institutions utilizing telephone-based applications, the extension “2222” is designated for Code Blue. Responsible parties for Code Blue management are identified by considering the size of the hospital and the diversity of services, and at least one person from the hospital administration is included among these responsible parties. Hospitals maintain Code Blue teams for every shift, and the team includes at least one physician and one healthcare professional (nurse, anesthesia technician/technologist, or health officer). It is mandatory for team members to have received Cardiopulmonary Resuscitation (CPR) training (2). The success of CPR, advanced airway interventions, and other life-saving procedures depends not only on the clinical competence of healthcare professionals but also on timely and complete access to necessary medications and equipment (1). The crash cart (CC) (emergency response cart) used for this purpose is a portable system that contains the critical drugs and equipment included in Advanced Cardiac Life Support (ACLS), Advanced Life Support (ALS), and Pediatric Advanced Life Support (PALS) protocols, enabling rapid and safe intervention in emergencies. Standardizing the content and use of the CCs, checking them regularly, and ensuring they are constantly ready for use shortens the time to start emergency intervention, strengthens intra-team coordination, and increases patient safety (4). Nurses and physicians, who bear the primary responsibility in life support and resuscitation applications, should always know the location, content, and use of the emergency response cart clearly and precisely. Similarly, it is imperative for all healthcare personnel to be proficient in the location and function of the resuscitation equipment in their own workspace for the effectiveness of the emergency response. Therefore, well-organized and accessible CCs are one of the fundamental components of in-hospital emergency care management (5).

According to the Health Quality Standards (HQS) of the Ministry of Health in Turkey (2), an emergency response set must be present in all units for situations requiring emergency intervention in hospitals. In HQS (2), the

emergency response set is defined as “the set containing the medications and equipment that may be necessary for emergency medical intervention to the patient,” and it must contain at least: a laryngoscope set for children and adults, spare batteries and intubation tubes, supraglottic airway devices, a bag-valve-mask system, oxygen tubing and masks, masks of various sizes, syringes, and personal protective equipment. Additionally, the medications that should be in the emergency response set should be determined according to the needs and patient profile of the unit using the set. The relevant institution should determine in which departments a defibrillator will be kept within the emergency response set. According to the Ministry of Health regulations regarding Code Blue protocols, necessary medications and resuscitation equipment for CPR in inpatient services—as deemed appropriate by the chief physician—may be maintained in CCs secured with tamper-evident security seals within each service or in a shared area accessible to multiple units. In units where an CC is available, an additional emergency response set or bag is not required (6). According to the annexes of the Private Hospitals Regulation, there must be at least one CC in each service/polyclinic intervention room, at least one for every inpatient unit, and at least one for each unit within neonatal, adult, and pediatric intensive care departments (7).

Proficiency in identifying emergency equipment, maintaining procedural familiarity with drawer configurations, and ensuring technical competence in their utilization are essential for healthcare personnel involved in resuscitation efforts (5,8). Existing international literature explores the knowledge levels and practical competencies of both professional nurses and nursing students regarding CCs (1,4,5,9-11). In a study conducted by Kaushik and Mancheri (12) with nurses and student nurses, it was reported that most of the nurses had sufficient knowledge about CC, but most of the nursing students had insufficient knowledge. In a study conducted by Gaikwad et al. (13) evaluating the use of a CC training booklet as a self-learning tool, nurses’ knowledge scores significantly improved from 52.6% pre-intervention to 87.8% post-intervention. Consequently, the authors concluded that this self-directed method is an effective strategy for enhancing nursing competencies regarding CCs. In the study of Similarly, Choukikar et al. (1) reported a significant improvement in the knowledge levels of second-year nursing students regarding CC utilization following the implementation of a self-learning module that integrated training sessions and workshops. Furthermore, Islam et al (4) and Sumi et al (5) observed that structured training interventions led to a significant

increase in the knowledge levels of third-year nursing students regarding the use of CCs (4,5). Nurses and nursing students should be trained in the organization of CC contents and the specific clinical indications for its use. Furthermore, clear operational instructions regarding CC utilization should be available in every hospital unit (12).

A review of the literature reveals a lack of studies examining the knowledge levels of nurses or nursing students regarding CCs and emergency response sets in Turkey. Therefore, this study aims to evaluate the knowledge status of senior nursing students concerning CCs and their associated equipment. While nursing students receive theoretical information on emergency response carts within certain curriculum courses, their initial practical encounter with them typically occurs during clinical placements. During these rotations, students may require more detailed information regarding the layout, medical devices, supplies, and operational use of these carts. The assessment of students' knowledge levels will provide essential data for planning targeted educational interventions and practical training to enhance their skills in procuring, checking, and utilizing emergency equipment.

Research Questions:

1. What is the knowledge level of senior nursing students regarding crash carts and sets?
2. What issues/situations do senior nursing students misunderstand or do not know about crash carts and sets?
3. What factors affect senior nursing students' knowledge of crash carts and sets?

Material and Method

Study Design and Study Population/Sample

This study was conducted using a descriptive, cross-sectional research design. It was conducted during the Fall 2021-2022 semester in the Department of Nursing at the Faculty of Health Sciences of a university in Turkey. The study population consisted of 159 final-year nursing students, of whom 147 agreed to participate. Post-hoc power analysis was performed using G*Power 3.1.9.4 based on the Mann-Whitney U test results (Gender comparison, $Z=-2.911$, $p=.003$). With an effect size of $d = 0.51$, an alpha of 0.05, and a total sample size of 147, the statistical power was calculated as 0.71. Given that the study reached 92.4% (147/159) of the target population,

this power level is considered sufficient for the scope of the study.

Instruments

The research data were collected using two forms prepared by the researchers: an introductory information form that asked about sociodemographic characteristics and an information form about CC and sets that was developed by reviewing the literature. The data collection forms were developed by two academic experts specializing in the field of nursing. The structuring of these forms was based on current international emergency care guidelines and a comprehensive review of the relevant literature (14-17). Although formal clinical expert opinion from an emergency medicine specialist or a field nurse was not obtained, the content validity of the instruments was meticulously ensured through the authors' academic expertise and professional experience in emergency care processes. The information form about CC and sets consisted of 10 questions that asked about students' knowledge of CC and sets. During the evaluation, students were given 1 point for each correct answer and 0 points for each incorrect or unanswered question. In the absence of a standardized scale, the knowledge levels were categorized based on the percentage of correct answers, a method frequently adopted in nursing education literature. Success rates of 80% and above were classified as 'high,' 50-79% as 'medium,' and below 50% as 'low' knowledge levels (11).

A pilot study was conducted with five senior nursing students to evaluate the clarity, scope, and clinical terminological appropriateness of the data collection form. During this process, the participants were asked to assess the questionnaire items for clarity and comprehensibility. The results of the pilot application indicated that the questions were clear and unambiguous, with no terminological confusion observed. Based on the feedback obtained, no modifications were required, and the final version of the form was approved by expert researchers. The data obtained from this participants were not included in the final statistical analysis.

Data Collection

The data collection tools took 5-10 minutes to complete. The forms were distributed to the students outside of class hours and they were asked to answer them. Then, the forms were collected back. At no point during this process was any identification recorded.

Ethical Considerations

This research was approved by the Ethics Committee for Human Research in the Social Sciences at a university in the western Black Sea region (protocol no. 2021/450). Written permission was obtained from the institution where the study was conducted and from the students who participated in the study, both in writing and verbally. The principles of the Declaration of Helsinki were followed.

Statistical Analysis

The IBM SPSS Statistics 22 program (SPSS Inc., Chicago, IL) was used for data analysis. Descriptive statistical methods were used in the evaluation of the data. The normality of the knowledge scores was assessed through skewness and kurtosis values. Since these values exceeded the ± 1.5 range (18), the data were determined to be non-normally distributed. For the comparison of non-normally distributed continuous variables between two independent groups, the Mann-Whitney U test was performed. Categorical variables were analyzed using the Chi-square test; however, in cases where the assumptions were not met due to low expected frequencies (more than 20% of cells with expected counts less than 5), Fisher's Exact Test was employed. Additionally, the relationship between variables was evaluated and interpreted using point-biserial and Phi correlations. The significance level in the study was taken as 0.05. Post-hoc power analysis was performed using G*Power 3.1.9.4 based on the Mann-Whitney U test results (Gender comparison, $Z = -2.911$, $p = .003$) with an effect size of $d = 0.51$ and an alpha of 0.05.

Results

The mean age of the students participating in the study was 22.34 ± 1.39 years, 76.9% were female, and 75.5% graduated from a high school other than health vocational high school. Of the participants, 90.5% stated that they had not previously worked as professional staff in a hospital setting, whereas 95.2% had participated in summer internships. While 74.1% of students completed an internship in an emergency department during their nursing education, 25.9% had never done an internship in an emergency department. Seventy-six point nine percent of the students stated that they took the elective course in emergency care nursing. It was found that 90.5% of the students stated that CC attracted their attention in the internships during nursing education and 81.6% of them wanted to receive an education about CC and its sets (Table 1).

Table 1. Sociodemographic and Nursing Education Characteristics of Students (n=147)

Variables	Mean \pm SD [†] (min-max) [‡]
Age	22.34 \pm 1.39 (20-29)
Gender	n (%)
Female	113 (76,9)
Male	34 (23,1)
High school graduated from	
Health Vocational High School	36 (24,5)
Other	111 (75,5)
Received non-nursing education after high school	
Yes	18 (12,2)
No	129 (87,8)
Currently working in any hospital	
Yes	7 (4,8)
No	140 (95,2)
Previously worked in a hospital	
Yes	14 (9,5)
No	133 (90,5)
Completed summer internship	
Yes	140 (95,2)
No	7 (4,8)
Participated in emergency service internships during nursing education	
Yes	109 (74,1)
No	38 (25,9)
Participation status in the elective course on emergency nursing	
Yes	113 (76,9)
No	34 (23,1)
Previously received any training related to the crash cart	
Yes	46 (31,3)
No	101 (68,7)
Participated in resuscitation practices during internships	
Yes	45 (30,6)
No	102 (69,4)
Noticed crash carts during internships in nursing education	
Yes	133 (90,5)
No	14 (9,5)
Desire to receive training on crash carts and their sets	
Yes	120 (81,6)
No	27 (18,4)
[†] SD:Standard Deviation; [‡] min-max: Minimum, Maximum	

The responses of the students to the questions about CC were analyzed. 59.2% of the students did not know the procedural steps to be taken if resuscitation practices were required during their internship. It was determined that 95.9% of the students had heard the term code blue, 64.6% stated that they knew which personnel were included in the code blue team, 55.1% had not seen a code blue given before, and 52.4% stated that they knew the phone number to be called in the hospital for code blue. It was found that 93.2% of students knew what the CC was and how it was used, and 92.5% had seen the CC before. 72.8% stated that they knew where/in which units the CC and its sets were located in the hospital. 63.3% stated that they knew the minimum equipment that should be included in the emergency response set and 70.7% had the opportunity to examine the medical devices, materials and drugs in the CC before (Table 2).

As presented in Table 3, the rates of students' true, false, and do not know responses to inquiries regarding CC and its sets are documented. The values associated with their knowledge scores are also provided. Consequently, it was ascertained that the lowest score was 0 and the highest was 10, with an average knowledge score of 8.39 ± 2.09 . The Cronbach's Alpha value for these knowledge scores was 0.816. Examining the items to which students gave the most incorrect answers revealed that 23.8% did not know that the CC's layout may vary according to departmental characteristics, such as those of pediatric clinics, and institutional standards. Additionally, the findings revealed that 21.1% of the participants held the incorrect belief that crash carts should remain unsealed, and an additional 19.7% lacked knowledge regarding whether these carts should be kept sealed. Furthermore, 24.5% of students were unaware of whether the CC seal should be made of easily breakable, disposable plastic material, and 14.3% knew the answer incorrectly (Table 3).

Table 2. Students' Responses to Questions about Crash Cart (n=147)

Item	Yes n (%)	No n (%)
1. Do you know the steps you need to follow if you have to perform resuscitation during your internships?	60 (40.8)	87 (59.2)
2. Have you ever heard the term "Code Blue"?	141 (95.9)	6 (4.1)
3. Do you know who are the members of the Code Blue team?	95 (64.6)	52 (35.4)
4. Have you ever witnessed a Code Blue being called?	66 (44.9)	81 (55.1)
5. Do you know which phone number should be dialed to call Code Blue in the hospital?	77 (52.4)	70 (47.6)
6. Do you know what a crash cart is and what it is used for?	137 (93.2)	10 (6.8)
7. Have you ever seen a crash cart?	136 (92.5)	11 (7.5)
8. Do you know where and in which units the crash carts and their sets are located in the hospital?	107 (72.8)	40 (27.2)
9. Do you know what the minimum equipment inside a crash cart set should include?	93 (63.3)	54 (36.7)
10. Have you ever had the opportunity to examine the medical devices, materials, and drugs inside the crash cart?	104 (70.7)	43 (29.3)

Table 3. Students' Knowledge About Crash Carts and Emergency Sets (n = 147)

Item	Correct n (%)	Incorrect n (%)	Do Not Know n (%)
1. The crash cart is a movable cart with wheels.	138 (93.9)	0 (0)	9 (6.1)
2. The crash cart contains medical devices, materials, and medications necessary for emergency interventions.	140 (95.2)	2 (1.4)	5 (3.4)
3. The layout of the crash cart may vary according to the characteristics of units such as pediatric clinics and institutional standards.	105 (71.4)	7 (4.8)	35 (23.8)
4. All healthcare personnel involved in emergency interventions should know the names, locations, and uses of the materials inside the cart.	137 (93.2)	1 (0.7)	9 (6.1)
5. Crash carts must be sealed.	87 (59.2)	31 (21.1)	29 (19.7)
6. The seal of the crash cart should be easily breakable and made of single-use plastic.	90 (61.2)	21 (14.3)	36 (24.5)
7. Stock levels of materials and medications should be determined, expiry dates monitored, and physical checks performed regularly.	139 (94.6)	1 (0.7)	7 (4.8)
8. After use, materials and medications should be replaced as soon as possible and made ready for reuse.	138 (93.9)	0 (0)	9 (6.1)
9. During each shift, devices, materials, and medications in the crash cart should be checked for completeness and seal integrity.	132 (89.8)	1 (0.7)	14 (9.5)
10. Even if unused, the crash cart should be opened at regular intervals (every 15 days or 1 month) to check expiry dates of contents.	128 (87.1)	5 (3.4)	14 (9.5)
Variable	Mean ± SD*	Min-Max	Cronbach's α
Knowledge score about crash carts	8.39 ± 2.09	0-10	.816

*SD = Standard Deviation; Min-Max = minimum-maximum.

A significant difference in CC knowledge scores was found between students of different genders. Accordingly, students who identified as female had higher knowledge scores. Additionally, the mean CC knowledge score of students who drew attention to CC during their nursing internships was statistically higher than those who did not (Table 4).

A significant, positive and weak correlation was found between the taking emergency care courses and status of CC's attracting students' attention ($\Phi=0.207$, $p<0.05$) (Table 5). In addition, there is a low level significant relationship between the status of taking emergency care nursing course and CC knowledge scores in the point two series correlation analysis ($r_{pb}=-0.181$, $p=0.029$).

Table 4. Comparison of Students' Sociodemographic and Other Characteristics With Crash Cart Knowledge Scores (n = 147)

Variable	Median	Mean Rank	Statistic / p*
Gender			
Female	9	79.56	Z = -2.911, p = .003
Male	8	55.51	
High school graduated from			
Health Vocational High School	9	75.86	Z = -0.313, p = .755
Other	9	73.40	
Currently working in any hospital			
Yes	9	88.71	Z = -0.970, p = .332
No	9	73.26	
Previously worked in a hospital			
Yes	9	72.18	Z = -0.174, p = .862
No	9	74.19	
Completed summer internship			
Yes	9	74.39	Z = -0.509, p = .611
No	9	66.29	
Took elective course on Emergency Care Nursing			
Yes	9	76.82	Z = -1.518, p = .129
No	8.5	64.62	
Noticed crash carts during internships			
Yes	9	76.46	Z = -2.238, p = .025
No	7.5	50.61	
Z = Mann-Whitney U test. p < .05.			

Table 5. Relationship Between Taking the "Emergency Care Nursing" Course and Noticing Crash Carts in Clinical Practice

		Noticed Crash Cart		χ^2	Phi (Φ)	df	p*
		Yes	No				
Took the Emergency Care Nursing course	Yes	106	7	6,284	0,207	1	.020**
	No	27	7				
χ^2 : Pearson Chi-Square, *p < .05, **Fisher's Exact Test: p-value was determined by Fisher's Exact Test due to small expected cell counts.							

Discussion

This study assessed the knowledge levels of intern nursing students regarding CCs and emergency response sets at a university in Turkey. The findings were interpreted in light of the existing literature, which remains relatively limited on this topic. Overall, the results indicated that most students had a high level of knowledge related to CC management. Although previous studies have reported varying levels of competence, our findings are consistent with research suggesting that senior nursing students may demonstrate a strong baseline of emergency preparedness. In a descriptive correlative study by Nair et al. (11), nursing interns (n=93) demonstrated moderate knowledge regarding CCs, with a mean score of 18.1 ± 3.2 out of 32. Similarly, Sreelakshmy and Haseena (19) reported that 56.7% of registered nurses had average knowledge of specific medical emergencies, while 16.7% showed poor knowledge. In this context, the relatively high knowledge level observed in our study supports the importance of emergency preparedness as a key component of nursing competency.

Conversely, a comparative study by Kaushik and Mancheri (12) in New Delhi identified marked differences between professional nurses and nursing students in both CC knowledge and practice. While 60% of staff nurses demonstrated adequate knowledge, only 10% of students achieved a comparable level. The gap was even more pronounced in clinical performance, with 80% of staff nurses demonstrating adequate practice, whereas 60% of student nurses showed inadequate CC-related skills. These findings emphasize that theoretical instruction alone may be insufficient and should be supported with practical demonstrations and hands-on training. Therefore, undergraduate nursing programs should ensure that graduates develop both theoretical knowledge and the clinical competence required to respond effectively to emergencies, regardless of their future clinical placement.

The current study also identified specific items in which students demonstrated unfamiliarity or incorrect knowledge. Many students were unaware that CC arrangements should be adapted according to departmental needs (e.g., pediatric clinics) and institutional standards. In addition, confusion was observed regarding CC security procedures, particularly the use of a tamper-evident single-use plastic security seal. Specifically, 24.5% of students were unsure whether the seal should be easily breakable and single-use, while 14.3% provided

incorrect information. These gaps are important, as both accessibility and appropriate organization of emergency equipment may directly influence response times.

Similarly, Dhudum and Mathew (20) evaluated ICU nurses' knowledge and self-reported practices regarding crash cart contents, maintenance, and emergency drug protocols. They found that although 75% of participants had good knowledge, only 8% reached an excellent level. While our study focused on intern nursing students and did not evaluate clinical performance, the presence of knowledge gaps even among ICU nurses suggests that CC competency requires continuous reinforcement. This highlights the importance of structured education beginning at the undergraduate level and continuing throughout professional practice.

Nurses are the healthcare professionals who remain with patients continuously; therefore, they must be prepared to initiate resuscitation or activate a code blue at any time (19, 20). For this reason, undergraduate nursing curricula should comprehensively address CC contents, emergency medications, and their clinical use. Students should also be informed about essential maintenance protocols, including routine checking and documentation procedures. This includes monitoring expiration dates of supplies, even when they remain unused, and ensuring that the defibrillator is fully charged at all times to support constant emergency readiness (20).

In the present study, female students achieved significantly higher CC knowledge scores than male students. In addition, students who reported paying closer attention to CCs during their clinical internships demonstrated significantly higher knowledge levels. A significant but weak relationship was also identified between taking the emergency care nursing course and paying attention to CCs in clinical settings. These findings are consistent with Nair et al. (11), who reported a moderate positive relationship between nursing students' knowledge and application scores regarding the CC system.

Furthermore, completing the emergency care nursing course showed a weak relationship with CC knowledge scores. Although group comparison was not statistically significant, correlation analysis suggested a weak association. At the institution where this research was conducted, the course is offered as an elective, which may contribute to self-selection bias, as students who choose the course may already have greater interest in

emergency nursing. Additionally, internship experiences may differ depending on clinical placement. Students assigned to high-acuity units, such as intensive care, emergency departments, or palliative care, may have greater exposure to CC use and resuscitation practices compared to those placed in general wards. Therefore, the observed relationship between course completion and CC knowledge should be interpreted cautiously, as other factors may also contribute to students' awareness and competency.

Although students who completed the emergency care nursing course demonstrated higher knowledge and awareness, these outcomes may reflect individual motivation and varying clinical exposure rather than the course effect alone. To ensure standardization and strengthen emergency preparedness among all nursing graduates, structured CC training may be integrated into the core nursing curriculum as a mandatory component rather than an elective course. In addition, incorporating repeated hands-on training sessions and clinical reinforcement during internships may support more sustained improvements in knowledge and preparedness.

Conclusion

This study concluded that intern nursing students demonstrated a high level of knowledge regarding CC and emergency response sets. A majority of the students participating had completed an elective course on emergency care nursing. Emergency care nursing education appears to be associated with higher crash cart knowledge scores; however, this relationship was weak. Despite this, integrating emergency nursing courses into the core curriculum may enhance students' preparedness for clinical emergencies. Although these courses provided fundamental information, most students reported a lack of additional specialized CC training and expressed a desire for further education. While overall knowledge scores were high, specific gaps and misconceptions were identified. Students who completed the emergency nursing course demonstrated greater attention to CCs in clinical settings and achieved significantly higher knowledge scores than those who did not. In light of these results, it is recommended that structured educational programs be implemented to strengthen nursing students' knowledge of CCs. Such training should be reinforced at regular intervals using diverse learning materials. Furthermore, bedside demonstrations by teaching staff and clinical nurses during internships would

enhance the retention and practical application of this knowledge. Additionally, maintaining booklets, such as 'Content and Usage of Crash Carts,' developed by experts and available in all clinical units, could serve as a valuable reference for the orientation of newly graduated nurses and the clinical preparedness of nursing students. Future studies with larger samples are recommended to evaluate both CC-related knowledge and practical application skills, as well as to develop validated measurement tools for this domain.

Limitations

The results of this study are limited to students enrolled in the final year of the nursing department at a university in Turkey who voluntarily participated in this study. Another limitation involves the use of a non-standardized survey instrument. Although the form was rigorously structured according to evidence-based protocols, it lacked a formal evaluation by independent experts for psychometric validation. The data were collected using self-report instruments, which may be subject to social desirability bias. Additionally, although the response rate was high, the voluntary nature of participation may have introduced selection bias, as students with a higher interest in emergency care might have been more likely to participate. This should be considered when generalizing the findings to the entire student population.

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