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ORIGINAL PAPER

Graduating nursing students' competence in nursing patients with acute coronary syndrome

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Abstract

Aim: To describe graduating nursing students' competence based on their knowledge in the nursing of a patient with acute coronary syndrome (ACS) and their self-assessed nurse competence. *Design:* A cross-sectional survey. *Methods:* The data were collected from 2018–2019 using an ACS test developed for this study and using the Nurse Competence Scale. The sample contained 47 graduating nursing students. The statistical analysis methods were used. *Results:* Only 48.9% (n = 23) of the students scored an accepted level of knowledge in the nursing of a patient with ACS, and a little over half (51.1%; n = 24) failed the ACS test. Graduating nursing students' self-assessed nurse competence was at a good level (69.7; VAS 0–100). No statistically significant differences in nurse competence assessments occurred between students who passed the ACS test and those who failed it. *Conclusion:* While graduating nursing students have a good level of nursing competence, their knowledge in the nursing of a patient with ACS was poor. It is important to emphasize the nursing of a patient with ACS in nursing education and to pay especially close attention to interpreting the patient's electrocardiogram findings.

Keywords: acute coronary syndrome, competence, graduating nursing student, knowledge-test, Nurse Competence Scale.

Introduction

Cardiovascular diseases (CVDs) are a huge global health problem, which in 2019 killed 17.9 million people worldwide and caused 38% of all premature deaths (< 70 years of age) from noncommunicable diseases (World Health Organization [WHO], 2021). CVDs are also a leading cause of deaths in the European Union (EU) (European Commission [EC], 2020), and their direct average costs range from $6,049 (~€5,400) to $1,972 (~€15,900) depending on the treatment across European countries (Ryder et al., 2019). In Finland, CVDs caused 34% of all deaths in 2019 (Official Statistics of Finland: cause of death, 2019). CVDs cover a wide range of medical problems affecting the circulatory system, but their most common manifestations are cerebrovascular disorders and ischemic heart disease (WHO, 2021). Ischemic heart disease, on the other hand, often manifests itself as an acute coronary syndrome (ACS), which is always a life-threatening condition for the patient (Norton, 2017).

A nurse is usually the first healthcare professional to encounter a patient with symptoms caused by ACS (Norton, 2017; Weeks et al., 2017). Nurses' appointments and the tasks assigned to them to compensate for the shortage of medical staff mean that the assessment and initial treatment of a patient with ACS may be carried out solely as a nurse's independent work without support from colleagues or medical staff (Roche et al., 2017). Based on a rapid and effective initial assessment by a nurse, the initiation of treatment for a patient with ACS is more effective, which may prevent myocardial injury and reduce mortality associated with acute cardiac events (Norton, 2017; Weeks et al., 2017).

In EU area, the Directives (2005/36/EC, 2013/55/EU) guide the nursing education, its minimum length (three years; 4,600 hours), the content of theoretical education, and the duration of compulsory clinical practicums, which is at least half of the minimum

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duration of the education (2,300 hours). In theoretical education, a wide range of teaching and learning strategies are used – for example, a skills laboratory, a simulation laboratory, and online or web-based teaching and learning strategies.

The amount of these varies across countries (Visiers-Jiménez et al., 2022). The Directives also regulate the nursing areas (seven in total) in which students need to have their clinical practicums during education. (EC, 2005, 2013.) In Finland, there are also more specific competence requirements for nursing students (updated in Kajander-Unkuri et al., 2020a). CVDs are one of the national diseases in Finland (Vartiainen, 2018) and thus well covered in curricula of nursing education (e.g., Diaconia University of Applied Sciences, 2022; Metropolia University of Applied Sciences, 2022; Savonia University of Applied Sciences, 2022). The updated Directive contain eight competence requirements that a nursing student needs to apply upon graduation. These competence requirements for general nurses include the need to "independently initiate life-preserving immediate measures" (EC, 2013). Thus, everyone who graduates as a nurse in the EU area should be able to act correctly when encountering a patient with ACS in any context of nursing (Norton, 2017; Weeks et al., 2017). Implementation of nursing care for a patient with ACS is based on strong knowledge (Chow et al., 2017). To ensure the safe care of patients, the competence of nursing students must be of a high standard, of uniform quality, and up to date at the time of graduation (Kajander-Unkuri et al., 2021). Competence in this study refers to graduating nursing students' "functional adequacy and capacity to integrate knowledge and skills to attitudes and values into specific contextual situations of practice" (Meretoja et al., 2004b). Graduating nursing students' generic nurse competence (hereafter "nurse competence") has been evaluated mainly by self-assessments that are on a good level in Europe (Kajander-Unkuri et al., 2020b, 2021; Kiekkas et al., 2019; Nilsson et al., 2019). In previous studies, several competence-related factors explaining the competence of graduating nursing students have been identified, such as age, working experience in healthcare (besides clinical practicums during nursing education), satisfaction with nursing education program, level of study achievements, graduating to the first choice of profession (Kajander-Unkuri et al., 2021), previous professional qualification (Kajander-Unkuri et al., 2014; 2020b), pedagogical atmosphere during a clinical practicum (Kajander-Unkuri et al., 2014; Visiers-Jiménez et al., 2021) and supervisory relationship between a nursing student and a mentor during a clinical practicum (Visiers-Jiménez et al., 2021). When assessing graduating nursing students' competence in special nursing areas, such as in intensive and critical care nursing, the related factors have been, age, nurse education, clinical practice in a comparable unit, experience of autonomy in nursing care, independent information retrieval, and use of nursing journals in information retrieval (Lakanmaa et al., 2014).

Despite the prevalence and severity of ACS, the related nursing competence has not previously been studied from the perspective of graduating nursing students. In graduated nurses, the existing research focuses on some aspect of nursing, such as the identification of a patient with ACS. Nurses have been found to have deficiencies in their skills, and they do not always recognize ACS in the background of the patient's symptoms (Ballard et al., 2011; Davis & Maness, 2019; Weeks et al., 2017).

It has been suggested using a knowledge test alongside with a self-assessed competence instrument to give a broader picture of the nursing students' competence at graduation (Kajander-Unkuri et al., 2014; Lakanmaa et al., 2014). The population in Europe continues to age, increasing the incidence of CVDs (European Society of Cardiology, 2021) and making the related nursing competence essential.

Aim

This study aimed to describe graduating nursing students' competence based on their knowledge in the nursing of a patient with ACS and their self-assessed nurse competence.

Methods

Design

A cross-sectional survey was conducted in Finland.

Sample

The target population consisted of graduating nursing students in 2018 in Finland (N = 3,507; Vipunen – Education Statistics Finland, 2021). A convenience sampling method was utilised. The inclusion criteria for students were: 1) studying for a bachelor's degree in a nursing program; 2) about to graduate after an ongoing final clinical practicum. A power analysis was done based on the main instrument of the study, the Nurse Competence Scale (NCS; Meretoja et al., 2004a). With a statistical power of 80% and significance level of 0.05 (two-tailed), the minimum sample size was 156 respondents. As the knowledge test was developed for this study, the power analysis could not be calculated. The reporting of the study

applied the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement to observational studies (von Elm et al., 2007).

Data collection

The data were collected with two instruments: 1) an ACS test developed for the study and 2) the Nurse Competence Scale (NCS; Meretoja et al., 2004a). Graduating nursing students' knowledge in the nursing of a patient with ACS was assessed using the ACS test developed for this study (Table 1), which utilized a traditional knowledge test and combined with a videotaped patient case, which has been found to be an internationally viable way to test the knowledge of nursing students (Shatto et al., 2019).

Table 1 Description of the ACS test

Alternating videos and questions during the ACS-test	Content	References
1st video	The patient arrives at reception. The nurse begins evaluating the patient's health condition. The nurse finds out the primary diseases and symptoms of the patient by interviewing. At the same time, the nurse observes the patient.	
Questions (5)	Interview: risk factors for coronary heart disease, patient's symptoms	Carlton et al. (2016); Chow et al. (2017); Davis & Maness (2019); Holmberg et al. (2017); Jakobsson et al. (2016); Norton (2017)
2nd video	The patient steps to the examination table. The nurse begins examining the patient with abdominal palpation while continuing the interview. The nurse asks the patient more specific questions.	
Questions (2)	Clinical examination: abdominal palpation, assessment of pain and general condition	Cardona-Morrell et al. (2016); Kvande et al. (2017); Norton (2017); Olgers et al. (2017); Royal College of Physicians (2017)
3rd video	The nurse always explains to the patient what she is going to do. The nurse measures the patient's vital signs. The measured values are displayed to the viewers.	
Questions (2)	Clinical examination: measurement of values of vital signs	Cardona-Morrell et al. (2016); Kvande et al. (2017); Norton (2017); Olgers et al. (2017); Royal College of Physicians (2017)
4th video	The nurse takes an ECG from the patient and interprets it. The ECG is displayed as a close-up to the viewers.	
Questions (5)	Clinical examination: ECG registration and interpretation Primary care and the organization of follow-up care: activation of emergency care	Arslanian-Engoren et al. (2010); Current Care Guideline (2014); Funk et al. (2017); Norton (2017); Tahboub & Yılmaz (2019)
5th video	The nurse asks the patient a few specific questions. She tells the patient about the ECG finding and calms the patient. The nurse instructs the patient to lie down and calls the ambulance.	
Questions (5)	Primary care and the organization of follow-up care: medication, supplementary oxygen, patient's supine position, venous line	Current Care Guideline (2014); Norton (2017); Smith et al. (2015)
6th video	While waiting for the ambulance to arrive, the nurse finds out if the patient has any drug allergies. She gives the patient ASA (250 mg by chewing) and two nitro sprays. The nurse gives the patient supplementary oxygen and keeps him at rest, the upper body raised. The nurse begins monitoring the heart rhythm and checks the values of vital organ functions. She calms the patient and asks about his feelings. Finally, the nurse puts an intravenous cannula into the patient.	

The video presentation shows a patient case in which a nurse encounters a patient suffering from symptoms caused by ACS. The venue is imaginary – a health centre where the nurse has an independent appointment. There are no doctors or other nurses on the site. The situation mimics the authentic nursing situation as closely as possible. The actress patient seen in the videos is a middle-aged man whose habit shows that he would be well-suited to the risk group for cardiovascular disease. One of the authors plays the role of the nurse. The clinical situation was videotaped in six parts and recorded encrypted on the YouTube video service on the internet. The recording provided a separate URL for the different sections of the video, which enabled them to be integrated into an electronic Webropol survey. The video presentations show a progressive clinical situation beginning when the patient arrives at the nurse's independent appointment and ending when an ambulance arrives. In the first video, the patient arrives at the nurse's appointment and the nurse begins evaluating the patient's health condition by interviewing. In the following videos, the nurse continues the clinical examination by measuring patient's vital signs and taking an ECG from the patient asking the patient more specific questions (Table 1).

The ACS test contains a total of 19 questions that measure the knowledge of graduating nursing students in connection with the nursing work of a patient with ACS. All questions are based on the current literature and Current Care Guideline of acute coronary syndrome: unstable angina and myocardial infarction without ST elevation used nationally in Finland (Current Care Guideline, 2014). In addition, the questions were prepared according to the process model of nursing (Walton, 2016) and the contents of the nursing of a patient who has suffered ACS. The nursing areas included observation and interview (5 questions), clinical examination (8 questions), and primary care and the organization of follow-up care (6 questions). Each question contained 2 to 4 different answer choices, only one of which is correct and one of which is "I don't know". The test began with a video showing the patient arriving at the nurse's independent appointment and talking about his undefined feeling in the upper abdomen. While the nurse is interviewing the patient, he appears to be short of breath, and he moves restlessly. The patient says that he is unable to work, as his physical condition is impaired. The nurse asks about the blood sugar as she has noticed in the patient records that he has type 2 diabetes. The video ends when the patient says that he usually doesn't measure his blood sugar level very often, but before leaving for the health centre, he measured it and it was 8.5. After the video, there were five questions, for example: "The patient's shortness of breath may be a sign of" – followed by the options: "increased respiratory work", "smooth breathing", "cyanosis", and "I don't know". The last question after each video was "the nurse should next do" – followed by the suitable options. In the next video, the student saw noticed that which was the correct answer to what the nurse should next do (Table 1).

Graduating nursing students had the opportunity to receive a total of 0–19 points in the ACS test (1 point for each correct answer). The student received one additional point if the answers progressed consistently in terms of the patient's overall care. Gaining an extra point also required the student not to make any error that would in a real-life situation seriously compromise patient safety. As the ACS test progressed, the students found out the correct answers, which prevented them from going back to change their answers and only allowed them to proceed to the next page.

The expert panel checked the content of the video presentation and ACS test questions before piloting. The panel of experts (n = 10) included an internal medicine specialist, two doctors specializing in acutology, a healthcare teacher, a paramedic, a nurse working in a health centre, three nurses working in an emergency department, and a nursing graduate who graduated before the actual data collection in spring 2018. The ACS test was piloted at one Finnish university of applied sciences (UAS) and involved 16 graduating nursing students. The piloting showed that the ACS test worked well as a research instrument, so no changes were made to it.

The optimal level of knowledge was reflected by a score of 20 / 20, in which case 100% of the respondent's answers were correct. This score required that the student had also received one additional point for consistent progress. To achieve the approved level of knowledge, a graduating nursing student had to score 80% of the maximum number of points in the ACS test (Nikula, 2011). The lowest score for approved competence was then 16 points. The error rate (20%) was allowed, as it is assumed that students' knowledge will increase after graduation with the experience gained from working life. A two-class variable was formed from the total scores, which made it possible to examine how many of the respondents had achieved at least the lowest score describing the accepted competence (16–20 points).

Nurse competence was measured by using the Nurse Competence Scale (NCS; Meretoja et al., 2004a). The instrument has been used worldwide to show evidence of reliability and validity in graduating nursing students (Flinkman et al., 2017; Kajander-Unkuri et al., 2021). The NCS is comprised of 73 items in seven categories. A visual analogue scale (VAS 0–100; 0 = low level of nurse competence, 100 = high level of nurse competence) is used to assess each item. To rate the level of nurse competence, the VAS is divided into four parts: 0–25 (a low level), > 25–50 (a rather good level), > 50–75 (a good level), and > 75–100 (a very good level). Moreover, the frequency with which each item is used in clinical practice is indicated on a four-point scale (0 = not applicable; 1 = used very seldom; 2 = used occasionally; 3 = used very often) (Flinkman et al., 2017; Meretoja et al., 2004a).

In addition, 15 background factors were asked to describe the sample and to investigate their association with graduating nursing students' knowledge in the nursing of a patient with ACS and nurse competence (Table 2). Most of these background factors were based on previous literature (Kajander-Unkuri et al., 2014, 2020b, 2021; Lakanmaa et al. 2014, Visiers-Jiménez et al., 2021) and explained the competence of graduating nursing students and were thus used in this study.

Data were collected at 11 (out of 20) UASs located in different parts of Finland. Data were collected in two parts from March 2018 to January 2019. First, using the ACS test, the data collection was conducted by going on-site at UASs to meet graduating nursing students and asking them to participate in the study. In addition, data was collected by sending the internet link of the ACS test via email to graduating nursing students by a contact person at the UASs. Students were told that the test wouldn't affect their grades. A total of 112 graduating nursing students (33% response rate) responded to the ACS test mainly in the classroom when one of the researchers was present. Second, a contact person at the UASs collected the data by e-mailing the NCS survey to graduating nursing students. A total of 337 graduating nursing students (32.9% response rate) responded to the NCS. In both data collections, graduating nursing students filled in their (unique) student number. After both data collections, the data were combined, and the student number served as a code to attach to their combined answers for the analysis phase. Forty-seven graduating nursing students had responded to both questionnaires (ACS test and NCS) and were thus the sample for this study. The minimum sample size based on the NCS test was not achieved.

Data analysis

Continuous variables are summarized with mean, median, standard deviation (SD) and range, and categorical variables with counts and proportions. Associations between the ACS results and the categorical background variables were tested with Fisher's exact test. The mean level of graduating nursing students' nurse competence, competence subscales, and frequency were compared between the knowledge-test results (passed / failed) with one-way analysis of variance. With the same method, it was examined which background variable is associated with the ACS results or NCS total mean (for every background variable, Table 2). Pearson correlation coefficients were calculated. P-values < 0.05 (two-tailed) were considered as statistically significant. The data analysis was performed using SAS software, Version 9.4, of the SAS System for Windows (SAS Institute Inc., Cary, NC, USA).

Results

A total of 47 graduating nursing students participated in this study. The majority were female (n = 40; 85.1%), and their mean age was 28.6 years (SD = 7.2; range 21–50) (Table 2).

Graduating nursing students' average score on the ACS test was 15.4 points (range 10–20; median = 15). Around one-quarter (25.5%) of the graduating nursing students scored a moderate level of knowledge (16–17) and 23.4% scored a high level of knowledge (18–20). Just over half (51.1%) of the graduating nursing students scored a low level of knowledge (< 15 points), and thus failed the ACS test. Only one graduating nursing student (2.1%) scored the maximum points from the ACS test. Graduating nursing students scored best in the category of "interview"; the average score was 4.9 out of 5 points. Primary care and organization of the follow-up care was scored with an average of 4.7 out of 6 points, and Clinical examination was scored with an average of 5.9 out of 8 points. Only seven graduating nursing students (14.9%) had a passing score, when assessing if their given care proceeded logically (Table 3).

Graduating nursing students assessed their nurse competence as good (VAS mean = 69.7; SD = 12.3). The graduating nursing students assessed their competence as very good in the "helping role" category (VAS mean = 78.9; SD = 12.4). All other categories were assessed as good. The lowest assessments were in the "ensuring quality" category (VAS mean = 65.4; SD = 16.5). In the "helping role" and "diagnostic functions" categories, graduating nursing students reported occasional use of

Table 2 Characteristics of the sample (n = 47) and the association between them and ACS test results (pass / fail) and nurse competence (NCS total mean)

Characteristics	Students n (%)	Association between ACS[a] results	Association between NCS[b] total mean
Age (years) (mean; SD)	28.6; 7.3	p = 0.740	p = 0.145
Gender		p = 0.701	p = 0.758
female	40 (85.1)		
male	7 (14.9)		
Previous degree in health care prior to nursing education (*yes*)	22 (46.8)	p = 0.128	p = 0.383
Working experience in health care besides clinical practices during nursing education (*yes*)	42 (89.4)	p = 0.608	p = 0.757
The length of the working experience in months (mean; SD)	30.0; 35.0	p = 0.239	p = 0.022*
Graduating to the 1st-choice profession (*yes*)	41 (87.2)	p = 1.000	p = 0.072
Plan to leave the nursing profession		p = 0.342	p = 0.657
never	21 (44.7)		
fairly seldom	23 (48.9)		
fairly often	3 (6.4)		
often	0 (0.0)		
Satisfaction with current nursing education program as a whole		p = 0.858	p = 0.378
very satisfied	10 (21.3)		
satisfied	36 (76.6)		
unsatisfied	1 (2.1)		
very unsatisfied	0 (0.0)		
Satisfaction with theoretical education		p = 1.000	p = 0.074
very satisfied	1 (2.1)		
satisfied	32 (68.1)		
unsatisfied	13 (27.7)		
very unsatisfied	1 (2.1)		
Satisfaction with clinical placements		p = 1.000	p = 0.469
very satisfied	27 (57.5)		
satisfied	19 (40.4)		
unsatisfied	1 (2.1)		
very unsatisfied	0 (0.0)		
Level of study achievements		p = 0.169	p = 0.863
excellent	3 (6.4)		
good	43 (91.5)		
poor	1 (2.1)		
very poor	0 (0.0)		
Interesting field of nursing		p = 0.238	p = 0.399
acute nursing (including emergency and ICU nursing)	18 (38.3)		
other	29 (61.7)		
Previous experience of a similar situation		p = 0.202	p = 0.356
once	5 (10.7)		
2–3 times	11 (23.4)		
more than 4 times	8 (17.0)		
no previous experience	23 (48.9)		
Adequacy of the ability provided by nursing education to encounter a patient with acs (*yes*) (n = 38)	25 (65.8)	p = 0.038*	p = 0.037*
Previous experience in a clinical placement in acute nursing (*yes*) (n = 46)	26 (56.5)	p = 0.305	p = 0.414

*[a]ACS results (pass / failed) are measured with the ACS test (0–20; 0–15 fail; 16–20 pass). [b]NCS total mean is measured on the Nurse Competence Scale (VAS 0–100). SD – standard deviation; ICU – intensive care unit; *statistically significant p-value*

competence in clinical practice (means 2.32 and 2.10, respectively). In all other categories, graduating nursing students reported somewhat lower use (Table 4). There was no statistically significant difference in the self-assessed nurse competence between graduating nursing students who scored "pass" (n = 23) or "failed" (n = 24) on the ACS test: VAS mean 70.2 vs. 69.3 (Table 4).

Graduating nursing students who assessed that, based on their nursing education, they had adequate abilities to encounter a patient with ACS passed the ACS test (p = 0.038) and assessed their nurse

competence higher (p = 0.037) than other students. Also, the longer length of working experience in healthcare (other than clinical practicums) during nursing education is statistically significantly associated with higher nurse competence (Table 2). The category level mean scores revealed a statistically significant positive correlation between the frequency of use of competence in clinical practice and nurse competence levels. Pearson's r-values varied from 0.410–0.862 (p < 0.0001–0.0056), indicating a strong correlation (r > 0.5) between frequency of use of competence in clinical practice and nurse competence in all categories besides the work role (r = 0.410). The frequencies of use of competence in clinical practice were not associated with the results (pass / fail) of the ACS test.

Table 3 The five highest and lowest questions of the ACS test, by answers

Nursing area	Topic of the question	Correct answers %	Incorrect / do not know %
Interview	cause of a sudden deterioration in the patient's physical condition	100.0	- / -
Interview	nurse's activities after the patient's interview	100.0	- / -
Clinical examination	interpretation of scored pain on a vas scale	100.0	- / -
Clinical examination	interpretation of the patient's vital signs	100.0	- / -
Clinical examination	nurse's activity after measuring the patient's vital signs	100.0	- / -
Clinical examination	nurse's activity after pain assessment	72.3	27.7 / -
Clinical examination	interpretation of the ECG	59.6	27.6 / 12.8
Clinical examination	interpretation of ST segment depression on the ECG	48.9	40.5 / 10.6
Primary care and the organization of follow-up care	activation of emergency care	29.8	59.6 / 10.6
Clinical examination	interpretation of ST segment elevation on the ECG	23.4	66.0 / 10.6

ECG – Electrocardiogram

Table 4 Graduating nursing students' level of nurse competence

Competence category	Total sample (n = 47)		Passed acs test (n = 23)		Failed acs test (n = 24)		Comparison between groups (passed / failed)
Frequency of use (f)[b]	mean[a] (SD)	range	mean[a] (SD)	range	mean[a] (SD)	range	
Helping role	78.9 (12.4)	47.9–100.0	80.3 (11.0)	53.7–96.4	77.5 (13.7)	47.9–100.0	p = 0.443
f	2.3 (0.4)		2.4 (0.3)		2.3 (0.4)		p = 0.485
Diagnostic functions	74.5 (15.3)	30.3–98.1	76.8 (12.3)	43.0–97.1	72.3 (17.8)	30.3–98.1	p = 0.325
f	2.1 (0.4)		2.1 (0.4)		2.0 (0.5)		p = 0.507
Managing situations	72.5 (15.1)	38.8–98.3	73.8 (14.0)	38.8–98.3	71.3 (16.4)	46.3–97.0	p = 0.583
f	1.8 (0.5)		1.9 (0.6)		1.8 (0.5)		p = 0.798
Teaching-coaching	69.8 (16.5)	28.8–96.5	69.1 (15.9)	38.9–87.8	70.5 (17.5)	28.8–96.5	p = 0.776
f	1.9 (0.5)		1.8 (0.5)		1.9 (0.5)		p = 0.535
Work role	67.7 (12.9)	36.4–94.4	67.4 (13.7)	36.4–90.3	68.1 (12.3)	51.0–94.4	p = 0.865
f	1.7 (0.4)		1.7 (0.4)		1.7 (0.5)		p = 0.889
Therapeutic interventions	66.1 (15.5)	35.8–96.1	65.7 (13.8)	39.6–92.4	66.4 (17.3)	35.8–96.1	p = 0.872
f	1.7 (0.5)		1.7 (0.4)		1.7 (0.5)		p = 0.707
Ensuring quality	65.4 (16.5)	25.6–97.5	67.2 (12.4)	38.3–81.7	63.8 (19.6)	25.6–97.5	p = 0.493
f	1.6 (0.5)		1.6 (0.5)		1.6 (0.6)		p = 0.828
Overall competence	69.7 (12.3)	40.6–92.4	70.2 (11.6)	46.7–86.7	69.3 (13.2)	40.6–92.4	p = 0.801

[a]*Level of nurse competence measured with Visual Analogue Scale 0–100: low (0–25); rather good (>25–50); good (>50–75); and very good (>75–100).*
[b]*f – frequency of use of competence measured with 0–3: not applicable in my work (0); used very seldom (1); used occasionally (2); used very often (3).*
SD – standard deviation

Discussion

This study aimed to describe graduating nursing students' competence based on their knowledge in the nursing of a patient with ACS and their self-assessed nurse competence. The main finding of this study is that graduating nursing students have a good level of nurse competence, but their knowledge in the nursing of a patient with ACS was not at an acceptable level. The result is somewhat worrying because the EU Directive (EC, 2013) requires general nurses to be able to "independently initiate life-preserving immediate measures" and because CVDs are a big problem in most European countries (European Society of Cardiology, 2021). This is especially worrying in Finland, because CVDs are one of the national diseases of Finland (Vartiainen, 2018) and the mortality is high in ACS diseases, even though medical treatments are high quality. Nurses play a significant role in guiding the treatment (WHO, 2020). Thus, everyone who graduates as a nurse in the EU should be able to act correctly when encountering a patient with ACS in any nursing context (Norton, 2017; Weeks et al., 2017). Lakanmaa et al. (2014) got similar results when assessing basic competence in intensive and critical care nursing; graduating nursing students' self-assessed competence was good while their basic knowledge based on knowledge test was poor (Lakanmaa et al., 2014). However, intensive and critical care nursing is specialized nursing requiring special competence; thus, the results are not directly comparable to our results. Based on our results, the nurse competence was self-assessed as good, in line with previous studies (Kajander-Unkuri et al., 2020b, 2021; Notarnicola et al., 2018). The results of this study also show that an objective assessment, such as a knowledge test, is needed to bring out real competence. Although self-assessment is a good method for developing competence, it is not always enough.

Only 48.9% of the graduating nursing students scored on the accepted knowledge level in the ACS test, and 51.1% failed the ACS test. The deficiency in knowledge in the nursing of a patient with ACS is well illustrated by the result that only one student scored the maximum points on the ACS test, and around one-fifth scored a high level of knowledge. Based on the results, the graduating nursing students achieved an acceptable level of knowledge in the interview category, as 95.3% of the answers were correct. None of the students would have sent the patient home after the interview, which indicates good judgment. However, although the interview category was excellent for graduating nursing students, individual respondents had chosen answers that would cause serious harm to the patient in real-life situations or, as nurses, would exceed their authority to treat the patient. For example, a couple of respondents thought that a patient's shortness of breath was synonymous with cyanosis (bluish skin) even though it was not noticeable on the skin of the patient seen in the video. The result shows that these students do not know the meaning of this medical term commonly used in nursing, and therefore they do not recognize the symptom in question when the patient encounters it.

In the clinical examination category, 73.1% of graduating nursing students' answers were correct; thus, their knowledge is not at an acceptable level. The result indicates that it may be difficult for students to know what the different measurement results mean for the patient's overall situation and how they should use the information they receive to plan patient care. In nursing education, more simulation could be used, as it has been found to increase nursing students' myocardial infarction awareness, treatment planning, and effectiveness (Hsu et al., 2014) and clinical reasoning (Havola et al., 2020; Ragsdale & Schuessler, 2021). Only 72.3% of graduating nursing students knew that the assessment of vital signs was the primary measure in examining the patient. Graduating nursing students who do not understand the importance of assessing vital signs cannot, in a similar real-life situation, find that the patient is suffering from a severe impairment of a vital organ function. Based on previous studies, patients' vital signs are poorly assessed in nursing care, which increases patients' risk of death (Cardona-Morrell et al., 2016; Lee et al., 2020). Assessing vital signs is a basic competence of every nurse (EC, 2013; Cardona-Morrell et al., 2016), and therefore this should be emphasized in nursing education.

Only 48.9% of the graduating nursing students were able to correctly interpret the patient's electrocardiogram (ECG) findings. This result indicates that the students did not receive enough training during their nursing education to prepare them to correctly interpret the patient's ECG findings. In previous studies, there are also gaps in practising nurses' ECG knowledge and interpretation skills (Funk et al., 2017), especially with nurses who had less than one year of work experience (Tahboub & Yılmaz, 2019). Measurements made by nurses are useless unless they can interpret their own results (Freysdóttir et al., 2019). Despite poor knowledge of ECG interpretation, the percentage of graduating nursing

students who knew that a patient on video suffered from ACS was 80.9%, which is an acceptable result. This differs from the results of previous studies, which found that nurses poorly identified a patient's symptoms as caused by ACS if they were atypical (Davis & Manes 2019; Weeks et al., 2017). However, the results indicate that graduating nursing students' knowledge is superficial, and in a real nursing situation, this could harm the patient. Therefore, the teaching related to interpreting the ECG – which can be used to increase the level of students' knowledge in this area – must be emphasized in nursing education. It is also important to change the prevailing attitude that the interpretation of the ECG belongs only to the doctors (Funk et al., 2017).

In the last category – primary care and organization of follow-up care – 77.7% of the graduating nursing students' answers were correct; thus, their knowledge is not at an acceptable level. The first task of a nurse alone with a patient in a health centre is to call an emergency centre and activate emergency care (Arslanian-Engoren et al., 2010; Current Care Guideline, 2014). Only 29.8% of the graduating nursing students knew that alerting additional care to the scene was paramount to the success of the patient's care. Based on the results, there were also gaps in the knowledge related to medication, as only 78.7% of the graduating nursing students knew the correct dose and method of administrating acetylsalicylic acid, in which case the result cannot be considered acceptable. The treatment of the patient with ACS is extensive and requires good knowledge of pharmacotherapy. As practising nurses, a few respondents would have exceeded their authority and given the patient medicine (enoxaparin sodium injection) that would only be given with a doctor's prescription. In a real-life situation, students would have seriously jeopardized patient safety, as medication-related errors are always serious adverse events (European Medicines Agency, 2021).

Graduating nursing students assessed their nurse competence on a good level with the NCS using the VAS scale. The result is in line with previous studies with the NCS (Kajander-Unkuri et al., 2020b, 2021; Notarnicola et al., 2018) and somewhat lower than assessed with other generic competence instruments (Kiekkas et al., 2019; Nilsson et al., 2019). The competence level varies in different competence areas. Graduating nursing students assessed highest the competence related "to helping a patient to cope and providing ethical and individualized care" (helping role; Meretoja et al., 2004b, p. 331), which is in line with previous studies using the same scale (Kajander-Unkuri et al., 2020b, 2021). From the viewpoint of nursing education, the result is favourable, since the helping role is at the core of nursing care (Lejonqvist & Kajander-Unkuri, 2022). The assessments were the lowest in "evaluating outcomes and contributing to further development of patient care" (ensuring quality; Meretoja et al., 2004b, p. 331). These issues need to be addressed in more depth during nursing education in order for students to master the overall care of a patient upon graduation.

We found that if graduating nursing students assessed themselves as having adequate abilities based on their nursing education to encounter a patient with ACS, they scored a pass on the ACS test and their self-assessed nurse competence was higher. This highlights the importance of emphasizing the nursing of a patient with ACS in nursing education. However, as our sample size was small, further research is required on associated factors.

Today's graduating nursing students are tomorrow's practising nurses, and therefore, evaluating graduating nursing students' competence is important because a high competence level of nurses is associated with the quality of nursing care (Aiken et al., 2017). Evaluation of graduating nursing students' competence in Europe is mainly based on self-assessments (Kajander-Unkuri et al., 2021; Kiekkas et al., 2019; Nilsson et al., 2019), and nurses need self-assessment skills to keep up to date and for safe nursing practice (Kajander-Unkuri et al., 2016; Taylor et al., 2020). However, self-assessments cover only one part of competence evaluation. Using a knowledge test alongside with a self-assessed competence instrument to give a broader picture of the nursing students' competence at graduation (Kajander-Unkuri et al., 2014; Lakanmaa et al., 2014). Based on our results, graduating nursing students' nurse competence is on a good level, but their knowledge in the nursing of a patient with ACS is poor. This might be because nursing students might have overestimated their nurse competence in their self-assessments (Kajander-Unkuri et al., 2016; Lakanmaa et al., 2014) or there are lacks in the teaching of the nursing of a patient with ACS in nursing education. The rapid and effective initial assessment by a nurse leads to a more effective initiation of treatment for a patient with ACS, which may prevent myocardial injury and reduce mortality associated with acute cardiac events (Norton, 2017; Weeks et al., 2017). Therefore, it is crucial that the nursing of a patient with ACS is emphasized in nursing education.

Limitation of study

There are a few limitations related to the validity of our study. The response rates for both data collections were low (using the ACS test: 33.0%; using the NCS 32.9%), thus the sample size is small and came from Finnish nursing students, which introduces some limitations to generalizing empirical findings internationally. The total sample size based on the power analysis was not achieved. However, to our knowledge, this is the first study where the competence of graduating nursing students is evaluated based on both a self-assessment instrument and a knowledge test, as suggested in previous studies (Kajander-Unkuri et al., 2014; Lakanmaa et al., 2014). In the future, the knowledge of this study will support the sample size estimation based on power analysis. The assessments of graduating nursing students' nurse competence are in line with previous studies with the same instrument (Kajander-Unkuri et al., 2020b, 2021; Notarnicola et al., 2018), strengthening our study. Graduating nursing students' knowledge in the nursing of a patient with ACS was assessed with the ACS test that was developed for this study. Its validity was ensured with the current literature, the evaluation by the expert panel, and the pilot study carried out before the actual data collection. However, it requires further testing.

Conclusion

While graduating nursing students have a good level of nursing competence, their knowledge in the nursing of a patient with ACS was poor. This study is among the first studies where competence is assessed with an objective knowledge test alongside with a self-assessment competence instrument. In nursing education, it is important to emphasize the nursing of a patient with ACS in the curriculum and pay especially close attention to the interpretation of the patient's ECG findings.

Ethical aspects and conflict of interest

The ethical principles outlined in the Declaration of Helsinki were followed. The ethical approval for the study was obtained from the Ethics Committee of the University of Turku (Statement 16/2017 6.3.2017). Permission for using the Finnish version of the NCS was obtained from the copyright holder, and permissions were obtained from the universities of applied sciences where the data collection was performed. Students signed their consent when agreeing to participate in the study and their right to privacy and anonymity, as well as their right to withdraw from the study, were fully ensured.

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Author contributions

Conception and design (JS-B, LS, SK-U), data analysis and interpretation (RT, JS-B, LS, EL, SK-U), manuscript draft and critical revision of the manuscript (RT, JS-B, LS, EL, SK-U), and final approval of the manuscript (RT, JS-B, LS, EL, SK-U).

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