



## Research article

# Critical care nurses' competence in mentoring students in intensive care units—A cross-sectional study

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## ABSTRACT

**Background:** Mentors play an important role in the practical education of critical care nursing students in intensive care units, yet little is known about the mentoring competencies of critical care nurses.

**Aim:** The aim of this study was to assess Norwegian critical care nurses' competence in mentoring students in intensive care units.

**Design:** This study has a descriptive, cross-sectional design, utilising a self-administered online survey.

**Settings:** The study population consisted of critical care nurses who mentor students in Norwegian intensive care units.

**Participants:** 178 critical care nurses participated in the study. The participants were recruited by contacting the units directly, through social media, and at a national critical care nursing conference.

**Methods:** The study utilised the Mentors' Competence Instrument, a self-evaluation tool for evaluating mentoring competence.

**Results:** The Norwegian critical care nurses generally evaluated their mentoring competence as middle to high level. The "reflection during mentoring" dimension was rated as the highest and "student-centered evaluation" as the lowest competence dimension. The critical care nurses who had formal mentoring education reported significantly higher mentoring competences, but the other demographic characteristics were not related to mentoring competence. Regardless of previous mentoring education, most participants reported a need to further develop their mentoring competencies.

**Conclusions:** Employers should collaborate with educational institutions to establish a system for continuous competence development for critical care nurse mentors.

## 1. Introduction

The education of critical care nurses (including intensive care nurses and ICU nurses in this study) varies significantly between countries. Within Europe alone, some countries do not offer formal education programs for critical care nursing, and existing programs range from six weeks to two years in duration (Endacott et al., 2015). There are

differences in both theoretical and practical education in critical care nursing education programs at postgraduate level, as well as in the level of education, both between and within countries (Gullick et al., 2019). The structure of practical studies also varies widely; some programs offer dedicated placements, others mandate clinical hours, and some consist solely of theoretical education supplemented by employment in an intensive care unit (ICU) (Gullick et al., 2019). The latest position

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statement by the [European Federation of Critical Care Nursing Associations \(2004\)](#) recommends that half of the postgraduate critical care nursing education should occur in clinical practice. In Norway, critical care nursing education consists of 90–120 European Credit Transfer System (ECTS) credits, including 30 weeks of mentored practical placements that are spread evenly over the course of 1.5 to 2 years of study ([Regulation on National Guidelines for Critical Care Nursing Education, 2021](#)).

Many factors affect nursing students' learning outcomes, satisfaction, and ultimately, professional development in clinical learning environments ([Flott and Linden, 2016](#)). Different terms are used to describe nurses who support students during their clinical practice ([Dobrowolska et al., 2016](#)). In this article, we use the term 'mentor' to refer to a critical care nurse who is employed by a healthcare provider and engages in clinical work while simultaneously mentoring a student in the clinical environment. The mentor is responsible for facilitating the student's learning and supporting the student's professional development ([Jokelainen et al., 2011](#)). A mentor plays an influential role in students' satisfaction and learning in clinical practice ([Ford et al., 2016](#); [Gusar et al., 2020](#); [Pitkänen et al., 2018](#)), and some studies specifically link the mentoring relationship and students' learning to nurse mentors' pedagogical competences ([McClure and Black, 2013](#); [Tuomikoski et al., 2020a](#)). Successful mentoring in clinical practice can ease the transition to work life and affect later job satisfaction ([Kaihlainen et al., 2021](#); [Koskinen et al., 2023](#)). To the best of our knowledge, there is a paucity of research assessing clinical learning environments and mentoring in postgraduate critical care nursing education. However, two studies have emphasised the mentor's clinical and pedagogical skills in successful clinical placements in advanced practice nursing ([Lee et al., 2023](#); [McQueen et al., 2018](#)).

According to the European Guideline on Clinical Nurse Mentors' Mentoring Competence Development ([Oikarainen et al., 2021](#)), nurses' personal mentoring competence comprises several factors that can be categorized into the mentors' individual competences and workplace interactions, the mentors' cultural competence, and the mentors' ability to support students' learning processes. Nurses' competence in mentoring practices within the workplace, the mentors' characteristics and motivation, their ability to engage in goal-oriented mentoring, reflection, and assessment, as well as their skill in providing constructive feedback, all interact to form an evidence-based model of mentoring competence as described by [Mikkonen et al. \(2020\)](#). This model has been developed in conjunction with the Mentors' Competence Instrument, a self-evaluation tool for nurses, which was used in this study.

The purpose of this study was to assess Norwegian critical care nurses' self-reported competence in mentoring students in clinical practice and explore factors affecting these mentoring competences. This study is part of a project aimed at developing an educational intervention to enhance Norwegian critical care nurses' mentoring competence.

## 2. Aim

The aim of this study was to assess Norwegian critical care nurses' competence in mentoring students in intensive care units.

Research questions:

1. How do the Norwegian critical care nurses evaluate their mentoring competence using the self-evaluation tool Mentors' Competence Instrument?
2. How are the background variables related to the critical care nurses' self-evaluated mentoring competences?

## 3. Methods

### 3.1. Study design

This study has a descriptive, cross-sectional design, utilising a self-administered online survey.

### 3.2. Population and setting

We included all Norwegian general, surgical, medical, and mixed adult ICUs in the survey, excluding neonatal ICUs, post-operative and recovery units, and high-dependency units. The inclusion criteria for participants were 1) to work as a critical care nurse, and 2) have experience in mentoring students in an ICU. Most of the critical care nurses in Norway have a Norwegian critical care nursing specialisation, but it is also possible for the specialist nurses in the ICU to have another relevant specialisation, such as anaesthesia nursing, or to have received their education from abroad. There is no registry of critical care nurses in Norway, and not all critical care nurses mentor students, making the total population for this study unknown. An official national survey, targeting all critical care nurses regardless of workplace identified 3212 individuals in 2019 ([The Office of the Auditor General, 2019](#)).

### 3.3. Instrument

The Mentors' Competence Instrument is a self-evaluation tool designed to evaluate mentoring competence in nurses who mentor students in clinical practice ([Tuomikoski et al., 2018a](#)). The instrument has been validated in the international context ([Mikkonen et al., 2020](#)), with the latest version consisting of 43 items, and 7 competence dimensions measured. The instrument utilises a four-point Likert scale with following answer options: (1) fully disagree, (2) disagree to some extent, (3) agree to some extent, and (4) fully agree. The competence dimensions are: (1) mentoring practices in the workplace, (2) mentor characteristics, (3) motivation of the mentor, (4) goal-oriented mentoring, (5) reflection during mentoring, (6) student-centered evaluation, and (7) constructive feedback. The instrument has been translated and validated in the Norwegian context showing acceptable validity and reliability ([Linnerud et al., 2024](#)). In this study, the number of items in each dimension and Cronbach's alpha values are presented in [Table 2](#).

ICU context-related background questions and three questions about critical care nurses' willingness to develop their mentoring competence were developed specifically for this project and added to the questionnaire. Demographic background variables included information about participants' age, work and mentoring experience, type and region of hospital they work at, and whether they have formal and informal mentoring education. Formal mentoring education was described as a credit-awarding course at a higher education institution, worth 5 to 10 ECTS credits. Informal mentoring education, such as theme days and non-credit-awarding courses, was also mapped.

### 3.4. Data collection

The survey was administered online using the official Norwegian survey platform 'Nettskjema' (n.d.), from March to September 2023. Recruitment efforts involved reaching out to ward managers at ICUs, utilising social media channels, and engaging participants at a national critical care nursing conference in Norway. Ward managers facilitated the recruitment process by distributing invitation emails to critical care nurses that contained details about the study and a link to the survey. Further recruitment took place through posts on the Norwegian Critical Care Nurses' Association's Facebook and Instagram pages, as well as direct engagement with attendees at the national critical care nursing conference.

The participation to the survey was voluntary and anonymous. The participants got an information letter with detailed information about

the survey, including data protection issues. Two remainders were sent to participating units, and the survey was advertised three to four times on different social media platforms.

A total of 178 critical care nurses participated in the survey. Out of 51 contacted ICUs, 22 units participated in the study by e-mail recruitment, which yielded 109 participants (61 %). Forty-six participants (26 %) found the survey through social media, 12 (7 %) through critical care nursing conference, and the rest (6 %) through other sources, such as a recommendation from a friend.

### 3.5. Data analysis

The data were analysed with IBM SPSS version 29.0. Descriptive statistics, including frequencies, means and standard deviations, were used reporting background variables and self-reported mentoring competences. There was an insignificant amount of missing data (0.1 % in test variables and 0.3 % in background variables), and it is assessed to be Missing Completely at random (Mirzaei et al., 2022). The missing data did not affect the analyses and sum variables for the competence dimensions were derived from the available data by omitting the missing values.

A previous study utilising the Mentors' Competence Instrument was used to determine the levels of mentoring competence (Tuomikoski et al., 2018b). K-means clustering (Wu, 2012) was utilised to create mentoring profiles, to determine whether different profiles had varying educational needs for mentoring competence. The clustering used participants' self-reported mentoring competences as the classification criteria. Kruskal-Wallis test was used in testing significance between the groups in competence variables and further Bonferroni corrected using Mann-Whitney testing. Cohen's d values (Cohen, 2013) were calculated to measure the magnitude of differences in self-reported mentoring competence between the groups and are presented in a Supplementary file. In background variables, subgroups were tested using Fischer's exact test and Chi square test. The significance level was set to 0.05.

### 3.6. Ethical considerations

The study was conducted in accordance with the Helsinki Declaration (World Medical Association, 2013). Participants received written

information about the study in advance, highlighting that participation was voluntary and that their anonymity and confidentiality would be maintained. The study received approval from the Norwegian Agency for Shared Services in Education and Research (Reference number: 210976). Certain units required an official study permit from the hospital administration, and in these cases the approval was obtained beforehand.

Participants had the option to enter a voluntary draw for gift cards. Those who chose to participate in the draw provided an email address as contact information. This email address could not be linked to their responses in the survey.

This report was written following the STROBE guidelines for reporting cross-sectional studies (von Elm et al., 2007), and in accordance with the International Committee of Medical Journal Editors' Recommendations for the Conduct, Reporting, Editing and Publication of Scholarly Work in Medical Journals (2024).

## 4. Results

### 4.1. Sample characteristics

Table 1 presents the characteristics of the participants. A total of 178 critical care nurses answered the survey. The mean age of respondents was 44 years (SD 9.2, min 27, max 65), and 85 % of the respondents were female. Participants' work experience ranged from 3 to 40 years (mean 18.9, SD 8.6), and experience in mentoring students from 1 to 35 years (mean 13.5, SD 8.6). Participants were from all four regional healthcare regions in Norway, with most participants from the South-East region. A bit less than half (42 %) of the participants worked at a local hospital, and the rest worked at university hospitals. The vast majority (87 %) of the participants had a Norwegian specialist education in critical care nursing, 10 % had a specialisation in another field of nursing, and 28 % had a master's degree in nursing.

One third (33 %) of the respondents had formal mentoring education, mainly in the form of a 10 ECTS credits course. Over half (55 %) of the participants had informal mentoring education. Formal and informal mentoring education were not mutually exclusive, and participants could have both types of education. Every fifth (19 %) of the participants had both formal and informal mentoring education, and around one

**Table 1**  
Characteristics of participants.

Characteristic	(n = 178)		
	n	%	
Gender	Female	151	85
	Male	27	15
Education	Critical care specialisation, yes	155	87
	Critical care specialisation, no	23	13
	Other specialisation, yes	18	10
	Other specialisation, no	160	90
	Master in nursing, yes	50	28
	Master in nursing, no	128	72
Region	North	38	21
	Middle	35	20
	West	32	18
	South-East	70	39
Type of hospital	Missing	3	2
	Local	74	42
	University	104	58
	Within 6 months	86	48
Latest mentoring experience	6–12 months ago	69	39
	1–2 years ago	10	6
	>2 years ago	13	7
Mentoring education	Formal mentoring education, yes	58	33
	Formal mentoring education, no	120	67
	Informal mentoring education, yes	98	55
	Informal mentoring education, no	80	45

**Table 2**  
Level of mentoring competence.

	Mean (SD)	Low-level (<2.50) n (%)	Middle-level (2.50–3.49) n (%)	High-level ( $\geq$ 3.50) n (%)	Cronbach's alpha
Mentoring practices in the workplace (6 items)	3.46 (0.52)	6 (3)	64 (36)	108 (61)	0.894
Mentor characteristics (7 items)	3.68 (0.33)	1 (1)	44 (25)	133 (75)	0.773
Motivation of the mentor (5 items)	3.60 (0.47)	7 (4)	51 (29)	120 (67)	0.816
Goal-oriented mentoring (6 items)	3.43 (0.48)	7 (4)	66 (37)	105 (59)	0.841
Reflection during mentoring (6 items)	3.78 (0.31)	0 (0)	23 (13)	155 (87)	0.813
Student-centered evaluation (9 items)	3.29 (0.49)	12 (7)	98 (55)	68 (38)	0.881
Constructive feedback (4 items)	3.33 (0.42)	3 (2)	90 (51)	85 (48)	0.617

All scales measured on Likert scale from 1 (lowest) to 4 (highest).

SD = standard deviation.

third (30 %) had neither. Half (48 %) of the respondents had mentored a student in the last six months, and a total of 87 % had mentored within the last year.

#### 4.2. Mentoring competence

Table 2 presents results on mentoring competences in general and divided into levels of competence. Participants evaluated their mentoring competences generally good. In three competence dimensions the average was high (i.e. dimension score  $\geq$  3.50), and the *reflection during mentoring* dimension had the highest score. In the four other dimensions the average was in the high end of middle-level competence (i.e. dimension score 2.50–3.49), with *student-centered evaluation* having the lowest average score. There were none to few participants who evaluated their own competences low (i.e. dimension score < 2.50) in any dimension.

#### 4.3. Mentoring competence profiles

Three distinct profiles were identified from self-reported mentoring competences. Table 3 presents those profiles, along with their respective competence dimensions and background variables. The groups had a statistically significant difference in all the competence dimensions ( $p < 0.001$ ). Effect sizes were calculated to measure the magnitude of differences between the groups. Cohen's  $d$  values (presented in a Supplementary file) ranged from 0.23 to 0.88. The largest differences were observed between profiles A and C. The effect sizes between profiles A and B, as well as between profiles B and C, were categorized as small ( $\geq 0.20$ ) to medium ( $\geq 0.50$ ). Between profiles A and C, the effect sizes ranged from medium ( $\geq 0.50$ ) to large ( $\geq 0.80$ ).

Profile A had the highest self-reported mentoring competence. They reported the highest competence in *reflection during mentoring* and the lowest competence in *constructive feedback*, although they reported high ( $\geq 3.50$ ) average competence in all dimensions. The average age in Profile A was 45 years, and they had an average of 20 years of work experience and 14 years of mentoring experience. Half of them had mentored a student within the last six months, and over 90 % within the last year. Almost half had formal mentoring education, and 60 % had informal mentoring education. Around 30 % had a master's degree in nursing. Half of the participants included in the Profile A worked at a local hospital, and half worked at a university hospital.

Participants in Profile B reported high ( $\geq 3.50$ ) average competence in three dimensions: *mentor characteristics*, *motivation of the mentor*, and *reflection during mentoring*. Competence in all other dimensions was reported as middle-level (2.50–3.49), with *student-centered evaluation* having the lowest average score. They had an average age of 43 years, and in average 18 years of work experience, and 14 years of mentoring experience. Around 40 % had mentored a student within the last six months, and a total of 80 % within the last year. One in four had formal mentoring education, and a bit over half had informal mentoring education. A bit less than 30 % had a master's degree in nursing. Around one third worked at a local hospital, and two thirds at a university hospital.

Participants in Profile C evaluated their mentoring competences as

the lowest. The average reported competence in all competence dimensions was middle-level (2.50–3.49), with the highest score in *reflection during mentoring* and the lowest in *student-centered evaluation*. The group had an average age of 42 years, an average of 17 years of work experience, and 12 years of mentoring experience. Over half had mentored a student in the last six months, and 90 % within the last year. In this group, 14 % had formal mentoring education, and a bit less than half had informal mentoring education. Around 30 % had a master's degree in nursing. A bit less than 30 % worked at a local hospital, and a bit over 70 % worked at a university hospital.

Having formal mentoring education differed between the three profiles (Fischer Exact Test 12.128,  $p = 0.002$ ). Multinomial logistic regression analysis using profile group as a dependent variable and all categorical background variables as covariates also showed only formal mentoring education as a statistically significant predictor between groups. The total model fit had Chi-Square of 27.259 ( $p = 0.018$ ), and in the Likelihood Ratio Test only formal mentoring education had significant effect (Chi-Square of 8.71,  $p = 0.013$ ). Parameter estimates showed that the Profile A was more likely to have formal mentoring education compared to the Profile C ( $B = -1.546$ ,  $p = 0.012$ ), but not compared to the Profile B ( $B = -0.683$ ,  $p = 0.077$ ). Other background variables were not statistically significantly different between Profile A and B or Profile A and C. Profiles B and C did not have any statistically significant differences in a multinomial logistic regression model based on the background variables.

#### 4.4. Willingness to participate in mentoring education

Almost all participants (93 %) agreed, to at least some extent, that they needed more competence in mentoring students. Almost as many (91 %) wished to participate in a mentoring course. A significant proportion of the participants (83 %) wished to participate in a mentoring course only during work time (Table 4).

Participants who had prior formal mentoring education scored higher than those without formal mentoring education, when asked if they needed more competence in mentoring (Fisher's Exact Test: 14.256,  $p = 0.001$ ), but not in the two questions concerning the desire to participate in a mentoring course (Fisher's Exact Test: 4.128,  $p = 0.236$ , and 6.665,  $p = 0.071$  respectively). In all participants, having informal mentoring education did not have a significant relation in the responses to any of these questions (Fisher's Exact Test: 4.787,  $p = 0.154$ ; 4.457,  $p = 0.181$ , and 5.368,  $p = 0.125$  respectively). The different participant profiles A, B and C did not differ significantly in their responses to any of these questions (Fisher's Exact Test: 8.955,  $p = 0.123$ ; 7.895,  $p = 0.193$ ; 3.480,  $p = 0.757$  respectively).

Multinomial regression models, which used the responses to these three questions as dependent variables and all categorical background variables as covariables, were unable to identify predictors for answers to questions about willingness to participate in mentoring education.

## 5. Discussion

The aim of this study was to assess the competence of Norwegian

**Table 3**  
Mentor profiles.

Characteristics	Profile A (n = 84)	Profile B (n = 65)	Profile C (n = 29)	p value		
Age, years (SD)	45 (9.07)	43 (9.09)	42 (10.03)	0.307	*	
Gender, %	Female	89	79	86	0.199	#
	Male	11	21	14		
Work experience, years (SD)	20 (8.54)	18 (8.62)	17 (8.68)	0.218	*	
Region, %	North	12	31	28	0.104	#
	Middle	23	17	18		
	West	18	15	25		
	South-East	46	37	29		
Type of hospital, %	Local hospital	50	37	28	0.067	#
	University hospital	50	63	72		
Mentoring experience, years (SD)	14 (8.52)	14 (8.57)	12 (9.29)	0.627	*	
Last time mentoring, %	Within 6 months	54	39	55	0.377	#
	6–12 months ago	38	42	35		
	1–2 years ago	4	9	3		
	>2 years ago	5	11	7		
Formal mentoring education, %	Yes	45	25	14	0.002	#
	No	55	75	86		
Informal mentoring education, %	Yes	60	55	45	0.373	#
	No	40	45	55		
Master's degree, %	Yes	29	28	28	1	#
	No	71	72	72		
Competence dimensions, mean (SD)						
Mentoring practices in the workplace	3.73 (0.39)	3.35 (0.42)	2.93 (0.56)	<0.001	*	
Mentor characteristics	3.84 (0.20)	3.67 (0.28)	3.24 (0.33)	<0.001	*	
Motivation of the mentor	3.80 (0.27)	3.65 (0.37)	2.90 (0.48)	<0.001	*	
Goal-oriented mentoring	3.76 (0.26)	3.29 (0.38)	2.79 (0.38)	<0.001	*	
Reflection during mentoring	3.95 (0.09)	3.79 (0.24)	3.29 (0.33)	<0.001	*	
Student-centered evaluation	3.69 (0.25)	2.99 (0.31)	2.75 (0.36)	<0.001	*	
Constructive feedback	3.56 (0.32)	3.25 (0.38)	2.89 (0.34)	<0.001	*	

SD = standard deviation; \*Kruskal-Wallis test; #Fischer's exact test.

critical care nurses in mentoring students during practical studies in the ICU. The participants rated their competences as relatively high across all measured dimensions, with the mean score exceeding 3.50 in three dimensions on a scale from 1 to 4. No previous studies have assessed mentoring competences in critical care nurses in other countries, but our results align with findings from registered nurses in Norway and Finland (Linnerud et al., 2024; Tuomikoski et al., 2018b) and is slightly higher than in Italy (Comparcini et al., 2020). One study has linked a lower level of nursing education with lower self-reported mentoring competences (Mikkonen et al., 2022), and one reason for the high average scores in this study may be related to the fact that undergraduate nursing education in Norway is at the bachelor's level, and the critical care nursing specialisation is currently at the master's level. It is also possible that critical care nurses with a greater interest in mentoring were more likely to participate in this survey.

The participants reported the highest self-reported competence in the dimension of *reflection during mentoring*. This finding aligns with the previous studies from Norway and Finland (Linnerud et al., 2024; Tuomikoski et al., 2018b). Reflection is widely regarded as an essential tool in learning within clinical practice (Gonczy, 2013; Mukhalalati and Taylor, 2019), and it is encouraging that the participants report that they feel competent in this important part of their mentoring role.

There were generally few participants who reported low competences in any of the competence dimensions. The lowest mean score was in *student-centered evaluation*, which is the same dimension that Finnish nurses also reported as their weakest (Tuomikoski et al., 2018b). Assessment can be viewed as a complex aspect of mentoring both undergraduate nursing students (Ford et al., 2016; Immonen et al., 2019) and in post-graduate critical care nursing studies (Øvrebø et al., 2022). Assessing a student's clinical practice is not always straightforward, and these results emphasise the complexity of the task.

Three competence profiles were identified in this study, and the only factor distinguishing the groups was whether they had received formal mentoring education, with the group reporting the highest mentoring

competences being significantly more likely to have formal mentoring education. An international study by Mikkonen et al. (2022) has similarly shown a connection between formal mentoring education and nurses' mentoring competence, and a recent review has concluded that formal mentoring education has a positive effect on nurses' mentoring competence (Keinänen et al., 2023). While it might seem obvious that formal mentoring education would have a positive effect on mentoring competences, we also inquired about participants' engagement in some form of informal mentoring education. Informal mentoring education did not have any connection with mentoring competences in this study. The differences in the competence profiles, such as the fact that the two lowest-scoring profiles (B and C) had the lowest average scores in the dimension of *student-centered evaluation*, can be used when developing personalised educational interventions to enhance mentor-student interaction and student-centeredness in learning.

In this study, the participants' age, work experience, and mentoring experience were not related to mentoring competences. This could suggest that mentoring competence is distinct from critical care nurse's clinical competence, which would be consistent with an idea that an expert in one field can be a novice in another (Benner, 1984). A larger international study that used the Mentors' Competence Instrument in registered nurses found higher self-reported mentoring competence among older participants with more work experience (Mikkonen et al., 2022), but the study did not report the isolated effects of these factors independent of others.

Almost all participants in this study reported that they needed more competence in mentoring students, and wished to attend to a mentoring course, irrespective of any previous mentoring education they had received. The European guideline on nurse mentors' competence development recommends ongoing mentoring education for nurse mentors (Oikarainen et al., 2021). In the UK, nurse mentors are provided with continuous education in student supervision and assessment (Duffy and Gillies, 2018), and a systematic review also recommends ongoing education of nurse mentors (Tuomikoski et al., 2020a). In Norway, the

**Table 4**  
Need for competence development.

	Fully disagree, n (%)	Disagree to some extent, n (%)	Agree to some extent, n (%)	Fully agree, n (%)	Mean (SD)
I have a need for more competence in mentoring students	2 (1)	11 (6)	69 (39)	96 (54)	3.46 (0.66)
I wish to participate in a course on mentoring students	2 (1)	15 (8)	53 (30)	108 (61)	3.5 (0.70)
I wish to participate in a course on mentoring students only in the work time	3 (2)	27 (15)	57 (32)	91 (51)	3.33 (0.79)

All scales measured on Likert scale from 1 (lowest) to 4 (highest). SD = standard deviation.

national model for formal mentoring education comprises studies worth 10 ECTS credits but does not specify continuous education after the course (Universities Norway, 2018), and this could be seen as a challenge as no further requirement for continuous education is deemed necessary.

The European guideline for nurse mentors' mentoring competence development (Oikarainen et al., 2021) presents an evidence-based approach to organising mentoring education and development for registered nurses. The learning outcomes of this guideline align with the Norwegian learning outcomes for mentoring education for health professionals (Universities Norway, 2018), as well as with the experiences of mentors and students in advanced practice settings (Lee et al., 2023; McQueen et al., 2018). Although there are no specific studies conducted in ICU settings, we argue that the European guidelines for the development of nurses' mentoring competence are also applicable to critical care nurses.

Eight out of ten participants in our study wanted to take part in a mentoring course only if it happened during work time. In forming of the Norwegian national guidelines for mentoring education, the topic of how the system is financed was also raised (Universities Norway, 2018). This topic is still to be resolved, and meanwhile the participants usually take this course in their free time without getting any financial incentives. We did not find any reports on how mentoring education is practically organised in other countries.

The practical placements are organised similarly across the Norwegian specialisations in anaesthesia, critical care, and operating room nursing. Therefore, we argue that many findings from this study could potentially be generalized to those study programs. However, new studies must be conducted to confirm this argument.

## 6. Limitations

A standardised instrument, the Mentors' Competence Instrument, which has been validated in several contexts, was utilised in this study. However, it is not known how well the self-reported competences align with competences that are tested or observed, and therefore, the results must be interpreted with caution. The results can be used to compare relevant groups and to measure change over time. The Mentors' Competence Instrument has been shown to be sensitive to changes in mentoring competences (Oikarainen et al., 2022; Tuomikoski et al., 2020b).

In this study, the Cronbach's alpha value for the *constructive feedback* dimension was 0.617, for the *mentor characteristics* dimension it was 0.773, and for the others, it was over 0.800 (see Table 2). Acceptable values typically range from 0.700 to 0.950 (Tavakol and Dennick, 2011). Lower values may result from a small number of items in the scale or the novelty of the scales (DeVon et al., 2007). Previous studies utilising the Mentors' Competence Instrument (Linnerud et al., 2024; Mikkonen et al., 2020; Tuomikoski et al., 2018b) have reported adequate internal consistency. *Constructive feedback* dimension consists of only four items, which could affect the internal consistency. Nevertheless, none of the individual items had a significant effect on the Cronbach's alpha for this dimension in this study. This issue should be taken into consideration when interpreting the findings of this study, as well as in future research.

As it is not known how many critical care nurses mentor students in ICUs in Norway, it was not possible to calculate response rate in this study. Based on the total population of critical care nurses in Norway it is estimated that the response rate was approximately 10 %. Despite the low response rate, the competence profiles formed were statistically significantly different, and the effect sizes in these analyses were adequate. Several factors introduced selection bias (Bethlehem, 2010) in this study. Firstly, low response rate itself introduces a question of non-observation error. It is possible that critical care nurses who were more interested in the topic were more likely to participate in this study. It is also theoretically possible that others than critical care nurses participated in the survey via an open invitation in the social media. The invitation was, however, only published in the Norwegian Critical Care Nurses' Association's Facebook and Instagram pages, and the inclusion criteria were emphasised in the invitation letter.

Low response rates are a common problem in online surveys (Shiyab et al., 2023). Recruiting participants by contacting the ICUs proved to be challenging. Despite several attempts, only 22 out of the 51 contacted ICUs forwarded the survey to their employees. The reasons why some units did not respond are unknown, but the recruitment strategy could have been more rigorous. The survey was also advertised on the social media platforms of the Norwegian Critical Care Nurses' Association and at a national critical care nursing conference. To enhance the response rate, participants were offered the chance to take part in a drawing for gift cards, and just under half of the survey participants entered the draw.

## 7. Conclusions

The results of this study show a significant relationship between formal mentoring education and higher self-reported mentoring competence among Norwegian critical care nurses. However, this study did not test or observe how well self-reported competences correlate with actual performance in mentoring situations. Several factors, such as the physical environment, organisational culture, and psychosocial factors, influence students' learning in clinical environments. Nonetheless, the personal mentoring competence of critical care nurses plays a significant role in this dynamic.

Formal mentoring education with continuous competence development is recommended for all critical care nurses who mentor students in practical studies. Employers should facilitate mentoring education in collaboration with educational institutions to enable critical care nurses to receive mentoring education during work hours. Employers should also establish a system for continuous mentoring competence development.

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## CRedit authorship contribution statement

**Matias Rasi:** Writing – original draft, Project administration, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Tove A. Hanssen:** Writing – review & editing, Funding acquisition, Formal analysis, Conceptualization. **Bente Norbye:** Writing – review & editing, Funding acquisition, Conceptualization. **Kristina Mikkonen:** Writing – review & editing, Formal analysis, Conceptualization. **Monica E. Kvande:** Writing – review & editing, Funding acquisition, Conceptualization.

## Declaration of Generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used the proprietary API for ChatGPT version 4.0 developed by UiT The Arctic University of Norway in order to improve the language and readability of the manuscript. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

## Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Editor in Nurse Education Today - Kristina Mikkonen If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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