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The Quality of the Clinical Learning Environment among nursing students experiencing delayed graduation: a secondary analysis

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Abstract

Introduction. A large body of evidence has highlighted the importance of a supportive clinical learning environment and mentorship. However, little is known about how these may contribute to delays in graduation. This study aims (a) to describe the perceived clinical learning quality among nursing students experiencing delayed graduation and (b) to explore whether it differs according to the preceptorship model reported by the student.

Design. A cross-sectional study was conducted based on a secondary analysis of data from a multi-campus cross-sectional study.

Methods. A convenience sample of undergraduate nursing students was recruited from several campuses of the same university located in different cities in Central Italy. Students were considered eligible if they had regular administrative status, were delaying graduation, and had completed an internship before data collection. Students' perceptions of clinical learning quality were measured using the Clinical Learning Quality Evaluation Index. Reported preceptorship models were classified as continuous or discontinuous. Independent samples t-tests were used to compare Clinical Learning Quality Evaluation Index scores between groups. Crude and multivariable linear regression models, adjusted for relevant sociodemographic covariates, were then estimated to assess whether the association persisted after accounting for potential confounding.

Results. A total of 282 nursing students were enrolled. The overall score on the Clinical Learning Quality Evaluation Index was 1.84 out of 3 (± 0.79). Quality of the learning environment (2.03 ± 0.88) and Safety and quality of care (2.07 ± 0.79) factors showed highest scores. The Self-directed learning (1.49 ± 1.02) and the Quality of tutorial strategies (1.58 ± 0.98) factors showed lowest scores. Significant differences emerged between students who reported supervision under a continuous preceptorship model and those who reported a discontinuous model. These associations remained statistically significant after adjustment for sociodemographic covariates.

Conclusions. Nursing students experiencing delayed graduation reported lower perceived clinical learning quality than that described in previous literature involving regularly progressing students, particularly in the domains of tutorial

strategies and self-directed learning. Moreover, in the reported continuous preceptorship model, the preceptorship relationship was consistently linked to more favorable perceptions of the clinical learning environment, highlighting the potential relevance of stable supervisory models for academically vulnerable students, although causal interpretations should be made with caution.

Keywords. Clinical rotation; Delayed graduation; Nursing education; Nursing students; Secondary analysis.

Background

Nursing education encompasses both theory and practice. The theoretical component involves classroom and laboratory instruction, while practical training occurs during internships, in which students develop competencies and skills and integrate theory with practice in a clinical learning environment [1].

The clinical learning environment is considered to be an interactive network of stakeholders, comprising the healthcare team, the patients, and their caregivers on one side and the clinical supervisor/nurse teacher/preceptor on the other [2]. A supportive clinical learning environment helps nursing students to develop psychomotor, cognitive, and affective skills to achieve the expected professional competencies for delivering high-quality nursing care [3]. Therefore, to attain the expected learning outcomes, nursing students should be immersed in environments capable of facilitating the learning process, encompassing clinical judgement, decision making and critical thinking [4], and fostering a culture of tolerance of faults and mistakes [5].

Conversely, an unsupportive clinical environment adversely affects learning outcomes [6], increases attrition rates among students [7], and contributes to nursing shortages [8]. A recent meta-analysis reported nursing program attrition

rates ranging from 5.7% to 35.5% [9]; meanwhile, the World Health Organization (WHO) [10] estimates a global shortage of approximately 4.5 million nurses, emphasizing the urgent need to address attrition to mitigate its impact on the healthcare workforce. Therefore, a supportive clinical environment is essential to promote learning, particularly for underperforming and/or unsuccessful students [11]. Among these students, a negative clinical experience can further increase attrition and academic failure [12].

The significance of the relationship between the preceptor and the students has been widely acknowledged among the various factors affecting the quality of the clinical environment. Clinical preceptorship involves a formal pedagogical relationship between a practising healthcare professional (the preceptor) and a new graduate or student within a clinical setting [13]. The learning process is facilitated through timely feedback provided by the preceptor, preferably in a one-to-one relationship [14], combining practical teaching, ongoing assessment, and support [15]. The preceptor enables the student to evaluate, reflect on, and act on their clinical experiences, thus developing the necessary competencies to integrate effectively into the healthcare team [16] and mitigate avoidable stress [17]. Given its significance, all instruments evaluating the quality of the clinical environment as perceived by students consider, among other factors, the quality of the preceptorship relationship [18].

A continuous relationship between students and preceptors has enhanced the quality and quantity of supervision, clinical teaching, and feedback [19]. Consequently, ensuring continuity in the preceptorship model by exposing students to the same nurse during clinical rotations may promote better learning outcomes. However, in various units both in the pre- and post-pandemic era, ensuring

continuity in this relationship has been challenging due to the increased frailty of nursing and healthcare systems (e.g., high turnover ratios and urgent deployments across units) [20].

To date, a large body of evidence has been accumulated regarding the importance of a supportive clinical environment [e.g. 21, 22-25] and the quality of preceptorship, providing evidence of their positive effects [26]. However, to the best of our knowledge, evidence has been provided regarding an unselected cohort of students engaged in their studies [27]. Moreover, little is known about students who have completed all required lessons but have not yet finished their exams and internship, which may contribute to delays in graduation. Expanding knowledge in this field may inform decisions regarding the most effective clinical environment and strategies to prevent delayed graduations; moreover, describing students' perceptions may help faculties to focus on their needs. Therefore, our aims were (a) to describe perceived clinical learning quality by nursing students experiencing delayed graduation and (b) to explore whether it differed according to the preceptorship model student reported.

Method

Study design

This is a secondary analysis of data collected from a multi-campus cross-sectional study involving undergraduate students who had not completed the nursing program within the expected timeframe (delayed graduation). The primary study was conducted across several campuses of Bachelor's degree program in Nursing in central Italy and aimed to explore aspects of the academic failure of nursing students delaying graduation, including moral distress and clinical learning quality. Specifically, the study focused on the cultural adaptation and psychometric

validation of the Italian version of the Moral Distress scale Nursing Students (It-ESMEE) [28]. Therefore, this secondary analysis was not part of the primary aim of the parent study and should be considered a post hoc analysis of variables already collected in the primary study.

The study complies with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for cross-sectional studies as reported in the **Supplementary Table 1 [29]**.

Setting and Participants

A convenience sample of undergraduate nursing students were recruited across several campuses belonging to the same university located in different cities. Students were considered eligible if they met the following criteria: (a) regular administrative enrollment status; (b) “delaying in graduation” defined as those students who had not successfully completed all examinations required across the years of the programme and therefore requiring an extended period of study beyond the expected duration (c) attendance of at least one clinical internship prior to data collection; and (d) provision of informed consent to participate in the study. Students with an inactive academic status for more than six consecutive months prior to data collection were excluded to ensure that participants were actively engaged in the academic pathway at the time of the study and to reduce heterogeneity related to prolonged academic disengagement unrelated to delayed degree completion.

Variables and data measurement

Delayed graduation

In Italy, each academic year includes both theoretical and clinical examinations. Students who do not pass all examinations required for a given year are not permitted to progress to the subsequent academic year, thus delaying their

graduation.

Sociodemographic Questionnaire

The sociodemographic characteristics (such as gender, age, living in, marital status, children, cohabiting with other students, working status, nursing career as the first choice, type of high school, relatives who work in the health system) were collected using a questionnaire developed specifically for this study.

Preceptorship model

To identify the preceptorship model, students were asked to indicate the professional figure who provided primary supervision and mentorship during their most recent internship placement. Participants' responses were classified in alignment with the following theoretical preceptorship models:

(a) *continuous preceptorship model*, in which students are supervised by a designated preceptor (registered nurse) responsible for defining clinical learning objectives, providing supervision, and evaluating students' performance with continuous feedback. In this model, students work the same shifts as their preceptor, who remains the same throughout the clinical placement, typically in a 1:1 ratio; and

(b) *discontinuous preceptorship model*, in which students are supervised by a registered nurse identified daily by the Nurse Manager. Consequently, these students have no continuity in their relationship with a preceptor. Clinical learning objectives, supervision, and feedback are based on daily performance and may vary between shifts, as the supervising nurse changes daily. This model is implemented when units lack sufficient nurse resources to dedicate a preceptor to a student.

Clinical Learning Quality Evaluation Index

Students' perception of *the clinical learning quality* was measured using the Clinical Learning Quality Evaluation Index (CLEQI) [24]. The CLEQI is a 22-item instrument assessing nursing students' perceptions of their clinical learning environment during internships. It comprises five factors: *Quality of tutorial strategies* (six items), *Learning opportunities* (six items), *Safety and nursing care quality* (four items), *Self-directed learning* (three items), and *Quality of the learning environment* (three items). Each item is scored on a 4-point Likert scale ranging from "nothing" (0) to "very much" (3), with higher scores indicating higher perceived quality of the learning environment. The CLEQI has demonstrated good psychometric properties, with confirmatory factor analysis indices showing a good fit (Comparative Fit Index = 0.966; Tucker-Lewis Index = 0.960; Root Mean Squared Error = 0.050; Standardized Root Mean Squared Residual = 0.028). The total scale showed a Cronbach's alpha of 0.95, and the factor-level alpha ranged from 0.82 to 0.93. Test-retest reliability was 0.866 [23, 24]. In the present study, Cronbach's alpha values were 0.95 for Quality of tutorial strategies, 0.93 for Learning opportunities, 0.89 for Safety and quality of care, 0.92 for Self-directed learning, 0.77 for Quality of the learning environment, and 0.97 for the overall scale.

Bias control

Selection bias was minimized by inviting all eligible students who met the inclusion criteria. Information bias was prevented through the training of RAs involved in data collection, the use of a validated instrument CLEQI, and the standardized data collection procedures. Confidentiality during the interviews was ensured to prevent social desirability bias.

Data collection

First, each campus had an academic coordinator who contributed to participant recruitment by emailing the students on their campus and sending three reminder emails at two-week intervals. After identifying eligible participants and sending the email invitation, research assistants (RAs) contacted the students by phone to explain the purpose of the study. Students who agreed to participate were subsequently scheduled for a standardized video-call session. Data collection was conducted through face-to-face interviews via video call with the support of RAs, each lasting approximately 30 minutes. To minimize potential power imbalances and social desirability bias, the RAs who conducted the interviews were not known to the participating students. All RAs received standardized training on study procedures, the informed consent process, and interview administration. Data collection was carried out between May and August 2020.

Data analysis

No missing data were observed among completed interviews; therefore, all data were included in the final analyses. To describe the sample characteristics, various descriptive statistics were utilized. These included measures of central tendency and variability, such as mean, standard deviation (SD). Additionally, frequencies and percentages were calculated to summarize categorical variables. To preliminarily assess comparability between students reporting discontinuous versus continuous preceptorship models, sociodemographic characteristics were compared using the independent samples t-test for continuous variables and the chi-square test for categorical variables.

CLEQI score was described by computing item-level and factors means. Then, the independent samples t-test was used to compare CLEQI scores between

preceptorship model groups (continuous vs discontinuous). Given the multidimensional structure of the CLEQI, inferential comparisons were primarily focused on the overall CLEQI score and its five factor scores, whereas item-level comparisons were considered descriptive and exploratory. To account for multiple testing across the CLEQI comparisons, Holm-Bonferroni correction was additionally applied. Prior to inferential analysis, the assumptions underlying the independent samples t-test were systematically evaluated. The independence of observations was ensured by the study design, as each participant belonged to one preceptorship model group only. The level of measurement assumption was addressed considering that, although CLEQI items are measured on a 4-point Likert (0-3), skewness and kurtosis values for all items were examined to assess the approximate normality of the distributions. The homogeneity of variances assumption was evaluated using Levene's test prior to each comparison; where appropriate, the Welch correction was applied. Additionally, measures of effect size (Cohen's *d*) were also reported. Values of < 0.20, 0.50, and 0.80 corresponded to small, medium, and large effect sizes, respectively [30]. To further examine whether the association between preceptorship model and CLEQI scores persisted after accounting for potential sociodemographic confounding, crude and multivariable linear regression models were estimated. In these models, CLEQI total score and each CLEQI factor score were entered separately as dependent variables, while the reported preceptorship model was entered as the main independent variable. Multivariable models were adjusted for age, gender, living condition, marital status, having children, cohabiting with other students, working status, nursing as first study choice, type of high school, and having relatives working in the healthcare sector. Regression coefficients (B), 95% confidence intervals (95% CI), p-values, and adjusted R² values

were reported.

The sample size used for this secondary analysis included all data collected on undergraduate nursing student study at the time of the analysis ($n = 282$). A post hoc estimation conducted with G*Power (v. 3.1.9.4) [31] indicated that the sample size was sufficient to provide a statistical power of $> 99\%$ to detect a medium effect size, with an alpha error of 0.05 (two-tailed). Statistical significance was determined at a p-value of $\leq .05$. All data analyses were performed using the Statistical Package for the Social Sciences, version 27.0.

Ethical considerations

Ethical approval was granted by the University Research Ethics Committee (Prot. 1/2020, University of Rome Tor Vergata, Italy). Informed consent was obtained from all participants prior to their start in the study. All procedures were conducted in compliance with the ethical standards established by institutional and national committees overseeing human research and adhered to the principles of the Declaration of Helsinki.

Results

Characteristics of the participants

A total of 340 students met the eligibility criteria and were invited to participate. Of these, 82.9% ($n=282$) completed the interview, with participants distributed across campuses (**Supplementary Material 2**). Participants had a mean age of 26.73 years ($SD = 4.43$; range 22–54) and were predominantly female (74.11%). Half of the students came from outside the region and lived in university accommodations (50.00%). Most participants did not have a partner (74.47%), did not have children (95.74%), and cohabited with other students (84.75%). The majority were not employed (58.51%), and nursing was the first choice of study for most of them

(79.08%). Secondary educational background was technical (38.65%) or scientific (25.89%), and 44.68% reported having relatives working in the healthcare system. Most students experienced a discontinuous preceptorship model during their clinical training (70.21%) (**Table 1**).

Table 1. Sociodemographic characteristics of the participants (N= 282)

Variables	N (%)
Gender (%)	
Female	209 (74.11)
Male	73 (25.89)
Age (mean, SD), <i>range</i>	26.73 (4.43), 22-54
Living in (%)	
The city	114 (40.43)
Out of the region (in accommodation in the city)	141 (50.00)
Commuter (travelling every day to reach the university)	27 (9.57)
Marital status (%)	
Without partner	210 (74.47)
With a partner	72 (25.53)
Children (%)	
No	270 (95.74)
Yes	12 (4.26)
Cohabiting with other students (%)	
No	43 (15.25)
Yes	239 (84.75)
Working status (%)	
No	165 (58.51)
Yes	117 (41.49)
Nursing as the first choice (%)	
No	59 (20.92)
Yes	223 (79.08)
Type of high school (%)	
Technical/professional	109 (38.65)
Scientific	73 (25.89)
Psycho-pedagogical	42 (14.89)
Linguistic	26 (9.22)
Literary	26 (9.22)
Artistic	6 (2.13)
Relatives who work in the health system (%)	
No	156 (55.32)
Yes	126 (44.68)
Reported preceptorship model (%)	
Discontinuous	198 (70.21)
Continuous	84 (29.79)

Legend. SD= standard deviation.

Clinical Learning Environment Quality Index items and factor scores

The overall scores obtained through the CLEQI were 1.84 out of 3 (± 0.79); the highest scores were in the *Quality of the learning environment* (2.08, ± 0.88), and

in the *Safety and quality of care* (2.07, $\pm$ 0.79) factors, while those with the lowest scores were in the *Self-directed learning* (1.49, $\pm$ 1.02) and in the *Quality of tutorial strategies* (1.58, $\pm$ 0.98) factors. Skewness and kurtosis indices were within acceptable ranges, supporting the assumption of approximate normality in the items scores (**Table 2**).

Table 2. The items scores of Clinical Learning Quality Evaluation among students with delayed graduation (n = 282)

CLEQI factors/items	Mean	$\pm$ SD	Skewness	Kurtosis
Quality of the tutorial strategies	1.58	0.98		
1. The preceptor explained to me the clinical thinking underlying the clinical decisions	1.62	1.01	-0.07	-1.09
2. The preceptor asked me questions to help me in clinical thinking	1.63	1.08	-0.20	-1.22
3. I had the opportunity to share with the preceptor emotions felt during the clinical experience	1.44	1.15	0.09	-1.42
4. The preceptor mediated my relationship with patients/family members in difficult situations	1.39	1.15	0.09	-1.43
5. The preceptor demonstrated enthusiasm in teaching me nursing practice	1.68	1.07	-0.23	-1.19
6. The preceptor's final evaluation was consistent with the feedback I received during the clinical experience	1.75	1.09	-0.29	-1.22
Learning opportunities	1.98	0.85		
7. I felt trusted	2.00	0.98	-0.57	-0.79
8. I was given the opportunity to perform interventions independently	2.11	0.90	-0.65	-0.55
9. I was given an adequate number of responsibilities	2.07	0.95	-0.72	-0.49
10. I was given the opportunity to express my opinions and critical reflections	1.90	0.99	-0.44	-0.90
11. I felt respected as a student	1.94	1.00	-0.47	-0.94
12. I felt encouraged during difficult situations	1.87	1.07	-0.44	-1.09
Safety and quality of care	2.07	0.79		
13. Nurses fulfilled a good standard of professional practice	2.12	0.88	-0.62	-0.56
14. Patients' safety was guaranteed in this context	2.13	0.90	-0.73	-0.39
15. Individual and safety devices were accessible	2.11	0.92	-0.79	-0.26
16. Nurses showed passion for the nursing profession	1.91	0.91	-0.42	-0.68
Self-directed learning	1.49	1.02		
17. I was offered meetings about my learning needs	1.49	1.02	-0.02	-1.18
18. I was stimulated to develop my self-learning plan	1.52	1.06	-0.03	-1.23
19. I was invited to perform a self-evaluation	1.46	1.06	0.00	-1.23
Quality of the learning environment	2.08	0.88		
20. This setting has been a good learning environment	2.08	0.88	-0.64	-0.56
21. Overall, I am satisfied with my clinical learning experience	2.07	0.92	-0.67	-0.47
22. I would like to consider this setting as a place to work as nurse	2.10	1.03	-0.73	-0.77
Overall CLEQI score	1.84	0.79		

Legend. SD: standard deviation.

Note. Clinical Learning Quality Evaluation Index (CLEQI) score: 0 = nothing, 3 = very much.

Comparison of sociodemographic characteristics according to reported preceptorship model

When comparing students according to the reported preceptorship model, the two groups were largely comparable across most sociodemographic characteristics. No statistically significant differences emerged with regard to gender, age, marital

status, having children, cohabiting with other students, working status, type of high school, or having relatives employed in the healthcare sector. A significant difference was observed only for living condition ($p = 0.047$): students reporting a continuous preceptorship model were more frequently from outside the region and living in accommodation in the university city (60.7% vs. 45.5%), whereas students supervised under a discontinuous model were more often residing in the city (44.9% vs. 29.8%). In addition, a non-significant trend was observed for nursing being the first study choice, which was slightly more frequent among students in the discontinuous preceptorship group (81.8% vs. 72.6%), **Table 3**.

Table 3. Comparison of sociodemographic characteristics according to reported preceptorship model.

Variables	Reported preceptorship model		P-value/chi-square
	Discontinuous (<i>n</i> = 198)	Continuous (<i>n</i> = 84)	
Gender (%)			
Female	149 (75.25)	60 (71.43)	0.503
Male	49 (24.75)	24 (28.57)	
Age (mean, SD), <i>range</i>	26.57 (4.33), 22-51	27.10 (4.65), 22-54	0.364
Living in (%)			
The city	89 (44.95)	25 (29.76)	0.047
Out of the region (in accommodation in the city)	90 (45.45)	51 (60.71)	
Commuter (travelling every day to reach the university)	19 (9.60)	8 (9.52)	
Marital status (%)			
Without partner	147 (74.24)	63 (75.00)	0.894
With a partner	51 (25.76)	21 (25.00)	
Children (%)			
No	192 (96.97)	78 (92.86)	0.118
Yes	6 (3.03)	6 (7.14)	
Cohabiting with other students (%)			
No	30 (15.15)	13 (15.48)	0.945
Yes	168 (84.85)	71 (84.52)	
Working status (%)			
No	121 (61.11)	44 (52.38)	0.174
Yes	77 (38.89)	40 (47.62)	
Nursing as the first choice (%)			
No	36 (18.18)	23 (27.38)	0.082
Yes	162 (81.82)	61 (72.62)	
Type of high school (%)			
Technical/professional	73 (36.87)	36 (42.86)	0.462

Scientific	55 (27.78)	18 (21.43)	
Psycho-pedagogical	32 (16.16)	10 (11.90)	
Linguistic	18 (9.09)	8 (9.52)	
Literary	15 (7.58)	11 (13.10)	
Artistic	5 (2.53)	1 (1.19)	
Relatives who work in the health system (%)			
No	112 (56.57)	44 (52.38)	0.518
Yes	86 (43.43)	40 (47.62)	

Note. SD, standard deviation.

Differences in Perceived Clinical Learning Quality According to Reported Preceptorship Model

Significant differences emerged between students who reported supervision under a continuous preceptorship model and those with a discontinuous model. In particular, the students who reported being supervised under a continuous preceptorship model perceived higher scores on the overall CLEQI score and across all factors compared with students who reported supervision under a discontinuous model. Among students who reported supervision under a continuous preceptorship model, the highest mean score was observed in the *Quality of the learning environment* factor (2.30 ± 0.79), whereas the lowest was found in the *Self-directed learning* factor (1.82 ± 0.93). In contrast, students who reported a discontinuous preceptorship model showed the highest scores in the *Quality of the learning environment* (1.99 ± 0.89) and *Safety and quality of care* factors (1.98 ± 0.80), while the lowest scores were obtained in the *Self-directed learning* factor (1.35 ± 1.03). Cohen's *d* values indicated small to moderate effect sizes across most CLEQI factors and items ($|d|$ range approximately 0.15-0.50) (**Table 4**). All significant crude differences observed across the five primary CLEQI comparisons remained statistically significant after Holm-Bonferroni adjustment for multiple testing. Detailed item-level comparisons are provided in **Supplementary Table 3**.

Table 4. The Clinical Learning Quality Evaluation Index differences between students who reported supervision under a continuous (n = 84) and the discontinuous (n = 198) preceptorship model.

CLEQI factors	Preceptorship model		<i>t</i>	<i>p</i> -value	<i>d</i> Cohen's [<i>CI</i> 95%]
	Discontinuous <i>n</i> = 198	Continuous <i>n</i> = 84			
	Mean ($\pm$ SD)	Mean ($\pm$ SD)			
Quality of the tutorial strategies	1.44 (0.95)	1.91 (0.96)	-3.774	0.001	-0.49 [-0.749 - 0.233]
Learning opportunities	1.89 (0.83)	2.17 (0.85)	-2.503	0.013	-0.33 [-0.582 - 0.069]
Safety and quality of care	1.98 (0.80)	2.25 (0.72)	-2.692	0.008	-0.35 [-0.607 - 0.093]
Self-directed learning	1.35 (1.03)	1.82 (0.93)	-3.562	<0.001	-0.46 [-0.722 - 0.205]
Quality of the learning environment	1.99 (0.89)	2.30 (0.79)	-2.624	0.009	-0.34 [-0.598 - 0.085]
Overall CLEQI score	1.73 (0.77)	2.09 (0.75)	-3.550	<0.001	-0.46 [-0.720 - 0.204]

Legend. SD, standard deviation, CI, Confidence interval

Note. Cohen's *d* was calculated as Discontinuous minus Continuous; negative values indicate higher scores in the continuous preceptorship group.

Crude and adjusted multivariable linear regression models examining the association between reported preceptorship model and CLEQI scores

To further examine whether the observed crude differences persisted after accounting for potential confounding, multivariable linear regression models were estimated with CLEQI total and factor scores as dependent variables. Covariates included age, gender, living condition, marital status, children, cohabiting with other students, working status, nursing as first study choice, type of high school, and having relatives working in the healthcare system. As shown in **Table 5**, students reporting a continuous preceptorship model consistently demonstrated significantly higher CLEQI scores than those reporting a discontinuous model, both for the overall index and for each specific CLEQI factor.

Table 5. Multivariable linear regression models

Outcome	Crude B (95% CI)	<i>p</i> -value	Adjusted B (95% CI)	<i>p</i> -value	Adjusted R ²
Overall CLEQI score	0.357 (0.159-0.554)	<0.001	0.342 (0.140-0.554)	<0.001	0.053
Quality of tutorial strategies	0.470 (0.225-0.715)	<0.001	0.436 (0.186-0.685)	<0.001	0.063
Learning	0.275 (0.059-	0.013	0.258 (0.035-	0.023	0.009

opportunities	0.491)		0.481)		
Safety and quality of care	0.273 (0.073-0.472)	0.008	0.285 (0.081-0.488)	0.006	0.035
Self-directed learning	0.464 (0.208-0.721)	<0.001	0.465 (0.207-0.723)	<0.001	0.080
Quality of the learning environment	0.297 (0.074-0.519)	0.009	0.277 (0.050-0.504)	0.017	0.033

Note. Crude B represents the unadjusted regression coefficient for the association between reported continuous preceptorship model and CLEQI scores. Adjusted B represents coefficients adjusted for **age, gender, living condition, marital status, children, cohabiting with other students, working status, nursing as first study choice, type of high school, and having relatives working in the healthcare system**. Discontinuous preceptorship was used as the reference category. Positive coefficients indicate higher CLEQI scores among students reporting a continuous preceptorship model.

Discussion

The study aimed to describe perceived clinical learning quality by nursing students experiencing delayed graduation and to explore whether it differed according to the preceptorship model as reported by students. This study is a secondary analysis of data originally collected within a broader investigation examining several aspects of the academic failure in undergraduate nursing students. The primary study highlighted that nursing students delaying graduation may experience relevant challenges during their educational and clinical training pathways, particularly in relation to moral distress and educationally complex situations encountered during clinical placements [28]. Previous research conducted by our group [32] has shown that only a minority of nursing students complete the program within the expected timeframe, while a substantial proportion remain enrolled but graduate later than scheduled.

A pedagogical atmosphere during clinical placement is known to exert a positive impact on learning outcomes among nursing students [33]. This effect is particularly pronounced when a student benefits from a one-to-one relationship [14] and experiences continuity in this relationship with their preceptor [19]. However, investigations to date have considered students undertaking their education as a whole, and no studies have measured the perception of the clinical environment

among students delaying graduation. From the methodological point of view, investigating students with delayed graduation is challenging; there is a need to approach them in an appropriate manner to prevent stigmatization and to ensure their freedom and privacy regarding their nursing education outcomes.

From the findings point of view, the characteristics of the participating students encompass several academic failure predictors that have already been documented in the literature [34]. Many of them attended a technical or professional secondary school, a factor recognised as increasing the risk of failure [32, 35]; nearly half were working alongside their nursing programme, another factor that increases the risk of failure due to the limited time devoted to study [36].

Overall, students reported positive perceptions of the clinical learning environment, with the highest scores observed for *Learning Opportunities*, *Safety and Quality of Care*, and *Quality of the Learning Environment*. Participants perceived that they were able to exercise responsibility and autonomy according to their level of competence, while the clinical setting was considered attentive to safety issues and supportive of a satisfactory learning experience. In contrast, the lowest scores were found for *Quality of Tutoring Strategies* and *Self-Directed Learning*. These dimensions are closely related to the expected role of preceptors, who are responsible for implementing effective tutoring strategies and fostering students' autonomous learning. Self-directed learning refers not only to students' ability to identify their own learning needs but also to their capacity to independently take action to achieve learning goals [37]. In the present study, students perceived limited opportunities to discuss their learning needs with preceptors, develop plans to address learning gaps, and engage in self-assessment followed by feedback discussions aimed at enhancing awareness of their clinical competence. Consistent

with these findings, tutoring strategies were also evaluated less positively. Previous research has demonstrated a positive association between clinical learning environments that promote self-directed learning and nursing students' competence development [38]. These findings suggest that preceptors should be better equipped to support students' autonomous learning processes, given their impact on educational outcomes. This requires adequate preparation in teaching methodologies, supervision skills, and pedagogical competencies [39].

The overall CLEQI score observed in our study (1.80) was lower than those reported by Gonnella et al. [21, 22] (1.97 and 2.02, respectively). Notably, only students supervised through the continuous preceptorship model achieved an overall score (2.09) comparable to those studies. Nevertheless, these comparisons should be interpreted with caution, as the studies by Gonnella et al. [21, 22] involved students with regular academic progression, whereas our sample differed in several characteristics that may have influenced perceptions of the learning environment.

Significant differences were observed between students reporting supervision under a continuous preceptorship model and those reporting a discontinuous model; students who reported being supervised under a continuous preceptorship model appeared to perceive higher quality of clinical learning. More importantly, these differences remained statistically significant even after controlling relevant sociodemographic characteristics, suggesting that the observed association was not merely attributable to differences in students' background profiles. Although the adjusted models showed statistically significant associations, the adjusted R^2 values were low, indicating limited explanatory power. Therefore, the reported preceptorship model should be interpreted as one relevant correlate of perceived clinical learning quality rather than as a comprehensive explanation of students'

evaluations.

A supervisory model based on nurses identified on a daily basis may expose students to fragmented guidance, inconsistent feedback, and reduced pedagogical continuity throughout the clinical placement, all conditions that may weaken the perceived quality of the learning experience [19]. In parallel, the nursing education literature has consistently emphasized the importance of supportive and satisfying educational environments in sustaining students' engagement and persistence throughout the academic pathway [40, 41].

Finally, although causal conclusions cannot be drawn, the results may suggest that continuity of tutoring could represent a relevant organizational lever for improving the clinical training experience of students experiencing delayed graduation. However, in our study, since students were not randomly allocated to preceptorship models or clinical placements, observed differences may partly reflect contextual characteristics of the placement environment rather than the reported preceptorship model alone.

Limitations

This study has several limitations. First, the cross-sectional design does not allow causal inferences; therefore, the observed associations should be interpreted as descriptive and exploratory. A longitudinal design would be required to clarify the directionality and temporal stability of the findings.

A further limitation is that all participants were students who had experienced a delay in their academic progression: comparative studies including students progressing on time would further clarify similarities and differences between groups. In addition, detailed information regarding the duration and main causes of the delay (e.g., examinations, clinical internships, or both), as well as the temporal

relationship between delayed status and the most recent clinical placement, was not available. Moreover, whether the most recent clinical placement occurred before or after the onset of the delay was not systematically recorded. These limitations related to the secondary nature of the analysis, may limit the interpretability of the findings.

Furthermore, students were asked to evaluate the quality of their most recent clinical placement; consequently, the findings may have been affected by recall bias [42]. Although the association between the preceptorship model and CLEQI scores remained significant after adjustment for several sociodemographic covariates, residual confounding due to unmeasured clinical placement or institutional characteristics cannot be excluded.

The preceptorship model was retrospectively classified based on students' self-reported supervision experience and was not independently verified by nurse educators or nurse managers. Although the preceptorship model was defined at the institutional level, reliance on students' retrospective reports may have introduced misclassification bias, as actual supervisory arrangements may be more complex than a binary categorisation suggests. In addition, the non-random allocation of students to clinical settings may have introduced residual confounding. Clinical placement data such as unit type, workload, staffing levels, and prior clinical experience were not available for adjustment and may partly explain the observed differences.

Therefore, the observed differences may partly reflect contextual characteristics of the placement environment rather than the preceptorship model alone. In addition, although data collection was conducted through structured

interviews supported by trained RAs, some degree of misclassification cannot be entirely excluded.

Implications for practice

These findings may offer useful insights for reflecting on how clinical placements should be organized for students experiencing delayed graduation. In particular, continuity in the supervisory relationship is associated with more favourable perceptions of the clinical learning environment; Therefore, universities and clinical units may consider whether more stable supervisory model, together with targeted support for preceptors in tutoring strategies and the promotion of self-directed learning, are feasible in supporting students academically vulnerable.

Understanding perceptions of the clinical learning environment may contribute to refining educational strategies aimed at supporting students in achieving their learning objectives. For students experiencing difficulties in completing their programme, careful allocation to clinical learning units may help reduce additional barriers that could negatively affect their learning experience. In addition, preceptors may benefit from targeted training focused on effective tutoring approaches and strategies that foster self-directed learning.

A preceptorship model characterised by continuity in the supervisory relationship may be preferable in some contexts. In contrast, models involving frequent changes in supervising nurses may present additional challenges in maintaining educational continuity and supporting vulnerable students in achieving internship objectives. From the perspective of rotating supervising nurses, the absence of continuity may limit the development of an ongoing educational relationship, potentially affecting the quality of the educational experience. Therefore, universities, in collaboration with clinical settings, may further

strengthen preceptor preparation through continuing education programmes aimed at enhancing tutoring competence and supporting students, particularly those in vulnerable academic situations, through structured educational strategies and the promotion of self-directed learning.

Conclusions

Our study found that nursing students experiencing delayed graduation reported differences in perceived clinical learning quality according to the preceptorship model. Continuity in the supervisory relationship was associated with more favourable perceptions of the clinical learning environment; Overall, these results highlight the relevance of clinical supervision models and provide useful insights for informing educational strategies aimed at supporting preceptors in promoting effective tutorial approaches and in fostering self-directed learning, particularly among academically vulnerable students. However, findings should be interpreted cautiously in light of the limitations, while future prospective studies should aim at evaluating how supervision models affect the clinical experience of academically vulnerable nursing students.

Declarations

Abbreviations

CLEQI. Clinical Learning Quality Evaluation Index.

SD. Standard Deviation.

RA. Research Assistants.

STROBE. Strengthening the Reporting of Observational Studies in Epidemiology.

WHO. World Health Organization.

Ethics approval and consent to participate

The study was approved by the University Research Ethics Committee (Prot. 1/2020, University of Rome Tor Vergata, Italy). Informed consent was obtained from all participants prior to data collection.

Consent for publication

Not applicable. The manuscript does not contain any individual person's data.

Availability of data and materials

Dataset is available upon request from the authors.

Competing Interests

The authors declare no competing interests.

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Author's contributions

Conceptualization, R.M., F.S, R.A., E.V., A.P., G.B. and M.M.; methodology, R.M., F.S, G.B. and M.M.; formal analysis, R.M., M.M., F.S, and G.B.; investigation, R.M., F.S., V.Z, M.M. and G.B.; data curation, R.M., F.S., V.Z., G.B. and M.M.; writing—original draft, R.M, F.S., V.Z. and G.B; writing—review and editing, R.M., F.S., V.Z., M.M., E.V., R.A., A.P, and G.B.. All authors have read and agreed to the published version of the manuscript.

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