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Nursing students' interprofessional educational experiences in the clinical context: findings from an Italian cross-sectional study

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ABSTRACT

Objective To explore nursing students' interprofessional educational (IPE) experiences during their most recent clinical rotation and to explore the factors supporting IPE experiences.

Design National cross-sectional study on data collected in 2016.

Setting 95 Bachelor of Nursing Sciences programmes; 27 Italian Universities.

Participants Students who (a) were attending or just completed their clinical rotations lasting at least 2 weeks in the same unit, and (b) willing to participate in the study.

Primary and secondary outcomes First to measure the occurrence of IPE experiences in the most recent clinical rotation; the secondary outcome was to discover factors associated with IPE occurrence.

Measures The primary outcome was measured using questions based on a 4-point Likert scale (from 0='never' to 3='always'). Explanatory variables were collected at both individual and regional levels with items included in the same questionnaire.

Results 9607 out of 10 480 students took part in the study. Overall, 666 (6.9%) perceived not having had any IPE experience, while 3248 (33.8%), 3653 (38%) and 2040 (21.3%) reported having experienced IPE opportunities 'only a little', to 'some extent' or 'always', respectively. From the multilevel analysis performed using the generalised linear mixed model, factors promoting the occurrence of IPE experiences were mainly set at (a) the clinical learning environment level (high: learning environment quality, self-directed learning encouragement, learning opportunities, quality of safety and nursing care and quality of tutorial strategies); and (b) the regional level, where significant differences emerged across regions. In contrast, male gender was negatively associated with the perception of having had IPE experiences.

Conclusions A large number of nursing students experienced either 'never' or 'only a little' IPE opportunities, thus suggesting that nursing education tends to remain within the nursing profession. Limiting students' interprofessional exposure during education can prevent future collaborative approaches that have been shown to be essential in providing best patient care. In order to increase IPE exposure, it is necessary to develop strategies designed both at the singular unit and regional levels.

Strengths and limitations of this study

- This is the first study examining the extent and associated factors of interprofessional education (IPE) experiences among nursing students.
- This is a national study involving a large number of nursing programmes, thus potentially affecting the generalizability of the findings.
- This is the first multilevel study in this context aimed at identifying the complexity of factors influencing IPE opportunities.
- A cross-sectional design was adopted to measure the primary outcome and associated factors at the same time; therefore, factors emerged as predictors of IPE experiences should be considered with caution.
- Data affecting IPE opportunities, such as study programmes contents and healthcare professional profiles available at the unit level, were not collected.

INTRODUCTION

The need to increase proficiency in both healthcare and clinical pathways, especially with the ageing population, has been documented as requiring improved collaboration and team-based models of care delivery[1] with interprofessional teams being in the best position to ensure quality and safe care.[2] In this context, interprofessional collaboration (IPC), defined as the degree of cooperation between nursing staff and other healthcare professionals (HCPs), spans a range of key dimensions, including shared goals, team identity, commitment, clear team roles and responsibilities, interdependence and integration among team members.[3]

From the patient's point of view, IPC has been documented as enhancing

patient-centred and family-centred care, thus increasing patient-reported quality of care,[4] and preventing the occurrence of the most frequent adverse events.[5] From the HCPs' point of view, IPC has been documented as improving communication among caregivers, increasing opportunities for shared responsibilities and effective participation in multidisciplinary decision-making[6 7] resulting in increased HCPs' satisfaction and well-being.[8]

Because of its relevance, different strategies aimed at increasing IPC have been documented to date. Among others, interprofessional education (IPE), that is, the opportunity to attend theoretical modules, courses and/or clinical training together (=nursing students and students in other health professions) in undergraduate programmes, has been documented as effective in increasing future collaboration among HCPs.[9 10]

Nurses have been shown to play a strategic role in IPC implementation by cooperating with a wide range of HCPs in all settings.[11] Given their role in promoting and enhancing IPC in daily practice,[2] it has become imperative for universities to provide nursing students with interprofessional knowledge and competences.[7] Different policies[12 13] and evidence[14] have recommended that nursing students should be exposed early to IPE both at a didactic and clinical level. Thus, students who have been exposed to IPE can start their professional career and work effectively in a team[15 16]; moreover, implementing their views by comparing their data and clinical thinking with other disciplines has been documented as promoting problem-solving and critical thinking abilities.[17] On the other hand, when IPE experiences are poor or take place at the end of the nursing programme, the student's effectiveness as a member of a team after graduation can be significantly limited.[18]

Despite their relevance, IPE opportunities are not being regularly included in undergraduate programmes, and nursing students have reported only few opportunities to have meaningful contact with other HCPs during their education.[7] Nurses are often educated exclusively within their profession without having the chance to learn about other HCP roles and responsibilities.[7] As a consequence, students have been reported to be less proficient in teamwork competences[19] and in need of more support when starting their professional role requiring teamwork.[11] Factors threatening the integration of IPE opportunities in clinical training have been established at the (a) organisational level, such as the lack of institutional collaboration; (b) managerial level, such as barriers in changing practices; (c) practical level, as for example the lack of time and (d) at the cultural level such as different perceptions of teamwork, stereotyped behaviour and the potential risk of dominance for one profession—usually physicians—over the others.[20 21]

To date, despite its documented relevance, the degree of IPE opportunities experienced by nursing students has not been studied in large samples; above all, factors promoting IPE have not been identified at the national level where both national healthcare policies and HCP educational policies can have an influence in promoting IPE and, consequently, future HCPs' cooperation. Therefore, the purpose of this study was to cover the gap in the available evidence by exploring nursing students' IPE experiences during their clinical learning and factors promoting IPE experiences.

METHODS

Setting, study network and design

Nursing education in Italy is provided at the University level and the duration of the course is 3 years. Enrolment is allowed for candidates at the end of their secondary education, after having passed an examination based on a programme defined by the Italian law. Theoretical education is offered at the University level; clinical rotations are instead offered in the National Healthcare Services , after the first semester of the first year, and then in the second and in the third year for a total of 1800 hours of education. The average number of clinical rotations ranges from two to five/year. At the time of the study, there were 208 Bachelor of Nursing Sciences (BNS) degrees in 43 universities, located in the 20 Italian regions.

On a preliminary basis, an Italian network was formed with the aim of evaluating nursing students' clinical education quality at all degrees and different research lines were established. Specifically, an open offer was sent to all BNS degrees to participate in the research network with a summary of the study protocol.[22] After 2 months, the invitation was closed, and the network consisted of 27 universities with 95 BNS degrees located in 15 regions.[22] Thereafter, the nation-wide, cross-sectional study took place and the findings have been reported here according to the STrengthening the Reporting of OBservational studies in Epidemiology (STROBE).[23]

Participants

Eligible students were (a) attending a BNS degree belonging to the national research network; (b) attending their clinical practical rotations lasting at least 2 weeks in the same unit; or (c) had just completed their clinical rotation in the previous 2 weeks without having started a new rotation at the time of the survey and (d) willing to participate in the study after being informed about its aims.

Primary outcome, explanatory variables and instruments

The primary outcome of the study was the IPE occurrence as experienced by students. This was assessed through the following question included in the questionnaire: 'Did you experience IPE occasions during your most recent clinical rotation?' Aiming at ensuring consistency in concept interpretation, some concrete examples of IPE were included in the questionnaire, for example, working and/or learning at the bedside assessing patient needs; deciding clinical treatments with other HCPs, or with other students attending their education in different disciplines; participating in multiprofessional

meetings where integrated decisions are made. Participants were required to answer by using a 4-point Likert scale according to their experience: the possible answers were 0=*never*; 1=*only a little*; 2=*to some extent* and 3=*always, when the situation requires*. The concept of 'when the situation requires' was introduced at the end of each level of the Likert scale, aimed at helping students to rank the IPE occasions experienced as compared with those expected in the different circumstances of the specific clinical environment. The item was developed by the research team[22] and piloted to assess its clarity and understandability among 100 students and this data have not been considered in this report.

The explanatory variables were collected at the individual and regional levels:

- At the individual level: we collected sociodemographic data (eg, age, gender and marital status); previous secondary and academic education data; the academic year attended (first, second or third); the working experiences, both prior and during nursing education and the previous clinical rotation experiences attended (in number) and in which settings. With regard to their most recent clinical rotation, participants were asked: (a) its duration in weeks; (b) the supervision model adopted by the unit, that is, whether the student was under the supervision of a clinical nurse, the entire staff, a nurse identified by the head nurse, a nurse teacher or a head nurse; (c) the perceived degree of competences learnt (4-point Likert scale ranging from 0=*none* to 3=*very* much) and (d) the perceived quality of the learning processes as measured by the Clinical LEarning Quality Evaluation Index (CLEQI) tool.[24] The tool has been developed and validated at the national level for nursing programmes; because of its characteristics, it has been recommended as an essential tool to evaluate routinely each clinical rotation attended by students.[24] It is composed of 22 items divided into five factors, namely 'Quality of the tutorial strategies' (six items), 'Learning opportunities' (six items), 'Self-directed learning' (three items), 'Safety and nursing care quality' (four items) and 'Quality of the learning environment' (three items). Each factor, as well as the overall CLEQI score, can range from 0—'nothing' to 3—'very much', with higher scores indicating a higher quality of the learning processes enacted in the clinical setting as perceived by students.
- At the regional level: we recorded the region where the BNS degree attended by each participant students was offered. In fact, by law, nursing education is provided through lectures in academic settings, while clinical rotations take place in local healthcare organisations. Due to the federalisation of the healthcare system at the regional level,[25] Italy has different systems according to regional policies and rules that can affect nursing education.

After piloting the questionnaire with the purpose ensuring its feasibility and comprehensiveness, the data collection process was performed in the same period via paper and pencil or via Google Drive, according to local feasibility and resources.

Data analysis

The descriptive statistical analysis was performed by calculating frequencies and percentages, averages with SD or CIs at 95%. A bivariate analysis was performed, where the primary outcome was considered as a categorical variable forming four groups: students who experienced IPE opportunities as 'never', 'only a little', 'to some extent' and 'always'. χ^2 tests, analysis of variance and Kruskal-Wallis tests were used to explore the significant differences, if any, across groups.

On a preliminary basis, the intraclass correlation (ICC) was evaluated under fixed and random effect assumptions to identify cluster effects at different levels, specifically: (a) at the unit level attended by students during their clinical rotation, assuming that some units can offer specific IPE opportunities due to differences in culture and skill mix; (b) at the nursing programme level, assuming that BNS programme can have designed different strategies to promote IPE and (c) at the regional level, since Italian regions have developed different healthcare systems after reforms federalising healthcare, with different regional policies affecting the culture of teamwork collaboration in the clinical settings attended by students.[25] The ICCs at the unit level were 0.07 (random effects) and 0.06 (fixed effects); at the nursing programme level, they were 0.01 (both under random and fixed effects); and, at the regional level, they were 0.06 (random effects) and 0.03 (fixed effects), respectively, meaning that the possible alternative hierarchical structures were not relevant in the studied phenomenon.

Next, a multilevel analysis using the generalised linear mixed model was performed by calculating the OR (CI 95%) and the pseudo R^2. The primary outcome was entered in the model as a dichotomous variable by aggregating options given by students 'always' + 'some extent' versus those reporting 'only a little' + 'never'. The model specification included the variables significantly associated with the outcome at bivariate analysis as explanatory variables. All analyses were performed by using the SPSS Statistical Package V.24 and R Core Team.[26] Statistical significance was set at $p<0.05$.

Patient and public involvement

Patients and public were not involved.

Bias control

At the national level, several strategies have been promoted to ensure a large participation of BNS by sending an open call invitation at different times, usually 2 weeks apart, thus preventing selection bias. Information bias was prevented by standardising the information provided to local researchers identified as responsible for the data collection in each participating nursing programme and by providing students with a precise description of study

aims and data collection procedures on the first page of the questionnaire.

Aimed at preventing recall bias, students were invited to fill in the questionnaire during the last week of their clinical rotation or within 2 weeks from its end when they were not exposed to the next clinical rotation. Data were analysed by the coordinator centre (University of Udine) in a blind fashion to ensure anonymity in regard to the units, nursing programmes and regions numbered consecutively (eg, region 1). Moreover, students were free to participate in the survey without any pressure or incentives.

RESULTS

Primary outcome

Out of 10 480 eligible students, 9607 participated in the study. A total of 666 (6.9%) students reported never having been involved in IPE opportunities; 3248 (33.8%) reported experiencing 'only a little' opportunities; 3653 (38.0%) reported experiencing these opportunities 'to some extent'; while the remaining 2040 (21.3%) reported having 'always' experienced IPE, when required, during their most recent clinical rotation.

Bivariate analysis

At the individual level (table 1), students who reported no experiences of IPE were more often female (p<0.00), older (p=0.015), unmarried (p=0.032), with previous work experience (p=0.017) and with a greater number of previous clinical rotations exclusively in a hospital setting (p<0.001).

Specifically, with regard to the last clinical rotation, students who reported no IPE experiences attended a shorter duration clinical rotation (p=0.007) where they were more frequently supervised by the nursing staff (p<0.001) and reported having learnt less competences (p<0.001). They also reported lower average scores both in all factors (all p<0.001) and in the total CLEQI score (p<0.001; table 1). On the other hand, students who reported to have always experienced IPE were more often attending their third year (p<0.001) and were working during their nursing education (p=0.016; table 1).

At the regional level, 0.9% of students from region 2% and 13% from region 15 who were attending their nursing programmes reported no IPE experiences versus 8.7% of students in region 12% and 41.1% in region 2, who reported having always experienced IPE opportunities (table 1). A significant difference across Italian regions has emerged regarding the IPE experienced by students.

Factors affecting IPE

The multilevel analysis performed using the generalised linear mixed model showed an acceptable value for the pseudo R^2 of 15.1%.

At the individual level, rotations reporting a high-quality learning environment (OR=1.506, 95% CI 1.337 to 1.659), highly encouraged self-directed learning (OR=1.485, 95% CI 1.361 to 1.620) and offered higher learning opportunities (OR=1.408, 95% CI 1.242 to 1.597) all increased the likelihood of IPE occurrence. Moreover, an environment characterised by high safety and nursing care quality (OR=1.317, 95% CI 1.178 to 1.473), where high-quality tutorial strategies were offered (OR=1.196, 95% CI [1.066 to 1.341), and where students reported high competences learnt (OR=1.411, 95% CI 1.292 to 1.540) also promoted the likelihood of IPE occurrence. Male gender (OR=0.821, 95% CI 0.727 to 0.927) was instead negatively associated with IPE occurrence (table 2).

At the regional level, students attending a nursing programme in region 2 were approximately 1.75 times more likely to have experienced IPE opportunities as compared with those in region 1 (OR=1.746, 95% CI 1.119 to 2.726). On the other hand, students attending their nursing programmes in other regions (eg, regions 3, 4, 6, 7 and 15), reported a lower likelihood (OR from 0.554 to 0.716) of IPE occurrence as compared with region 1.

DISCUSSION

This study explored nursing students' IPE experiences and promoting factors during the clinical rotations at the national level. IPE has been considered an effective educational strategy to increase professional and collaborative competences, thus promoting IPC in the real context.[14 27 28] It has been recommended that teaching non-technical skills—such as teamwork—should be offered early to healthcare students in their undergraduate core curriculum as cooperation across different professions is pivotal in providing high-quality and safe care.[2 29] However, despite its wide recognition, Italian nursing students experienced a lack of interprofessional learning occasions, with 40.7% of them reporting 'never' to 'only a little' IPE opportunities during their last clinical rotation. Poor examples of IPC in the clinical settings,[30] as well as a poor understanding of each HCP's role and responsibility have been reported as affecting the opportunity to undertake IPE experiences[16 31] that can affect also the future skill of cooperating with other members of a team.

Aimed at discovering IPE experiences during their undergraduate education, we have involved the largest sample of nursing students where the main sociodemographic characteristics were in line with those reported at the national level.[24] However, according to the findings, IPE occurrences were only partially affected by individual factors, whereas a greater influence has emerged in the clinical environment and geographical context where clinical rotations were attended. With respect to the latter, students have been exposed to different IPE occurrences across Italian regions, suggesting that different healthcare systems[25] have developed different IPC sensitivities at the ward level. High occurrences of IPE in some

Table 1 IPE occasions as experienced by students during the most recent clinical rotation

	Never	Only a little	To some extent	Always	
	n=666			n=2040	
	–6.90%	n=3248 (33.8%)	n=3653 (38.0%)	–21.30%	P value*
Individual level					
Age, years, mean (95% CI)	23.2 (23 to 23.7)	22.9 (22.7 to 23.0)	22.79 (22.7 to 22.9)	23.0 (22.8 to 23.2)	0.015
Female (n=9596), n (%)	531 (80.0)	2561 (78.9)	2732 (74.9)	1479 (72.6)	<0.001
Civil status, n (%)					
Unmarried	629 (94.4)	3047 (93.8)	3460 (94.7)	1909 (93.6)	0.032
Married/cohabitant	26 (3.9)	164 (5.0)	138 (3.8)	107 (5.3)	
Divorced	3 (0.5)	110 (0.4)	14 (0.4)	9 (0.4)	
Widowed	2 (0.3)	1 (0.0)	1 (0.0)	3 (0.1)	
Missing	6 (0.9)	25 (0.8)	40 (1.1)	12 (0.6)	
With children, n (%)	26 (3.9)	138 (4.3)	174 (4.8)	90 (4.5)	0.636
Secondary education (n=9442), n (%)					
High school	450 (68.2)	2260 (70.8)	2507 (69.9)	1414 (70.3)	0.287
Technical school	25 (3.8)	149 (4.7)	160 (4.5)	76 (3.8)	
Professional school	112 (17.0)	490 (15.4)	596 (16.6)	320 (15.9)	
Teacher school	58 (8.8)	256 (8.0)	282 (7.9)	172 (8.6)	
Secondary school abroad	15 (2.2)	34 (1.1)	39 (1.1)	28 (1.4)	
Academic year attended (n=9579), n (%)					
First	183 (27.5)	1008 (31.2)	1123 (30.8)	595 (29.3)	<0.001
Second	249 (37.5)	1149 (35.5)	1251 (34.3)	633 (31.1)	
Third	233 (35.0)	1078 (33.3)	1272 (34.9)	805 (39.6)	
Academic experience (n=9515), n (%)					
None	428 (64.5)	2235 (69.3)	2538 (70.2)	1386 (68.9)	0.224
Graduated in other fields	38 (5.7)	130 (4.0)	154 (4.3)	98 (4.9)	
Uncompleted degree	191 (28.9)	829 (25.7)	894 (24.7)	512 (25.4)	
Other	5 (0.8)	31 (1.0)	30 (0.8)	16 (0.8)	
Previous work experience (n=9553), n (%)	248 (37.6)	1059 (32.8)	1254 (34.5)	740 (36.4)	0.017
Work experience during the degree (n=9526), n (%)	147 (22.2)	629 (19.6)	709 (19.6)	457 (22.6)	0.016
Previous clinical rotations (n=9498), number, mean (95% CI)	5.05 (4.80 to 5.31)	4.85 (4.74 to 4.97)	4.87 (4.77 to 4.98)	5.01 (4.87 to 5.14)	0.216
Setting (n=9551), n (%)					
Only hospital	479 (72.1)	2249 (69.6)	1478 (68.3)	1300 (64.1)	<0.001
Only community setting	10 (1.5)	53 (1.6)	51 (1.4)	39 (1.9)	
Hospital and community	175 (26.4)	932 (28.8)	1097 (30.3)	688 (34.0)	
Length of the most recent clinical rotation, weeks, mean (95% CI)†	5.75 (5.52 to 5.98)	5.74 (5.64 to 5.83)	5.78 (5.69 to 5.86)	5.99 (5.88 to 6.10)	0.007
Tutorial model of the most recent clinical rotation (n=9563), n (%)† I was supervised by					
A clinical nurse	278 (42.1)	1570 (48.6)	1999 (54.9)	1249 (61.5)	< 0.001

Continued

Table 1 Continued

	Never	Only a little	To some extent	Always	
	n=666			n=2040	
	–6.90%	n=3248 (33.8%)	n=3653 (38.0%)	–21.30%	P value*
The nursing staff	335 (50.8)	1436 (44.4)	1386 (38.1)	647 (31.9)	
A nurse identified daily by the head nurse	6 (0.9)	37 (1.1)	29 (0.8)	21 (1.0)	
A nurse teacher	33 (5.0)	140 (4.3)	160 (4.4)	72 (3.6)	
The head nurse	8 (1.2)	50 (1.6)	66 (1.8)	41 (2.0)	
Degree competence learnt in the most recent clinical rotation, (n=9577), mean (95% CI)†‡	1.50 (1.45 to 1.56)	1.83 (1.80 to 1.85)	2.15 (2.13 to 2.17)	2.50 (2.49 to 2.54)	< 0.001
CLEQI factor scores, mean (95% CI)†‡					
Tutorial strategies quality	1.31 (1.25to 2.37)	1.71 (1.68 to 1.73)	2.04 (2.02 to 2.06)	2.48 (2.45 to 2.50)	<0.001
Learning opportunities	1.40 (1.35 to 1.46)	1.71 (1.69 to 1.73)	2.02 (2.01 to 2.04)	2.46 (2.44 to 2.49)	<0.001
Self-directed learning	0.83 (0.78 to 0.89)	1.24 (1.21 to 1.26)	1.57 (1.55 to 1.59)	2.03 (2.00 to 2.06)	<0.001
Safety and nursing care quality	1.58 (1.53 to 1.63)	1.86 (1.84 to 1.88)	2.12 (2.10 to 2.13)	2.50 (2.48 to 2.52)	<0.001
Quality of the learning environment	1.33 (1.27 to 1.39)	1.76 (1.73 to 1.78)	2.11 (2.09 to 2.14)	2.50 (2.48 to 2.53)	<0.001
Overall CLEQI score†‡	1.29 (1.24 to 1.34)	1.66 (1.64 to 1.68)	1.98 (1.96 to 1.99)	2.40 (2.38 to 2.42)	<0.001
Regional level (n)					<0.001
Region 1 (701)	29 (4.1)	208 (29.7)	297 (42.4)	167 (23.8)	
Region 2 (469)	4 (0.9)	78 (16.6)	194 (41.4)	193 (41.1)	
Region 3 (943)	66 (7.0)	231 (24.5)	397 (42.1)	249 (26.4)	
Region 4 (2000)	129 (6.4)	720 (36.0)	745 (37.3)	406 (20.3)	
Region 5 (54)	2 (3.7)	17 (31.5)	20 (37.0)	15 (27.8)	
Region 6 (1094)	66 (6.0)	364 (33.3)	426 (38.9)	238 (21.8)	
Region 7 (1256)	72 (5.7)	398 (31.7)	482 (38.4)	304 (24.2)	
Region 8 (626)	51 (8.2)	193 (30.8)	262 (41.8)	120 (19.2)	
Region 9 (179)	14 (7.8)	57 (31.8)	71 (39.7)	37 (20.7)	
Region 10 (977)	86 (8.8)	412 (42.2)	332 (34.0)	147 (15.0)	
Region 11 (166)	18 (10.8)	75 (45.2)	53 (31.9)	20 (12.1)	
Region 12 (207)	25 (12.1)	96 (46.4)	68 (32.8)	18 (8.7)	
Region 13 (169)	21 (12.4)	67 (39.6)	64 (37.9)	17 (10.1)	
Region 14 (407)	48 (11.8)	137 (33.7)	151 (37.1)	71 (17.4)	
Region 15 (269)	35 (13.0)	105 (39.1)	91 (33.8)	38 (14.1)	

*χ^2 for dichotomous variables, analysis of variance and Kruskal-Wallis test for continuous variables.
†The more recent clinical experience was that under evaluation.
‡On a 4-point Likert scale (0 = 'nothing'; 3 = 'very much').
CLEQI, Clinical Learning Quality Evaluation Index; IPE, interprofessional educational experience.

regions should be considered best practices for other regions, thus encouraging to share policies and/or interventions implemented. On the other hand, regions where healthcare institutions have offered few IPE experiences to students should reflect on whether the care models underlying the delivery of services are still based on the traditional hierarchy across HCPs in order to identify strategies that can promote teamwork. Moreover, given the IPE variability emerged across regions, case studies are also suggested in order to understand policies and/or factors in those regions where students reported a greater IPE occurrence.

All factors measured with the CLEQI tool[24] detecting the quality of learning processes enacted by the student in the actual context were positively associated with high likelihood of IPE occurrences. The clinical learning environment is composed of different psychosocial, organisational, cultural and interactive factors in addition to the

Table 2 IPE occurrence* as experienced by students during the most recent clinical rotation: a multilevel analysis

	Estimate	SE	z value	Pr(>|z|)	OR (CI 95 %)
(Intercept)	−2.904	0.333	−8.733	0.000	0.055 (0.029 to 0.105)
Individual level					
Age, years	−0.009	0.008	−1.118	0.264	0.991(0.975 to 1.007)
Male gender vs female	−0.197	0.062	−3.183	0.001	0.821 (0.727 to 0.927)
Unmarried vs no	0.175	0.136	1.291	0.197	1.192 (0.913 to 1.555)
Year of nursing education attended, first	†				
Year of nursing education attended, second vs first	−0.093	0.066	−1.402	0.161	0.911 (0.800 to 1.038)
Year of nursing education attended, third vs first	0.076	0.070	1.074	0.283	1.079 (0.939 to 1.238)
Previous work experience, yes vs no	0.097	0.063	1.544	0.123	1.102 (0.974 to 1.246)
Work experience during the degree, yes vs no	0.051	0.069	0.738	0.461	1.052 (0.919 to 1.206)
Context of previous clinical learning experiences					
Only hospital	†				
Only community setting	−0.040	0.212	−0.190	0.849	0.961 (0.634 to 1.455)
Hospital and community setting	−0.035	0.064	−0.551	0.581	0.965 (0.851 to 1.095)
More recent clinical rotation, tutorial model					
I was supervised by a clinical nurse	†				
By the nursing staff	0.106	0.065	1.631	0.103	1.112 (0.979 to 1.262)
By a nurse identified daily by the head nurse	−0.435	0.271	−1.608	0.108	0.647 (0.381 to 1.100)
By the head nurse	0.190	0.135	1.407	0.159	1.209 (0.928 to 1.575)
By the nurse teacher	−0.212	0.197	−1.074	0.283	0.809 (0.550 to 1.191)
Length of the most recent clinical rotation, weeks, mean (95% CI)‡	−0.001	0.010	−0.105	0.916	0.999 (0.979 to 1.020)
Degree competence learnt in the most recent clinical rotation‡	0.344	0.045	7.687	0.000	1.411 (1.292 to 1.540)
CLEQI factors					
Quality of the tutorial teaching strategies (0–3)§‡	0.179	0.059	3.053	0.002	1.196 (1.066 to 1.341)
Self-direct learning (0–3)§‡	0.395	0.045	8.874	0.000	1.485 (1.361 to 1.620)
Learning opportunities (0–3)§‡	0.342	0.064	5.341	0.000	1.408 (1.242 to 1.597)
Safety and nursing care quality (0–3)§‡	0.275	0.057	4.830	0.000	1.317 (1.178 to 1.473)
Quality of the learning environment (0–3)§‡	0.409	0.061	6.752	0.000	1.506 (1.337 to 1.695)
Regional level					
Region 1	†				
Region 2	0.557	0.227	2.453	0.014	1.746 (1.119 to 2.726)
Region 3	−0.471	0.172	−2.736	0.006	0.624 (0.446 to 0.875)
Region 4	−0.412	0.149	−2.768	0.006	0.662 (0.495 to 0.887)
Region 5	−0.318	0.394	−0.808	0.419	0.727 (0.336 to 1.575)
Region 6	−0.386	0.166	−2.328	0.020	0.680 (0.491 to 0.941)
Region 7	−0.334	0.163	−2.051	0.040	0.716 (0.520 to 0.985)
Region 8	0.023	0.185	0.124	0.901	1.023 (0.712 to 1.470)
Region 9	−0.153	0.281	−0.545	0.586	0.858 (0.495 to 1.488)
Region 10	−0.305	0.167	−1.833	0.067	0.737 (0.531 to 1.021)
Region 11	0.070	0.281	0.251	0.802	1.073 (0.618 to 1.862)
Region 12	−0.401	0.235	−1.708	0.088	0.670 (0.423 to 1.061)

Continued

Table 2 Continued

	Estimate	SE	z value	Pr(>|z|)	OR (CI 95 %)
Region 13	−0.286	0.269	−1.061	0.289	0.751 (0.443 to 1.274)
Region 14	0.411	0.220	1.865	0.062	1.508 (0.979 to 2.324)
Region 15	−0.590	0.278	−2.124	0.034	0.554 (0.321 to 0.955)

Sigma indiv, 0.169; AIC, 9376.414; BIC, 9629.481; LogLik, −4652.207 (df 36); LogLik_null, −5479.081 (df 2); pseudo R^2, 0.151.
*'Always'+ 'some extent' vs 'only a little' + 'never'.
†Reference group.
‡On a 4-point Likert scale (from 0= 'never' to 3= 'always').
§The most recent clinical rotation was that under evaluation.
CLEQI, Clinical LEarning Quality Evaluation Index; IPE, interprofessional educational experience(s).

physical space and the teaching/learning components that all promote the learning of competences,[32] including interprofessional ones. Specifically, the odds of reporting IPE experience in the last rotation were positively affected by the perceived quality of the clinical learning environment. The perceived quality of the clinical environment has already been associated with the type, quality and amount of interactions between students and the nursing staff,[33] suggesting that a good-quality environment can also increase the quality of interprofessional interactions, thus promoting IPE occasions.

Similarly, the odds of reporting IPE experience in the last rotation were positively affected by the environments encouraging students to be independent in their learning processes as self-directed learners. Self-directed learning has been documented as encouraging self-evaluation[34]; by evaluating their own learning needs and searching for different strategies to address them, students can be encouraged also to collaborate with other HCPs, for example, as a source to understand the nature of patients' problems[16] thus learning from other disciplines.[35]

Perceiving higher learning opportunities as well as high-quality and safe nursing care delivered in the ward also increased the perception of IPE opportunities. Having the chance to learn a range of technical and non-technical skills is deeply intertwined with IPE as students can increase their confidence in searching for multidisciplinary collaboration.[29] Moreover, teamwork, cooperation and shared discussions among HCPs[16] have all been documented as fundamental in promoting quality of care and patient safety: students experiencing their clinical learning in units based on these principles can discuss with their supervisors various care processes,[36] they can be involved in or witness IPC during meetings and they can also be involved in integrated care planning.[16] On the other hand, units with poor attention to patient safety and quality of care can have fewer IPC opportunities: as a consequence, missed interprofessional involvement of students can limit the opportunity of IPE.[28 36]

Furthermore, the quality of tutorial strategies increased the likelihood of IPE experiences, thus suggesting that nurses responsible for clinical teaching can create opportunities to expose students to interprofessional contacts. However, the contribution of these factors to IPE is limited. In line with this finding, tutorial models delivered at the ward level have not influenced students' IPE experiences, given that the different options (eg, being supervised by a clinical nurse or staff) are all inside the nursing profession. Provision of a more complex model of nursing student supervision also involving other HCPs should be further studied for its impact on IPE. According to available evidence,[37] only student exposure to the team can increase understanding of interprofessional processes of care, thus allowing the development of strong interprofessional skills.

Finally, the degree of competences acquired during the students' last clinical rotation was positively associated with the perception of IPE experiences; in contrast, units offering fewer competences have resulted in limited IPC experiences, indicating that IPE can also affect the achievement of learning outcomes.

At the individual level, only male gender emerged as negatively associated with IPE experiences suggesting that male students should be more supported in developing interdisciplinary skills compared with female students; however, the reasons behind these findings[38] should be further explored.

Limitations

Students were asked to self-report their IPE experiences in their most recent clinical rotations, not in their entire nursing education or, for example in the academic setting, such as in simulation laboratories or in the classroom. Moreover, their perception regarding the occurrence (from 'never' to 'always') has been based on their personal judgement and further studies are encouraged to measure quantitatively the IPE experiences. Furthermore, no data have been collected on the IPC theoretical core contents across nursing programmes that could have promoted different IPE expectations among students; similarly, the quality of IPC examples witnessed in the clinical practice was not assessed. What students see about the team in clinical practice may not be ideal (eg, when reinforcing hierarchies) and should be thoughtfully debriefed within an interprofessional student group and with a facilitator skilled in addressing these issues.

Also, some relevant data such as HCPs profiles available at the unit level (eg, only nurses and physicians) and the

team-to-students ratio, as well as the role of the students (eg, supernumerary or fully involved in nursing care), were not collected.

We used only one question to explore IPE occurrence by providing some examples of IPC to increase clarity and consistency in data collection; however, the type and quality of these IPE experiences have not been investigated. In the attempt of discovering the explanatory variables, we have used the CLEQI[24] tool which measures the quality of the clinical environment while no data with regard to the quality of the academic environment has been collected. Additionally, the cross-sectional design must be used with caution when considering emerged factors in the multilevel analysis as predictors of IPE according to students' perception since other study designs would have been preferable to answer causative questions. Finally, the multilevel analysis results show that students' perceptions of IPE opportunities are only partially explained by the considered model (the pseudo R^2 is 0.15). Consequently, future research is recommended to grasp other significant factors not identified in this study. Moreover, future studies should also target the barriers preventing IPE experiences among nursing students by also involving other HCPs, aimed at acquiring a complete picture of IPE throughout HCPs in Italy.

CONCLUSIONS

A large number of nursing students felt they were exposed to IPE experiences 'never' to 'only a little' during their clinical rotation, thus suggesting that nursing education seems to remains mainly inside the nursing profession. The limited opportunities to develop teamwork skills to transfer into future practice for a large number of next-generation healthcare workers may also prevent the complete transition from hierarchical approaches to collaborative approaches, which have been identified as providing the best patient care.

Associated factors have emerged mainly at the clinical context level where students attend their clinical rotations, and at the regional level, suggesting that IPE is influenced by a collaborative culture promoted at the ward level and by the policies developed at regional levels, inspiring both healthcare institutions and nursing programmes. Nurse academicians should include in their agenda strategies aimed at developing IPE opportunities both at the university and at the clinical levels. Specifically, learning environments should be periodically assessed for their ability to offer to students the opportunity to develop collaborative skills. Moreover, benchmarking policies at the regional level, aimed at promoting a higher sensitivity regarding the link between interprofessional teamwork and patient safety are recommended. Differently, individual factors have shown a limited contribution to IPE occurrences, suggesting that male students should be more encouraged to collaborate with other HCPs.

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