ORIGINAL RESEARCH

The association between nursing students' perceptions of their clinical reasoning ability and their background of clinical experience: A cross-sectional correlation study

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Received: September 17, 2023 **Accepted:** October 16, 2023 **Online Published:** October 18, 2023
DOI: 10.5430/jnep.v14n2p5 **URL:** https://doi.org/10.5430/jnep.v14n2p5

ABSTRACT

Background and objective: Nursing students tend to show poor clinical reasoning skills and incompetence in clinical performance. This study aimed to explore nursing students' perceptions of their clinical reasoning ability in relation to their different background of academic program and clinical experience.

Methods: A cross-sectional correlation study was conducted in a private tertiary professional training institute. Nursing students (n = 508) were surveyed with demographic details and a self-reported Nurse Clinical Reasoning Scale (NCRS) questionnaire about their perceptions of clinical reasoning in relation with their clinical experience.

Results: Descriptive statistic, parametric analyses of variance, and Pearson's correlation coefficients were used to determine the relationships between variables. The mean NCRS score was lower for paid student nurse externs (49.22 $\pm$ 9.2) than for participants who were not paid student nurse externs. The mean NCRS scores differed significantly between the different clinical placements that nursing students last experienced (F = 5.41, $p \leq .001$), as well as between students of various academic programs (F = 11.88, $p \leq .001$), with students of the sub-baccalaureate level nursing program showing the highest score (53.04 $\pm$ 10.48), followed by those of the accelerated baccalaureate level nursing program (52.93 $\pm$ 7.67) and those of the baccalaureate level nursing program (48.82 $\pm$ 10.11). The mean NCRS score showed a weakly positive, but significant, correlation with the attendance of pre-clinical training, r(506) = .12, p = .009. The free-text surveys provided rich information concerning nursing students' preferences for future pre-clinical training.

Conclusions: Different academic backgrounds and clinical experiences influence nursing students' clinical reasoning competence. Strategies are needed to motivate earlier clinical preparedness and caring attitudes which are essential attributes of a nursing student before their exposure to real patients.

Key Words: Clinical reasoning, Pre-clinical training, Nursing education

1. BACKGROUND

Medical incidents are common, and research shows that inadequate clinical reasoning and clinical judgment skills are among the human factors contributing to medical incidents and adverse events.[1,2] Nurses' clinical thinking ability, including clinical reasoning, clinical problem-solving, and

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clinical judgment, is essential for preventing medical incidents.[3] The theory–practice gap experienced by nursing students puts patients and nursing students at risk.[4] In the local institution where this study took place, both employer and graduate surveys reported that graduates were rated low scores in clinical reasoning, communication skills and task prioritization. The education to develop nursing students in acquiring clinical reasoning skills is still unclear. Various research studies were done to (1) define clinical reasoning; (2) identify relation between incompetent clinical reasoning with medical incidents: (3) recommend effective teaching strategies; and (4) suggest assessment methods.[5] The program design and structure, including the pattern of clinical placement, may affect students developing clinical reasoning. Nursing students may find clinical placement inadequate and therefore, work as paid nurse student externs to gain extra clinical experience. These factors contribute to nursing students' clinical reasoning ability worth further investigation.

Clinical reasoning is essential in nursing education but is challenging to both educators and nursing students because it is complex, tacit and invisible.[6] Clinical reasoning is a cognitive process that involves collecting and analyzing patient information, evaluating its relevance, and deciding on possible nursing actions to improve patients' health outcomes.[7] Nursing students continue to struggle with a disconnect between their learning experience and the reality of clinical work.[8,9] Liu et al. found that traditional lectures and skills training for pre-job nurses are not comprehensive.[10] Students' clinical experience accumulated from exposure to many clinical cases and construct and remember illness patterns. A nursing curriculum can design many clinical encounters, in clinical settings or in a simulated environment.[5] Limited clinical placement during the COVID-19 pandemic severely affects students' clinical learning. The schedule of clinical training may contribute to the theory-practice gap issue, as nursing students may be unable to use the knowledge and skills learned due to the long time interval between classroom study and clinical practice. Liu et al. further suggested that nursing educators should explore the application value of flexible and timely training before clinical placement to promote nursing students' clinical reasoning skills.[10]

Many nursing students will work as paid student nurse externs to gain clinical experience. It is important to have policy in place to ensure nurse student externs have been properly trained and exposed to clinical practicum under teacher's direct supervision before they can work independently to help relieving the workload in wards. Saifan et al. found that nursing students experienced stress about having received inadequate clinical training during their nursing studies before their real-world clinical practice.[9] This finding is consistent with Mazalova et al. who found that clinical practice was stressful due to factors such as lack of clinical experience, unfamiliar working environments, difficult patients, risk of making mistakes, and fear of being assessed by clinical teachers.[2] Saifan et al. reported that senior nursing students experienced reduced stress levels as their clinical training and experience progressed.[9] However, due to the COVID-19 pandemic, clinical placements were limited. Senior year nursing students faced extreme stress in their clinical placements, as the ward staff expected them to be experienced and capable of carrying out tasks independently. Compared with lower-year nursing students, fourth- and final-year nursing students also set higher expectations for themselves as they are nearing graduation. Nursing students' clinical preparedness can be accomplished by pre-clinical training.

Pre-clinical training is not included in the program curriculum but is frequently discussed in various meetings between training institutions and students. Findings from van Wyngaarden et al. demonstrated that low cognitive traditional teaching and assessing methods that only reinforce 'rote learning' to memorize and 'regurgitate' the content were not effective in promoting clinical reasoning.[11] Other types of pre-clinical training could supplement this cognitive processing. Simulation training has been shown to be effective for clinical reasoning training, and nursing students generally welcome it. However, curriculum scheduled limited practice time and as such, students do not get adequate opportunities to practice their clinical skills in a simulated environment.[6] Moreover, Johnston et al. noted that some students may face difficulty in identifying the clinical problems in simulated scenarios if the scenarios are different to those experienced in clinical placement settings.[12] Saifan et al. also reported that simulation training cannot equip nursing students in communication with real patients.[9] The knowledge and skills transferred from simulated to real settings are uncertain, but are likely related to clinical reasoning processes.[13] Nonetheless, simulation training remains a valuable tool to prepare nursing students for clinical practice. Apart from simulation training, laboratory practice is another common request from students. Adequate practice time in a university laboratory setting is important for nursing students to acquire and apply clinical skills, thus bridging the theory–practice gap.[4] However, scarce studies are focused on pre-clinical preparation which is important especially when COVID-19 pandemic had affected the program structure and clinical placement. This study aimed to explore nursing students' perceptions of their clinical reasoning ability in relation to their different background of academic program and clinical experience.

2. METHODOLOGY

2.1 Design and setting

This study adopted a descriptive, correlational, cross-sectional study design. The study was conducted at a single private tertiary professional training institute, from January to April 2023. This institute offers baccalaureate level and sub-baccalaureate level nursing programs. This institute also offers baccalaureate level program in medical laboratory, medical imaging and radiology, physiotherapy, and occupational therapy.

2.2 Sample

A survey was used to collect data from undergraduate nursing students who met the inclusion criteria of being aged 18 or above, enrolled in a nursing program, and with or without prior clinical experience. Students who were not enrolled in a nursing program were excluded. To get significant result (p <.05) with sufficient power (80%) to detect at least correlation coefficient of .20, using G*Power Version 3.1.9.4, the minimum required sample size for this study was 191. Ultimately, 509 questionnaires were collected, and one questionnaire with missing items was excluded, resulting in a final sample size of 508.

2.3 Instrument

The Nurses Clinical Reasoning Scale (NCRS) is a self-reported instrument developed and validated by Liou et al. to measure self-perceived nursing clinical reasoning ability.[14] The scale consists of 15 items that are rated on a 5-point Likert response scale ranging from 1 (strongly disagree) to 5 (strongly agree), with a total score ranging from 15 to 75. A higher score indicates a higher self-perceived level of clinical reasoning ability. To assess the stability of the NCRS, the intraclass correlation was computed to indicate 2-week test–retest reliability, which was found to be satisfactory. The instrument's internal consistency was also high, with a Cronbach's alpha coefficient of .94. The author of this study obtained permission from the original authors of the NCRS to use the questionnaire for this research.

2.4 Data collection

In January 2023, an invitation email containing a form requesting demographic details and the NCRS questionnaire was sent to all nursing students enrolled in various nursing programs. The demographic details form aimed to collect information on students' demographic characteristics, such as sex, age, academic program, study year, prior clinical experience, and previous exposure to pre-clinical training.

2.5 Data analysis

The data collected from the survey were analyzed using SPSS statistical package version 26 (IBM, Armonk, NY, USA). Descriptive statistics, means, and standard deviations were calculated to analyze the demographic characteristics of the sample and outcome variables, as appropriate. Independent-sample Student's t-tests and parametric analyses of variance (ANOVAs) were used to compare the NCRS scores among students studying different programs and among students with different clinical placements previously attended. Post-hoc tests were conducted to compare significant differences between the programs and between different clinical placements. Pearson's correlation coefficients were used to determine the relationships between variables. A p value of less than .05 was considered statistically significant.

2.6 Ethical consideration

Ethical approval for this study was provided by the Research Ethics Committee of the institute where this study took place (REC2022150). Participation was voluntary.

3. RESULTS

Five hundred and eight nursing students participated in this study. The demographic characteristics of the sample are summarized in Table 1. The majority of the participants (70.87%) were female, and the remaining 29.13% were male. The age distributions of the participants were as follows: 47.83% were 18–21 years old, 35.04% were 22–24 years old, and 17.13% were 25 years old or older. In terms of academic programs, 51.77% of the participants were enrolled in the baccalaureate level nursing program, 26.18% were enrolled in the accelerated baccalaureate level nursing program, and 22.05% were enrolled in the sub-baccalaureate level nursing program. Additionally, 25% of the participants were Enrolled Nurses and 24.61% had worked as paid nursing student externs.

The mean NCRS score of the entire sample was 50.83 $\pm$ 9.82. The mean NCRS score was higher for Enrolled Nurses (53.76 $\pm$ 7.6) than for participants who were not Enrolled Nurses (49.85 $\pm$ 10.28). There was a significant positive correlation between being an Enrolled Nurse and the NCRS score (point-biserial correlation coefficient [rpb] = .17, n = 508, p $\leq$ .001). Conversely, the mean NCRS score was lower for paid nursing student externs (49.22 $\pm$ 9.2) than for participants who were not paid nursing student externs (51.36 $\pm$ 9.97). The mean NCRS score was highest for sub-baccalaureate level nursing program students (53.04 $\pm$ 10.48), followed by accelerated baccalaureate level nursing program (52.93 $\pm$ 7.67), and baccalaureate level nursing program students had the lowest mean NCRS score (48.82 $\pm$ 10.11) (see Ta-

ble 2). An ANOVA revealed significant differences in the mean NCRS scores between students of different academic programs (F = 11.88, $p \leq .001$). Bonferroni post-hoc tests showed that the pairwise group comparisons of baccalaureate level nursing program with accelerated baccalaureate level nursing program and baccalaureate level nursing program with sub-baccalaureate level nursing program had p values less than .05, indicating that these pairwise groups were significantly different in terms of the NCRS score (see Table 3). However, no significant correlation was found between the study year and the NCRS score, r(506) = .06, p = .172. Nursing students are required to attend clinical placements one to four in the baccalaureate level or sub-baccalaureate level nursing programs. The different clinical placements that nursing students last experienced was found to be significantly associated with the NCRS score (F = 5.41, $p < .001$). Bonferroni post-hoc tests showed that the pairwise group comparisons of no prior clinical placement with the second clinical placement and of no prior clinical placement with the fourth clinical placement had p values less than .05, indicating that these pairwise groups were significantly different in terms of NCRS score (see Table 4). The correlation between the clinical practicum nursing students last experienced and the NCRS score was weak, but positive, r(506) = .23, $p <$ .001.

The participants who perceived pre-clinical training as useful for clinical reasoning had higher mean NCRS scores (51.22 $\pm$ 9.5) than those who perceived the training as not useful (49.89 $\pm$ 10.53). A point-biserial correlation analysis revealed that the correlation between the perceived usefulness of pre-clinical training and the NCRS score was not statistically significant (rpb = .06, n = 508, p = .165). In contrast, Spearman's correlation analysis revealed a weakly positive, but significant, correlation between the NCRS score and the attendance of pre-clinical training, r(506) = .12, p = .009.

In addition to collecting NCRS scores in the survey, the participants were also asked about their perceptions of the contribution of pre-clinical training to their clinical reasoning skills (see Table 5 and Figure 1), as well as the type of pre-clinical training they would prefer in the future with regard to their last clinical placement experience (see Table 6) and academic program (see Table 7). The results showed that 77.95% of the participants considered pre-clinical training to be useful. Among the types of pre-clinical training, simulation training (32.68%) and skills practice (27.36%) were most preferred in relation to the last clinical placement experience and academic program.

Table 1. Participants' demographic characteristics

	Overall (n = 508)	
	n	**%**
Sex		
Male	148	29.13
Female	360	70.87
Age		
18-21	243	47.83
22-24	178	35.04
25 or older	87	17.13
Program and study year		
Sub-baccalaureate	112	22.05
Year 1	47	09.25
Year 2	65	12.80
Baccalaureate	263	51.77
Year 1	27	5.31
Year 2	72	14.17
Year 3	61	12.01
Year 4	79	15.55
Year 5	24	4.72
Accelerated baccalaureate	133	26.18
Year 1	14	2.76
Year 2	4	0.79
Year 3	67	13.19
Year 4	22	4.33
Year 5	26	5.12
Enrolled nurse		
Yes	127	25.0
No	381	75.0
Paid nurse student extern		
Yes	125	24.61
No	383	75.39

Table 2. Mean NCRS scores of students from different programs

	N	**Mean**	**Std. Deviation**
Baccalaureate	263	48.82	10.11
Accelerated baccalaureate	133	52.93	7.67
Sub-baccalaureate	112	53.04	10.48
Total	508	50.83	9.82

Note. NCRS- Nurse Clinical Reasoning Scale.

Table 3. Bonferroni post-hoc-tests comparing different programs

		Mean diff.	**Std. Error**	***p***	**95% CI lower limit**	**95% CI upper limit**
Baccalaureate	Accelerated baccalaureate	-4.11	1.023	$< .001^{***}$	-6.6	-1.62
Baccalaureate	Sub-baccalaureate	-4.22	1.085	$< .001^{***}$	-6.86	-1.58
Accelerated baccalaureate	Sub-baccalaureate	-0.11	1.233	1	-3.11	2.89

$^{*}p < .05$; $^{**}p < .01^{***}p < .001$.

Table 4. Bonferroni post-hoc-tests comparing different clinical placements

		Mean diff.	Std. Error	*p*	95% CI lower limit	95% CI upper limit
Never	CP1	-2.71	1.81	1	-8.03	2.61
Never	CP2	-4.94	1.297	.002**	-8.75	-1.12
Never	CP3	0.5	2.835	1	-7.84	8.83
Never	CP4	-4.2	1.402	.029*	-8.32	-0.08
CP1	CP2	-2.22	2.102	1	-8.4	3.95
CP1	CP3	3.21	3.283	1	-6.44	12.86
CP1	CP4	-1.49	2.168	1	-7.87	4.88
CP2	CP3	5.43	3.03	.736	-3.48	14.34
CP2	CP4	0.73	1.763	1	-4.45	5.92
CP3	CP4	-4.7	3.076	1	-13.74	4.34

Note. Never – Students have never experienced clinical placement; CP-Clinical placement 1-4. *$p < .05$; **$p < .01$***$p < .001$.

Table 5. Participants' perceptions on the types of pre-clinical training that contributed to their CR

	You consider the pre-clinical learning activities is/are useful for clinical reasoning?						Total	
	Yes			No				
	n	%	% within Pre CP training participants like most	n	%	% within Pre CP training participants like most	n	%
Sim lab	193	37.99	85.4	33	6.5	14.6	226	44.49
Supervised skills labs	127	25	83.01	26	5.12	16.99	153	30.12
NA	18	3.54	35.29	33	6.5	64.71	51	10.04
POCT	7	1.38	100	0	0	0	7	1.38
Others	34	6.69	70.83	14	2.76	29.17	48	9.45
Case study	16	3.15	76.19	5	0.98	23.81	21	4.13
Case sharing	1	0.2	50	1	0.2	50	2	0.39
Total	396	77.95		112	22.05		508	100

Note. Sim lab- Simulation laboratory training; Supervised skills labs- students practice skills under teachers' supervision; NA- Not applicable; POCT- Point-of-care test.

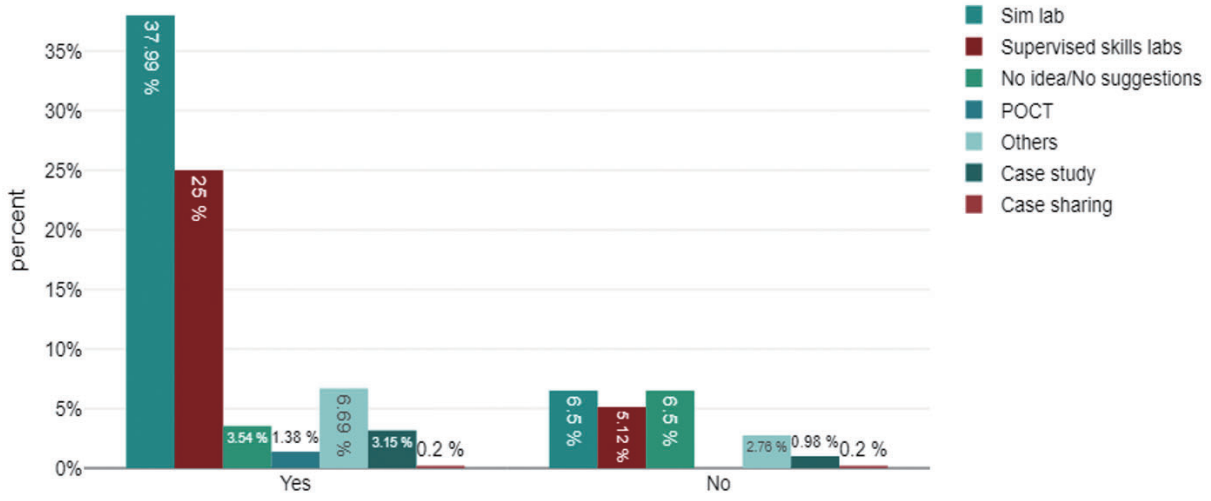

Figure 1. Participants' perceptions of the types of pre-clinical training contributed to their clinical reasoning

This figure demonstrates participants' perceptions of pre-clinical training contributing to their clinical reasoning in percentage. The "Yes" group on the left side of the figure means the participants agree that the types of pre-clinical training contributed to their clinical reasoning; while the "No" group on the right side of the figure means the participants disagree that the types of pre-clinical training contributed to their clinical reasoning.

Table 6. Participants' preferences of future pre-clinical training after their last clinical placement experience

	What pre-clinical learning activities do you like to have in the future?												Total	
	Others		Supervised skills labs		Sim lab		No idea/No suggestions		Case study		POCT			
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Never	75	14.76	96	18.9	109	21.46	42	8.27	15	2.95	7	1.38	344	67.72
CP1	7	1.38	11	2.17	10	1.97	1	0.2	1	0.2	1	0.2	31	6.1
CP2	16	3.15	16	3.15	29	5.71	3	0.59	2	0.39	0	0	66	12.99
CP3	2	0.39	5	0.98	3	0.59	1	0.2	1	0.2	0	0	12	2.36
CP4	16	3.15	11	2.17	15	2.95	5	0.98	8	1.57	0	0	55	10.83
Total	116	22.83	139	27.36	166	32.68	52	10.24	27	5.31	8	1.57	508	100

Note. Supervised skills labs- students practice skills under teachers' supervision; Sim lab- Simulation laboratory training; No idea/No suggestions- participants have no suggestions on the pre-clinical training; Case study- case study tutorial session; POCT- Point-of-care test; CP- Clinical placement.

Table 7. Participants' preferences of pre-clinical training from different academic programs

	What pre-clinical learning activities do you like to have in the future?												Total	
	Others		Supervised skills labs		Sim lab		No idea/No suggestions		Case study		POCT			
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Sub-baccalaureate	32	6.3	27	5.31	30	5.91	14	2.76	8	1.57	1	0.2	112	22.05
Baccalaureate	61	12.01	77	15.16	85	16.73	20	3.94	14	2.76	6	1.18	263	51.77
Accelerated baccalaureate	23	4.53	35	6.89	51	10.04	18	3.54	5	0.98	1	0.2	133	26.18
Total	116	22.83	139	27.36	166	32.68	52	10.24	27	5.31	8	1.57	508	100

Note. Others- other suggestions of pre-clinical training; Supervised skills labs- students practice skills under teachers' supervision; Sim lab- Simulation laboratory training; No idea/No suggestions- participants have no suggestions on the pre-clinical training; Case study- case study tutorial session; POCT- Point-of-care test.

4. DISSCUSSION

This study explored nursing students' perceptions of their clinical reasoning ability in relation to their different background of academic program and clinical experience. The important points in relation to these outcomes are discussed below.

4.1 Correlation of clinical reasoning with the background of enrolled nurses, clinical placement, and being a paid nursing student extern

First, this study examined how different factors, such as the background of Enrolled Nurses, clinical placement, and being a paid nursing student extern, were related to clinical reasoning. Enrolled nurse is a licensed practical nurse or licensed vocational nurse completed a sub-baccalaureate level training e.g., higher diploma or associate degree. The results showed that nursing students who were already Enrolled Nurses had higher mean NCRS scores than those who were not Enrolled Nurses. This may be due to their exposure to multiple clinical placements and their previous training as Enrolled Nurses, which made them more competent in clinical reasoning.

Furthermore, this study found significant differences in the mean NCRS scores across the different clinical placements that nursing students last experienced ($F = 5.41$, $p < .001$). The different arrangements of clinical placements may explain this finding. For instance, during the first clinical placement, nursing students were supervised by the institute's clinical teacher in a group setting and they primarily focused on learning basic nursing skills. As a result, they may not have had many opportunities to practice clinical reasoning independently. During their second clinical placement, students worked independently under the supervision of a clinical mentor, who may not have been able to provide close guidance due to heavy workload demands. By the fourth- and final-year clinical placements, students were expected to master both basic nursing skills and clinical reasoning, leading to higher mean NCRS scores.

In contrast, the participants who were paid nursing student extern had lower mean NCRS scores than those who were not paid nursing student extern, which warrants further investigation. During the COVID-19 pandemic, formal clinical placements were suspended in Hong Kong, and hospitals hired paid nursing student extern, even though some students had not yet received clinical training. As a result, these students were not always under proper supervision or coaching, and their experiences varied widely. Some students may have had opportunities to learn nursing skills, while others may have worked only as patient care assistants. This inconsistency in clinical exposure and lack of proper coaching may

have contributed to their low clinical reasoning competence. This finding was supported by the study of Delaney & Golding, the clinical settings were described as inadequate and unsupportive to students learning needs.[6]

The correlation between the clinical practicum nursing students last experienced r(506) = .23, $p < .001$ with NCRS score, and the attendance of pre-clinical training, r(506) = .12, $p = .00$ with the NCRS score is low, simply suggested that the strength of relationship is low but they are positively correlated.[15] It is essential to consider other factors possibly affecting the result such as the contact time between ward mentors with the students, the mentors' teaching approaches, and the types and frequency of pre-clinical training. Adequate and supportive clinical placement is an ongoing need to support the application of theoretical knowledge into practice.[11] Clinical reasoning involves a complicated cognitive process that will be influenced by multiple factors. Nevertheless, the findings suggested these variables positively benefit nursing students' clinical reasoning in some degree.

4.2 Correlation of clinical reasoning with the academic program

Another point for discussion is the difference in the mean NCRS scores between sub-baccalaureate level and baccalaureate level nursing program students. Sub-baccalaureate level nursing program students had the highest mean NCRS score (53.04 $\pm$ 10.48), followed by accelerated baccalaureate level nursing program students (52.93 $\pm$ 7.67), while baccalaureate level nursing program students had the lowest mean NCRS score (48.82 $\pm$ 10.11). Sub-baccalaureate level nursing program is a 2-year program with four clinical placements, while baccalaureate level nursing program is a 5-year program with four clinical placements, with its first clinical placement arranged in the third year of study. Due to the COVID-19 pandemic, the first clinical placement for baccalaureate level nursing program was postponed until their fourth year of study. The differences in program and course structure explain the variations in mean NCRS scores between sub-baccalaureate level nursing program and baccalaureate level nursing program students. The accelerated baccalaureate level nursing program is a completion of a baccalaureate program within a compressed period of time, usually three years. The students of the accelerated baccalaureate program had either obtained an Enrolled Nurse license or had studied sub-baccalaureate level nursing program, which gave them some exposure to clinical practice. However, the delayed first clinical placement and different learning needs in various stages of the academic program may have affected the progression of clinical reasoning learning.

4.3 Students' perceptions of the usefulness of pre-clinical training for developing clinical reasoning

The third point of discussion concerns nursing students' perceptions of the usefulness of pre-clinical training for developing their clinical reasoning. The findings showed a weakly positive, but significant, correlation between the mean NCRS scores and the attendance of pre-clinical training, r(506) = .23, $p < .001$. This result suggests that different types of pre-clinical training may have different effects on clinical reasoning, but further investigation is needed to determine which types of training are most effective. Additionally, nursing students' needs for pre-clinical training may vary depending on the stage of the program they are in due to differences in program design.

4.4 Students' pre-clinical training preferences

The final point of discussion pertains to nursing students' preferences for pre-clinical training. The survey included free-text questions that asked students to list their preferred types of pre-clinical training for the future. The findings yielded valuable insights into students' attitudes and learning motivations, which varied according to their academic program, study year, and previous clinical experience. At the local institute, several types of pre-clinical training are offered, including supervised skills laboratory training, simulation training, and point-of-care testing, the last of which is required by hospital policy to ensure accurate bedside blood sugar monitoring using a glucose meter. Nevertheless, pre-clinical training is not included in program curriculum.

The survey reported that 116 students (22.83%) suggested additional types of pre-clinical training, which could be divided into several categories. The first category focused on basic skills, such as injections, drug administration via In-Patient Medication Order Entry, aseptic technique, tube insertion, health assessment, electrocardiogram, bladder scan, and drain care. The second category included advanced skills, such as ventilator care, setting up intravenous access, drawing blood, palliative care, trauma care, and case management. The third category pertained to simulation and virtual reality, such as demonstrations of ward settings and specialties like the operating theatre, model answers for simulation laboratory training, teacher demonstrations in simulation training, more realistic simulation settings, and simulated patients. The fourth category addressed other clinical skills, such as shift handover, reading medical records, interpreting laboratory results, clinical management systems, and filling out different medical forms. The fifth and final category involved other information sharing, such as ward routines, hospital tours and visits, survival skills in the ward, graduate sharing, and ward staff sharing (see Figure 2).

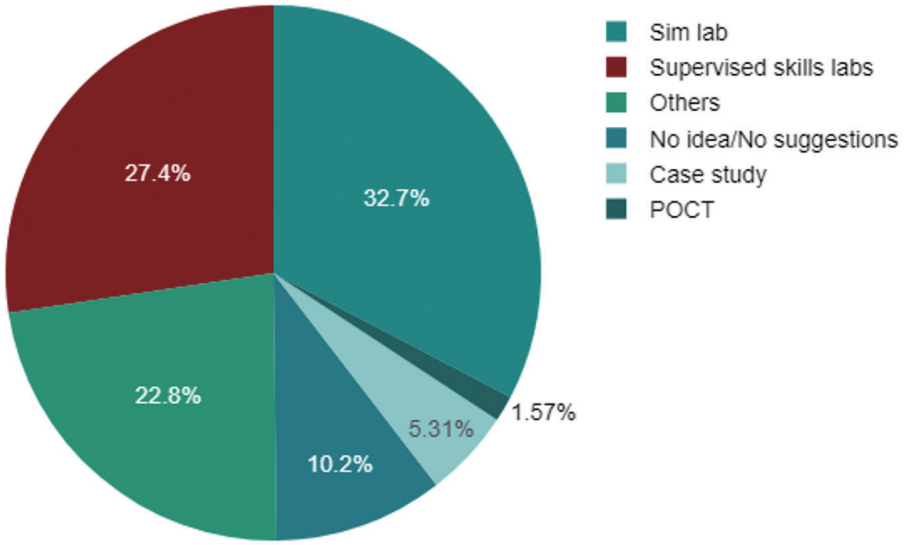

Figure 2. Participants' pre-clinical training preferences
This pie chart demonstrates participants' preferences for future pre-clinical training in percentage.

The study findings were surprising, given that the skills and knowledge mentioned by the nursing students as inadequate are already integrated into the nursing curriculum. The free-text answers showed that senior nurses would prefer more simulation training, especially providing specialty scenarios and settings, e.g. operation theatre, accident and emergency department. This finding reflected that lecture and tutorial discussions were not comprehensive enough for certain specialties. Virtual hospitals would be the alternative approach that nursing educators could consider in future. However, the outcomes of virtual learning and its effectiveness of clinical reasoning as compared with traditional classroom and clinical education was not clear.[16] On the other hand, junior students prefer more supervised skills laboratory sessions to consolidate their basic psychomotor skills which was quite normal due to the fundamental courses in the junior years focus on bedside care and simple nursing procedures.

Another finding worth discussing was that students from accelerated baccalaureate program who were already Enrolled Nurses would prefer more case studies discussion before clinical placement. Due to their Enrolled Nurse qualification, many students were doing part-time jobs and their roles were Enrolled Nurses working independently in the wards. They need more clinical reasoning skills and techniques in shift handover. Kavanagh and Szweda explained that a curriculum overloaded with content does not solve the problem, but rather exacerbates the issue of information overload.[1] Similarly, Saifan et al. reported that students had different comments regarding laboratory preparation for clinical practice, some students finding it beneficial and some finding it inadequate.[9] This study's findings align with previous studies that have found that nursing students perceive their clinical knowledge and skills as insufficient and not transferable to clinical practice.[8,9,17]

Another notable finding was that 52 students (10.24%) reported having no ideas or suggestions regarding pre-clinical training. The majority of this group of respondents were baccalaureate level nursing program students and had never been exposed to clinical experience. This finding indirectly reflects students' poor learning attitudes and low levels of clinical preparedness. Safazadeh et al. supported this finding by stating that nursing students' poor attitudes, lack of interest in the profession, and prioritization of academic grades over adequate preparation for clinical practice can be barriers to effective learning and clinical preparedness.[18] van Wyngaarden et al. also shared a similar opinion. They found that students' self-directedness and responsibility for their studies were possible causes leading to the inability to reason and make sound decisions. They commented that if a nurse student does not care about their study and work, it could not be expected of them to have clinical reasoning skills.[11] Nursing faculties should consider strategies to reinforce self-directed learning and caring attitudes are essential elements for a nurse at earlier stage in the program.

4.5 Strengths and limitations

This quantitative, cross-sectional correlation study has several strengths and limitations. One of its strengths is the recruitment of a large sample size, including nursing students from different programs and study years, which provided a

broad scope of data. The use of free-text surveys to explore nursing students' preferences for pre-clinical training and their association with their clinical reasoning competence is another strength of the study. However, the study also has limitations. One limitation is the recruitment of samples from only one local institute, which may have limited the generalizability of the findings to other institutes. Another limitation is the use of a self-reported instrument, which may be subject to response bias or social desirability bias.

4.6 Recommendations for further research

Further research is needed to examine how students perceive clinical reasoning competence differently with their academic and clinical background, and how the type and sequence of clinical placement would influence their clinical reasoning competence. Research using longitudinal and observational study designs is needed to compare the differences in various phases. Future studies should include multisite evaluations in a range of geographic locales to determine if a difference exists by institutions or programs. Research is also needed to investigate the learning environment that the paid nursing student extern experienced in clinical settings.

4.7 Relevance to nursing education

The COVID-19 pandemic has had a significant impact on nursing students' learning experiences in both academic and clinical settings. This influence was not only happened in the venue where this study took place, but also in other institutions in Hong Kong SAR, China as well as other places in the world. The demand of nurses is increasing worldwide. Both the attrition rates in school and post-graduation are high due to inadequate clinical preparedness. The findings of this study suggest that nursing educators should take into account students' values and expectations about clinical learning and provide appropriate support to enhance their clinical performance. Huston et al. emphasized the importance of promoting theory–practice integration in nursing education curricula.[19] To achieve this, it is crucial to increase the number of clinical instructors in nursing programs and involve them in curriculum development and teaching innovation, as suggested by Akram et al.[20] Faculty members should also collaborate with nursing students to establish a creative learning environment that enhances their work readiness and confidence in clinical learning.

The theory–practice gap strongly affects the preparation of nursing students for clinical practice.[9] This sentiment is echoed by Akram et al., who noted that nursing students commonly experience extreme stress and nervousness before clinical practice.[20] Saifan et al. highlighted that prior visit to clinical settings is essential to facilitate students' consolidation of knowledge and attainment of learning objectives during clinical practice.[9] Therefore, this study recommends revising the curriculum to provide more effective simulated pre-clinical training and to start clinical placements for students earlier in the program through collaboration with clinical stakeholders. Earlier arrangement of clinical practice and pre-clinical training will benefit students' adaptation in nursing practice and further stabilize the workforce. Such measures may help bridge the theory–practice gap and better prepare nursing students for clinical practice.

5. Conclusion

To conclude, this study findings suggest that different academic backgrounds and clinical experiences influence nursing students' clinical reasoning competence. Both subbaccalaureate and accelerated baccalaureate level programs nursing students with clinical background before they enrolled the programs reflecting higher self-perceived clinical reasoning competence. Whereas the baccalaureate level program nursing students tend to be inadequately prepared for nursing studies. It is evident that nursing students from different backgrounds require varying levels of pre-clinical training and support from their educational institutes. Nursing educators also need to consider strategies to motivate earlier clinical preparedness and caring attitudes which are essential attributes of a nursing student before their exposure to real patients.

Acknowledgements

I would like to acknowledge Professor Liou for their permission to use their instrument, Nurses Clinical Reasoning Scale (NCRS). I also like to thank my supervisor Professor Kwan who critiqued my initial manuscript and led me through the process.

Authors contributions

Not applicable. The author is the only author.

Funding

This research was supported by Tung Wah College, School Research Grant (2021-04-52 SRG210404).

Conflicts of Interest Disclosure

The author declares that there is no conflict of interest

Informed consent

Obtained.

Ethics approval

The Publication Ethics Committee of the Sciedu Press. The journal's policies adhere to the Core Practices established by

the Committee on Publication Ethics (COPE).

PROVENANCE AND PEER REVIEW

Not commissioned; externally double-blind peer reviewed.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

DATA SHARING STATEMENT

No additional data are available.

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