ORIGINAL RESEARCH

Nursing students' self-assessed levels of nursing skills at the time of graduation in a Japanese University during the COVID-19 pandemic: A retrospective observational study

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ABSTRACT

Background and aim: Clinical placements and on-campus practice are the core components of nursing skill acquisition, but the COVID-19 pandemic demanded fundamental modifications in the educational process for the nursing skill acquisition. The purpose of our research was to investigate how students at a nursing university assessed their own levels of nursing skills at graduation, relative to the target levels established by the Japanese government during the COVID-19 pandemic.
Methods: This retrospective observational study included fourth-year students in 2020, 2021 and 2022 at the Faculty of Health Science and Nursing, Juntendo University, Japan all of whom had undertaken and completed the required clinical placements. A total of 141 skills required in nursing practice and corresponding target levels had been established by the Japanese government. Following their final clinical placement, students assessed their achieved level for each of the 141 skills.
Results: Of the 141 skills, 20 (14.2%) were classified as "skills with difficult-to-achieve targets", and 64 (45.4%) as "skills with easy-to-achieve targets." All environmental adjustment skills were classified as "skills with easy-to-achieve targets." Less than 40% of the nursing skills were classified as "skills with easy-to-achieve targets" in the subcategories of elimination support skills, activity and rest support skills, and respiration and circulation support skills.
Conclusions: During the COVID-19 pandemic, it was difficult for nursing students to fully achieve the target levels of nursing skills. Nursing students who were forced to lose the opportunity to receive clinical placements and practice nursing skills in their university nursing education may be in serious need for generous support after graduation.

Key Words: Nursing education, Nursing skills, Nursing students, At graduation, Self-assessment, COVID-19, Pandemic

1. INTRODUCTION

On March 11, 2020, the World Health Organization (WHO) declared a global pandemic of Coronavirus disease-2019 (COVID-19).[1] Since the outbreak of COVID-19, prevention of the infection changed the lives of people worldwide. Nursing education was one of the areas that was most influenced by the pandemic, dramatically disturbed due to restrictive social distancing policies and public health measures imposed[2,3] and it was forced to modify its previously established educational processes.[4] Among these processes,

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clinical placements required substantial changes. Examples included suspension of clinical placements, a reduction in the number of days or hours for clinical placements per day, and a move to on-campus or online training.[5] The impact of the COVID-19 pandemic on nursing students has been reported in terms of lack of experience,[6,7] anxiety,[7–10] communication,[11] and difficulties in nursing tasks after graduation.[12]

Nursing skills have been identified as one of the key factors in enhancing patient safety.[13] In 2008, the Ministry of Health, Labour and Welfare of Japan established a total of 141 nursing skills and their corresponding target levels for nursing students to achieve before licensure.[14–17] A nursing license can be obtained by earning the required credits at school and passing a written exam. Therefore, acquiring these skills is not directly related to obtaining the qualification. Based on these criteria, it has been reported that nursing students in the COVID-19 pandemic had lower achievement rates for target levels in nursing skills compared with nursing students before the pandemic.[18,19] However, these reports are limited to a single clinical placement and students in the middle of their studies. Ono et al. have divided these nursing skills into those related to on-campus exercises and those related to clinical placements and have reported that the target levels for the skills of the former were achieved well, while some of latter skills were not.[20] To our knowledge, no previous studies have investigated nursing students' attainment of target levels for nursing skills upon graduation over multiple years during the COVID-19 pandemic.

This study had two aims. The first was to clarify nursing students' self-assessed levels of nursing skills at the time of graduation from a nursing university, in accordance with the target levels established by the Japanese government during the COVID-19 pandemic. The second was to identify the nursing skills that students regarded as either easy or difficult to reach the designated target levels during the same period.

2. METHODS

2.1 Study design, study population and ethics statement

This retrospective observational study used data prospectively obtained through routine educational activities at the Faculty of Health Science and Nursing, Juntendo University, Japan. Participants were fourth-year students in 2020, 2021 and 2022 who had completed all required clinical placements.

The Faculty of Health Science and Nursing, Juntendo University has collected data similar to those used in this study as part of the educational process every year. The data from 2017 to 2019 have been previously reported[21] with the aim of clarifying the level of nursing skills at graduation in normal times. We initiated our previous study in 2022, submitted the manuscript in 2023, and it was accepted for publication in 2024. At the time we initiated our previous study, data from 2022 had not been collected. This study reports the level of achievement of nursing skills during the COVID-19 pandemic from 2020 to 2022. The same methods were used for data collection and statistical analyses in both the previous study and the present study.

This study was approved by the institutional review board of Juntendo University (Approval Number: 5–07). This retrospective observational study followed the STROBE statement.[22] English language editing support was provided by ChatGPT (OpenAI, San Francisco, CA, USA) to improve clarity and grammar. The authors reviewed and verified the final content.

2.2 Instrument and data collection

A detailed description of the instrument and data collection can be found in our previous work.[21]

2.3 Responsibilities of teachers and clinical instructors

Two main instructional roles supported the students during clinical placements: university teachers and clinical nurse instructors at affiliated hospitals. University teachers provided preparatory guidance, monitored students' progress, and evaluated their clinical activities. Clinical nurse instructors offered on-site supervision and instruction in the hospital setting. During each placement, students were assigned one patient for whom they provided nursing care.

2.4 Clinical placements before the COVID-19 pandemic

Before the COVID-19 pandemic, the university provided students with clinical placements for basic nursing for a week in the first year and for two weeks in the second year. In the third and fourth years, the students experienced clinical placements for public health nursing (5 weeks), perioperative nursing (3 weeks), chronic care nursing (3 weeks), geriatric nursing (3 weeks), maternal nursing (2 weeks), pediatric nursing (2 weeks), psychiatric nursing (2 weeks), and home care nursing (2 weeks). In the fourth year, a final clinical placement for comprehensive practice was conducted for 2 weeks.

2.5 Clinical placements during the COVID-19 pandemic

During the COVID-19 pandemic, all clinical placements stopped from May to June 2020 and from September to December 2020, and students developed the nursing process on paper patients at home and discussed it remotely with their teachers via ZOOM (Zoom Video Communications, Inc.). Clinical placements gradually resumed in 2021, and from about April 2021, they had completely resumed as Japan

adapted to the COVID-19 pandemic. However, some clinical placements were restricted depending on the situation of the COVID-19 pandemic for the prevention of infections. The restrictions included a decrease in the number of days for the clinical placement, limiting durations for students to spend at the bedside to 15 minutes, and only shadowing onsite nurses.

2.6 Data analysis

A detailed description of the statistical analysis can be found in our previous work.[21] Statistical analysis was conducted with the R programming language (R Core Team 2023, A language and environment for statistical computing, R Foundation for Statistical Computing, Vienna, Austria, URL http://www.r-project.org/). Definitions of key terms used in this study are presented in Appendix 1.

3. Results

3.1 Participants' characteristics

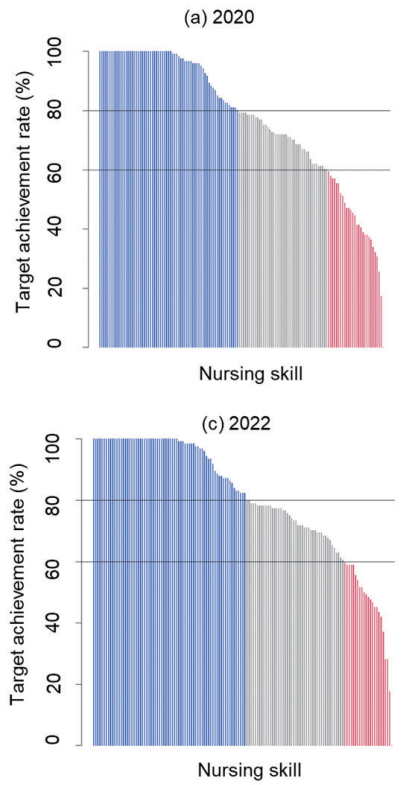
In total, 121 students in 2020, 118 in 2021, and 124 in 2022 participated in this study as fourth-year students. All students agreed to the use of their data. Among the 363 participants, 344 were female (95%) and 19 were male (5%). Participants' ages ranged from 21 to 25 years, with a mean age of 21.

3.2 Target achievement rates of nursing skills

Figure 1 shows the distribution of target achievement rates for nursing skills from 2020 to 2022. In 2020, fewer nursing skills reached achievement rates of 80% or higher compared to 2021 and 2022. In 2020, a greater number of nursing skills had achievement rates below 60% compared to 2021 and 2022.

3.3 Achievement difficulty rank for nursing skills

Table 1 shows how nursing skills were classified by achievement difficulty rank. Among the 141 skills assessed, 64 (45.4%) fell into the category of "skills with easy-to-achieve targets." In contrast, 20 skills were categorized as "skills with difficult-to-achieve targets." A detailed list of these skills is available in Appendix 2.



Year	2020		2021		2022	
Nursing skills, N	141		141		141	
TAR (%), N, %						
80 - 100	69	48.9	76	53.9	72	51.1
60 - 80	44	31.2	39	27.7	46	32.6
0 - 60	28	19.9	26	18.4	23	16.3

Figure 1. Waterfall plots of target achievement rates for nursing skills from 2020 to 2022

In (a), (b), and (c), the horizontal axis represents nursing skills, and the vertical axis represents the target achievement rate, which is defined as the proportion of students achieving the target level of nursing skills. The order of nursing skills differs in (a), (b), and (c) because nursing skills are listed from left to right in the order of the target achievement rate. The blue bars indicate nursing skills with target achievement rates of more than or equal to 80%, the gray bars indicate target achievement rates of less than 80% and more than or equal to 60%, and the red bars indicate target achievement rates below 60%. The intervals in the table in (d) are open to the right and closed to the left, except for the highest interval. TAR in the table in (d) represents the target achievement rate.

Table 1. Achievement difficulty rank for nursing skills

Achievement difficulty rank, N, %	N = 141	
Skills with easy-to-achieve targets	64	45.4
Skills with neither easy- nor difficult-to-achieve targets	57	40.4
Skills with difficult-to-achieve targets	20	14.2
Skills with variable target achievement rates	0	0.0

Notes. Analysis was conducted for the 141 nursing skills.

3.4 Category and achievement difficulty rank

As shown in Table 2, all environmental adjustment skills were classified as "skills with easy-to-achieve targets." Less than 40% of the nursing skills were classified as "skills with easy-to-achieve targets" in the subcategories of elimination support skills, activity and rest support skills, and respiration and circulation support skills.

3.5 Target level and achievement difficulty rank

Of nursing skills with target levels I or III, less than 40% of skills were classified as "skills with easy-to-achieve targets" (see Table 3). Of those with target levels I or II, more than 20% of nursing skills were categorized as "skills with difficult-to-achieve targets."

3.6 Nursing skills involving medical manikins and their achievement difficulty rank

Table 4 shows that none of the 15 nursing skills involving medical manikins (0/15, 0%) were classified as "skills with easy-to-achieve targets," whereas 64 out of 126 skills not involving manikins (64/126, 50.8%) were categorized as such.

Table 2. Relationship between category or subcategory and achievement difficulty rank for nursing skills

Types of skills, N, %		Nursing skills N = 141	Achievement difficulty rank							
Category	Subcategory		Skills with easy-to-achieve targets		Skills with neither easy- nor difficult-to-achieve targets		Skills with difficult-to-achieve targets		Skills with variable target achievement rates	
1) Daily life support skills	1. Environmental adjustment skills	3	3	100	0	0.0	0	0.0	0	0.0
	2. Dietary support skills	10	4	40.0	4	40.0	2	20.0	0	0.0
	3. Elimination support skills	13	4	30.8	7	53.8	2	15.4	0	0.0
	4. Activity and rest support skills	14	5	35.7	8	57.1	1	7.1	0	0.0
	5. Hygiene and bedclothes exchange support skills	15	6	40.0	8	53.3	1	6.7	0	0.0
2) Medical support skills	6. Respiration and circulation support skills	14	4	28.6	5	35.7	5	35.7	0	0.0
	7. Wound management skills	7	4	57.1	3	42.9	0	0.0	0	0.0
	8. Medication administration skills	25	16	64.0	7	28.0	2	8.0	0	0.0
	9. Emergency medical treatment skills	8	2	25.0	5	62.5	1	12.5	0	0.0
	10. Symptom and biofunctional management skills	14	6	42.9	6	42.9	2	14.3	0	0.0
	11. Infection prevention skills	7	5	71.4	0	0.0	2	28.6	0	0.0
	12. Safety management skills	8	3	37.5	4	50.0	1	12.5	0	0.0
	13.Comfort management skills	3	2	66.7	0	0.0	1	33.3	0	0.0

Notes. Analysis was conducted for the 141 nursing skills.

Table 3. Relationship between target level and achievement difficulty rank for nursing skills

Target level, N, %	Nursing skills N = 141	Achievement difficulty rank							
		Skills with easy-to-achieve targets		Skills with neither easy- nor difficult-to-achieve targets		Skills with difficult-to-achieve targets		Skills with variable target achievement rates	
I	34	8	23.5	18	52.9	8	23.5	0	0.0
II	54	23	42.6	20	37.0	11	20.4	0	0.0
III	21	1	4.8	19	90.5	1	4.8	0	0.0
IV	32	32	100	0	0.0	0	0.0	0	0.0

Notes. Analysis was conducted for the 141 nursing skills.

Table 4. Relationship between nursing skills involving medical manikins and their achievement difficulty rank

Involving medical manikins, N, %	Nursing skills N = 141	Achievement difficulty rank							
		Skills with easy-to-achieve targets		Skills with neither easy- nor difficult-to-achieve targets		Skills with difficult-to-achieve targets		Skills with variable target achievement rates	
Involving manikins	15	0	0.0	14	93.3	1	6.7	0	0.0
Not involving manikins	126	64	50.8	43	34.1	19	15.1	0	0.0

Notes. Analysis was conducted for the 141 nursing skills. Nursing skills were classified as either involving or not involving medical manikins. For example, one nursing skill is "can do closed chest cardiac massage correctly using a medical manikin."

4. DISCUSSION

To our knowledge, this is the first study to investigate, over multiple years, nursing students' achievement of the target levels of nursing skills established by the Ministry of Health, Labour and Welfare of Japan upon graduation during the COVID-19 pandemic. Although the absence of comparative data limits the interpretation of the results, it remains unclear whether students successfully reached the target levels. Both the target levels and the nursing skill categories appeared to be associated with students' target achievement. We have previously reported on nursing students' achievement of the target levels for nursing skills upon graduation during 2017–2019, before the COVID-19 pandemic.[21] Here we discuss the results of our current study in comparison with the previous study.

In Japanese nursing universities, as first October 2020, 97% of the universities took alternative measures for clinical placements such as on-campus exercises, writing reports, and online learning.[23] Similarly, other countries have reported suspension or restriction on clinical placements due to the COVID-19 pandemic.[4,6,24,25] Kosako et al. have reported that for clinical placement in pediatric nursing, there were 24 of 108 nursing skills for which the number of students who said they did not have the opportunity to experience the nursing skill increased by 10% or more before and during the COVID-19 pandemic.[19] Nursing students could not obtain the required clinical experience in clinical placements.[11] In the current study, of the 141 nursing skills, only 64 (45.4%) were classified as "skills with easy-to-achieve targets" and 20 (14.2%) were classified as "skills with difficult-to-achieve targets." Most of the 20 nursing skills classified as "skills with difficult-to-achieve targets" also had low target achievement rates in a previous study.[21] Compared with the results of our previous study,[21] the number of nursing skills rated as "skills with easy-to-achieve targets" decreased by 17 skills (12%) and the ones rated as "skills with difficult-to-achieve targets" increased by 15 skills (10%) before and during the COVID-19 pandemic (see Appendix 3). For all nursing skills, the achievement difficulty ranks were the same or worse during the pandemic than before (see Appendix 4). This aggravation might have been attributable to the loss of opportunities for practicing nursing skills in clinical settings due to the restrictions on clinical placements. For newly graduated nurses, there is a tendency for nursing skills not experienced in clinical placements not to be performed independently after graduation.[26] Continued support would be necessary after graduation to ensure that nursing students who lack experience in some clinical placements due to the COVID-19 pandemic can provide reliable nursing skills.

Shimanouchi et al. have reported that in home-visit nursing, the most time-consuming weekly care was skin care, hygiene care, oral nutrition care, elimination care, and exercise and ambulation support.[27] In the current study, of subcategories consisting of 10 or more nursing skills, elimination support skills, activity and rest support skills, respiration and circulation support skills had low proportions of nursing skills classified as "skills with easy-to-achieve targets." Among these, activity and rest support skills and respiration and circulation support skills did not show such a tendency prior to the COVID-19 pandemic (see Appendix 5). Some of the students in this study were restricted from remaining at bedsides for more than 15 minutes at a time during clinical placement for prevention of COVID-19 infection. Hence some of the students may not have experienced elimination support skills and activity and rest support skills in clinical placement because they are time-consuming care. Similarly, respiration and circulation support skills may not have been experienced by students in clinical placements to protect students from COVID-19 infection. These nursing skills are routinely performed in clinical practice. Therefore, more generous support may be needed after graduation for students whose experience in clinical placements was restricted by the COVID-19 pandemic during the university nursing education. In addition, it may be necessary to investigate the acquisition of nursing skills for these students after graduation.

Inoue et al. have reported that environmental adjustment skills were the skills experienced most in the basic nursing practicum.[28] In the current study, environmental adjustment skills had high target achievement rates. This tendency was the same as before the COVID-19 pandemic (see Appendix 5). The students in 2020 and 2021 completed the basic nursing practicum provided in the first and second years before the COVID-19 pandemic. The students in 2022 were also able to complete basic nursing practicum in the first year before the COVID-19 pandemic. These target achievement rates in environmental adjustment skills remained the same as before the COVID-19 pandemic, perhaps because of the completion of the basic nursing practicum. In addition, environmental adjustment skills are learned early in the first year through on-campus exercises, so they are practiced many times after that. This may be another reason for the environmental adjustment skills to have high target achievement rates.

Presence or absence of experience of nursing skills in clinical placements influences students' target achievement in nursing skills.[15] During the COVID-19 pandemic, clinical placements were restricted to observation, shadowing, and other limited forms of participation and direct care was limited.[5] The current study found that nursing skills assigned target levels I, II, and III were more likely to be difficult

for students to achieve. Before the COVID-19 pandemic, these tendencies were not observed for nursing skills with target levels I and II (see Appendix 6). Clinical placements promote nursing students from a state of knowing to a state of being able to perform nursing skills.[29] The loss of practice opportunities may have deprived nursing students of the opportunity to know that they can perform the nursing skills adequately. Achieving the target levels for nursing skills with target levels I and II would require ensuring that students have the opportunity to perform these skills in clinical placements.

According to Maruo et al.,[30] nursing skills for which target achievement rates were 10% or lower were mainly linked to skills involving critically ill or high-acuity patients, or to skills requiring physical invasiveness. In the current study, none of the 15 nursing skills involving medical manikins was classified as "skills with easy-to-achieve targets." The nursing skills here involve either urgency, severity, or invasiveness. Nursing skills with medical manikins may present challenges to achieve the target levels. Before the COVID-19 pandemic, the proportion of nursing skills with medical manikins that were rated as "skills with easy-to-achieve targets" was less than 40% of the total and it decreased during the COVID-19 pandemic (see Appendix 7). The target levels of nursing skills with medical manikins are target level III. During the COVID-19 pandemic, on-campus practice shifted to a style of real-time online viewing of teachers' demonstrations and explanations, as well as repeated viewing of the videos[31] and opportunities for repeated practice of nursing skills on campus were reduced. There is a limit to the learning of nursing skills only by reading textbooks and watching videos. Students experience discovery and difficulty through practice. Repeated practice on campus would be essential for students to achieve the target levels for nursing skills with medical manikins.

Several limitations should be acknowledged in current our research. First, the study population consisted solely of Japanese students from one nursing university. Second, the achieved levels of nursing skills may have been overestimated due to the absence of an option to indicate a lack of knowledge regarding a particular skill. Third, there is an insufficiently detailed analysis of the particular implementation of each clinical placement and the achievement of nursing skills. Fourth, since the students in our current and previous studies were different, comparisons of the achievement difficulty rank before and during the COVID-19 pandemic might have been confounded by student ability. Finally, inconsistencies may have existed between self-assessments by students and teachers' evaluations of the achieved levels for students' skills.

In order to become a nursing professional in Japan, it is necessary to complete basic nursing education, pass the national examination, then obtain a national qualification. For basic nursing education, which is the education required prior to obtaining a nursing license, the pathway for high school graduates includes studying at university college (four years), junior college (three years), or nursing school, such as vocational school (three years) in Japan.[32] Levels of nursing skills achieved by nursing students upon graduation cannot be said to be sufficiently high regardless of the COVID-19 pandemic.[21] The acquisition of nursing skills relies heavily on opportunities for on-campus practice and clinical placements. Despite the increase in the number of courses in Japanese nursing education, education hours decrease,[16] making it difficult to increase opportunities for on-campus practice and clinical placements. In addition, nursing skills that can be practiced by pre-licensure nursing students are limited.[16] It is difficult for nursing students to fully acquire nursing skills only by nursing education in a university. After ensuring that a wide range of knowledge is acquired through university nursing education, nursing skills may only be fully acquired through post-licensure nursing practice. Therefore, in Japan, clinical training for newly graduated nursing personnel is provided to equip newly graduated nurses with the essential clinical skills required for practice.[32] To achieve this, university faculty could be expected to play a role in working with employers to ensure that students are able to fully acquire nursing skills after graduation. Nursing education in Japan remains in need of change.

5. Conclusion

During the COVID-19 pandemic, it was difficult for nursing students to fully achieve the target levels of nursing skills, as determined by the Japanese government. This tendency was also observed before the pandemic, but it was exacerbated during the pandemic. During the COVID-19 pandemic, elimination support skills, activity and rest support skills, respiration and circulation support skills, and nursing skills with target levels I, II, and III were more difficult for students to achieve. Elimination support skills and nursing skills with target level III had a similar tendency before the pandemic. These trends in other nursing skills were not observed before the pandemic. For environmental adjustment skills, these tended to be easy for students to achieve the target levels before and during the pandemic. Insufficient acquisition of nursing skills in university nursing education may lead to a decline in the quality of care after graduation. Nursing students who were forced to lose the opportunity to receive clinical placements and practice nursing skills in their university nursing education may be in serious need of generous

support after graduation.

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AUTHORS CONTRIBUTIONS
Mikako Notsu: Conceptualization, Methodology, Formal analysis, Writing- Original draft preparation, Writing- Reviewing and Editing. Emiko Nishioka: Investigation, Writing- Reviewing. Yuko Takakuwa: Investigation, Writing- Reviewing. Akifumi Notsu: Conceptualization, Methodology, Formal analysis, Writing- Reviewing. Taichi Sakai: Investigation, Methodology, Writing- Reviewing, Supervision.

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The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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DATA SHARING STATEMENT
No additional data are available.

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