


# Effectiveness of Health Guidance Simulation in Community Settings for Public Health Nursing Students: A Preliminary Study

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## Abstract

**Introduction:** Simulation-based learning is a relatively new concept in public health nursing education, and little is known about the efficacy of this approach for teaching of health guidance.

**Objective:** The aim of this study was to evaluate the effectiveness of health guidance simulation in community settings for public health nursing students.

**Methods:** Using a pre/post-test design, 29 public health nursing students in their third year participated in a high-fidelity simulation program with standardized patients. We developed six scenarios on health guidance for three themes (mother and child, tuberculosis, and adult occupational health) and practice guidelines for the standardized patients to act and assist in understanding of the purpose of the course. Data were collected at baseline and after the simulation sessions through evaluation sheets that the students placed in a designated box on campus. Changes in the level of self-confidence of the students were evaluated based on the “practical skills required for public health nurses and achievement level at graduation” of the Ministry of Health, Labor and Welfare, and the skills in the minimum requirements for public health nurse education defined by the Japan Association of Public Health Nurse Educational Institutions.

**Results:** The total score for self-confidence and the mean self-confidence scores for health guidance skills for mother and child, tuberculosis, and adult occupational health nursing were significantly higher post-test compared to pre-test ( $p < 0.001$ ).

**Conclusion:** These results indicate that high-fidelity simulation focused on health guidance in community settings can bridge the gap between theoretical knowledge and practice of students.

## Keywords

health care, high fidelity simulation training, perception, public health nursing, patient simulation

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## Introduction

Improving the social determinants of health and health inequity is a global mission (Donkin et al., 2017). As healthcare professionals, public health nurses (PHNs) have the responsibility to address these inequities by providing individual care in the community (American Public Health Association & Public Health Nursing Section, 2013). In Japan, most PHNs work as public servants and have a central role in providing health guidance as individual care for community people in municipalities and prefectures (Japanese Nursing Association, 2016). Through health guidance, PHNs have identified

health issues of individual and his/her family members and focused on their disease prevention and health

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promotion (Ministry of Health, Labour and Welfare, 2013). To apply the knowledge to real-world situations, new graduates are expected to work as full-fledged PHNs as soon as possible, and faculty should focus on student-centered learning in accordance with the rapidly changing and complex healthcare environment (Joyce et al., 2018). However, a systematic review showed that simulation-based training programs focused on providing nursing care for inpatients in hospital-settings, lack of community-settings focusing on health guidance skills of PHNs for community people who have health issues (Hegland et al., 2017).

## Literature Review

Simulation-based clinical education has developed as a pedagogical approach for nursing students to integrate theoretical knowledge into practical skills in clinical settings, while maintaining patient safety and supportive environments. Simulated learning experiences are crucial in improving the confidence of nursing students in practice, while promoting their critical thinking and decision-making skills (Hayden et al., 2014). At the beginning of simulation-based learning, the faculty was focused on helping students understand clinical nursing practice (Perry, 1973). However, this was different from active learning. To overcome inadequate hands-on practice in the classroom, simulation-based learning is more practical than traditional nursing education styles, such as role-playing using written case scenarios (E. Kim, 2018). Additionally, the level of fidelity of the simulation has a significant impact on the effectiveness (Boling & Hardin-Pierce, 2016; Romero-Collado et al., 2020). A meta-analysis showed that a high-fidelity simulation with standardized patients (SPs) had the most significant effect compared to low-fidelity simulations (J. Kim et al., 2016). Trained SPs also promote the efficacy of simulation learning (Rutherford-Hemming et al., 2019). Thus, high-fidelity simulation is a novel teaching-learning approach for improving student confidence and competencies in the school setting.

In PHN education, simulation-based learning has just begun, and has been divided into four categories: care of individuals in the community; care of groups in the community; care of vulnerable populations in the community; and health of communities (Akselbo et al., 2018; Alexander et al., 2017; Babenko-Mould et al., 2015; Distelhorst & Wyss, 2013; Husson et al., 2014; Lebcir et al., 2017; Romero-Collado et al., 2020; Martin et al., 2016; Okamoto et al., 2020). However, these studies did not use SPs and did not focus on health guidance by PHNs, as their core competencies (Ministry of Health, Labour and Welfare, 2008).

In Japan, the minimum requirements for PHN education include health guidance as one of the core skills

for PHN students to acquire at the undergraduate level (The Japan Association of Public Health Nurse Educational Institutions, 2014). Additionally, the national government committee on nursing education proposed that simulation-based nursing education should start in Japan to bridge the gap between theoretical knowledge and practice among the students (Ministry of Health, Labour and Welfare, 2019). However, there is a lack of evidence for the efficacy of simulation-based education for health guidance in previous studies in Japan (Nakayama et al., 2018; Tamaki et al., 2019).

## Aim of the Study

The aim of this preliminary study was to evaluate the efficacy of simulation-based education using SPs for teaching health guidance skills to PHN students in community settings.

## Methods

### Definition of Health Guidance

Based on the national guideline of public health nursing, we defined health guidance (Ministry of Health, Labour and Welfare, 2013) in this study as below: a competency of PHNs for identifying health issues of individual and his/her family members to solve it with them for preventing disease and promoting their health in a community-setting.

### Design and Sample

A pre/post-test design was used. Among 31 students enrolled in a PHN course in the first semester of their third year, 29 participated in the study. All participants were Japanese women.

### Development of Simulation Scenarios and the Course

A high-fidelity simulation program was developed with SPs based on Kolb's (1984) experimental learning theory and Schön's (1983) theory of reflective practice, after our participation in the Fundamental Simulation Instructional Methods of SimTiki at the University of Hawaii. Development of simulation scenarios included three phases: goal setting, developing a scenario, and piloting and revising the scenario (Aschenbrenner et al., 2012). We set the goals of the course based on the curriculum, as follows: 1) students are able to assess the life and health issues of each subject, and 2) students should be able to provide evidence-based advice to subjects as health guidance. These goals were reflected in the simulation scenarios. The themes, goals of the class, settings of simulation,

simulation scenarios, and tasks for the students are shown in Table 1. Practical training was conducted for fourth-grade students and focused on three themes: a mother and her baby, a tuberculosis patient, and a male employee.

Through discussion with faculty members and use of the SimTiki Fundamental Simulation Instructional Methods, we identified themes for the simulations and the goals of the class. To promote student understanding of the continuity of the subject's life in a community, we divided each theme into a two-part simulation: 1-1) a home visit of a mother and her first baby, who was not gaining weight adequately, 1-2) a 4-month-old health checkup for the baby and mother; 2-1) preparation of a health checkup for a tuberculosis patient with a slight fever and cough for the previous three months, who lived with her sister and 0-year old niece, 2-2) supporting patients to continue Direct Observed Treatment Short Course in their local community after discharge; 3-1) specific health guidance for a male employee who was found to have a high uric acid level at a health checkup, and 3-2) follow-up guidance two months later, to confirm changes in dietary and fitness habits.

The program of simulations is shown in Table 2. Based on the theoretical frameworks (Kolb, 1984; Schön, 1983), we designed the program such that students learned nursing skills and competencies in health guidance through simulation practice and debriefing with each repetition. The course comprised 15 classes of 90 minutes each. Using the three themes, the 15 classes were divided into three groups of five classes each. In the first class for each theme, we conducted an assessment test for preparation of the students, lectured on each theme, and had group work with students to promote understanding of the theme.

In the second and third classes for each theme, we conducted simulation as followed: 1-1) a home visit of a mother and her first baby, who was not gaining weight adequately; 2-1) preparation of a health checkup for a tuberculosis patient with a slight fever and cough for the previous three months, who lived with her sister and 0-year old niece; and 3-1) specific health guidance for a male employee who was found to have a high uric acid level at a health checkup. We determined that each simulation needed a briefing of 10 minutes, during which the faculty explained the theme of the simulation, the goals of the class, and introduced the scenario of simulation first and the tasks for the students. The students discussed how to assess the SP through group work in 25 minutes. Subsequently, the students were divided into two groups and moved to the simulation laboratory. The students formed pairs and the initial simulation was conducted within 20 minutes. Other students observed the simulation in the same room and made a

note of the positive and negative points of their performances.

After the first simulation session, a 15-minute debriefing session was conducted by a faculty member. The two students who conducted the simulation commented on their experience, and observers discussed the positive and negative points that required improvement for the next simulation session. Finally, the faculty provided advice so that their knowledge and skills could be integrated into the next session. The simulation and debriefing sessions were repeated four times for each scenario. In the fourth and fifth, the students moved to the classroom, and the faculty summarized the simulation practices and each theme in 25 minutes.

We also developed practice guidelines for the SPs, who had experience as PHNs to act and assist in the understanding of the purpose of the course. In these guidelines, we included 1) a simulation outline sheet, 2) the time course, 3) the motion and role of the SP, 4) expected behaviors of the students according to their learning goals, 5) involvement of the facilitator during the simulation session, 6) setting of the simulation laboratory for increasing reality and the necessary items for each simulation scenario, 7) the background of the simulation case, 8) health data for each subject in the simulation scenarios, and 9) a list of potential questions from the student and answers for the SP on the scenarios.

Before starting the course, to keep a safe learning environment for the students, all scenarios were tested (Jeffries, 2006), and debriefing was performed in collaboration with the faculty members of the School of Nursing. The scenarios and practice guidelines were revised based on their comments. Also, two professors who conducted the simulation program explained the revised scenarios and guidelines to the SPs as preparation.

### *Data Collection and Measures*

Data were collected at baseline and after the simulation sessions through evaluation sheets that the students returned into a designated box on campus. Two outcomes were included in the evaluation sheet, as follows.

### *Practical Skills Required for PHNs and Achievement Level at Graduation*

The primary outcome was a change in the level of self-confidence of the students using the "practical skills required for PHNs and achievement level at graduation" of the Ministry of Health, Labor and Welfare (2008). The skills included 71 individual care items and 29 health guidance items. The health guidance items were divided into four subscales: multiple and continuous

**Table 1.** Theme of Simulation, Goals of Class, Scenarios, and Tasks for Students.

Themes	Goals of the class	Settings of simulation	Scenarios of simulation	Tasks for the students
1 Mother and her baby	<ol style="list-style-type: none"> <li>1 Understanding the anxiety of a mother regarding childrearing and communicating with her.</li> <li>2 Following the growth of the newborn and collecting information for assessing her growth.</li> <li>3 Considering the necessity of care for the mother and her infant.</li> </ol>	<p>Health guidance for a mother and her first baby, who was not gaining weight adequately at home and at the community health center.</p>	<p>Ms. Midori Hanazono (33 years old) has moved from Tochigi prefecture to Shinjuku city due to transfer of her husband at 35 weeks of pregnancy. She had no family support during maternity leave. Her husband comes home late and works on holidays. There were no problems during pregnancy and delivery. The infant was discharged seven days after birth (weight 2817g). At the one-month checkup, weight was 3339g and the height was 52.2cm. The mother expressed her anxiety about her fussy baby whose breastfeeding was inadequate and indicated that she was tired due to childrearing.</p>	<p>At 35 days after birth, you visited the mother's home as a municipal public health nurse. Please collect the information needed to assess the growth of the infant and the health condition of the mother. Based on these data, please conduct health guidance for the mother.</p>
2 Tuberculosis patient	<ol style="list-style-type: none"> <li>1 Understand the growth of a 4-month-old infant.</li> <li>2 Collect information for assessing her growth.</li> <li>3 Express sympathy for the mother.</li> </ol>	<p>Health guidance at 4-month-old health checkup for the baby and mother.</p>	<p>1-1) Ms. Hanako Higashi, who is an office worker aged 39 years old, has a fever. Due to increasing cough and sputum, she visited a nearby medical clinic on 1st December. A doctor prescribed antibiotics. However, her condition did not improve. One week later, she revisited the same clinic. The doctor prescribed another medicine, but her health did not recover. On 16th December, she visited another hospital and was admitted for a pulmonary tuberculosis cavity. She was worried that her family and contacts may also be infected with tuberculosis.</p> <p>1-2) The infant was brought to the community health center. The mother wanted to ask about the frequency of breast-feeding.</p>	<p>Ms. Hanazono came to the community health center for the 4-month-old health checkup for her baby. Please read the questionnaire and maternal and child health handbook, and collect information needed for assessing the growth of the baby and the mother's health condition. You are a public health nurse who works at a public health center and has visited Ms. Higashi. Based on your information, the doctor in charge of the public health center will decide on the range of health checkups for the contacts. Please conduct health guidance regarding preparation of a health checkup for relatives who have had contact with Ms. Higashi.</p>
	<ol style="list-style-type: none"> <li>1 Understand the daily life of the patient.</li> <li>2 Consider how to take medicine after discharge with the patient.</li> </ol>	<p>Health guidance for support of a tuberculosis patient to continue Direct Observed Treatment in their local community after discharge.</p>	<p>2-1) Ms. Higashi was discharged 3 days later. She was pleased to be released. However, she felt difficulty with regard to taking many antituberculosis drugs.</p> <p>2-2) Ms. Higashi was discharged 3 days later. She was pleased to be released. However, she felt difficulty with regard to taking many antituberculosis drugs.</p>	<p>Based on information collected from Ms. Higashi, the public health team will decide how to support her Direct Observed Treatment, Short-course. Please collect the required information from her.</p>

(continued)

Table 1. Continued.

Themes	Goals of the class	Settings of simulation	Scenarios of simulation	Tasks for the students
3 Male employee	<ol style="list-style-type: none"> <li>1 Communicate with the employee and understand his daily life and factors related to his high uric acid level.</li> <li>2 Conduct health guidance for improving his everyday life.</li> </ol>	<p>Specific health guidance for a male employee who was found to have a high uric acid level at a health checkup.</p>	<p>3-1) Mr. Taro Tomihisa aged 37 years old, had a health checkup every April. His uric acid level is very high. For follow-up health guidance, a public health nurse will meet with Mr. Tomihisa.</p> <p>Before this health guidance, Mr. Tomihisa got the results of the health checkup by mail. He did not understand the meaning of the high uric acid level.</p> <p>3-2) Within 2 months, you conduct health guidance for Mr. Tomihisa to reduce his alcohol and meat diet. Also, you told him that he needs exercise. At that time, you plan to conduct health guidance again 2 months later. However, Mr. Tomihisa did not improve his daily life and lacked a sense of crisis.</p>	<p>You are the public health nurse who works at Office A and meets Mr. Tomihisa for follow-up health guidance after the health checkup. Please conduct this health guidance for him.</p> <p>Please confirm the daily life of Mr. Tomihisa and conduct health guidance for him.</p>

assessments of the lives and health of community people (7 items; subscale 1), finding explicit and potential health issues in the community (4 items; subscale 2), developing a support plan for solving health issues (5 items; subscale 3), and conducting practice as PHNs (13 items; subscale 4). The level of self-confidence of each item was measured using a 5-point Likert scale, from “0: Did not have the opportunity to learn,” “1: Able to understand as knowledge,” “2: Able to perform within the school setting,” “3: Able to perform with assistance from a faculty member,” and “4: Able to perform independently.” The Cronbach alpha coefficient for the total scale was 0.968 for satisfaction.

### Minimum Requirements for PHN Education

The secondary outcome was minimum requirements (MRs) for PHN education that was published by the Japan Association of Public Health Nurse Educational Institutions (2014). A total of 24 items on individual care were used from the MRs divided into three subscales: maternal and child health (8 items; subscale MC), tuberculosis and communicable diseases (4 items; subscale TB), and adult and occupational health (12 items; subscale AO). The students were asked to mark their self-confidence level of skills on a 100-mm visual analog scale (VAS) marked at one end as “Unable to do it at all” and at the other as “Able to do it.” The VAS was marked before the start of the first class for each theme and after the five classes for each theme.

### Ethical Considerations

The Institutional Review Board (IRB) of Nursing Research approved the study protocol on April 18, 2016 (ID: 27-10). To ensure equal learning opportunities for all students, the purpose and methods of the study were explained in writing and verbally after the end of the course. We explained to the students that consent to participate in the study was voluntary and unrelated to their evaluation, and how they could withdraw their consent. Based on the advice of the IRB, no information on student attributes and readiness for learning was collected to ensure that the students were evaluated and graded fairly. All students who agreed to participate in the study provided anonymous evaluation sheets with their consent in a designated box on campus.

### Statistical Analysis

Statistical analysis was performed using SPSS Statistics, ver. 25 (IBM Japan, Tokyo, Japan). A  $p$ -value  $\leq 0.05$  was considered to indicate a significant difference from before to after the study. The total score for each subscale of “practical skills required for PHNs and achievement level at graduation” and the score for all 29 items

**Table 2.** Coursework for Each Simulation Theme, Data Collection and Measurement.

Program	Simulation scenarios	Time table	Contents	Practical skills X (Before starting the class)	Data collection and measurement Minimum requirements X (Before starting each theme)
Before starting the class	—	—	Baseline assessment	X	X
Preparation for simulation practice	—	Session 1: 90 minutes 10 minutes 35 minutes 45 minutes	Assessing test for preparation Lecture on each theme Group work with students for understanding each theme	X	X
Simulation 1)	—	Session 2 & 3: 180 minutes 10 minutes	Briefing The faculty explained to the students about the simulation scenario and task for the students. Students discussed how to assess the SP through group work. (Move to the simulation laboratory) Simulation 1	X	X
Mother and baby group Tuberculosis patient group	1-1) 2-1)	25 minutes	The students are grouped into pairs, and the initial simulation is conducted within 20 minutes. Other students observed the simulation in the same room and made a note of the positive and negative points of their performances. Debriefing 1	X	X
Male employee group	3-1)	(5 minutes) Within 20 minutes × 1 pair  15 minutes × 1 pair	The two students who conducted the simulation commented on their experience. Observers discussed the positive and negative points that required improvement for the next simulation session. Finally, the faculty provided advice so that their knowledge and skills could be integrated into the next simulation session. (Break time) Simulations 2, 3, 4 (the same method was used as for simulation 1.) Debriefing 2, 3, 4 (the same method was used as for debriefing 1.) (Break time)	X	X

(continued)

Table 2. Continued.

Program	Simulation scenarios	Time table	Contents	Data collection and measurement
Simulation 2)		Sessions 4 & 5: 180 minutes		
Mother and her baby group	1-2)	10 minutes	Briefing	
Tuberculosis patient group	2-2)		The faculty explained to the students about the simulation scenario and task for the students.	
Male employee group	3-2)	Within 20 minutes ×3 pairs	Simulations 1, 2, 3	
		15 minutes ×3 pairs	Debriefing 1, 2, 3	
		(10 minutes)	(Break time)	
		Within 20 minutes ×1 pair	Simulation 4	
		15 minutes ×1 pair	Debriefing 4	
		(5 minutes)	(Move to the classroom)	
Summary	—	25 minutes	The faculty summarized the simulation and each theme.	
After finishing the class	—	—	Follow-up assessment	X (After finishing the whole class) X (After finishing each theme)

Practical skills: practical skills required for public health nurses and achievement level at graduation (Ministry of Health, Labour and Welfare, 2008).  
 Minimum requirements: skills in the minimum requirements for PHN education published by The Japan Association of Public Health Nurse Educational Institutions (2014).

on health guidance in the community, and MRs that was the mean VAS score for each MR subscale were compared by Wilcoxon signed-rank test.

## Results

A comparison of pre and post-test scores for practical skills required for PHNs and achievement level at graduation, and MRs for PHN education is shown in Table 3.

There were significant changes in the pre-test ratings of self-confidence compared to the post-test ratings for the PHN students. Students rated their self-confidence on the post-test greater than their pre-test self-confidence for all four health guidance items subscale ( $p < 0.001$  for all four subscales).

There were also significant improvements in the pre-test ratings of the change in self-confidence level of skills of the students compared to the post-test rating for them. Students rated their skills of MRs on the post-test greater than their pre-test for all these health guidance items subscale ( $p < 0.001$  for all three subscales).

## Discussion

We found that the total score for self-confidence was significantly higher post-test compared to the pre-test. Additionally, the results showed that the mean scores of their perception of being able to do health guidance for mother and child, tuberculosis, and adult occupational health nursing were significantly higher the post-test compared to pre-test. Simulation activities assisted nursing students in gaining knowledge, critical thinking, and self-confidence, and narrowed the gap between 'know' and 'do' (Alt-Gehrman, 2019; Romero-Collado et al., 2020), and students also learn through observation and debriefing (Akselbo et al., 2018). Through debriefing, repeating of the student's reflection and translation

of the experience into practice enhance integration of theoretical and practical skills (Gunowa et al., 2018), and a combination of thinking and practice is more useful for improvement of self-confidence (Amerson, 2017). Thus, a combination of high-fidelity simulation experiences and the debriefing method could contribute to improving self-confidence of PHN students in health guidance in the community setting.

Our scenarios included three subjects, and the results significantly showed improvement in their confidence to complete the skills for health guidance in each case in the post-test. Previous researchers have focused on enhancing skills of students through simulation-based learning for care of a single case in the community (Akselbo et al., 2018; Babenko-Mould et al., 2015; Lebcir et al., 2017). For the novice learner, the beginning of the simulation experience should focus on a straightforward patient problem (Pinnock et al., 2019). However, PHNs support various community people in their practice. The simulation program provided students with real situations and opportunities for individual care in community settings, which enhanced their perception of doing the skills and knowledge (Herron et al., 2017). More realistic simulation scenarios should be developed for PHN students to successfully enhance their perception of doing the skills and bridge the gap between theoretical knowledge and practice.

We developed practical guidelines for SPs based on the educational curriculum for PHN students in their first semester. Practical simulation study used clinical care scenarios based on a curriculum (Herrington & Schneidereith, 2017) with high-quality practice guidelines (Lewis et al., 2017) over a semester. Previous studies of simulation-based education as a part of a class did not occur over an entire semester (Akselbo et al., 2018; Babenko-Mould et al., 2015; Lebcir et al., 2017;

**Table 3.** Comparison of Pre and Post-Test Practical Skills Required for PHNs and Achievement Level at Graduation and Minimum Requirements for Public Health Nursing Education.

Item		Pre-test		Post-test		P
		Mean	SD	Mean	SD	
Practical skills required for PHNs and achievement level at graduation	Subscale 1	9.9	4.4	15.6	5.4	<0.001
	Subscale 2	5.1	3.0	10.1	3.5	<0.001
	Subscale 3	7.2	3.0	11.7	3.9	<0.001
	Subscale 4	16.9	8.0	31.0	10.3	<0.001
	Total score	39.1	16.4	68.4	22.3	<0.001
Minimum requirements for public health nursing education	Subscale MC	34.0	11.8	53.5	10.0	<0.001
	Subscale TB	34.4	14.9	58.4	16.5	<0.001
	Subscale AO	32.1	12.0	52.0	15.6	<0.001

PHN: public health nurse.

MC: maternal and child health.

TB: tuberculosis and communicable diseases.

AO: adult and occupational health



Romero-Collado et al., 2020; Tamaki et al., 2019). Use of SPs and high-fidelity simulation is more effective than low-fidelity simulation (Cant & Cooper, 2017; J. Kim et al., 2016). SPs provided the students with realistic experiences in assessing each case and communicating with them based on the vision of people-centered care (Romero-Collado et al., 2020). Also, verbal and nonverbal responses of the SPs enhance the clinical reasoning of nursing students (Herron et al., 2017). Furthermore, training SPs affects the quality of their performance and the practical skills of the students (Rutherford-Hemming et al., 2019). Therefore, utilizing curriculum-based scenarios and trained SPs with practice guidelines can contribute to effective high-fidelity simulations and improve the skills of students.

### Limitations

This study had several limitations. First, we had a small sample of only Japanese female students in one setting, and we did not control for bias and limited generalizability. Second, we only measured the self-confidence and their perception of doing the skills. We could not collect any demographic data owing to the protection of the participants' anonymity, so as not to affect their evaluation and grade. Additionally, we selected evaluation items on individual care and health guidance, respectively. To measure the efficacy of the approach more accurately, a new scale is needed to evaluate simulation learning. Third, participants did not experience all the scenarios during the course, and increasing the length of the course to allow this to occur would improve the course design.

### Conclusion

This study was the first step of a pilot study of the effectiveness of health guidance simulation in community settings for PHN students. The strengths of the study were the use of various scenarios and trained SPs for PHN students in the first semester of their third year, which contributed to improving their self-confidence and their perception of being able to do the skills. Thus, a high-fidelity simulation program focused on health guidance in community settings may be crucial in bridging the gap between theoretical knowledge and clinical practice, and in improving self-confidence of PHN students. A larger study with the collection of demographic data and a randomized controlled trial design is needed to examine the effect of simulation learning in the public health nursing field.

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### Authors' Contributions

K. Y-M, and K. N. contributed to the study design; K. Y-M, and K. N. was responsible for the data collection; K. Y-M conducted data acquisition and analysis; K. Y-M and K. N. contributed to interpretation of data and the manuscript's preparation; K. Y-M, and K. N. revised the manuscript and approved the final version of manuscript.

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