

ORIGINAL RESEARCH

Effect of a physical assessment educational program on clinical practice

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Received: February 21, 2018

Accepted: March 26, 2018

Online Published: April 4, 2018

DOI: 10.5430/jnep.v8n8p96

URL: <https://doi.org/10.5430/jnep.v8n8p96>

ABSTRACT

Objective: This study aimed to investigate the effect of an educational program on physical assessment skills for registered nurses focusing on respiratory and cardiovascular systems.

Methods: Design: Survey research using a self-administered questionnaire was used. Methods: The study was conducted in the physical assessment education program and the clinical settings. The study involved 104 registered nurses who completed a self-administered questionnaire, distributed immediately and 2 months after the physical assessment education program. The data were analyzed using the Wilcoxon signed-rank test.

Results: The usage frequencies of 19 physical assessment skills increased after the educational program. The most frequently cited barrier to using these skills changed from a lack of knowledge to a lack of confidence and insufficient time. Before the program, the hospital nurses used their physical assessment skills more frequently than the home-visit nurses, but the reverse became true afterward. Nurses who recognized that they needed physical assessment skills that were learned through education showed a tendency to use these skills in nursing practice.

Conclusions: These results suggest that the educational program on physical assessment skills affected the use of these skills in clinical practice for this study cohort for this study cohort.

Key Words: Cardiovascular assessment, Nurse education, Physical assessment skills, Respiratory assessment

1. INTRODUCTION

Assessment is the first step in the nursing process and is recognized as an essential element of nursing practice. The more accurate assessment nurses can form, the better outcomes patients can achieve. Teaching physical assessment skills to nurses is essential for providing quality patient care.^[1]

Research on physical assessment skills has highlighted a gap between what is taught in a basic nursing education curriculum and what is actually practiced.^[2,3] Studies have shown that only one-third^[3] or one-fourth^[2] of about 120 physical assessment skills taught in undergraduate baccalaureate nursing programs were routinely used by nurses. Approximately

one-third of 30 core physical assessment skills identified by Giddens^[2] involved cardiovascular and respiratory assessment. These cardiovascular and respiratory physical assessment skills suggest that nurses consider assessment of these body systems to be most important for patient outcomes.^[4]

Benner^[5] noted that nursing curricula need to be modified to close the gap between basic nursing education and clinical practice and enhance students' transition into practice. Transition into professional practice can be facilitated by focusing physical assessment courses on essential competencies.^[6] Nurses require appropriate initial and ongoing education and training to ensure that they practice competently.^[7] Both

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basic nursing education and postgraduate continuing education must be modified to close this gap between education and clinical practice, focusing on evidence-based essential competencies of physical assessment.

Background

Japan is well known for its long life expectancy, which is causing challenges for healthcare systems. Changes are being made to reduce the number of hospital beds and facilitate a move from acute to community-based care.^[8] There is an increasing need for high-quality medical treatment and care provision in both community settings and hospitals. Therefore, both hospital and home-visit nurses need to improve their physical assessment abilities.

There are several courses of basic nursing education in Japan. In the main courses, basic nursing education is provided at 4-year colleges/universities, 3-year junior colleges or 3-year training schools after graduation from high school to take a national examination to obtain the national license. The educational institutions offering these three courses are under different regulating authorities; colleges/universities and junior colleges are under the jurisdiction of Ministry of Education, Culture, Sports, Science and Technology (MEXT) while most training schools are under the jurisdiction of Ministry of Health, Labour and Welfare (MHLW). The qualification of nursing personnel in Japan lacks any renewal system so that continuing education after obtaining a license is not compulsory.^[9] The regulation of Japanese nurses takes place under the post-war legislation, the Public Health Nurse, Midwife and Nurse Law of 1948, which is long overdue for major revision. This legislation allows nurses, midwives and public health nurses to be licensed for life once they have passed their national examinations. Japanese nursing qualification doesn't have any renewal system, and lasts for the rest of nursing personnel's lives.^[10]

Japanese people's long life expectancy and low birthrate have led to rapid population aging. To cope with this situation, the government introduced a long-term public care insurance system in 2000.^[11] This system provides various home care services, the most important of which is home-visit nursing care. Home-visit nursing is the responsibility of home-visit nurses.^[12] Home-visit nursing in Japan have shown leadership in promoting home care and their roles have expanded.^[13]

The first nursing university was inaugurated in 1952. It was not until the late 1990s that university graduates began to appear in significant numbers. A key issue with the rapid growth in university bachelor programs, from 30 in 1994 to 146 in 2006, is that there has not been a commensurate

growth in faculty qualified to teach at university level.^[10]

Physical assessment was introduced to the nursing educational curriculum in Japan in the late 1990s. Before this, nurses had usually learned physical assessment skills on the job.^[14] In 2007, the importance of these skills was officially recognized by the Ministry of Health, Labour and Welfare. However, schools could not agree on the duration and content of physical assessment training.^[15]

Studies in the USA have shown that only one-third^[3] or one-fourth^[2] of about 120 physical assessment skills taught in undergraduate baccalaureate nursing programs were routinely used by nurses. Recent studies on physical assessment in Australia^[16] and in Italy^[17] skills have shown that about one-third of the skills learned in basic nursing education are used daily. Osborne^[18] found that the core skills for acute care nurses and midwives mainly covered vital signs. The skills used also depend on nurses' areas of specialty.^[16,19-21] Cicolini^[18] reported that nurses working in intensive care units or nursing homes are more likely to use physical assessment skills than nurses in other settings.

Several factors have been found to constrain nurses' use of physical assessment skills, including lack of confidence,^[22,23] lack of time,^[16,22] lack of support from others,^[23] and a perception that physical assessment is not a nursing responsibility.^[17,23] One study revealed several barriers to nurses' use of physical assessment skills in acute hospitals,^[22] including reliance on others and technology, ward culture, lack of nursing role models, and lack of influence on patient care.

Fennessey^[24] suggested that many physical assessment courses are based on a medical model that does not support the more holistic approach used in nursing. West^[25] suggested that physical assessment to enhance safe and effective patient care must include in contemporary nursing practice. Physical assessment education has two perspectives: positivism and interpretivism.^[4]

Considine^[26] advocated the importance of identifying clinical deterioration as a patient safety strategy and recommended use of the primary survey approach (assessment of airway, breathing, circulation and disability). Zambas^[4] recommended teaching the physical assessment skills of cardiovascular and respiratory status. Accurate physical assessment is undoubtedly essential for nursing practice. It is necessary to identify core physical assessment skills that are most useful to improve patient outcomes. Despite an emphasis on the importance of continuing education, there is little empirical evidence on the effectiveness of continuing education program.^[27] Continuing education programs of physical as-

assessment for hospital and home-visit nurses should be based on evidence and their effectiveness evaluated.

In this study, we examined an educational program covering core physical assessment skills related to the respiratory and cardiovascular systems, which were represented by a physiological model, and assessed the impact of the educational program on the frequency with which nurses used those skills.

2. METHOD

2.1 Questionnaire design

We selected physical assessment skills related to the respiratory and cardiovascular systems^[28-30] and developed a questionnaire to measure the frequency with which nurses

use these skills on a 5-point scale. The questionnaire drew on the structured self-administered questionnaire developed by Yamauchi.^[14]

We formulated 24 items, 12 of which concerned the respiratory system and 12 the cardiovascular system (see Table 1). The five answer options for frequency of use were: 1 = never perform, 2 = seldom perform, 3 = sometimes perform, 4 = often perform, and 5 = perform very frequently. We also included items for factors that constrain (10 items) and encourage (7 items) the use of these skills (see Table 2). Participants were required to select the two most influential factors to use physical assessment skills. We also asked the participants to state the total number of years they had been in general nursing and how many years they had worked as a hospital or home-visit nurse.

Table 1. Frequency of use of each skill item

Physical Assessment Skills	
Respiratory System	Cardiovascular System
1 Inspection of chest	Inspection of jugular vein pulse
2 Inspection of areas other than chest	Inspection of jugular vein engorgement
3 Palpation of skin and hypodermis	Measuring central venous pressure by inspection
4 Palpation of trachea	Palpation of arterial pulse
5 Palpation of chest wall mobility	Determining deficient pulse based on pulse rate and heart rate
6 Palpation of fremitus	Checking status of peripheral circulation
7 Percussion of chest	Measuring blood pressure by palpation or auscultation
8 Auscultation of pulmonary sound	Palpation of pulsus cordis
9 Auscultation of inhalation/exhalation ratio	Percussion of chest
10 Discerning pulmonary sound by auscultation position	Auscultation of cardiac sound
11 Checking for abnormal pulmonary sound	Discerning cardiac sound by auscultation position
12 Auscultation of sonorants	Checking for excessive cardiac sound (heart murmur)

Table 2. Factors influencing the use of physical assessment skills

Factors impeding use	A	lack of knowledge
	B	lack of confidence
	C	insufficient time
	D	lack of equipment
	E	told that nurses need not perform
	F	think that nurses need not perform
	G	told that nurses must not perform
	H	think that nurses must not perform
	I	insufficient information given by this assessment
	J	no relation to nursing care given by this assessment
Factors encouraging use	K	told that nurses may perform
	L	think that nurses may perform
	M	told that nurses must perform
	N	think that nurses must perform
	P	sufficient information given by this assessment
	R	effective explanation to patients and families

2.2 Reliability and validity

We asked two people to evaluate the questionnaire: an instructor who teaches physical assessment as part of basic nursing education and a nurse with more than 10 years of experience in performing respiratory and cardiovascular assessments in clinical settings. These individuals confirmed the content validity of the questionnaire.

Test–retest reliability was used to evaluate the questionnaire’s reliability. The questionnaire was administered twice to 20 participants at a 2-week interval, and we performed the Wilcoxon signed-rank test to assess the consistency of the results.

2.3 Participants

Hospital and home-visit nurses who participated in the educational program (workshop, lectures, seminars) on respiratory and cardiovascular physical assessment were asked to complete the questionnaire.

The participants completed the questionnaire immediately after the educational program and again 2 months later. The questionnaires consisted of how often the respondents used physical assessment skills related to the respiratory and cardiovascular systems, and the factors affecting their use.

2.4 Analysis

Data were analyzed on a matched-pair basis by pairing data from the two surveys. We used the Wilcoxon signed-rank test to determine how the frequency of use varied between the two surveys and the chi-square test to examine the factors influencing the use of the physical assessment skills.

We also compared the frequency of use of each physical assessment item for hospital and home-visit nurses using the Wilcoxon rank sum test. We performed the chi-square test to determine whether different factors influenced the use of physical assessment skills. We used adjusted residuals to analyze the variation in the factors promoting the performance of skills that were significantly correlated with the training. The significance threshold was set at $p < .05$. The statistical software used for the analysis was SPSS ver. 18.0 for Windows (SPSS Inc., Chicago, IL).

2.5 Ethical considerations

This study was approved by the ethics committee of Nagoya University. The nurses indicated their consent to participate in the study after receiving a written briefing. The briefing informed the participants that:

- Participation was entirely voluntary
- The questionnaire contained no items that could be used to identify them

- They were free to withdraw at any time
- The results would only be used on an aggregated basis
- The decision to participate in the study would not influence their participation in the training program

The survey was designed to ensure that individual respondents could not be identified. We asked nurses to return the completed questionnaires in an anonymous envelope. We also asked the nurses to indicate their birthdate on each questionnaire so that we could match the data. There was no way to infer identity from the birthdate given.

3. RESULTS

3.1 Participants

We collected 240 questionnaires immediately after the educational program (response rate, 98.0%), of which 201 could be used (effective response rate, 83.8%). In total, 121 nurses responded 2 months later (response rate, 50.0%; effective samples, 116; effective response rate, 95.9%).

The 201 nurses who responded to the first survey had a mean of 8.1 (SD = 7.18) years of experience working as a nurse, and the 116 nurses who responded to the second survey had a mean of 9.8 (SD = 8.20) years of experience. A total of 104 nurses responded to both surveys, with a mean of 9.1 (SD = 7.85) years of nursing experience. In total, 82 (78.8%) participants were hospital nurses, with a mean of 7.7 (SD = 7.15) years of nursing experience, and 22 (21.2%) were home-visit nurses with a mean of 14.5 (SD = 8.28) years of nursing experience and a mean of 2.0 (SD = 2.46) years working as a home-visit nurse.

3.2 Frequency of use and influencing factors

In total, 11 respiratory system-related skill items and 8 cardiovascular system-related skill items had a higher frequency of use at the time of the second survey (see Table 3). Table 4 shows the results of the chi-square test regarding the reasons for using or not using each skill item; from these results, we determined which reasons were significantly correlated with the training (see Table 4). There was a significant correlation between the intervention and 16 skill items, 8 respiratory system-related items, and 8 cardiovascular system-related items.

For most items, the adjusted residuals for “think that nurses may perform” increased in weight in the second survey. We then used adjusted residuals to assess the variation in the constraining factors significantly correlated with the training. For all items, “lack of knowledge” declined significantly in the second survey, and “think that nurses need not perform” declined for two respiratory and three cardiovascular skill items. “Lack of confidence” as a reason for not per-

forming the skill item “respiratory 1: inspection of chest” declined. “Lack of confidence” increased for “respiratory 6: palpation of fremitus” and “respiratory 9: auscultation of inhalation/exhalation ratio”. “Insufficient time” increased for two respiratory skill items and six cardiovascular skill items.

Table 3. Comparison of frequency of use of physical assessment skills before and after training

Physical assessment skill	Before	After	p	
	Median value (interquartile range)	Median value (interquartile range)		
1 Inspection of chest	3.0 (2.0-4.0)	4.0 (3.0-4.0)	< .001*	
2 Inspection of areas other than chest	3.0 (2.0-4.0)	4.0 (3.0-4.0)	.011*	
3 Palpation of skin and hypodermis	2.0 (2.0-3.0)	3.0 (2.0-4.0)	.005*	
4 Palpation of trachea	1.0 (1.0-1.0)	1.0 (1.0-2.0)	< .001*	
5 Palpation of chest wall mobility	1.0 (1.0-2.0)	2.0 (1.0-3.0)	< .001*	
Respiratory system	6 Palpation of fremitus	1.0 (1.0-1.0)	1.0 (1.0-2.0)	< .001*
7 Percussion of chest	1.0 (1.0-1.0)	1.0 (1.0-2.0)	< .001*	
8 Auscultation of pulmonary sound	4.0 (3.0-5.0)	5.0 (4.0-5.0)	.434	
9 Auscultation of inhalation/exhalation ratio	2.0 (1.0-3.0)	3.0 (2.0-4.0)	< .001*	
10 Discerning pulmonary sound by auscultation position	3.0 (2.0-4.0)	4.0 (3.0-5.0)	< .001*	
11 Checking for abnormal pulmonary sound	4.0 (3.0-5.0)	4.0 (3.0-5.0)	.026*	
12 Auscultation of sonorants	2.0 (1.0-4.0)	3.0 (2.0-4.0)	< .001*	
Cardiovascular system	1 Inspection of jugular vein pulse	1.0 (1.0-2.0)	2.0 (1.0-3.0)	< .001*
2 Inspection of jugular vein engorgement	1.0 (1.0-2.0)	2.0 (1.0-3.0)	< .001*	
3 Measuring central venous pressure by inspection	1.0 (1.0-1.0)	1.0 (1.0-1.0)	< .001*	
4 Palpation of arterial pulse	4.0 (2.0-5.0)	4.0 (3.0-5.0)	.194	
5 Determining deficient pulse based on pulse rate and heart rate	3.0 (1.0-4.0)	3.0 (1.0-4.0)	.353	
6 Checking status of peripheral circulation	4.0 (3.0-5.0)	4.0 (3.0-5.0)	.730	
7 Measuring blood pressure by palpation or auscultation	5.0 (4.0-5.0)	5.0 (4.0-5.0)	.441	
8 Palpation of pulsus cordis	1.0 (1.0-1.0)	1.0 (1.0-2.0)	< .001*	
9 Percussion of chest	1.0 (1.0-1.0)	1.0 (1.0-2.0)	< .001*	
10 Auscultation of cardiac sound	2.0 (1.0-3.0)	2.0 (1.0-4.0)	< .001*	
11 Discerning cardiac sound by auscultation position	1.0 (1.0-1.0)	1.0 (1.0-3.0)	< .001*	
12 Checking for excessive cardiac sound (heart murmur)	1.0 (1.0-2.0)	2.0 (1.0-3.0)	< .001*	

* p < .05

3.3 Comparison between hospital and home-visit nurses

Table 5 shows the results of the Wilcoxon rank sum test comparing the frequency of use between hospital and home-visit nurses. After training, there was a significant difference between hospital and home-visit nurses in the frequency of use of two respiratory items and five cardiovascular items. All seven skills were used more often by home-visit nurses.

We performed a chi-square test to identify correlations between the reasons for performance or nonperformance of each skill item and the type of nurse. In the second survey, three skill items showed correlations: “respiratory 1: inspection of chest”, “cardiovascular 1: inspection of jugular vein pulse” and “cardiovascular 3: measuring central venous pressure by inspection.” Using adjusted residuals, we analyzed the variation in the reasons for performance. For “respiratory 1: inspection of chest” hospital nurses were more likely to

select “think that nurses may perform” (adjusted residual = 2.2), and home-visit nurses were more likely to select “effective explanation to patients and families” (adjusted residual = 3.3). For “cardiovascular 3: measuring central venous pressure by inspection”, home-visit nurses were more likely to select “think that nurses may perform” (adjusted residual = 2.2) or “efficient communication among health caregivers” (adjusted residual = 2.6). For the assessment skill “cardiovascular 9: percussion of chest”, home-visit nurses were more likely to select “think that nurses may perform” (adjusted residual = 2.2).

4. DISCUSSION

4.1 Frequency of use and influencing factors

Our study showed that this cohort of Japanese nurses often or very often used around one-third of the 24 physical assessment skills related to the respiratory and cardiovascular

systems. The five skills for checking vital signs were already not change afterward. The other skill items were used more being used before the training, and their frequency of use did frequently after training.

Table 4. Comparison of factors influencing use of physical assessment skills before and after training

Physical assessment skill	χ^2	df	p-value	
Respiratory system	1 Inspection of chest	33.28	13	.002*
	2 Inspection of areas other than chest	16.49	14	.284
	3 Palpation of skin and hypodermis	20.61	13	.081
	4 Palpation of trachea	49.64	14	.000*
	5 Palpation of chest wall mobility	62.51	14	.000*
	6 Palpation of fremitus	71.91	13	.000*
	7 Percussion of chest	78.88	13	.000*
	8 Auscultation of pulmonary sound	8.93	11	.628
	9 Auscultation of inhalation/exhalation ratio	42.96	13	.000*
	10 Discerning pulmonary sound by auscultation position	25.86	12	.011*
	11 Checking for abnormal pulmonary sound	13.51	11	.262
	12 Auscultation of sonorants	30.52	13	.004*
Cardiovascular system	1 Inspection of jugular vein pulse	55.06	12	.000*
	2 Inspection of jugular vein engorgement	50.08	12	.000*
	3 Measuring central venous pressure by inspection	88.62	11	.000*
	4 Palpation of arterial pulse	18.18	12	.11
	5 Determining deficient pulse based on pulse rate and heart rate	17.74	12	.124
	6 Checking status of peripheral circulation	6.18	11	.861
	7 Measuring blood pressure by palpation or auscultation	10.21	11	.511
	8 Palpation of pulsus cordis	70.84	11	.000*
	9 Percussion of chest	79.31	12	.000*
	10 Auscultation of cardiac sound	25.34	12	.013*
	11 Discerning cardiac sound by auscultation position	55.19	12	.000*
	12 Checking for excessive cardiac sound (heart murmur)	51.99	12	.000*

* $p < .05$

The finding that nurses were routinely using vital sign-related physical assessment skills before the educational program is consistent with a previous study.^[14,18] In their study on registered nurses and midwives, Osborne^[18] identified a set of core skills that most nurses used all the time, including assessment of temperature, oxygen saturation, blood pressure, breathing effort, and skin, wound, and mental status.

Before training, the nurses in our study were routinely using pulmonary auscultation, which is consistent with the findings reported by Yamauchi.^[14] Some studies showed that pulmonary auscultation was rarely used,^[17,18] and others showed that it was used frequently.^[2,3] Shinozaki^[15] conducted a quantitative descriptive study using the Delphi technique to establish the minimum essential health assessment competency levels for Japanese nursing education with particular emphasis on the respiratory system. They reported a strong consensus that auscultation competency is essential

for physical assessment of the respiratory system. However, Cicolini^[17] reported that the Italian nurses they surveyed did not consider auscultation techniques to be part of typical nursing practice. Instead, they saw them as high-level techniques that should normally be performed by doctors. A study in Australia^[16] also indicated that certain skills were not practiced because of lack of time and the role of nurses. The study showed the nurses used less physical assessment skills than midwives.

In our study, some physical assessment skills were never used even after training. The main factor inhibiting the use of these skills before training was the belief that “nurses do not need to perform this skill” After training, significantly fewer nurses cited this reason and instead said that they thought nurses could perform these skills. For all skills, lack of knowledge was improved by providing education. The most frequently cited barrier to using these skills changed from

“lack of knowledge” to “lack of confidence” and “insufficient time.”

The barriers to using physical assessment skills identified in the present study are consistent with those in previous

studies. These barriers include the perception that physical assessment is not a nursing responsibility,^[17] lack of confidence,^[22] and lack of time.^[16,22] However, our study also showed for the first time that training can change nurses’ attitudes toward physical assessment skills.

Table 5. Comparison of frequency of use between hospital and home-visit nurses

Physical assessment skill	Before educational program			After educational program			
	Hospital nurses	Home-visit nurses	<i>p</i>	Hospital nurses	Home-visit nurses	<i>p</i>	
	Median value (interquartile range)	Median value (interquartile range)		Median value (interquartile range)	Median value (interquartile range)		
Respiratory system	1 Inspection of chest	3.0 (2.0-4.0)	3.0 (2.0-4.0)	.349	3.5 (3.0-.04)	4.0 (2.8-5.0)	.784
	2 Inspection of areas other than chest	3.0 (2.0-4.0)	4.0 (3.0-4.0)	.423	4.0 (3.0-4.0)	4.0 (2.8-5.0)	.237
	3 Palpation of skin and hypodermis	2.0 (1.5-3.0)	3.0 (1.8-4.0)	.242	3.0 (2.0-4.0)	4.0 (2.0-4.0)	.468
	4 Palpation of trachea	1.0 (1.0-1.0)	1.0 (1.0-1.0)	.585	1.0 (1.0-2.0)	2.0 (1.0-3.0)	.005*
	5 Palpation of chest wall mobility	1.0 (1.0-2.0)	1.0 (1.0-1.0)	.333	2.0 (1.0-2.3)	2.0 (1.0-3.0)	.114
	6 Palpation of fremitus	1.0 (1.0-1.0)	1.0 (1.0-1.0)	.668	1.0 (1.0-2.0)	2.0(1.0-2.3)	.139
	7 Percussion of chest	1.0 (1.0-1.0)	1.0 (1.0-1.0)	.728	1.0 (1.0-2.0)	2.0 (1.0-3.0)	.007*
	8 Auscultation of pulmonary sound	4.0 (3.0-5.0)	4.0 (3.0-5.0)	.324	5.0 (3.8-5.0)	4.5 (3.8-5.0)	.562
	9 Auscultation of inhalation/exhalation ratio	2.0 (1.0-3.0)	2.0 (1.0-4.0)	.616	3.0 (2.0-4.0)	3.0 (2.0-4.0)	.67
	10 Discerning pulmonary sound by auscultation position	3.5 (2.0-4.0)	2.5 (1.0-4.0)	.002*	4.0 (2.0-5.0)	4.0 (3.0-5.0)	.925
	11 Checking for abnormal pulmonary sound	4.0 (3.0-5.0)	4.0 (2.0-4.0)	.003*	4.0 (3.0-5.0)	4.0 (3.5-5.0)	.687
	12 Auscultation of sonorants	2.0 (1.0-4.0)	2.0 (1.0-3.3)	.134	3.0 (1.8-4.0)	4.0 (2.0-4.0)	.526
Cardiovascular system	1 Inspection of jugular vein pulse	1.0 (1.0-2.0)	1.0 (1.0-2.3)	.862	2.0 (1.0-3.0)	2.0 (1.8-3.0)	.478
	2 Inspection of jugular vein engorgement	1.0 (1.0-2.0)	1.0 (1.0-1.3)	.247	2.0 (1.0-3.0)	2.0 (1.0-3.0)	.874
	3 Measuring central venous pressure by inspection	1.0 (1.0-1.0)	1.0 (1.0-1.0)	.879	1.0 (1.0-1.0)	1.0 (1.0-2.0)	.025*
	4 Palpation of arterial pulse	5.0 (3.0-5.0)	3.0 (2.0-4.0)	.001*	4.0 (3.0-5.0)	4.0 (3.0-5.0)	.525
	5 Determining deficient pulse based on pulse rate and heart rate	3.0 (1.0-4.0)	2.0 (1.0-3.0)	.068	3.0 (1.0-4.0)	2.0 (1.0-4.0)	.454
	6 Checking status of peripheral circulation	4.0 (3.0-5.0)	4.0 (3.0-5.0)	.102	4.0 (3.0-5.0)	4.0 (3.0-5.0)	.876
	7 Measuring blood pressure by palpation or auscultation	5.0 (4.0-5.0)	5.0 (5.0-5.0)	.166	5.0 (4.0-5.0)	5.0 (4.0-5.0)	.78
	8 Palpation of pulsus cordis	1.0 (1.0-1.0)	1.0 (1.0-1.0)	.685	1.0 (1.0-2.00)	1.0 (1.0-3.0)	.203
	9 Percussion of chest	1.0 (1.0-1.0)	1.0 (1.0-1.0)	.535	1.0 (1.0-2.0)	2.0 (1.0-3.0)	.004*
	10 Auscultation of cardiac sound	2.0 (1.0-3.0)	3.0 (1.0-4.0)	.053	2.0 (1.0-3.0)	3.0 (2.0-4.0)	.008*
	11 Discerning cardiac sound by auscultation position	1.0 (1.0-1.0)	1.0 (1.0-1.3)	.795	1.0 (1.0-3.0)	3.0 (1.8-4.0)	.003*
	12 Checking for excessive cardiac sound (heart murmur)	1.0 (1.0-2.0)	1.0 (1.0-2.3)	.725	2.0 (1.0-3.0)	3.0 (1.0-4.0)	.029*

p < .05

4.2 Comparison between hospital and home-visit nurses

Before training, the hospital nurses used physical assessment skills more frequently than did the home-visit nurses, but the reverse became true after training. We identified several skills for which the influencing factors varied significantly between hospital and home-visit nurses. Home-visit nurses were more likely to cite “efficient communication among caregivers” or “effective explanations for patients and families” as reasons for using the skill. As home-visiting nurses in Japan are required to convey information gathered by themselves to other occupations, patients and families, it is considered that they are trying to obtain more information by

using physical assessment skills. Previous research has suggested that the specialty area can influence the performance of physical assessment skills.^[2,16–18] One study in a hospital setting showed that physical assessment skills utilisation differed significantly by clinical areas reporting fewer skills compared to surgical, medical, oncology, or maternity.^[18] Another study showed that the nurses operating in intensive care units or nursing homes were significantly more likely than all others to perform the recommended physical assessment skills.^[17] As a reason of physical assessment skill utilization, it was showed that intensive care unit and nursing home were highly challenging areas, in which nurses often

work alone, are an active part of the decision-making process, and they have to manage high-risk patients. Consistent with the previous study,^[17] our results suggest that home-visit nurses in Japan acquire and practice a wider range of physical assessment skills. That home-visit nurses in Japan acquire and practice a wider range of physical assessment skills.

Tenner^[31] showed the importance of noticing and interpreting changes in the clinical situation that require attention to certain patients. Factors hindering the use of physical assessment skills that increased after training were lack of time and confidence. The core physical assessment skills that did not show a change in their frequency of use and that did not show improvement in their reason for use would not be included in the continuing educational program. The continuing educational program to increase nurses' ability to assess changes in the patient's condition within a constrained amount of time needs to be constructed.

4.3 Limitations

The nurses who participated in the physical assessment training in the present study may not be representative of nurses as a whole. For example, they were probably more interested in physical assessment than the average nurse, which could mean that they were more likely to change their practice following training.

5. CONCLUSION

The present study, which focused on skills related to the physical assessment of the respiratory and cardiovascular systems, showed the effect of an educational program on the performance of these skills. The most frequently mentioned barriers to the use of physical assessment skills changed from a lack of knowledge to a lack of confidence and insufficient time. Nurses who recognized that they needed physical assessment skills learned through education showed a tendency to use these skills in nursing practice. Factors obstructing the use of physical assessment skills provided by the educational program were improved, suggesting the possibility of acquiring and practicing physical assessment skills. It is necessary to establish a continuing educational program to improve nurses' physical assessment ability and improve patient outcomes.

ACKNOWLEDGEMENTS

We thank Angela Morben, DVM, ELS, from Edanz Group (www.edanzediting.com/ac), for editing a draft of this manuscript. This study was supported by JSPS KAKENHI Grant Numbers JP25463547 and JP25293431.

CONFLICTS OF INTEREST DISCLOSURE

The authors declare that there is no conflict of interest.

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