

Simulation-Based Learning in Undergraduate Nursing Education in Japan

A review of the literature

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Abstract—The use of simulation in health professional education has increased rapidly in Japan during the past decade. However, to date, only a limited number of studies reporting this situation has been published. We, herein, endeavored to ascertain how simulation has been adopted in nursing education, reviewing Japanese articles in this field. Searching a database, Nippon Igaku Chuo Zasshi, identified 86 peer-reviewed research studies published in Japanese between 1986 and 2016. Since 1999, around 5 articles per year have consistently been published. Simulation was applied predominantly in basic and medical-surgical nursing areas, to learn physical assessment, fundamental skills, injection, and perioperative care. Forty-one percent of the simulation-based learning was conducted using 3-D-models to provide infection and cardiopulmonary resuscitation education. Intermediate and high fidelity patient simulators were applied to teach physical assessment, fundamental skills, and perioperative care, only in rare cases. In Japan, much higher importance should be placed on simulation-based undergraduate nursing education, and the socioeconomic environment for introducing more sophisticated simulators must be improved.

Key words- nursing education; nursing; simulation; simulators; health care professionals.

I. INTRODUCTION

The primary aim of simulation is to improve patient safety and to help the student nurse achieve competence, linking their theoretical knowledge with clinical practice [1]. The use of simulation in health professional education has increased rapidly over the past 2 decades [2]. The current range of simulation in this field consists of written simulations, three-dimensional models, screen-based simulators, standardized patients (SP), intermediate fidelity patient simulators, and interactive patient simulators (Table 1)[3].

In the current health education system, the demand for clinical placements is increased, while there is a global social need for higher quality healthcare services with shorter hospital stays [4]. In addition, in Japan, clinical practicum hours have been decreasing remarkably in the recent nursing education curriculum, as students spend more time in theoretical classroom learning. Thus, nursing students have less chance to be involved in patient care and reduced opportunities to deal with practice situations [4]. This may

lead to decreased clinical competencies in nursing school graduates [5]. Hence, there has been a need to reproduce the experience by some other means. Indeed, the Japanese Ministry of Health, Labour and Welfare encouraged trainees to complement skills that could not be experienced during a practicum using simulation-based learning.

Reflecting a global trend of accelerating use of simulation in nursing education, the simulation-based education in our country seems to be spreading recently. However, a limited number of studies going through this situation has been published in Japanese, and there have been none in English. In this study, we endeavored to ascertain how simulation has been adopted in nursing education in Japan, reviewing Japanese articles in this field.

II. METHODS

A. Literature Search Strategies

The research question that informed the search was ‘How has simulation been used in nursing education in Japan?’ Boolean operators of AND & OR were used in the search. A Japanese electronic database, Nippon Igaku Chuo Zasshi (Japana Centra Revuo Medicina), was searched for peer-reviewed research studies in the Japanese language published between the years of 1986 and December 2016, focusing on simulation and/or simulator use in nursing education. The search terms used to discover the literature were: Simulation; Simulators; Nursing; Education; Skills.

B. Inclusion and Exclusion Criteria

Studies were selected if they described an impact of simulation-based learning in nursing undergraduate education. Excluded studies were literature reviews, those reviewing learning theory, qualitative reviews of student or faculty experience, and those targeting simulation education for qualified staff.

C. Literature review and analysis

The searches identified a total of 86 articles on simulation-based undergraduate nursing education during the period. Articles were grouped based on the major and sub-specialties of nursing science, types of simulation, and subjects who were the targets of simulation training. The

TABLE I. PROPOSED TYPOLOGY OF SIMULATION METHODOLOGIES BY ALINIER [3]

Simulation Techniques	Examples
Written simulations	Pen and paper simulations, or “Patient Management Problems”, and latent images
3-D models	Basic mannequins, low fidelity simulation models, or part-task simulators
Screen-based simulators	Computer simulation, simulation software, videos, DVDs, or Virtual Reality and surgical simulators
Standardized patients	Real or simulated patients, role playing
Intermediate fidelity patient simulators	Computer controlled, programmable full body size patient simulation not fully interactive
Interactive patient simulators or computer controlled model driven patient simulators	High fidelity simulation platforms

major specialties included basic (fundamental nursing skills), communities/public, geriatric, medical-surgical, midwifery, pediatric, and psychiatric and mental health nursing, and the subspecialties of cardiac, critical care, disaster, emergency, home, informatics, management, oncology, orthopedic, perioperative, and wound, ostomy and continence (WOCN) nursing, in addition to major categories. Studies dealing with general subjects of major specialties were sub-classified into the category designated as being as the same as the major one (Table 2).

III. RESULTS

A. Annual Change in the Number of Articles on Simulation-based Undergraduate Nursing Education in Japan

The first report on simulation-based learning for nursing students appeared in 1987. Since 1999, the articles on simulation-based education for undergraduate nursing students have been consistently published, around 5 articles per year on average (Fig. 1).

B. Specialities in Simulation-based Nurse Education

Simulation was applied predominantly to basic and medical-surgical nursing areas; the proportion of the basic nursing was 57%, and that of medical-surgical nursing 22%

TABLE II. NUMBER OF ARTICLES CLASSIFIED BY MAJOR AND SUB- SPECIALITIES

		Major specialities						Total		
		Basic	Communities/public	Geriatric	Medical-surgical	Midwifery	Pediatric		Psychiatric and mental health	
Subspecialities	Basic	29	0	0	2	0	2	0	33	
	Cardiac	1	0	0	0	0	0	0	1	
	Critical care	0	0	0	2	0	0	0	2	
	Disaster	2	0	0	0	0	0	0	2	
	Emergency	6	0	0	1	1	0	0	8	
	Geriatric	0	1	0	0	0	0	0	1	
	Home	0	1	0	0	0	0	0	1	
	Informatics	0	2	0	0	0	0	0	2	
	Management	4	0	1	0	0	2	0	7	
	Medical-surgical	2	0	0	1	0	0	0	3	
	Midwifery	0	0	0	1	3	0	0	4	
	Oncology	1	0	0	1	0	0	0	2	
	Orthopedic	0	0	1	0	0	0	0	1	
	Pediatric	2	0	0	0	0	0	0	2	
	Perioperative	2	0	0	10	0	0	0	12	
	Psychiatric and mental health	0	0	0	0	0	0	3	3	
	WOCN	0	0	1	1	0	0	0	2	
	Total		49	4	3	19	4	4	3	86

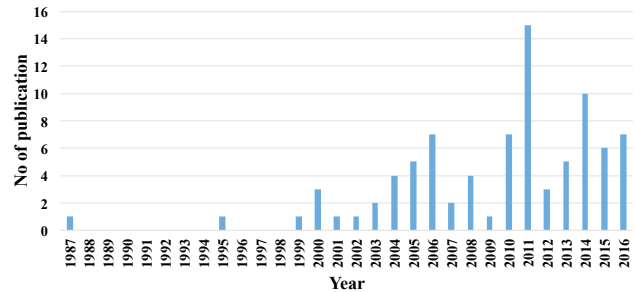


Figure 1. Annual Change in the Number of Articles Reporting Simulation-Based Undergraduate Nursing Education in Japan

(Fig. 2). Among the subspecialties, simulation was primarily used to learn basic nursing science (Fig. 3).

C. Training Subjects Intended in Simulation-based Nursing Education

Simulation was mainly implemented to educate trainees in physical assessment, fundamental skills, injection, and perioperative care (Fig. 4). The subject “injection” mostly included venipuncture.

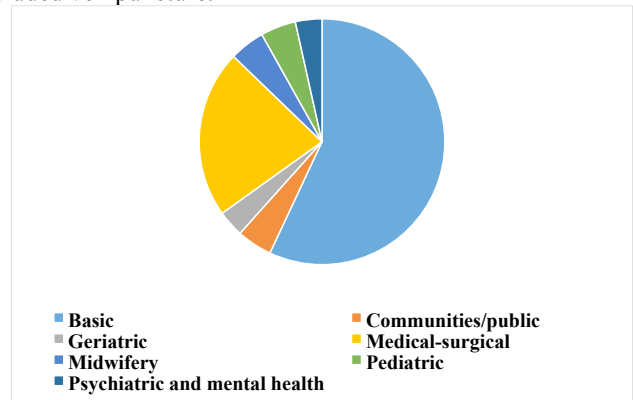


Figure 2. Major Specialties in Simulation-based Nurse Learning

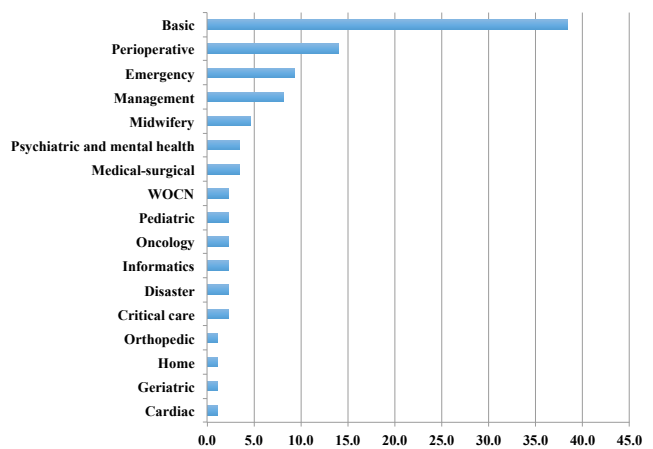


Figure 3. Subspecialties in Simulation-based Nurse Education

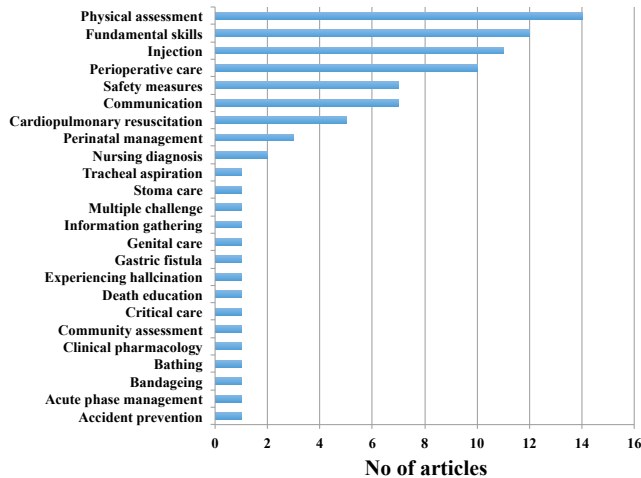


Figure 4. Training Subjects in Simulation-based Nursing Education

In the subspecialty “basic nursing”, which comprised the main part of the simulation-based education (Fig. 3), the major training subjects consisted of injection, fundamental skills, physical assessment, and communication (21, 19, 12, and 9%, respectively).

D. Types of Simulation in Undergraduate Nursing Education

Forty-one percent of the simulation-based learning was conducted using 3-D-models (Fig. 5), to teach infection management and cardiopulmonary resuscitation (CPR) (Fig. 6). SP were used in communication and fundamental skills education (Fig. 6). Intermediate and high fidelity patient simulators were applied to learn physical assessment, fundamental skills, and perioperative care education, only in rare cases (Fig. 6). Articles targeting education with these sophisticated simulators first emerged in 2003, and have been consistently produced since 2010 (Fig. 7).

IV. DISCUSSION

To our knowledge, this is a first literature review in English reporting the simulation-based learning for undergraduate nurses in Japan.

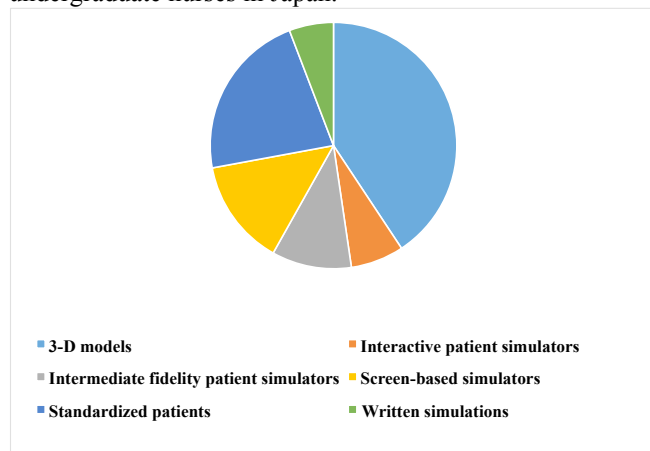


Figure 5. Types of Simulation

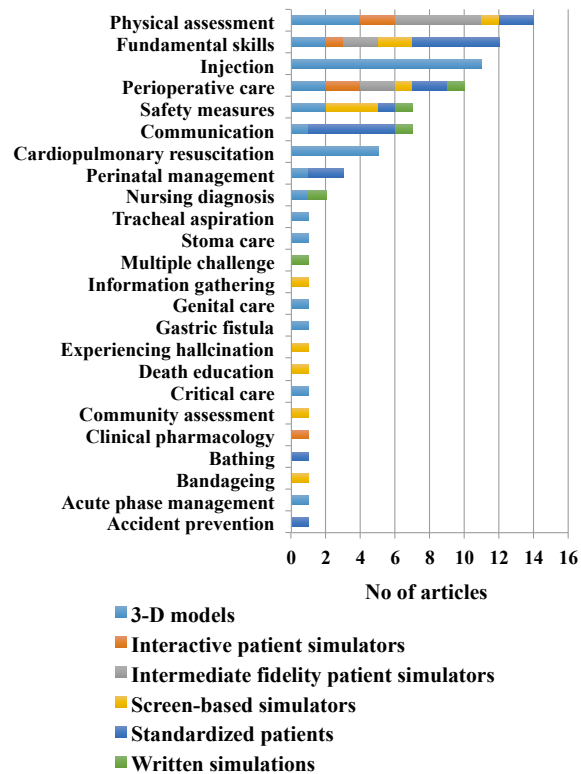


Figure 6. Distribution of Types of Simulation in Training Subjects

Since 2003, the number of articles in this field has started increasing, possibly highlighted and promoted by four governmental bulletins. The Japanese Ministry of Education released a report on the university/college education for practical nursing skills in 2002, and one on the attainment target for this education in 2004. In 2003, the Japanese Ministry of Health, Labour, and Welfare also issued a report on the desired skill education for undergraduate nursing students, and one on education in practical nursing skills for novice nurses. These noted that nursing students have fewer chances to be involved in patient care, and to deal with practice situations, because of a socioeconomic need for shorter hospital stays, and consideration of the human rights of patients, and medical safety measures. The bulletin in 2003 suggested applying role-playing to practical training within the campus, which may have pioneered simulation-based nursing education in Japan. Indeed, SD was one of the major issues in the articles published (Fig. 5), and these studies came out consistently (Fig. 7).

This literature review revealed that 3-D models, including basic mannequins, low fidelity simulation models, or task trainers were prevalently used in pre-licensure nursing education in Japan, when teaching physical assessment, general fundamental skills, injection, or CPR. This observation, although literature based, is in line with an actual survey by Kuroda et al [7], showing that 61.2 % and 69.3 % of nursing schools possessed task trainers and low fidelity simulators, respectively.

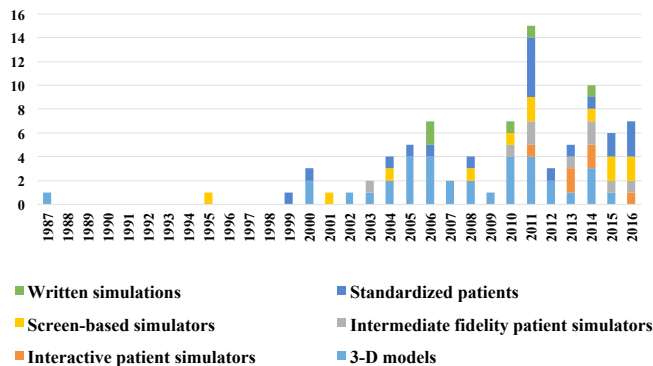


Figure 7. Annual Changes in Types of Simulation

A report reconsidering the teaching contents and methods in the undergraduate nursing education released by the Japanese Ministry of Health, Labour, and Welfare in 2012 advised that skills, which could not be experienced during the practicum training, should be complemented by simulation, and even referred to introducing more sophisticated simulators, which may have brought about emergence of the articles addressing intermediate and high fidelity simulators (Fig. 7). Multiple studies confirmed that high fidelity simulation benefited nursing students in terms of knowledge acquisition and critical thinking, and created a learning environment that contributed to greater knowledge, skills, safety, and student confidence [7]. These devices, however, have not been sufficiently distributed in our country, to date; the ownership ratio of intermediate fidelity simulators for physical assessment, that for critical care, and high fidelity ones for the nursing schools were reportedly 45.2-71.0, 86.5, and 24.2%, respectively [6].

The limitation of this study is that the data are based on a literature review, rather than on an actual condition survey. Furthermore, investigations to elucidate the history and the current status of this subject should be required, and published in English.

We conclude that, in Japan, much more importance should be attached to simulation-based undergraduate nursing education as a teaching methodology, as well as a research field. The optimal socioeconomic environment to introduce sophisticated patient simulators must be prepared by the government.

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