

# Introducing Simulation Education to the Process of Training Doctors

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## Introduction

Since it was reported that errors in medical treatment were causing serious health hazards to patients,<sup>1</sup> the medical care paradigm has shifted, and there is now a strong demand worldwide for revision and improvement of the safety and quality of medical care.<sup>1,2</sup> In particular, during the process of learning clinical techniques, more importance has been attached to the training and education of doctors.<sup>2</sup>

When learning the techniques of medical care, the “see one, do one, teach one” policy has long been widely accepted. This means that when beginners receive training for a certain medical care technique, they should first observe what their supervisory doctors do, then carry out the same procedures themselves, and finally with full mastery of the techniques, they can teach them to others. Learning by doing is an essential process in mastering any procedure. However, as the importance of patient safety has grown in recent years, it has become difficult for beginners to learn techniques by means of on-the-job training with patients.

Because of this situation, simulation education is an indispensable process by which doctors in training master medical care techniques. It has been pointed out that simulation education has many advantages: it allows repeated practice of techniques without the aforementioned ethical concerns; techniques can be practiced even at levels which would be dangerous with actual patients; technical improvement can be rated in numerical terms; the training is provided in a stress-free environment.<sup>3</sup>

## Background

### Medical adverse events

According to the 2009 issue of the report on medical adverse event information, which is published every year by the Japan Council for Quality Health Care, 27.9% of medical adverse events resulted from therapeutic procedures. When doctors were responsible for such adverse events, those who had graduated from medical school 3–5 years previously accounted for the largest proportion.<sup>4</sup> Trainee doctors at this stage generally have finished 2 years of postgraduate training and have presumably reached a level of clinical capability allowing the provision of medical care for patients by themselves. These young doctors are about to start their specialized training. However, knowledge and skills in their specialties are not yet sufficient. It is thus inferred that implementation of specialized therapeutic procedures by trainee doctors on their own can lead to the occurrence of medical adverse events.

### Simulators

Simulators developed for medical education and training are broadly classified as dummy models that mimic human bodies, virtual reality (VR) models that create a virtual reality space on a computer, and hybrid models that have features of both hybridized dummy and VR models, such as the Human Patient Simulator (HPS). These simulators are designed for training in clinical examination skills including listening to heart and breath sounds, training in therapeutic procedures such as centesis, suturing and endoscopy, and emergency care training that requires a

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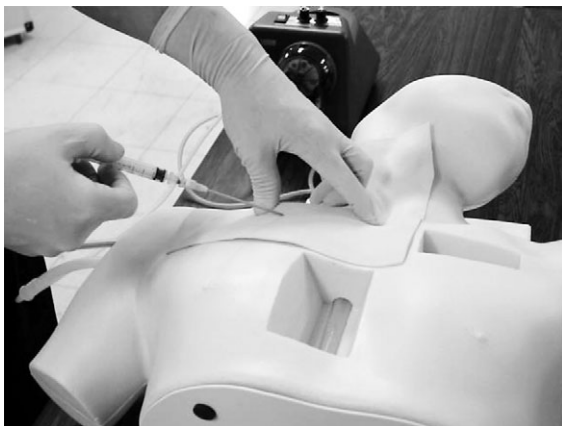


Fig. 1 Central venous puncture and catheterization model



Fig. 2 Advanced cardiac life support training with use of Human Patient Simulator

hybrid model with the functions of altering vital signs according to the situation being simulated.

## Efforts at Chiba University Hospital

### Facilities

#### Skills lab and development of simulators

In 2001, our hospital began to purchase various simulators with an education support grant from the Ministry of Education, Culture, Sports, Science and Technology (MEXT), and initiated simulation education for medical students and trainee doctors. We set up a skills lab that was equipped with physical examination simulators comprising mainly dummy models (auscultation of heart and breath sounds, fundoscopic examination, otoscopic examination, etc.), imitation skin for practice in suturing, venous blood collection and injection models.

In 2002, our hospital worked on the development of simulators in cooperation with a manufacturer in a pilot project under the auspices of the MEXT. By means of this project, dummy models for intestinal anastomosis, rectal examination, central venous puncture/catheter insertion, etc. were developed, and some have actually been introduced to the market (Fig. 1).

In December 2005, the objective structured clinical examination (OSCE), a type of shared examination designed to evaluate clinical skills of medical students, was launched. Because certain embarrassing medical procedures (rectal examination, breast palpation, etc.) were included among

the items to be learned and evaluated, simulators of these procedures were also made available. VR models (for insertion of venous indwelling needles) and the HPS were also put in place. It also became possible to provide emergency life saving training such as advanced cardiac life support (ACLS) by using the HPS (Fig. 2).

#### Simulation Center (SC) and expansion of simulation education

Because both the types and the numbers of simulators placed in the skills lab grew, a dedicated space was newly prepared inside the hospital to develop the skills lab into an actual SC in April 2009. Then, a manager was assigned to the SC in April 2010. The presence of this manager whose task was to run the facility allowed the SC to be available on a steady basis, resulting in a utilization increase. Hands-on seminars that use newly installed VR models (upper or lower endoscopy, cardiac catheterization, ultrasonography) and trainer boxes for endoscopic training have been planned and implemented.

Although the use of the SC was formerly restricted to medical students and trainee doctors, the facility was opened to other healthcare providers including nurses, after its expansion. Technical training designed for nurses, focusing especially on blood collection and insertion of venous indwelling catheters using simulators, has been in operation as part of the nursing technical training process.

Simulation education using simulated patients (SPs) was also introduced. The role of SPs is

significant in medical interview training, including collection of information from patients, establishment of the patient-doctor relationship and patient education. The use of SPs allows simulated training for medical interview scenes that medical students and trainee doctors may encounter in clinical practice, covering areas from basic communication skills to more advanced skills needed to respond to various cases in which communication is difficult.

#### **Clinical skills center (CSC)/Chiba career support center for doctors**

As simulation education diversified, needs arose for facilities with various functions. In our hospital, we decided to replace the current SC with a CSC to address these needs. For this purpose, the former psychiatric ward will be renovated to become a facility with an area of more than 1,300 m<sup>2</sup> which is equipped with a training room where various simulators are available, a simulation room where the HPS can be used, a lecture room, a debriefing room, an examination room for OSCE, a conference room for students and trainee doctors, a locker room, and a room with SPs, etc. In the CSC, a wet lab where animals or other materials are used will be established (though in a different location), in addition to dry labs where simulators and SPs are used.

For renovation of this facility, a subsidy was provided by the local healthcare recovery fund from Chiba Prefecture. This facility is dedicated to providing medical practitioners in the community with well-developed simulation education and thereby improving their clinical skills, leading to the promotion of patient safety and patient-centered healthcare services. The final goal of establishing this education and training system that has clear outcome targets is to enhance the appeal of medical training in Chiba Prefecture, and thereby increase the number of trainee doctors who choose hospitals in Chiba as their training sites. The CSC will also be available for extramural doctors and nurses as the Chiba career support center for doctors. The management and operation of this facility will be assigned to the Chiba Doctor's Career Support Network, an incorporated nonprofit organization, with backing from the Chiba Medical Association. Through these activities, Chiba University School of Medi-

cine and Chiba University Hospital will actively contribute to the educational development of young healthcare providers and improvement of the quality of community healthcare services in cooperation with the Chiba prefectural government and the Chiba Medical Association.

#### **Programs**

Purposes of simulation education are broadly divided into training in clinical examination techniques, diagnosis and treatment techniques, and emergency care procedures.<sup>5</sup> Training in clinical examination techniques includes auscultation of heart and breath sounds, fundus examination and rectal examination, whereas training in diagnosis and treatment techniques includes venous blood collection and catheterization, lumbar puncture and endoscopy. Training in emergency care procedures includes ACLS. These training programs are developed to follow the process from initial acquisition of knowledge of the relevant technique, through simulator-based training, participation in actual implementation of the technique, performance of the technique in the presence of a supervisory doctor, and finally solo implementation of the technique.<sup>6</sup> With simulator-based training, the training process generally consists of implementation of the technique using a simulator, reviewing the recorded performance of the technique (debriefing), and then performing the technique again. Our hospital also offers training programs that use animals and other materials.

#### **Conclusions**

In regard to simulation education, the usefulness of VR simulators in training for endoscopic surgical procedures and examinations has been demonstrated by a number of studies,<sup>7</sup> and this method of education is now recognized as being indispensable in the process of training doctors. This is an educational method essential to the entire educational development process of doctors including not only specialized techniques but also undergraduate medical education.<sup>5</sup> To enhance the usefulness of simulation education in the future, well-designed programs are required. Further expansion of clinical studies that verify the usefulness of simulation education is awaited.

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