PPAS- Practicing Physical Assessment with Simulators for Medical and Nursing Students

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Yoshitoshi Murata
Faculty of Software and Information Science
Iwate Prefectural University
Takizawa, Japan
y-murata@iwate-pu.ac.jp

***Abstract*— Because medical professionals have to understand their patients' conditions, students in medical and nursing schools need to practice physical assessments. Since real patients and clinical situations are difficult to produce in school settings, many kinds of simulators have been developed to enable students to practice physical assessments. Simulated patients do not need additional cost but do need a lot of medical knowledge and experience. Moreover, since simulated patients are healthy, they do not display abnormal values when their vital signs are measured. One of purposes in this track is proposing a concept "a healthy person imitating a real patient," and educational measuring instruments and a simulator based on this concept are demonstrated. This track also presents research into medical simulators and simulation-based learning in Japan and introduces a new learning method combining e-learning with simulation training.**

Keywords-physical assessment; medical simulator; nursing; medical instrument; vital measuring instrument; auscultation.

I. INTRODUCTION

Medical professionals need to obtain skills to understand their patients' conditions, particularly the ability to provide advanced accurate physical assessments [1]. Therefore, students in medical and nursing schools are required to practice physical assessments. However, real patients and clinical situations are difficult to reproduce in school settings. To solve this problem, many kinds of simulators have been developed and new learning methods that use such simulators have been contrived. Simulated patients are trained to present patient-specific sentiments and personalities in addition to clinical histories and physical findings as realistically as possible; and have been widely employed to educate medical staff in addition to co-medical students [2]. Simulated patients do not need additional cost but do need a lot of medical knowledge and experience. Moreover, since simulated patients are healthy, they do not display abnormal values when their vital signs are measured. Simulators such as humanoid simulators can display abnormal values, but they are very expensive, so there are usually far fewer simulators than students in a class.

One of purposes in this track is proposing a concept: a healthy person imitating a real patient. In this concept, a healthy person plays the role of a patient, but unlike simulated patients, their measured vital data also are abnormal and correspond to diseases. An innovative educational thermometer, blood-pressure manometer, and auscultation simulator based on this concept are demonstrated.

Other presentations in this track introduce research into medical simulators and simulation-based learning in Japan and a new learning method combining e-learning with simulation training.

II. SUMMARY OF CONTRIBUTIONS

The first presentation will explain how simulations have been adopted in nursing education, reviewing Japanese articles in this field. One database, Nippon Igaku Chuo Zasshi, contains 86 peer-reviewed research studies published in Japanese between 1986 and 2016. Since 1999, around five articles per year articles have consistently been published. Simulations have been used predominantly in basic and medical-surgical nursing areas to teach physical assessment, fundamental skills, injection, and perioperative care. Forty-one percent of the simulation-based learning was conducted using 3-D-models to teach about infections and cardiopulmonary resuscitation. Intermediate and high fidelity patient simulators were used to teach physical assessment, fundamental skills, and perioperative care, but 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.

The second presentation will discuss the effectiveness of a blended learning system—combining e-learning with simulation training. Although e-learning affords numerous

benefits to learners, it also presents several challenges. First, e-learning relies on learners' ability to self-manage their learning process, and second, e-learning methods must possess features that help maintain the desire to learn [3]. For example, massive open online courses (MOOCs) [4] can theoretically provide instruction to an extremely large number of participants, but they do not allow learners to self-manage their learning, and students tend to drop out of these programs owing to diminished desire to learn. The authors thus propose "blended learning," which combines face-to-face and e-learning methods, to resolve problems in MOOCs. The authors evaluated how e-learning improves physical assessment knowledge and its application in simulation training. They also reviewed evaluations of the blended learning system, comprising e-learning and simulation training, after students experience the system and the effect of blended learning on their desire to learn. They used an interventional study design with a questionnaire survey. The results showed that e-learning improved participants' physical assessment knowledge. However, simulation training in conducting auscultation and palpation showed no significant learning effects. E-learning helped participants to recognize the relevance of learning content to their professional practice.

The third presentation will demonstrate new educational medical instruments able to intentionally display abnormal values on the basis of the concept of "a healthy person imitating a real patient." Even though highly functional simulators can imitate changes of vital signs on a monitor, no educational measuring instruments such as a blood-pressure manometer, thermometer, and pulse oximeter have been developed that can show unhealthy values in addition to normal values. The authors developed prototypes of educational models of a thermometer and blood-pressure manometer. Their displays can indicate not only an arbitrary value but also its difference from the average value for healthy people. Also, a delay can be set to present the above values. These instruments are useful for students to learn vital sign assessment, clinical reasons, estimation of a patient's condition, and administration. Both the thermometer and blood-pressure manometer will be demonstrated in this track.

The fourth presentation will demonstrate a new auscultation simulator also based on the concept of "a healthy person imitating a real patient." Most students in medical and nursing schools practice auscultation. Students usually learn disease sounds and correct points and order for locating a stethoscope on a body. Humanoid-type simulators have been widely introduced to practice auscultation. However, most humanoid-type simulators cannot detect whether or where a stethoscope is located on a body. Since they are very expensive, there are usually far fewer simulators than students in a class. The authors thus developed a low-cost and high performance system for practicing auscultation [5]. In this system, students themselves play the role of a patient, instead of a humanoid, and stethoscope locations on the body are measured using KINECT. Also, appropriate disease sounds including normal ones can be assigned at some points on the upper body. Students listen for such sounds, synchronized with breathing movements, through an earphone or speaker when a stethoscope is placed on assigned points. In the demonstration, participants will be able to practice auscultation with the system after its configuration and operation are explained to them.

III. CONCLUTION

This paper summarized presentations about research into medical simulators and simulation-based learning in Japan and a new learning method combining e-learning with simulation training. Additionally, demonstrations about an innovative educational thermometer, blood-pressure manometer, and auscultation simulator were described. We believe two medical measuring instruments for education (a thermometer and blood-pressure manometer) and an auscultation simulator using MS-KINECT will improve simulation-based learning for medical and nursing students.

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