





## SUBMITTED ABSTRACTS

### DESCRIPTIVE STUDIES – ORAL

00002

#### **Innovative Manikin Storage for Staff Occupational Safety and Health in a Simulation Training Center**

*Tsoi Shing Chi, Leung Yuk Wah*

Pamela Youde Nethsole Eastern Hospital

**Introduction & Aims:** Use of high-fidelity manikin in medical simulation training is common in practice. With the sophisticated function and the build of the manikin, the manikin can be heavy, large, difficult to handle or grasp. Handling and storage of manikin is a challenge in the daily operation of the simulation training center, where the risk from the handing of the manikin should not be underestimated. Meanwhile, the dedicated parts from the high-fidelity manikin required careful handling to prevent the damage, in which the repairing cost could be extensive.

Hence, Nethersole Clinical Simulation Training Center (NCSTC) explored an alternative method to facilitate the handling and storage of the manikin to ensure the occupational health of operating staff and the protection of the expensive, dedicated manikin should be safeguarded.

**Methods:** An innovatively designed cabinet is used to solve the above problem. In each layer, there are numerous heavy-duty stainless-steel precision delivery balls mounted in the adjustable, slide out stainless steel slide. The delivery ball can sustain 150KG loading. This special design allows a smooth horizontal transfer of the heavy manikin. The safety lock is available to lock the slide to allow three modes of adjustment (Storage, checking, transfer) to facilitate operating staff in checking and handling of the manikin. There are three-layer areas in the cabinet, in which the upper layers are designed to fit the adjustable height of the patient bed.

**Results & Discussion:** Although the uploading and tagging of assets may be laborious in the starting phase, the ATS has greatly improves the operation and effectively tracks each asset thoroughly from where the asset is, what event it was being used for, how long was the asset used for and who are the people using it. Also, with the automated notification, SIMS staff is timely updated if the asset has not been returned instead of tracking it manually in the past. Furthermore, with the maintenance history, SIMS staff is able to identify the frequency of repair and justify if there is a need to replace a certain asset.

00006

## Mid Posting Survey Of Radiology Residents With Respect To Confidence In Carrying Out Water Soluble Contrast Meal Study For Suspected Malrotation In Paediatric Patients

*Tang Phua Hwee*

KK Women's and Children's Hospital

**Introduction & Aims:** KK Women's and Children's hospital in Singapore sees the majority of the referrals for medical problems in children in Singapore. Department of Diagnostic and Interventional Imaging within the hospital provides imaging support for the children who requiring imaging to guide management decisions. Being a teaching hospital, procedures are carried out by junior doctors under the supervision of qualified radiologists. However, the teaching for emergency procedures may be suboptimal as these cases present frequently as emergencies and it can be difficult to ensure that the junior doctors are adequately exposed to such cases and each trainee has the opportunity to get adequately training with enough practice to gain proficiency. Aim to carry out a survey of existing radiology residents in KK Women's and Children's hospital during the middle of the posting to determine if they have had sufficient exposure and are adequately trained to carry out water soluble contrast meal study for investigation of malrotation in a paediatric patient.

**Methods:** "Radiology residents in KK Women's and Children's hospital were surveyed in the middle of the posting during a lunchtime teaching session in March 2019. Survey captured gender and year of training of each resident and also obtained signed consent for presentation of survey results. Survey captured if resident had prior experience with children, prior experience in carrying out contrast studies, had seen/performed a water soluble contrast study for suspected malrotation and if resident was confident in teaching others how to carry out such a procedure. The residents were also surveyed on their knowledge of each step of the procedure such as administering oral contrast, patient positioning, minimisation of radiation, co-ordination with nurse and radiographer, dealing with potential complications.

Ten residents from 2nd to 4th years of radiology residency were surveyed, consisting of 6 males and 4 females. Only 2 residents had experience with young children while 9 had experience with carrying out some form of contrast examination of the gastrointestinal tract. By the middle of their 6 month posting, all 10 residents have seen at least a case of water soluble contrast study for suspected malrotation, although 7 have actually carried out such a procedure and only 2 were confident in teaching others how to do so. Regarding the steps involved in the procedure, those with were confident in teaching others showed higher confidence in carrying out these steps compared to those who were not confident in teaching others. Those who had carried out the procedure themselves also showed higher confidence in carrying out these steps compared to those who had just observed but had not performed the procedure. There was no significant effect of year of residency on the confidence of the residents in carrying out the steps of the procedure."

**Results & Discussion:** "There is room for improvement in the teaching of emergency procedure to radiology residents. Literature shows virtual reality healthcare environments can improve interprofessional communication, team functioning and collaborative leadership among students including those in medicine and nursing. Virtual environments can provide a meaningful, intrinsically motivational and activating learning environment, able to emotionally engage learners. Surgical trainees who had virtual reality training to supplement their training showed better operating times than those who did not.

Student's knowledge and skill sets get progressive better with more exposure and practice and a virtual reality training program will allow students to train as many times as the student requires. If virtual reality training program can be used successfully to teach emergency procedures to radiology residents, it will pave the way for a new mode of training for radiology residents.

00009

### **Application of Motivational Interview in Primary Care Setting: Train the Trainer Program**

*Anna Purani Raman Singarasoo, Rohanah Pagi, Tan Ai Meng*  
SingHealth Polyclinic

**Introduction & Aims:** Motivational Interviewing is a patient-centered, counselling approach that actively engages patients and draws on their underlying motivation for change. Health care

professionals have the opportunity to guide patients in their lifestyle modification and provide support for self-care management of their chronic diseases. Therefore, healthcare professionals need to be adequately trained with the relevant knowledge and skills in understanding patients' perspectives and priorities to self-care and towards positive behavior change. Train the Care Manager on the application of Motivational Interviewing technique, and to assume the role of a trainer for teaching healthcare professionals.

**Methods:** A train the trainer program was initiated and participated by 20 Care Managers in July 2017. The curriculum included a theoretical component of Motivational Interviewing skills, teaching methodology and didactic sessions, video vignettes, written exercises, individual and group role-play and group discussion to test out the training curriculum. Upon completion of the training, the Care Managers were assessed competent before assigned to teach healthcare professionals.

Following the Motivational Interviewing skills training for Care Manager, a one-day Motivational Interviewing skills training program was developed for Medical Students on their attachment to the Polyclinics.

**Results & Discussion:** The Motivational Interviewing training for Medical Student was piloted for 13 second year Medical Students on their attachment to the polyclinic in August 2018. From September

2019 to January 2019, formative assessment was carried out in the classroom and summative assessment done in the clinical setting. The practical session on the application of Motivational Interviewing skills in counseling patients was assessed by the Care Manager.

Subsequently, the curriculum was reviewed based on the feedback of the Medical Students. The theory component was shortened and the hands-on experiences were extended. Feedback on the duration of the program to be just right increased from 62% on August 18 to 100% on January 19.

From August 2018 to January 2019, a total of 51 Medical Students have completed this on-going training. Majority of the Medical Students (82.5%) found the Motivational Interviewing skills training useful. The Medical Students verbalized that the role-play component had provided them with hands-on experiences which increased their confidence level in the application of Motivational Interviewing skills. Positive feedbacks were received from the Medical Students. These were their verbatim: "The role-playing sessions were amazing because it allows us to immerse ourselves in the experience", " Good interviewing skills. Increases my questioning repertoire", and "Learnt essential skills that we can put into practice".

The train the trainer program for Care Manager has effectively prepared the Care Manager to conduct training for healthcare professionals. The inaugural Motivational Interviewing training for Medical Students was successfully carried out. Medical Students have provided positive feedback about the skills and knowledge acquired on Motivational Interviewing.

This has strengthened the Medical Students' ability in empowering patients to participate in self-care management of their conditions.

**00011**

### **Multidisciplinary Team Code Blue Simulation for Effective Resuscitation**

*Tan Hui Li, Claudia Tien Jong-Chie, Phua Ghee Chee, Ng Shin Yi, Sewa Duu Wen, Chai Hui Zhong, Tan Qiao Li, Lu Han, Kan Sook Han, Carrie Leong Kah Lai*  
Singapore General Hospital

**Introduction & Aims:** Survival of patients with cardiac arrest is time sensitive to the resuscitation initiated by the first responder. The ability of the healthcare providers to function effectively as a team in cardiac arrest affects mortality and morbidity. One strategy that has been successfully utilized to improve cardiac resuscitation is multidisciplinary team simulation training. Multidisciplinary team simulations allow healthcare providers to practice infrequent critical tasks, expand knowledge, builds self-confidence and collaborative teamwork with no risk to patients.

The aims were 1) to provide participants the knowledge, skills, and attitudes necessary to provide safe and collaborative teamwork during code resuscitation; and 2) to identify active and latent system issues.

**Methods:** Two models of multidisciplinary based simulation trainings were developed for code blue multidisciplinary team education. One using lab simulation; and the other using mock code activation simulation. The focus for lab simulation training was on recognizing the deterioration of the patient's condition and applying a team approach to care; proficiency in providing Advance Cardiac Life Support (ACLS) and good quality cardiopulmonary resuscitation (CPR); and demonstrating clear, effective communication. The focus for mock code blue activation simulations was to identify latent threats and provide continuous quality improvement feedback to the hospital and healthcare providers. Both modalities used the same faculty, manikins of equivalent fidelity and the same bank of scenarios. An observational behavioral based evaluation tool and a self-reported survey were used to assess participants' performance, engagement and self-confidence.

**Results & Discussion:** A total of 51 lab simulations and 10 mock code activation simulations were conducted from June 2018 to March 2019 with 253 participants. 50% of the participants strongly agreed that the experience and knowledge gained were useful. All agreed that they could apply the new skills and knowledge to their workplace. 61.9% of the participants strongly agreed that the experience boosted their confidence to manage crisis situations. All of the participants agreed that they were more aware of the initial team management plan for an acutely deteriorating patient after attending the simulations. Active and latent issues identified included healthcare providers' unfamiliarity with emergency carts layout, defibrillators use and administration of resuscitation drugs; knowledge deficit on ACLS protocols; low usage of CPR board; infection control gaps during code resuscitations; missing or malfunctioning equipment. Outcomes associated with our code blue multidisciplinary team simulations include improvement in individual participant technical proficiency; reinforcement of desirable individual and team behaviours; reinforcement of teamwork and desirable communication behaviours; and improvement in clinical outcomes with increased rate of return of spontaneous circulation (ROSC) during cardiac arrests.

The overall positive results supported the usefulness of our multidisciplinary team simulations. Our code blue team training provided the participants the knowledge, skills, and attitudes necessary to provide safe, evidence-based patient care during code resuscitations. Understanding team roles and communicating effectively in code resuscitation resulted in highly effective teams and decreased adverse outcomes. Latent threats and knowledge gaps identified provided continuous quality improvement feedback to hospital and healthcare providers to improve patient safety. Information gained through code simulations could help novice programmes develop robust training systems by focusing on core areas.

## **Pioneer Simulation-Based Training on Tracheostomy Emergencies Management in Hong Kong**

*Authors: Tsoi Shing Chi, So Hang Mui, Leung Yuk Wah Natalie, Kwok Lai Ping,*  
Nethersole Clinical Simulation Training Centre (NCSTC), HKEC Training Centre for Healthcare Management & Clinical Technology, Hong Kong East Cluster, Hong Kong SAR

**Introduction & Aims:** Simulation training is useful in promoting skill acquisition, addressing teamwork and testing protocol. Tracheostomy emergencies are not uncommon and can lead to the life-threatening situation if appropriate airway interventions are not performed timely. Simulation training on managing of tracheostomy emergencies is limited in Hong Kong. Therefore, a high-fidelity simulation training workshop on managing tracheostomy emergencies was firstly organized by the Nethersole Clinical Simulation Training Center (NCSTC) of HKEC Training Centre for Healthcare Management & Clinical Technology. NCSTC locates in the Hong Kong East Cluster and was set up in 2012 to provide a simulation training platform for clinical and healthcare professionals.

This simulation-training workshop aimed at empowering a team of nurses to experience and learn to respond to tracheostomy emergencies in a controlled and safe environment without jeopardizing the patient's safety.

### **Methods:**

A 3.5 hours scenario-based high-fidelity patient simulation training workshop was designed. The workshop consists of three aspects; (1) quick recap session to review anatomy of temporary and permanent tracheostomy, current guidelines and the newly designed quick guide on the management of tracheostomy emergencies; (2) demonstration session with illustration of equipment commonly used in managing tracheostomy emergencies; and (3) simulation scenario session with four immersed scenarios related to life-threatening tracheostomy emergencies (tube occlusion, bleeding tracheostomy, tube displacement, CPR on patient with permanent tracheostomy) were designed and implemented. Debriefing session after each scenario was conducted for learning highlights.

Nurses from 7 hospitals of the HKEC were nominated to join this "train-the-trainer" workshop delivered in scenario-based simulation. Each workshop involved 14-16 nurses who were divided into 2 groups. Each participant had opportunities to join the simulation scenarios.

There is no single method to evaluate the effectiveness of such simulation-based training. Therefore, Kirkpatrick principle of training evaluation was adopted in this project, which refers to 3 levels of assessing participant's gain and commitment after completion of the training. In short, level 1 (Reactions) refers to the overall satisfaction level of participants. Therefore, an 11-items post-workshop questionnaire with Likert scale (1-6) to evaluate the satisfaction level of the participants was prepared. Level 2 (Learning) refers to the evaluation of the participant's mastery of knowledge. Then a 7-items post-test quiz related to the management of tracheostomy emergencies was

designed. Level 3 (Behavior) refers to the engagement of participants to function as the nurse trainers in the unit to complete related training within 12 months.

In April 2018, four identical simulation-based workshops were conducted, and 59 nurses participated. All participants completed the 11-items post-workshop questionnaire and they were highly satisfied with the high-fidelity simulation training (average score 5.35). The result of the quiz showed the participants had significant improvement in assessment skills and self-perceived competency to manage tracheostomy-related emergencies with the use of the quick guide (average score 5.46). After completion of the simulation training, these participants become eligible nurse trainers serving as the resource person regarding tracheostomy care, to design and deliver department-based training in their respective departments. These nurse trainers reported that at least 10 training programs were carried out in their departments for disseminating the tracheostomy-related skills, knowledge, and experience to other colleagues.

**Results & Discussion:** High-fidelity simulation training on management of tracheostomy emergencies was successfully implemented by NCSTC in HKEC. The scenarios were tailored to the afore-mentioned 4 commonly emergencies in which the related interventions are not necessary well mastered by less experienced nurses in general wards. Therefore, the adoption of the train-the-trainer model with simulation and the subsequent unit-based training help to maximize learning opportunities to more nurses within a short period. Together with the guide of the Kirkpatrick principle for the evaluation of the training program, evaluation findings can be systemically presented to identify any gaps for subsequent improvement regarding the organization of the workshop. In level 1 (Reaction), it is to measure how the participants are engaged and contributed, to allow participants to feel the training is valuable. In level 2 (Learning), it measures the participants' knowledge, skills levels and attitude by means of self-perception. In the level 3(Behavior), it measures the long-term process of the behaviors taken places over weeks or months after the initial train-the-trainer workshop including the application of their learning into practice, or the participants are able to teach and deliver the new knowledge, skills or attitudes to other people.

Based on the results, our simulation workshop on tracheostomy emergencies were rated with high satisfactory reaction (Level 1), and improvement in self-perceived competency (Level 2) toward tracheostomy-related emergencies and change in participant's behaviors by delivery department-based training (Level 3).

High-fidelity simulation training is effective to empower nurse's knowledge, skill, and to enrich their experience in handling tracheostomy emergencies. Similar simulation involving multidiscipline namely doctors, nurses and health care assistants will be essential to establish an effective team for handling emergencies situation.



00018

## **Automation Of The Recognition BLS Procedures Using An Outside Sensor And Its Application In Basic Life Support Instruction**

*Nao Sato, Makoto Hirose, Nami Yamamoto, Satoru Okamoto, Kenji Karino*  
Shimane University Faculty of Medicine

**Introduction & Aims:** Background In basic life support (BLS), the time from cardiac arrest to the commencement of sternum pressing and the discontinuation time during sternum pressing must be shortened. Chest compression fraction (CCF) must be considered in providing training for sternum pressing. However, practical guidelines that must be focused on in training have not been clarified. Health professionals are only aware of such aspects. In recent years, BLS education has increasingly adopted assessment type simulators that provide feedback on the speed and depth of pressing. Using such devices has been reported to make BLS education more effective. This has visualized the quality of cardiopulmonary resuscitation but does not lead to interventions to processes for achieving targeted outcomes. Therefore, this study aimed to provide interventions for processes such as posture and movement in BLS by using an outside sensor that digitally captures movements of the human body. We developed an automatic recognition program for BLS procedures through machine learning, which is based on artificial intelligence. In this presentation, we report the details of the program.

**Methods:** Methods We used Kinect by Microsoft. The device allows capturing motion without wearing special measurement devices. The subjects were 75 health professionals who had undergone BLS training within the previous year. The subjects performed BLS, and data from 68 of them were used as teaching data. We performed pattern recognition learning on a support vector machine by using the teaching data. When it was difficult to tell similar procedures from each other, machine learning through a neural network was performed. Results BLS procedures were classified into the following seven tasks: identifying a patient; checking surroundings for safety; checking the consciousness of the patient; requesting for support; checking the airways, breathing, and circulation of the patient; pressing the sternum; and assisting respiration. The classification enabled the outside sensor to automatically recognize each procedure. Automatic recognition of the seven procedures enabled the automatic calculations of the time spent on each procedure and the intervals between each procedure.

**Results & Discussion:** Discussion In this study, we automated the recognition of BLS procedures by using an outside sensor, which enabled the automatic calculations of the time spent on each procedure. Going forward, by using the program that records 25 joint coordinates, the line of movement and posture, which are determinant factors of time spent on each procedure, must be analyzed with a perspective toward more detailed process interventions.

# RESEARCH STUDIES – ORAL

00004

## Assessment Of Construct Validity Of Virtual Reality TURP Simulator

*Ee Jean Lim, Allen Sim, Henry Ho, Weber Lau Ko, Kenneth Chen*  
Singapore General Hospital

**Introduction & Aims:** To assess construct validity and potential training benefits of a virtual reality TURP simulator.

**Methods:** There were a total of 40 participants recruited to complete a virtual simulation median lobe prostate resection task twice on the TURP simulator (VirtaMed UroS tm ).Participants were distributed according to their level of experience as follows : 12 experts (> 300 TURPs performed), 11 Residents( Year 1 to Year 6) and 17 novices( no prior experience). Performance indicators such as percentage of prostate resected, percentage of capsule resected, time diathermy loop active without tissue contact(TAWC) were recorded via TURPsim and compared across all levels of experience (novice to experts) to assess construct validity. Repeated attempts of the task by the novices and residents were analysed to assess the training benefits of the TURPsim.

**Results & Discussion:** Experts resected a significantly greater percentage of prostate per second ( $p < 0.001$ ) (Fig1) and had significantly less active diathermy time without tissue contact(TWAC) than novices and trainees.(Fig2) Percentage of capsule resected was also significantly greater in the novice and resident group compared to the expert group.(Fig3) Following a repeated attempt, all groups had improvement in all performance indicators, with an expected greater increase in the novice and resident group compared to the expert group.(Fig 4) There was also a decrease in %capsule resected/time noted in the novice group and junior residents( R0 to R3) as opposed to the senior residents(R4-R6) and expert group. (Fig 5).

This study has demonstrated the construct validity for the virtual reality TURP simulator. It has also shown potential benefit in utilizing this simulator in training, particularly in the novice and junior resident population.

00007

## The Impact of Mindfulness Meditation on Anxiety and Clinical Practice Accuracy in Adult Nursing Students in Simulated Learning: Preliminary Results of a Primary Research Study.

*Dr Antonio Bonacaro*  
Anglia Ruskin University

**Introduction & Aims:** A considerable part of nursing students' training takes place in simulation laboratories where real-life clinical situations are replicated through guided learning experiences. The subjective experience of stress and anxiety can significantly reduce the quality of the teaching and learning experience, limit the quality of students' performance and increase the probability of making mistakes that can compromise patients' safety. Mindfulness meditation is a technique that helps students develop skills of paying attention to themselves and the world in a non-judgemental manner and encourages compassion, acceptance and kindness which are values at the core of the nursing profession. A significant body of literature demonstrates the benefits of mindfulness meditation in terms of stress reduction, increased quality of sleep, increased self-regulatory processes of attention control and emotion regulation. The aim of this project is to explore the potential of mindfulness meditation in improving the quality of the learning and teaching experience of nursing students involved in a simulated clinical scenario based on a case of sudden cardiac death.

**Methods:** The study will consist of three stages. Stage 1: all students will attend 30 minute lecture reiterating the concept of sudden cardiac death and basic life support. The group will then be divided into 2 randomly allocated teams of 4 students each and then asked to manage a 20 minute simulated scenario based on a deteriorating patient resulting in a cardiac arrest. All of the participants' clinical performances will be video-recorded along with the continuous monitoring of their vital signs. At the end of the simulated session all students will be tested for stress and anxiety levels through the application of validated assessment tools. Feedback will be provided on the participants' performance during a 30 minute debriefing session based on the video-recorded sessions. Stage 2: all participants will complete a 21-day mindfulness meditation training programme, delivered by a qualified instructor and adapted from the Mindfulness-Based Stress Reduction Programme, devised by Kabat-Zinn. Stage 3: all participants will undergo another simulated skill session following a similar process described in Stage 1.

**Results & Discussion:** The expected outcomes of this study are: improving self-monitoring and attention regulation, reducing anxiety and stress, limiting procedural mistakes, improving the quality of the teaching and learning experience and improving patients' safety. This session will offer an overview of the preliminary subjective and objective data collected from six 3rd year adult nursing students taking part in the study on a voluntary basis.

00029

## Characterizing Virtual Reality Exergames for Cognitive and Motor Rehabilitation

*Gregg Lloren*

University of Edinburgh

**Introduction & Aims:** Immersive technology (e.g. 360 video, virtual reality, augmented reality, mixed reality) has made significant revolutionary developments in the world of digital media since its inception into popular use less than half a decade ago. In the aftermath of its debut on social media, gaming facilities, mobile gadgets, and other publicly accessible multimedia playback equipment, its presence has introduced new ways of augmenting human knowledge in understanding himself and his world. The popularity of the technology has ushered in the production of immersive and simulated virtual environments, many of which have neither maximized nor justified the power of the technology in terms of viewer-medium interaction, its socio-cultural implications, multimodal compositionality, and its effect on human cognition. In the field of healthcare – specifically cognitive and motor rehabilitation – there is a surge of research interest in applying virtual reality (VR) games (serious exergame) in the rehabilitation of the cognitive and motor impaired, among other health deficiencies. However, VR research for healthcare is quite new that a proper use of off-the-shelf VR material for exergaming is debatable, such that not all VR games developed for entertainment result to real life learning. This paper, therefore, is a study of VR functionality in consonance with human cognitive and motor faculties.

**Methods:** The study conducts a semi-structured survey of apps in Oculus Go and categorizes them by functionality that corresponds accordingly with specific human dexterities; thereby, serving as preamble to recognizing their applicability and specificity in transferring human learning from gaming to real life. The paper punctuates the characteristics of VR games that have direct triggers to rehabilitation and training. The study intends to establish the parameters of human-machine interaction in simulation and virtual environment for future development and design of exergames for cognitive and motor rehabilitation.

**Results & Discussion:** The paper works under the premise that VR augments human faculties - as tools of thought process - which enables humans to perform tasks that initiates cognitive and motor skills. The paper concludes that, as human cognition and motor skills deteriorate in ageing, VR serves as the “medium of last resort” for humans to reconnect with the real world through the appreciation of the simulated and virtual world.

00033

## The Effect of Simulation Training For the Implementation of Nurse Co-led Cardio-pulmonary Resuscitation in the ED

*Patrick Armstrong, Jodie Pikinton-Ching, Brad Peckler, David McQuade*  
Wellington Hospital

**Introduction & Aims:** A statistically significant increase in the NOTECHs scale was detected for the measures of leadership ( $p=0.0028$ ), CRM ( $p=0.0001$ ), adherence to NZRC ALS algorithm ( $p=0.0088$ ), and Situational Awareness ( $p=0.0002$ ). On average, scores for communication also increased but this difference was not statistically significant. From informal, written feedback collected about the training program, nurses and the EP's universally agreed this was a better process to manage a cardiac arrest. Junior doctors commented the co-led model allowed them to make complex decisional processes in a short period of time. EP's felt they had more time to analyse the data and make informed complex treatment decisions. The lead-nurses enjoyed the leadership, autonomy, and added responsibility. Whilst Advanced Life Support is in their scope of practice and they all are required to be current, they would normally not have the chance to lead the algorithm in a real clinical situation. Additional comments demonstrated that feelings of enhanced team dynamics were maintained in non-simulated, non-cardiac arrest resuscitation situations. Nurses felt more empowered to contribute clinically and doctors were more receptive to their input. This study shows that a short simulation training programme improved teamwork performance in the setting of nurse co-led CPR in the ED which could easily be replicated in other departments.

**Methods:** Empowering a senior nurse as a co-team leader has been proposed as a more efficient set up for the cardiac arrest team in ED. We hypothesised that a structured simulation training program that focussed on implementing a nurse co-led CPR model, would improve teamwork quality in the setting of nurse co-led cardiac arrest as measured by a validated teamwork scale (NOTECHs). The aim of this investigation was to determine whether this simulation program could be implemented in the ED. In this model, a senior nurse leads the cardiac arrest algorithm which allows cognitive off-loading of the lead emergency physician (EP). The EP is then more available to perform tasks such as echocardiography and exclude reversible causes. Hi fidelity simulation was used for training and evaluation.

**Results & Discussion:** 15 senior ED nurses participated in this pre-intervention-post observational study. Training consisted of a didactic course on leadership and critical resource management (CRM) followed by 4 x 10 minute resuscitation scenarios with a structured debrief focusing on team leadership skills and CRM. EP's involved in the study also underwent similar training in tandem. Primary outcomes were measured on scenarios 1 and 4 using a modified NOTECHS teamwork scale. Training took place in the Wellington Simulation and Skills Centre and in Wellington Hospital ED.

# DESCRIPTIVE STUDIES – POSTER

00001

## Asset Tracking System for Simulation Equipment and Laboratory Specimens

*Tay Khoon Khiam, Lee Keng Leng Darren, Willy Dharmawan, Goh Ying Hong*  
SingHealth Academy & SingHealth Duke-NUS Institute of Medical Simulation (SIMS), Singapore

**Introduction & Aims:** The simulation equipment and laboratory specimens under SingHealth Duke-NUS Institute of Medical Simulation (SIMS) are used extensively for training programmes. The request to loan these assets are done through an email from the requestor. Upon receiving a request, SIMS staff will check if the asset is available and response accordingly. The requestor will then sign an equipment/specimen loan form upon collection and return. The form includes information about the requestor, the loan purpose, the loan period and the asset details to ensure that requestor is liable for any damages to the asset being loaned. The details in the loan form are then transferred to an Excel Sheet. SIMS staff will need to track if the asset is returned by referring to the loan form manually. Often, the details are not timely updated and hinder the process of a new request. The conventional way of tracking the asset is time consuming and bound to human error.

The implementation of the Asset Tracking System (ATS) aims to provide a central tracking system to manage current and future planning of the simulation equipment and laboratory specimens under SingHealth Duke-NUS Institute of Medical Simulation (SIMS) which will in turn increase productivity, accuracy and optimising staff deployment.

**Methods:** Details of the assets are uploaded into the Asset Tracking System (ATS). Each asset is assigned and tagged with a specific Radio Frequency Identification (RFID). Requestors may login to the ATS to view the assets available and submit a request. In order to submit a request, particulars of the requestor, loan purpose and loan period are required. Once a request is submitted, a request ID will be generated. Upon approval by SIMS staff, a notification will be sent to the requestor with the collection detail. Information will be loaded into the RFID Scanner concurrently and requestor may proceed to scan and check out the items from the ATS. These RFID Scanners are highly sensitive and is able to scan a large number of RFIDs within a second reducing the time needed to record individual asset manually. Upon check out, other requestor will view the item as unavailable in the ATS. If the items are not returned by the end of the loan period, a notification will also be sent to prompt the requestor.

Other function of ATS includes stock taking and generating utilisation reports. Maintenance history can be recorded too.

**Results & Discussion:** Although the uploading and tagging of assets may be laborious in the starting phase, the ATS has greatly improves the operation and effectively tracks each asset thoroughly from where the asset is, what event it was being used for, how long was the asset used for and who are the people using it. Also, with the automated notification, SIMS staff is timely updated if the asset has not been returned instead of tracking it manually in the past. Furthermore, with the maintenance history, SIMS staff is able to identify the frequency of repair and justify if there is a need to replace a certain asset.

00002

### **Innovative Manikin Storage for Staff Occupational Safety and Health in a Simulation Training Center**

*Tsoi Shing Chi, Leung Yuk Wah Natalie*

Nethersole Clinical Simulation Training Centre (NCSTC), HKEC Training Centre for Healthcare Management & Clinical Technology, Hong Kong East Cluster, Hong Kong SAR

**Introduction & Aims:** Use of high-fidelity manikin in medical simulation training is common in practice. With the sophisticated function and the build of the manikin, the manikin can be heavy, large, difficult to handle or grasp. Handling and storage of manikin is a challenge in the daily operation of the simulation training center, where the risk from the handing of the manikin should not be underestimated. Meanwhile, the dedicated parts from the high-fidelity manikin required careful handling to prevent the damage, in which the repairing cost could be extensive.

Hence, Nethersole Clinical Simulation Training Center (NCSTC) explored an alternative method to facilitate the handling and storage of the manikin to ensure the occupational health of operating staff and the protection of the expensive, dedicated manikin should be safeguarded.

**Methods:** An innovatively designed cabinet is used to solve the above problem. In each layer, there are numerous heavy-duty stainless-steel precision delivery balls mounted in the adjustable, slide out stainless steel slide. The delivery ball can sustain 150KG loading. This special design allows a smooth horizontal transfer of the heavy manikin. The safety lock is available to lock the slide to allow three modes of adjustment (Storage, checking, transfer) to facilitate operating staff in checking and handling of the manikin. There are three-layer areas in the cabinet, in which the upper layers are designed to fit the adjustable height of the patient bed.

**Results & Discussion:** The adjustment modes of the slide minimize the horizontal distance between the cabinet and bed; facilitate the transfer of the manikin by operating staff by shortens the time of the transfer from 180 seconds to 45 seconds.

As the design is tailored to allow the horizontal sliding of the manikin without any vertical lifting, enhancing the safety during the handling. The design minimizes awkward posture or movements (raised arms, bent wrists, over-reaching) during manipulation, and possible occupational health risks from handling of the manikin would be minimized.

As the force in handling the manikin is largely decreased by the use of precision delivery ball via horizontal sliding, the number of staff used in the transfer can be minimized from 3 to 1, which enhances the effectiveness. The horizontal area for the storage of manikin can be largely decreased from 3 patient beds to one cabinet (approximate 80% of one patient bed). The space of the training center can be better utilized with enhanced tidiness.

The satisfaction of operating staff regarding the storage and handling of the manikin before and after the installation of the cabinet showed a significant increase, from overall rating 2 to 5 in five-point Likert-scale.

Therefore, this innovative workplace design for manikin storage area is essential in protecting staff's occupational health, increase efficiency and effectiveness in the manipulating manikin, good staff satisfaction with better utilization of space.

**00010**

### **Crystalizing Principles of Interprofessional Collaboration Through Simulation: The FAIR-est Approach**

*D Appadorai Dorai Raj, Albert Lo Francis, Acharya Ranjana, Singh Medha*  
Tan Tock Seng Hospital

**Introduction & Aims:** Interprofessional collaboration is an imperative core competency that is required of all healthcare professionals. It holds promise for reducing medical errors, improving quality of healthcare and safeguarding positive patient outcomes. Less emphasis is given for this skill set in most undergraduate medical education. Managing an acute medical scenario requires the utility of a wide array of soft skills that encompasses effective collaboration. Among the crucial skills necessary during a crisis are leadership and followership, role delegation, adaptability, teamwork, professionalism, empathy and interpersonal communication. Learners must be aware of the unique roles and responsibilities of various healthcare personnel in order to ensure an optimal collaborative care environment. In order to inculcate and crystalize these skills amongst medical graduates, we conduct simulation based programme, the Integrated Resuscitation Drill (IRD), just before they embark on housemanship. The learning objectives for each simulated drill covers various soft skills outlined above, with the intent to assess effective collaboration between medical graduates and nurses. With reference to the FAIR principles for effective learning – Feedback, Activity, Individualisation and Relevance; we believe simulation possesses the tools necessary to deliver a holistic experience needed to boost interprofessional collaboration.



**Methods:** "Learners are comprised of Year 5 graduate medical students and nurses of varying qualifications (Enrolled Nurses and Registered Nurses). They are grouped into teams of 5. Each team is comprised of medical students and nurses to emulate a typical first responder team in the in-patient setting. The learners are given pre-reading materials for perusal prior to attending the drill. At the drill itself, they are given a briefing that entails introduction to the purpose and processes of the IRD. They are then given a systematic introduction to the simulation environment. Before the drill, the facilitators stress a list of learning objectives which covers the various soft skills outlined above. The learners are then instructed to manage four acute medical scenarios of varying complexities requiring both nursing and medical intervention. After each hands-on drill, the learners undergo a structured debrief with trained facilitators.

Excerpts of Quantitative data across several domains were collated from graduate medical students as follows:

A. How confident are you in handling an acute medical emergency crisis or resuscitation with fellow nurses/doctors after today's Resus Drill? Somewhat Confident: 34.21%; Confident: 63.16%

B. How confident are you in interacting with fellow doctors/nurses in handling an acute medical emergency crisis or resuscitation after today's Resus Drill? Somewhat Confident: 27.38%; Confident: 67.45%

C. Overall, the Resus Drill improved my communication skills with fellow doctors/nurses :

Agree - 68.42%; Strongly Agree: 31.58%

Numerous qualitative feedback were recorded as follows:

" I think that it was key that reflection consolidates the experience"

"Good simulation experience and prep for real life situations"

" First hand experience working with nurses - best way to familiarize"

**Results & Discussion:** "Simulation based healthcare education is an ideal pedagogy to instil skills required to enhance interprofessional collaboration. We believe it is the FAIR-est model to ensure that the learning objectives are met. Soft skills are not acquired from textbook reading or didactic lectures. Simulation, on the other hand, provides an ideal platform that covers all aspects of effective learning as described by the FAIR principles below:

a) Feedback: Debriefing encourages reflective sharing of new perspectives and skills. This aids in closing performance gaps within teams. Feedback during debrief is multidirectional and allows for exploration of individual and team mental models. It reinforces good performance and provides an opportunity for the learners to correct their weaknesses in a conducive environment.

b) Activity: The hands-on drill is the most stimulating aspect of the IRD. Learners are urged to replicate a performance as close to realism as possible. This segment of the IRD often leaves

learners describing it as the most interesting part of the session. This segment allows facilitators to assess both technical and soft skills.

c) Individualization: The learners are comprised of graduate medical students and nurses. Both groups have unique roles and responsibilities when encountering an acute medical scenario. The IRD recognizes these individual skills. During the debrief by facilitators, the interactive discussion is guided to promote inclusive language so as to ensure no particular group is left out.

d) Relevance: The hands-on sessions and debrief allow for abstract analysis of a medical situation and conceptualization of new ideas and thought processes. These are relevant as they are then extrapolated into clinical practice where active experimentation takes place. This methodology is based on the fundamental principle of experiential learning, postulated by David A. Kolb.

The IRD is conducted regularly for new joiners (house officers and nurses) at the Department of General Medicine, Tan Tock Seng Hospital. It continues to garner robust feedback and is a prominent feature on our educational calendar. We believe it is the ideal method to crystalize principles of good interprofessional collaboration in a healthcare setting."

**00012**

### **From Classroom to Bedside: Enhancing the Skills and Learning Experience of Clinical Nurses in Managing Paediatric Resuscitation**

*Linda Ang, Lee Siew Kum, Lee Ang Noi, Adelene Aw Yong, Kwek Choo Poh, Lim Lee Ngoh, Rosanna Lim, Sam Koh, Annellee Camet*  
KK Women's and Children's Hospital

**Introduction & Aims:** There are many advantages in conducting an in-situ training in the clinical area as compared to training in a simulation centre. Firstly, in-situ training allows the nurses to be trained together as a team. This helps to foster team work and cohesiveness among one another during crisis management. The nurses are also more familiar with their work environment as this is more realistic in terms of obtaining the resources and equipment that is required.

Frequent in-situ training allows the retention of knowledge and skills of the nurses in managing emergency situations. It also aids in building the confidence of the nurse and a faster response rate if similar situation happens in the department.

The aim of this study was to look for opportunities to improve the current mock code simulation training process for nurses by:

1. Increasing training opportunities for nurses
2. Improving one's knowledge and skills in managing crisis in the clinical setting

**Methods:** The process flow was mapped out and listed all the possible areas for improvement in order to enhance the current training process and root cause analysis was conducted to identify the contributing factors for the lack in confidence of the nurses in managing crisis management. The following root causes were identified

- Knowledge deficit and confident due to infrequent encounter and lack of practice
- Unable to conduct frequent training session due to lack of resources in trainers and venue
- Unable to provide personalized areas need training due to mixture of participants from different disciplines
- Lack of manpower to cover ward duties if more staff from the same ward were sent to attend training
- Not aware where the emergency equipment was stored and unfamiliar with handling of the equipment due to individual ward setting
- No teamwork as staff were not trained together as a team

Study had shown that lessons learnt by ward staff during regular in situ team training led to significantly improved recognition and management of deteriorating in-patients with evolving critical illness. In order to carry out this strategy, the workgroup has requested a representative from each ward to be trained as instructor to facilitate in conducting in-situ simulation trainings in the department.

**Results & Discussion:** A total of 469 nurses who did not have any prior experience of handling a crisis management for more than 6 months took part in a pre and post questionnaire. This questionnaire aimed to evaluate their knowledge on managing crisis in the clinical setting. The results have shown the mean knowledge scores has improved from 7.06 to 7.59 (10 max) which is statistically significant t-value of -3.18, and p-value of 0.002 after the in-situ training was conducted. 90% of the nurses also reported that the training assisted them to be more prepared in managing a patient during an emergency situation.

In-situ training has provided several positive outcomes in terms of enhancing the knowledge and preparedness of the nurses in managing a patient during an emergency. Moving forward, the team is collecting more data to evaluate the effectiveness of in-situ training. The ultimate aim of the team is to ensure that nurses are ever prepared and ready to handle a medical emergency in the clinical setting so as to improve patient outcome and patient morbidity.

00013

**GPFirst Challenge**

### **Introduction & Aims:**

#### 1. Emergency Need for Change -

Changi General Hospital's A&E Department sees a high number of patients every day but identified that ~40% were actually non-urgent attendances! What added to the surprise was that:

- 45% of such cases were contributed by young working adults aged 20 to 45 years old; and
- attendances peak when other resources like General Practitioner (GP) clinics were open.

#### 2. Life and Death Impact -

Such behavior severely impacts the operations of an Emergency Department. Thus, Project "GPFirst" was created to focus on reducing these cases by:

- working with 200 GPs in the East
- educating the public to visit their regular family doctor

The success of GPFirst Programme would not only reduce waiting time at A&E but will also greatly optimize their resources so that the critically ill can be treated as quickly as it is needed.

#### 3. Decision-Making Time -

The public needs better understanding and more information on how to make the right decision:

- What medical conditions/symptoms to look out for?
- Who can treat them?
- Where to seek treatment?
- When would A&E be needed?
- How can one benefit from GPFirst Programme?

Education being a pivotal success factor, GPFirst team collaborated with "Gametize" to provide gamification which is well-suited for the younger audience we seek to reach. With mobile games achieving a penetration of 17.3% in 2019 and expected to hit 27.6% by 2023\*, gamification would undoubtedly be the way to go for this important education exercise!

\*Source of information from [www.statista.com](http://www.statista.com)".

### **Methods:**

#### 1. It's Fun to Do the Right Thing! -

Ever find yourself baffled and confused whether you should be visiting the A&E or a GP for the condition at hand, after browsing pages and pages of internet offered opinions?

GPFirst Challenge Application takes you on a learning journey through multiple levels of challenges using a variety of Flashcards, Photo & Video Challenges and Quizzes.

## 2. Role-Playing Simulation -

Immense in experiential learning and gain first-person experience by playing the role of simulated characters and help them determine the actions they should take!

Simulated case scenarios created using “Doodly” were carefully crafted together with our hospital Clinicians and community GPs to ensure accurate depiction of conditions featured.

## 3. Never a “Wrong” Move -

GPFirst Challenge ensures that players are educated of the right thing, especially when the wrong answers are chosen! All players will be awarded points as they attempt various stages of GPFirst Challenge and be ranked on a “Leadership Board”, with attractive prizes to be won by the top 3 players, every 2 weeks.

**Results & Discussion:** "The GPFirst Challenge App will be launched in the coming months. Together with other publicity efforts, we aim to attain a total reach of 2.2 million Singaporeans\* (aged between 20-45 years old).

\*Source of information from [www.singstats.com.sg](http://www.singstats.com.sg)

Though no results have yet been attained, we know we will be able to monitor participants’ level of engagement, the extent of our outreach, obtain cross sectional profile of the players for example age, gender (and so much more) through Gametize platform’s extensive array of analytical tools for data collection and analysis.

With the above, we shall have good ability to identify any learning gaps and improve the quality of this crucial education piece.

**00016**

### **"How real can you get" - Creating a realism simulation experience**

*Too Xin Yi, Sng Bi Xia, Goh Ying Hong, Kent Tan*

SingHealth Duke-NUS Institute of Medical Simulation (SIMS)

**Introduction & Aims:** Moulage is the art of creating an environment or enhancing high-fidelity manikins to be as real as possible. It help to provide realism to a simulated scenario that allow the

participants to visualise a true representation of an injury, medical condition or procedure therefore, it is an essential component. With the increase demand for simulation workshops, the challenge to provide quality moulage at a sustainable cost increased as well.

**Aim:** How low cost and quality moulage can be incorporate in an in situ simulation to mimic a proximal femoral nail anti-rotation (PFNA) procedure and its influence on participant engagement.

**Methods:** Both SimMom and Noelle manikins were used to achieve the scenario needs. Equipment required were crepe bandages, foam sheets, luggage straps, table cloth and training bone. The moulage effect to create this orthopaedic PFNA procedure was achieved at a cost less than \$20 as most of the items are household items or equipment that were used in our training centre.

**Results & Discussion:** The experience from the participants during the in situ simulation was reviewed using evaluation forms. An overall rating of 4.9 out of 5 were achieved with many indicated that they found the scenario realistic and how moulage has created a total realism experience for them as they can relate better to the situation and immerse themselves into the scenario.

In conclusion, moulage is essential in simulation as it show result that it enhance the whole simulation experience by allowing the participants to believe that it is real!

0020

### **Low Cost Uterus Model for Simulation in Caesarean Scenarios**

*Sng Bi Xi, Too Xin Yi, Goh Ying Hong, Kent Tan*  
SingHealth Duke-NUS Institute of Medical Simulation (SIMS)

**Introduction & Aims:** In SingHealth Duke-NUS Institute of Medical Simulation (SIMS), we often conduct multi-disciplinary in-situ simulation programmes. For one of the perioperative in-situ simulation workshops, the faculties had decided to conduct an obstetric scenario where a pregnant woman had to undergo an emergency cesarean section during which severe Primary Postpartum Haemorrhage (PPH) occurs after the baby was delivered. However, to create a realistic cesarean procedure at a low cost, we will had to improvise and create a uterus model instead of using the available parts in the manikin.

**Methods:** Laerdal's SimMom is usually used for our obstetrics scenarios. However, due to the high frequency of running such scenarios, our team is unable to support the high cost involved if we were to cut SimMom's abdominal skin and uterus for every caesarean simulation.

We identified 6 layers to simulate in the uterus to carry out a realistic cesarean. They are namely the skin, subcutaneous tissue, fascia of anterior rectus sheath, thin transversalis fascia and peritoneum, bladder flap, uterine wall with serosa. Our team used the following materials to create the layers.

These materials are, cloth as artificial skin (S\$2); foam which is recycled from delivery boxes as subcutaneous tissue (S\$0); zip lock bag filled with simulated blood as the fascia of anterior rectus sheath and thin transversalis fascia and peritoneum (S\$1); red food colouring to create simulated blood (S\$1.50); using expired urine bag from the hospital to simulate bleeding upon applied pressure (S\$0); thin foam to simulate bladder flap (S\$2); red velvet cloth to simulate the uterine wall to hold the above items together (S\$2); velcro to seal the uterus (S\$0.50).

A total of S\$9 was used to create the uterus model. This has provided cost savings of approximately US\$900 to replace the abdominal skin and uterus if we were to use the original parts from Laerdal.

**Results & Discussion:** Our method of creating the uterus model is cost effective and has received positive feedback from both the faculty and participants of the simulation scenario. The participants felt that the experience was realistic while the faculty mentioned that the uterus model created was convincing in the caesarean procedure as participants were able to do a wound closure after retrieving the baby.

00021

### **Merging Fantasy and Reality: Professional Skills Training through Cognitive Authenticity**

*Kevin Yi-Lwern Yap, Kai Zhen Yap, John Yin Gwee Yap, Uday Athreya*

La Trobe University Melbourne, Australia, National University of Singapore, Singapore

**Introduction & Aims:** The Generation Y students who get into the pharmacy course are technology-savvy and digitally-focused. Educators face a constant challenge to sustain the students' interests in modules, encourage peer learning, and improve their practical skills. Currently, professional skills training (confidence, critical thinking, communication skills, responsible decision-making) are taught through demonstration and role-plays. Practical skills are usually taught in a laboratory-based setting. However, students have little opportunities to practice different scenarios on an individual basis. It is a challenge for them to integrate what they have learnt and apply it to practice settings. Their learning experiences need to be enhanced so that they are competent when they go out to practice in real-life settings. Role-playing games are ideal as they are naturally motivating and also provide a safe environment for students to learn at their own pace without experiencing any real-life negative consequences. In this project, gamification of professional skills development was explored to address 3 main objectives:

- (1) Increase students' critical thinking and health communication skills;
- (2) Encourage interest in learning, engagement, interactivity and team collaboration;
- (3) Provide an awareness of social and global issues (e.g. ethics, responsibility)

**Methods:** A three-dimensional (3D) Multiplayer Online Role-Playing Game was developed to train the professional skills needed by students in their future practices. Students engage as avatars in a fantasy, post-apocalyptic setting to “save the world” from a plague. They play the game scenarios individually or as a team to perform various tasks (e.g. drug compounding, dispensing, counselling, making extemporaneous (non-commercially available) products, medication labeling and review), and learn various practice principles through virtual patient encounters (e.g. identifying medication errors, ethical and responsible decision-making). The game was developed in the Unity 3D gaming engine with 2 main technologies – a Leap Motion device (motion capture sensor that detects hand and finger movements) and the Oculus Rift (virtual simulator worn by players to provide a more immersive environment during gameplay).

**Results & Discussion:** This game is based on a blended educational approach combining Gamification (Four-dimensional Framework, de Freitas & Oliver, 2006) and Authentic Learning Environment (ALE) pedagogies. In order to maximize student interactions and experiences, the gameplay tasks, rewards, feedback and environments are designed following Kaptelinin’s activity theory and Bronfenbrenner’s ecological systems theory (Kaptelinin & Nardi, 2006; Paquette & Ryan, 2001). The ALE game scenarios follow a ‘play-your-own-adventure” storyline, where the emphasis is on “cognitive authenticity” (Herrington & Herrington, 2008) on how the game tasks promote a realistic way of solving problems, rather than the “physical authenticity” of the virtual environment. Game tasks follow a problem-based learning approach (Azer et al. 2012), in which students face virtual patient encounters representative of issues encountered in real-life practices. A usability study in pharmacy undergraduates (n=178/187, response rate 95.2%) showed that majority felt that the game was effective in training of health communication skills (93.8%), extracting drug information from monographs (85.4%), patient history-taking skills (84.3%) and knowledge of pharmacotherapy of drugs (83.7%). One-quarter (25.3%) felt that the game was more effective than lectures in helping them meet the learning objectives. In another small-scale pilot study of the whole game (n=30), 63.3% wanted to play the game as part of their curriculum. More than half wanted the game to supplement lectures (60.0%), counselling (90%) and compounding lab sessions (73.3%). In summary, this game was well-received by students. Further evaluation studies on its effectiveness in training professional skills are intended among subsequent student cohorts.

00022

### **Strengthening Clinical Learning through Simulation Training and Digital Learning**

*Aekaluck Kobsarigorn, Krit Pongpirul*

Personnel Development and Training Center, Chulalongkorn University

**Introduction & Aims:** Bumrungrad International Hospital, a world-class leader in health services, is determined to be the best and safest hospital for everyone. This descriptive aim to explain stepping into the future of patient care, adapting education, and creating new innovations are some of the



main values of the organization and so we are dedicated to developing different formats of teaching and learning so our employees receiving the most effective education possible.

**Methods:** The Bumrungrad International Workforce Training and Development System has been created to manage the training and development of personnel and create innovation in teaching according to the Bumrungrad Model, designed by a group of experts from different fields and certified by leading institutes.

This process includes the creation of training curriculums that involve simulated situations specific to Bumrungrad International Hospital to accommodate the increasing complexity of disease. The creation of the Bumrungrad Simulation Orientation in the e-Learning format and assessment tools allow assessment during training as well as while working have been developed as clear tools, as well as using clinical research to ensure the best results of the training.

We are the first private hospital using this type of learning during post-graduation of professional nurses. Experts from leading universities, the HA, and the Thailand Nursing and Midwifery Council have visited the Center and used it as a prototype in elevating and promoting the curriculum on a national level.

Bumrungrad International Hospital is the only institution in Thailand with a Simulation Training Center onsite. In 2003, on the sixth floor of the Bumrungrad International Hospital building, a room was designed to be as similar to a real patient room as possible.

One aspect of the ultramodern technology is the high-fidelity mannequin, a model that reacts similarly to a human patient. Throughout the training process, from start to finish, the mannequin is controlled by computer system and the training can be observed through cameras and audio equipment. All of these are controlled by educators in the control room. There is also a system to record and transmit during the training to other places in the hospital.

Debriefing is done every single time after the training to allow learners to review what they have learned and assess their behaviors during the simulation.

The teaching is done on a one-to-one basis as well as in a group setting to practice communication skills in a team setting. Appropriate curriculums are created in simulation format, integrating the high quality of the hospital and the culture of safety in every simulated situation.

The Bumrungrad iLearn-iGrow is a mobile learning application specific to Bumrungrad International Hospital, offering more than 100 programs designed, created, and produced to enhance the abilities of personnel using blended learning to establish real professional skills.

All of this is to support Bumrungrad personnel in receiving hands-on experience and to feel included in decision making, on-the-spot problem solving, analysis, critical thinking, quickly assessing situations, working as a team, leadership skills, and effective communication, instilling in the learners confidence when confronted with real-life situations. This also improves satisfaction in learning and increases knowledge as well as improves behavior in the workplace and reduces

accidents in patients. Consequently patient care is improved and patient care is the excellent result from learning and development, broken down into three aspects:

In terms of structure, the most effective simulation training is providing experience as close to reality as possible in patient care and expert assessment from the start to the finish of training. Ensure that learners can review what they have learned and assess their behaviors. Support this with digital learning that reduces non-productivity hours by 30% and decreases training expenses by up to 70%.

In terms of system, surveying the need for training led to the creation of a curriculum specific to Bumrungrad International Hospital in designing simulations as close to reality as possible for high-risk, critical, and infection situations. Since the mannequin can be controlled wirelessly through the network, there is no limitation of the location for field training, such as rescuing from high floors, natural disaster relief, and transporting patients by helicopter. The result is increased skills in patient care and patients are more accurately, quickly, and appropriately assessed. This ultimately reduces accidents related to patient safety.

In terms of staff, the Bumrungrad International Workforce Training and Development System helps personnel receive training according to plan, increases learning efficiency, increases knowledge and skills related to patient care, and promotes a culture of learning.

**Results & Discussion:** The commitment in the transformation to digital hospital, simulation training, and digital learning demonstrates vision, efficacy, progress, and innovation in personnel development, leading to proficiency and expertise of personnel in various disciplines. Creating a system of expertise contributes to patient safety and innovations used for continual and lasting development in and out of the organization.

00027

### **Using Code Blue Simulation As a Tool To Evaluate The Existing Operating Theatre (OT) "Code Blue" workflow In The Newly Opened IVF OT in KK Hospital**

*Shen Hai Ying, Chee Li Li, Eileen Lew, Mathur Deepak,*  
KK Women's and Children's Hospital

**Introduction & Aims:** We aimed to use a simulated code blue as an evaluation tool to test the adequacy of current KKH OT code-blue workflow in the newly opened IVF operating theatre recovery room. The newly opened IVF OT consists of one operating theatre with an adjoining 11-bedded recovery room. The recovery room and IVF OT are remotely located on the third floor which is away from the Major OT complex on the second floor.

It was anticipated that because the only available medical response team in this OT may be occupied with procedures, and consequently unable to respond to any medical emergency in IVF OT recovery area. This is different from the major OT suite which will usually have someone available to assist in an emergency.

**Methods:** A Plan-Do-Study-Act (PDSA) method was used to evaluate the efficiency of the existing “Code Blue” workflow in IVF OT.

The first simulation was conducted with the surgeons, anaesthetists and nursing team working in the IVF OT, based on the current OT “Code Blue” workflow. This would require the activation of an ‘internal’ OT code blue within the OT complex during office hours, with the initial responders being from the team already present in the OT complex.

A Fish Bone chart and Root cause Analysis were used during the study phase to identify factors related to inefficiency in responding to the code blue activation in recovery room.

The findings of the first simulation exercise led to a repeat simulation exercise being conducted, this time using the hospital wide code team as the primary responders.

Our observations included an assessment of quality of primary responders arriving at the simulated emergency; their arrival times at the site and the effectiveness of the response team in dealing with the emergency in the recovery area..

**Results & Discussion:** This simulation exercise highlighted many gaps in the suitability of the existing workflow for this environment which would impact patient safety in the IVF OT recovery room. We recognised that the internal code activation would be inadequate in the IVF OT recovery room due to lack of available personnel. Hence, the hospital code team would need to be activated for any effective response here.

It was also identified that the hospital code team were unable to access the IVF OT recovery area due to existing security restrictions and that the code team responders would need to be given the security permissions to ensure access.

Using simulation to evaluate the efficiency of an existing “Code Blue” workflow for a new environment was an effective tool, as it allowed us to identify and address gaps in mounting an effective and timely response with its impact on patient safety.

Simulation also allows us to give an opportunity to code responders to become familiar with the workflows, environment and the physical layout of newly opened clinical areas in the hospital, leading to greater efficiency in managing emergencies.

**00036**

**Posture improvement method for insufficient chest compression depth in CPR**

**Introduction & Aims:** For high-quality Cardio-Pulmonary Resuscitation (CPR) need good posture. However, there is a report that women with slender chest compressions have shallow chest compressions even if their posture is good. In this study, we examined the posture improvement method when chest compression depth is shallow due to poor physical constitution.

**Methods:** The subjects of the study were 20 people (Male 5, female 20) who received BLS training or had experience in teaching, and chest compression used the Resusci Anne QCPR Manikin (Laerdal Medical). In order to analyze the posture of chest compressions, a situation during chest compression was taken with a video camera from the left side. The posture of chest compression was evaluated by the angle formed (referred to as the chest pressure angle) by the rescuer's shoulder, wrist and waist. **Results:** Chest compression depth and the chest pressure angle were positively correlated ( $R^2 = 0.169$ ,  $y = 0.249x + 78.798$ ). When the chest pressure angle was 85 degrees or less, 75% of the subjects had chest compression depths of 5.0 cm or less. From the average depth results of chest compressions, subjects were divided into 5 cm or more group (referred to as group A) and 5 cm or less group (referred to as group B), and the chest pressure angles were compared. The chest pressure angle of the group A was 93.60 (S.D. 7.03) degrees, the chest pressure angle of the group B was 88.19 (S.D. 5.08) degrees, and there was a significant difference between the two groups ( $p = 0.043$ ). The depth of chest compression was less than 5cm for 12 subjects and more than 5cm for 13 subjects. Eight of the 12 subjects whose chest compression depth was less than 5cm had the chest pressure angle less than 90 degrees. However, other 5 subjects had the chest compression depth were less than 5cm even though chest compression angles of 90 degrees. these five all subjects were petite women. On the other hand, eight of the 13 subjects whose chest compression depth was more than 5cm had the chest pressure angle greater than 90 degrees. Three of the eight who had chest pressure angles greater than 90 degrees were petite women, similar to the 5 subjects who had chest compression depth less than 5 cm even if chest compression angle was 90 degrees. But their chest pressure angles were 93.6 degrees, 96.2 degrees and 111.4 degrees.

**Results & Discussion:** Good posture of CPR is placing the heel of your other hand on top of your first hand, lacing fingers together, then keep arms straight and your shoulders directly over your hands. At this time, the chest pressure angle must be 90 degrees. But if the rescuer is petite woman, setting chest pressure angle to 90 degrees or more may increase chest compression depth to 5 cm or more. **Acknowledgements:** This work was supported by JSPS KAKENHI Grant Number 17K08917.

00037

**Improving Critical Care Training And Simulation Using Kirkpatrick's Training Evaluation Model**

*Chai Hui Zhong, Tan Qiao Li, Tan Hui Li, Claudia Tien, Carrie Leong*  
Singapore General Hospital

**Introduction & Aims:** Graduating residents from the Singhealth Internal Medicine Junior Residency Programme move on to specialty training which includes rostered in-house Senior Resident calls. On-call Senior Residents manage critically ill patients in the Intensive Care Unit (ICU), respond to Code Blue activations and take on the role of Code Blue Team Leader. Feedback from Junior Residents indicate enhanced training is required to strengthen technical as well as crisis resource management skills during ICU calls and Code Blue activations. Project Equip, a Critical Care refresher course incorporating Code Blue Simulation, was developed as part of the Internal Medicine Junior Residency training curriculum.

The goals of Project Equip are to:

- 1) Refresh essential skills and knowledge required in management of the critically ill patient
- 2) Ensure learner competency by using domain-based assessment
- 3) Increase learner confidence in caring for the critically ill patient as a Senior Resident on-call and Code Blue Team Leader

We used Kirkpatrick's Training Evaluation Model as a means to analyse and evaluate the effectiveness of Project Equip and to identify areas for improvement.

**Methods:** Project Equip was initiated in 2016 and is conducted yearly. We adopted a blended learning approach, incorporating both online educational materials and in-classroom sessions. Learning objectives, relevant journal articles, videos and procedure checklists are provided in advance to Junior Residents. The SGH Medical ICU Handbook is also provided. This allows self-directed learning before the course.

The in-classroom sessions include didactic lectures, skills stations with task trainers as well as in-laboratory simulation training. Following the hospital-wide revamp of the Code Blue system in October 2018, Project Equip was updated to include an interprofessional Code Blue Simulation session where cardiac arrest scenarios are simulated using a high-fidelity mannequin. The Junior Resident takes on the role of the Code Blue Team Leader and works together with the Code Blue nurse and Respiratory Therapist to resuscitate the simulated patient. Following the simulation, a team debriefing session is done using a standardized evaluation form. The team is guided through a process of self-reflection, focusing on technical skills such as the quality of resuscitation, and also non-technical skills such as communication, teamwork, task prioritization and leadership.

**Results & Discussion:** As part of continued quality improvement, the Kirkpatrick's Training Evaluation Model was utilized to structure and guide the improvement of the educational process. Firstly, residents provide feedback immediately after the course (Kirkpatrick Level 1). We also conduct pre and post course quizzes to assess residents' knowledge and skills (Kirkpatrick Level 2).

Finally, a follow-up survey 6 months after the course is undertaken to assess confidence levels and impact on the residents' medical practice (Kirkpatrick Level 3).

Following the implementation of Code Blue simulation training embedded within Project Equip in June 2018, the hospital wide Code Blue revamp was rolled out in October 2018. Median in-patient Code Blue Team response time was reduced from 6 minutes to 2.8 minutes within the first 6 months. The median return of spontaneous circulation (ROSC) rate in first 6 months was 76.5%, which is significant compared to the US National Cardiac Arrest Registry, which reports ROSC rates of approximately 60% (Kirkpatrick Level 4). Improved rates of ROSC is a complex function and cannot be solely attributed to shortened response times. Other factors such as improved knowledge of resuscitation algorithms, quality of resuscitation and a trained interprofessional team also play an equally important role, thus emphasizing the importance of a systematic education programme.

Moving forward, we have identified further areas of need and plan to expand Project Equip to include training on intra-hospital transfer of critically ill patients. We strive to continue to improve Project Equip as part of our ongoing efforts in medical education to improve patient safety and outcomes

**00041**

### **A Low Cost Self-Learning eMAR Package For Nursing Students**

*Emily Kwan, Amir Abas, Huang Fang*  
Nanyang Polytechnic

**Introduction & Aims:** To align with the Singapore Ministry of Education's (MOE) framework for 21st century competencies and student outcomes (Ministry of Education, 2018), the School of Health and Social Sciences (SHSS) in Nanyang Polytechnic, developed a low-cost electronic medication administration records (eMAR) platform and a self-learning package for our nursing students. This learning package aim to empower the learners to be autonomous and responsible for their own learning.

**Methods:** A perennial need exists in nursing education for a realistic, effective and functionally accurate educational Electronic Medication Administration Records (eMAR) platform that trains nursing students the principles of safe medication administration practices. Existing commercial off-the-shelf products (COTS) are unable to meet this need due to a myriad of issues such as educational requirements, context insensitivity, usability, ease of access and cost effectiveness. The school created a learning platform that replicated the clinical workflow and processes of a real eMAR system as closely as possible, without causing burden to users like unnecessary administrative and technical complexity. The low-cost and user friendly eMAR platform, known as the SHSS electronic medication administration record for nursing students (SeNS), was developed using

spreadsheet (Microsoft Excel) with user defined functions and process automation (Visual Basic for Applications).

SeNS enabled the educators to create clinical cases and empowered nursing students to utilise this platform in their own computers for repeated practices. This interactive platform emphasised the principles of safe administration of medications. Additionally, to complete the nursing students learning experience, the subject content was created using a e-learning software (Articulate Storyline) integrating the SeNS. The learning package comprises 3 sections. The first section introduces the features of the eMAR platform. The second section demonstrates the process of administering medication using a clinical case and the last section evaluates student's learning using a quiz.

The SeNS was piloted in April 2018 and introduced to Year 2 nursing students in April 2019 in the teaching and assessment of administration of oral medication. A total of 1583 students used the SeNS. They were required to go through the learning package prior to attending laboratory lessons on the topic. During the laboratory lesson, the lecturer facilitated the students' learning using the sample case in the SeNS. Several weeks later the students were assessed on the administration of oral medication.

**Results & Discussion:** This study aims to evaluate if the in-house developed learning package for nursing students (1) improved their knowledge in safe medication administration, (2) promoted their competency in medication administration with the ease of accessing the eMAR, and (3) enhanced their autonomy in learning within a technology-enabled environment.

\*The data collection is currently under way.

00047

### **Development of Low-cost FONA Manikin for skills training**

*Theodore Wong, Victoria YJ Tay, Johari Bin Katijo  
Singapore General Hospital*

**Introduction & Aims:** Front of neck access (FONA) is the last option in oxygenating and rescuing patients in "can't intubate-can't oxygenate" (CICO) situations. Although such events occur rarely – roughly one in 10,000 general anaesthetics<sup>1</sup> – FONA is a crucial skill that every airway specialist should be familiar with. Training and re-training of relevant staff is necessary to maintain competence in such emergency situations. The primary aim of this project is to develop low-cost FONA models, which will equip physicians with the necessary skills to effectively manage such scenarios.

**Methods:** FONA training is an essential component of advanced airway workshops and local departmental re-training sessions. The ideal training session would include didactic teaching of algorithms and techniques, intensive hands-on practice on live animals, and high-fidelity simulation

sessions. Such a session however, would be highly expensive and time consuming for training a large number of physicians. Commercially-available FONA manikins have been used in the past, but are limited in quantity and are relatively costly. This limits the number of physicians that can be trained at any one time.

The Department of Anaesthesia at Singapore General Hospital (SGH) has developed FONA models that enable the hands-on training and re-training of staff in fairly large numbers. Our model includes items that can be easily obtained from the operating theatre and purchased from hardware, art, or stationery stores. One FONA set basically includes: one long rectangular sponge (muscles and soft tissues of the neck), a piece of textured paper (skin), a 15cm-long piece of tubing from the anaesthetic breathing circuit (trachea) with two plastic rings (thyroid and cricoid cartilages), and a heart-shaped rubber balloon (lung). The average cost of making one set is about \$3. The assembly of our model essentially mimics the “front of neck”, which is used for training of the needle cricothyroidotomy and scalpel-bougie techniques, as well as for FONA oxygenation techniques such as the via the Ambu Bag, Manujet and Monsoon jet ventilations, and Rapid-O2 oxygen insufflation. By using these FONA models over the past two years, coupled with easy access re-training, we have managed to successfully teach more than 150 physicians during various airway workshops, including the National Airway Programme Singapore (NAPS). This is an improvement on previous years when no formal training was provided. These efforts have not only equipped physicians with the technical skills needed during CICO cases, but also maintained the quality of their skills to effectively manage such emergencies.

**Results & Discussion:** CICO cases are emergency scenarios that can occur in routine anaesthetic practice – albeit rarely. According to the 4th National Audit Project of The Royal College of Anaesthetists (NAP4), the success rate of rescuing lost airways in these situations is abysmal, with a 60% failure rate for needle cannulae and jet ventilation technique<sup>1</sup>. High failure rates are due to lack of training, failure to follow standard protocols, a lack of suitable and readily-available equipment, and skill regression occurring six to nine months after initial training<sup>1</sup>. Outcomes of CICO can be improved by providing regimented FONA training to anaesthetic providers, so that they are always at the ready with the techniques, algorithms and equipment required. However, such training necessitates dedicated educators and a comprehensive training programme with access to cost-efficient equipment in order to allow for mass repetitive training. The Department of Anaesthesia (SGH) has developed and produced FONA manikins that have fulfilled this need.

**Reference:** The Royal College of Anaesthetists and the Difficult Airway Society. 4th National Audit Project of The Royal College of Anaesthetists and The Difficult Airway Society: Major complications of airway management in the United Kingdom, Report and findings March 2011 [Internet]. United Kingdom: Royal College of Anaesthetists. 2011 [cited 12 Aug 2019]. Available from <https://www.rcoa.ac.uk/system/files/CSQ-NAP4-Full.pdf>



## RESEARCH STUDIES – POSTER

00005

## **Development of Tool for Objective Assessment of Student Experience with Simulation Training Session**

*Aekaluck Kobsarigorn, Krit Pongpirul,*

Bumrungrad Personnel Development and Training Center Co., Ltd

**Introduction & Aims:** A total of 183 sessions (152 individual-based and 31 team-based) were conducted during 2014 – 2015. Based on the focus group discussion on the fifteen video records, ten 5-point Likert scale questions were identified as potentially measurable and meaningful experience of the learner: “I had a chance to touch the mannequin”, “The physical environment was similar to that of my workplace”, and “I felt being watched all the time”, for example. The psychometric testing was performed in 103 participants (mean age 32.36 years, female 95.15%, mean work experience 7.98 years). EFA revealed three main components: Active Participation (5 items), Functional Equipment (3 items), and Realistic Environment (2 items). Concurrent validity was adequate and test-retest reliability was good. A simple and meaningful set of questions could be useful for objective assessment of student experience with simulation sessions.

**Methods:** Existing methods to assess the effectiveness of simulation laboratory have been limited to the subjectivity of the students and instructors. This study was aimed to describe the development of our approach to objectively assess student experience with simulation training session.

**Results & Discussion:** This Exploratory Sequential Mixed Methods study started with a qualitative component to identify objective activities that emerged from a series of random video recordings to develop the tool, followed by a quantitative psychometric testing of the tool. One to six video recorded during 2014-2015 were randomly selected in proportion to the total number of sessions from each of the five clinical scenarios. Five experts reviewed all videos and identified critical steps that are direct benefits of the simulation sessions. The tool was tested in hospital staff who took the simulation training sessions during July – October 2017. Each of the participants was asked to respond to the tool immediately after the session finished (BESSE-Student) and one week later (BESSE-Student1W). The assessor of the session also completed the tool for each of the participants while they were in the simulation session (BESSE-Assessor). Exploratory Factor Analysis (EFA) was performed. Concurrent validity was assessed by comparing the BESSE-Student and BESSE-Assessor whereas test-retest reliability was assessed by comparing BESSE-Student and BESSE-Student1W.

00019

## **Innovative Ways to Incorporate Obsolete Manikin Parts and Medical Equipment to Enhance Realism in Simulation**

*Nurul Hadainah Binte Muhamad Suhaimi*  
Changi General Hospital

**Introduction & Aims:** Changi Simulation Institute (CSI) has received increasing demands of complex moulage set up ever since the increase of Inter-professional simulation scenarios. Crisis Resource Management (CRM) Simulation Course which runs by Anaesthesia department involves multiple professions like anaesthetist, surgeons and nurses. The high fidelity manikin has limitations for the surgeons as the scenario requires the surgeon to practice suturing skills to manage an active bleeding from an ongoing laparoscopy surgery. We managed to come up with innovative ideas so all professionals are able to have a role in the CRM scenario. By incorporating obsolete manikin parts and medical equipment, we are able to enhance the scenario set up as well as creating roles for each of the professions.

**Methods:** To enhance the scenario set up, it involves using an obsolete part task manikin with full venous filled with fake blood and a 3 litres suction canister filled with fake blood. The confederate surgeon will make the first initial incision and will activate the second surgeon due to massive bleeding from the incision site. The surgeon will need to manage the active bleeding by suturing the incision site of part task manikin during the scenario. Having the obsolete part task manikin only is not enough for the team to activate Massive Transfusion Protocol (MTP) as the amount of fake blood the part task manikin can hold is around 120ml only. We have to come out with an active bleeding of at least 3 litres of fake blood. The use of the suction canister filled with fake blood will allow the confederate surgeon to suction the blood near the incision site. We used a suction tubing to attach to the suction canister and the tubing is hidden under the drapes and placed near the part task manikin. Another suction apparatus with tubings and a yankuer suction handler will be used to suction the fake blood. Using the yankuer suction handler allows the confederate surgeon to control the suctioning as how much of litres of blood are suctioned throughout the scenario. The anaesthetist will then notice the active bleeding from incision site via the suction bottle and will activate MTP during the scenario.

**Results & Discussion:** Some factors to consider for the set up are the amount of fake blood to use and the material for the surgeon to suture on. After discussing with the faculty, they agreed upon using the obsolete part task manikin which has the same texture and feel of the internal organs. The advantages of using the obsolete part task manikin are cost saving and also increase the usage of the part task manikin before finally disposing it. We also need to factor in minimization of fake blood spillage to avoid damaging the high fidelity manikin. The suction canister helps to minimize the spillage of the fake blood and holds the volume of 3 litres of fake blood. Overall, the feedbacks from the various profession involved in the scenario have been 5 out of 5 from the evaluation forms in terms of realism of the scenario. 90% of the surgeons involved the scenarios also mentioned the set

up help to initiate them to get them involved in the scenario as compared to previous set up where there wasn't any part task manikin for the surgeon to stop the bleeding and practice suturing. Complex moulage set up requires innovative ways and "do it yourself" set up. A few trials were also involved to finalised the set up. It can be unique to each individual scenario or it can be used during a similar set up as long as the objectives are the same.