



## High Performance CPR: Multi-D Approach

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### Background

Survival of patients with cardiac arrest is time sensitive to the cardiopulmonary resuscitation (CPR) initiated by the first responder. The chance of successful resuscitation is reduced by 7% to 10% for each minute delay<sup>1</sup>. 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 interprofessional or multidisciplinary (Multi-D) code blue simulation training. Multi-D simulations allow healthcare providers to practice infrequent critical tasks, expand knowledge, builds self-confidence and collaborative teamwork with no risk to patients. Currently, multi-D code blue simulation is not formally taught in Singapore General Hospital.

### Aim

- To provide the knowledge, skills, and attitudes necessary to provide safe and collaborative teamwork during code resuscitation
- To identify active and latent system issues during CPR

### Methodology

- Two models of multi-D simulations – in-laboratory and in-situ code blue activations were used to improve the performance of CPR
- In-laboratory simulations focused on applying team approach to care and communications; and the use of instrumented manikins to perfect rate and depth of chest compressions, ventilation and peri-shock pause
- In-situ simulations focused on applying team approach to care and communication, identifying latent safety threats and providing quality improvement feedbacks to code blue providers and hospital administrators
- Cardiac arrest scenarios were simulated to provide each of the code blue providers (doctors, nurses and respiratory therapists) with a significant role to play in the CPR
- A typical simulation lasted approximately 40 minutes with the clinical scenario conducted for 10-12 minutes
- Teams were guided through a process of self-reflection, focusing on technical skills such as the quality of resuscitation, and non-technical skills such as communication, teamwork, task prioritization and leadership (Fig 1)
- Kirkpatrick's 4 level of outcome measures were used to evaluate the simulation training programme (Table 1)

Table 1: Kirkpatrick Outcome Measures  
 Kirkpatrick's 4 Level of Outcome Measures

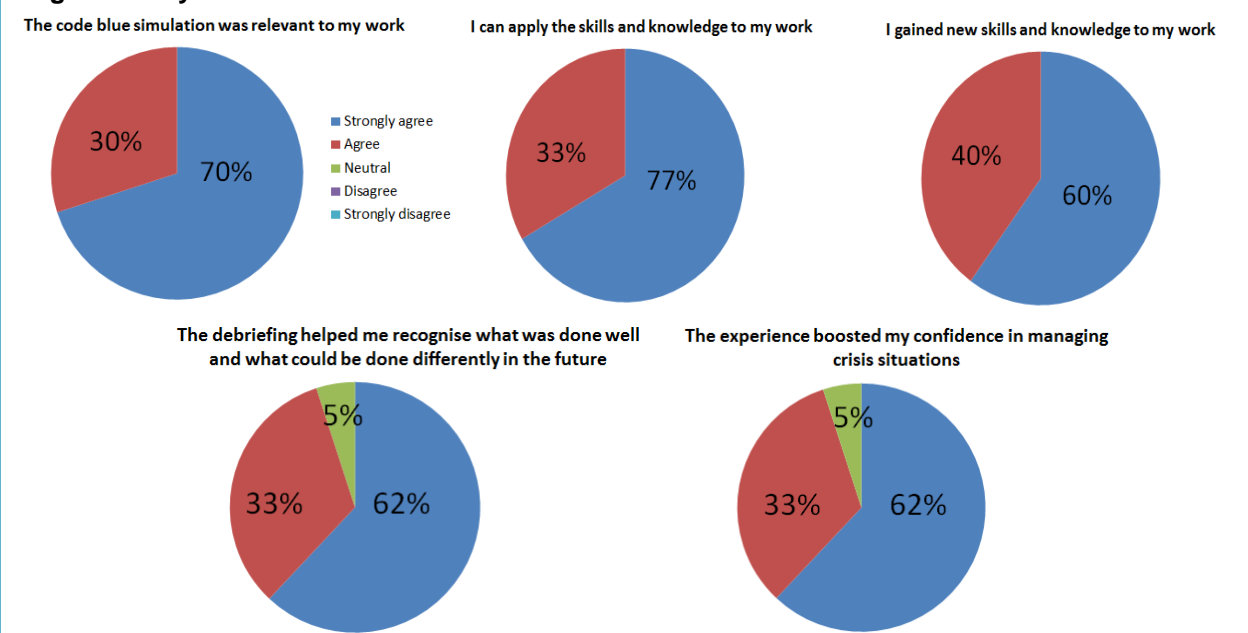
Kirkpatrick's Outcome Measures	Program Outcome Measures
<b>Level 4 Results</b> Outcomes, positive impact to learners, patients & organization	Performance observed during real code resuscitations, feedbacks from other healthcare professionals, audits on time of CPR response & defibrillations
<b>Level 3 Behaviour</b> Application & required drives	Observation checklist, Master trainers & audits by unit nursing managers
<b>Level 2 Learning</b> Knowledge, skill, attitude, confidence & commitment	Self-report on knowledge, skill, confidence level
<b>Level 1 Reaction</b> Satisfaction, engagement & relevance	Post course evaluation

Fig 1: Debrief Form

### Results

- 253 code blue providers participated in 51 in-lab simulations and 10 in-situ simulations from June 2018 to March 2019
- All participants were more aware of the initial team management plan for an acutely deteriorating patient after attending the simulations
- All agreed the experience and knowledge gained were useful and enhanced their confidences to manage crisis (Fig 2)
- Positive outcomes included improvement in individual participant technical proficiency; reinforcement of desirable individual and team behaviours and communications; increased rate of return of spontaneous circulation (ROSC) during cardiac arrests
- Active and latent issues identified were unfamiliarity with emergency equipment and resuscitation drugs; knowledge deficit on ACLS protocols; interrupted or inadequate chest compressions; low usage of CPR board and infection control gaps during CPR

Fig 2: Survey Results



### Conclusion

- Overall positive results supported the usefulness of our multi-D team simulations
- Safety threats were tested, knowledge gaps were identified, teamwork were reinforced
- Our results were well received by hospital's administrators. The expertise and resources of our training programme were tap upon by the new Outram Community Hospital to train their code blue providers



### In-Lab Simulation Training



### In-Situ Simulation Training



### References

- Neumar et al. American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. *Circulation*, 2015
- Arnold et al. Simulation-based clinical rehearsals as a method for improving patient safety. *JAMA Surg*, 2018