ORIGINAL ARTICLE

HOW CAN WE IMPROVE CODE BLUE TRAINING FOR NON-PAEDIATRICIANS: AN EXPERIENCE FROM STUDENTS-CONDUCTED ASSESSMENT IN NATIONAL CLINICAL SKILLS CONFERENCE

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Abstract

Introduction: Training of all health personnel involved in paediatric care is a key determinant of successful outcome during paediatric emergencies. We aimed to identify the need for paediatric Mock Code Blue skills training among non-paediatricians in a pre-hospital setting through checklist assessment of their performance. **Methods:** A paediatric septic shock and cardiac arrest Mock Code Blue pre-hospital scenarios were presented for non-paediatricians during a National Clinical Skills Conference. Eight medical student assessors and four clinical facilitators were involved in this training. Participants were expected to be able to demonstrate the skills and teamwork necessary to manage paediatric emergencies according to the learning outcomes. **Results:** A total of 97 delegates participated in a facilitated paediatric Mock Code Blue for multidisciplinary groups of health personnel. Outcome measures showed a significant lack of communication and team work skills, and weakness in "closing the loop" as barriers to successful resuscitation. **Conclusion:** We recommend Mock Code Blue simulation training to be offered regularly to all groups of healthcare providers involved in paediatric and neonatal care while not overlooking the emphasis on non-technical skills.

Keywords: Assessment, Emergency Paediatric, Simulation Training, Student Assessors
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Introduction

Paediatric emergency training is crucial for all health professionals involving in paediatric care. Children, adolescents and adult's physiological, anatomical, cognitive, social and emotional attributes differs and can effect the way a child presents acutely. This necessitates non-paediatric health professionals to receive specific training on paediatric emergencies. The Malaysian pediatric health system (Ministry of Health,

Health Education Division) organises training in health promotion and education for health personnel and non-health staff, non govermental organisations and in the private sector. However, there are no uniform training or education policies that integrates non-paediatricians for prehospital care. Because most Emergency Medical Service providers infrequently encounter ill paediatric patients, it is important to regularly refresh their psychomotor resuscitation skills for a safe transfer to a higher level of care. Moreover, studies have shown that many healthcare providers do not have sufficient training and skills to perform resuscitation effectively in an emergency situation, particularly in low- and middle-income countries [1,2,3,4].

Code Blue is an emergency announced intended for a team of healthcare providers to initiate immediate and skilled resuscitation. A Mock Code Blue simulation can provide an ideal structured and standardised learning approach for multi-disciplinary health personnel in different settings. It also offers a safe context where confidence and competence can be assessed [5] through training of both technical and non-technical skills. Similarly to the Neonatal Resuscitation Programme that had significantly reduces mortality rates [6], Mock Code Blue simulation training is known to promote safety and improve outcomes [7,8,9].

However using simulation training requires active trainer involvement and low learner-to-trainer ratios to ensure sufficient training. This comes with hidden costs and faculty time. To avoid burnout and successfully sustain investment in Mock Code Blue simulation, programmes need to be creative in building, sustaining, and managing the trainer workforce [10]. In this manner, using students or peers as assessors are not only reliable [11] for psychomotor skills training but feasible and cost effective that can be transferable across multidisciplinary healthcare professionals.

To provide health professionals and students opportunity to gain such experience, a National Clinical Skills Conference (NSC) was held from Sep 25-27, 2014 in Seremban, Malaysia [12]. The event was organised collaboratively by Hospital Tuanku Ja'afar and the International Medical University (IMU) where general practitioners, medical officers, house officers, paramedics and medical students from different regions in Malaysia received a run-through knowledge and paediatric skills training over two days. The goal was to offer an opportunity for delegates to gain or refresh their psychomotor skills in the management of paediatric emergencies through paediatric Mock Code Blue simulation. This study aims to identify the most appropriate training needs for paediatric resuscitative care among non-paediatricians in a prehospital setting through checklist assessment carried out by final year medical students.

Methods

Setting

Participants of the NSC attended four concurrent workshops held at IMU Clinical School campus in Seremban, Malaysia. They were offered a theoretical update through a 30-minutes key lecture on paediatric Mock Code Blue presented by the chief facilitator. The lecture and training covered the American Heart Association (AHA) Guidelines for Cardiopulmonary Resuscitation (CPR) and Emergency Cardiovascular Care (Paediatric Advanced

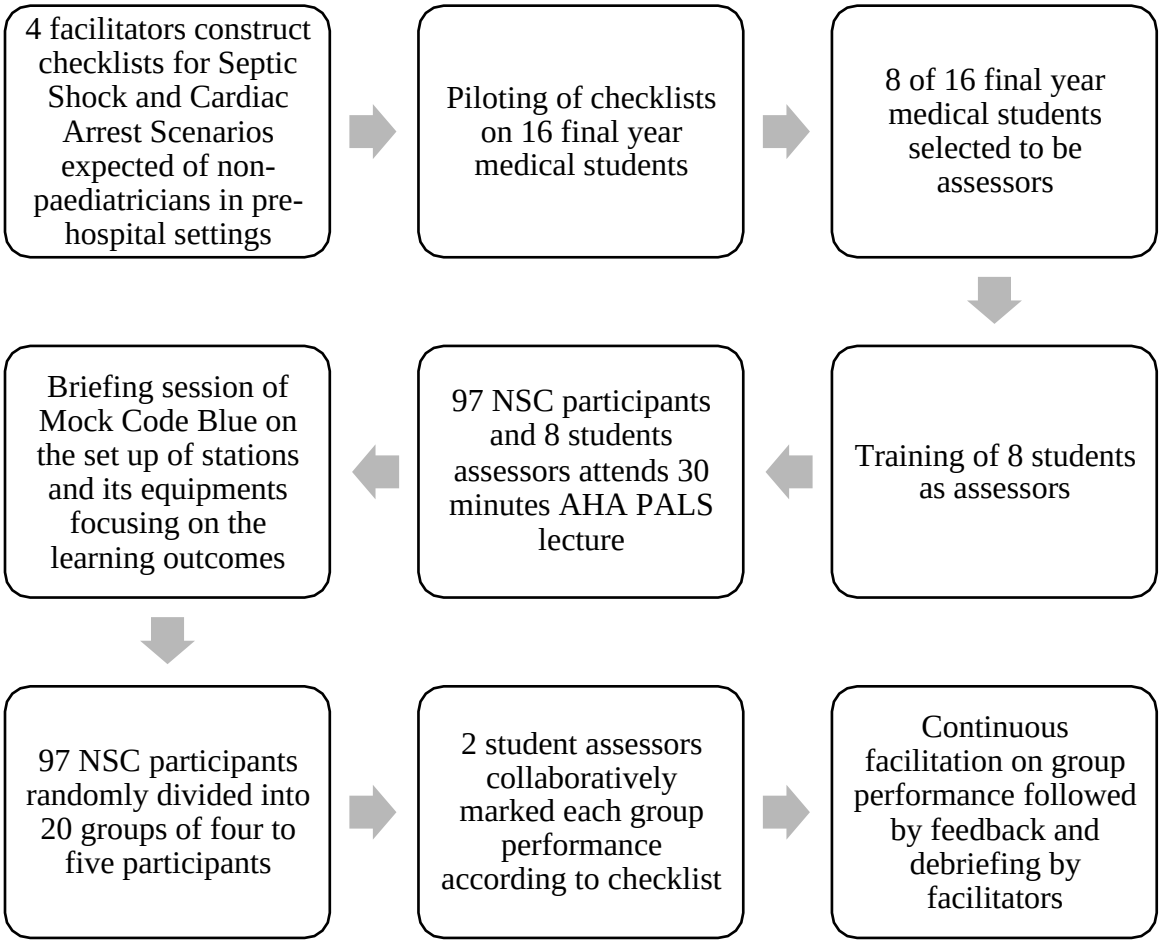
Life Support) (AHA PALS) principles [13] guided by scenarios from the AHA training book.

Preparation

The setup of two different scenarios were prepared and conducted by a group of four facilitators: septic shock in an infant (Appendix 1) and cardiac arrest in a child (Appendix 2). The paediatric Mock Code Blue addresses skills training in the areas of clinical assessment, airway and breathing, cardiovascular and drugs involved in resuscitation. Non-technical components focus on leadership, roles of team members, communication, mutual performance monitoring with peer feedback as well as task management [14]. The overarching criteria for achieving learning outcomes were situational awareness, decision making, task management and team work [15].

A total of 16 final year medical students volunteered to test the feasibility, logistics and quality of the two scenarios to achieve the expected learning outcomes. Four PALS certified clinical facilitators - two senior clinical lecturers, one senior paediatrician with educational experience and one associate professor- from the Department of Paediatrics developed the construction of standardised checklists (Appendix 3) and feedback rubrics. The validated checklist items were sourced from the AHA PALS guidelines [13]. These checklists were piloted and their accuracy was tested through quality assurance and revised where necessary (Figure 1). Students confirmed the appropriateness and usefulness of the final setup of the scenarios. They assured that all scenarios were delivered in a uniform fashion through instruction and this was confirmed by the chief facilitator. Measurements were assumed to be valid because they related to clearly defined activities monitored by assessors and data were disaggregated according to resuscitation items. Standardisation of scenarios, checklist items and student assessment are expected to increase the probability of collecting reliable data.

Figure 1. Flow of the national paediatric Mock Code Blue simulation for non-paediatricians in Malaysia involving medical students as assessors



Then 8 out of the 16 student volunteers were selected to be assessors during the NSC event based on their level of confidence and knowledge in their (1) technical skills in septic shock and cardiac arrest emergency scenarios, (2) capability to appreciate technical oversight and inaccuracies of resuscitation algorithm; and (3) understanding of variation in team approach to paediatric resuscitation emergencies. These students were thereafter individually trained two weeks before the event through one-to-one supervision until they had demonstrated their ability to use the checklist tool prior to its actual implementation before the mock (Appendix 4).

During the Mock Code Blue in NSC, equipment and supplies (Appendix 1 and 2) were available in the same approach each time a new group started the Mock Code Blue simulation. Group members were encouraged to participate actively and they were expected to take roles as team leader or otherwise defined by placement determined by priority of proximity to manikin.

Participants

Participants were randomly divided by the organisers into groups of four to five each and moved from station to station to have hands-on experience in various areas of clinical skills, among them the two scenarios that required the initiation of a paediatric Code Blue (Figure 1).

Intervention

Groups were assigned to one of two identical septic shock and to one of two cardiac arrest scenarios (Appendix 1 and 2). Each scenario training lasted for 20 minutes plus 10 minutes for feedback and debriefing. Facilitators started by informing participants of the learning outcomes during a briefing session. The learning outcomes were defined as participants being able to assess the patients' medical condition and to respond immediately through team approach action. This includes early recognition of patients with respiratory and circulatory problems as well as managing them accordingly, demonstrating basic resuscitation skills, knowing and applying equipment and tools, awareness of working environment and efficient teamwork and communication. The skills training focused on assessment, airway management, resuscitation skills, managing cardiac arrhythmia using automated external defibrillator, intravenous access and insertion of intra-osseous cannula. Both scenarios demanded an efficient emergency response communication.The four facilitators briefed the participants on the set up of the two stations and the equipment as well as on the learning outcomes.Two student assessors marked each group performance according to the checklist collaboratively (Appendix 3). A debriefing session and feedback on clinical assessment, management and collaborative skills was given after the Mock Code Blue by the PALS certified facilitators (Figure 1).

Ethical considerations

This study is part of event evaluation and feedback from participants from NSC 2014. It involves testing within normal educational requirements with no research question involved.

Analysis of data

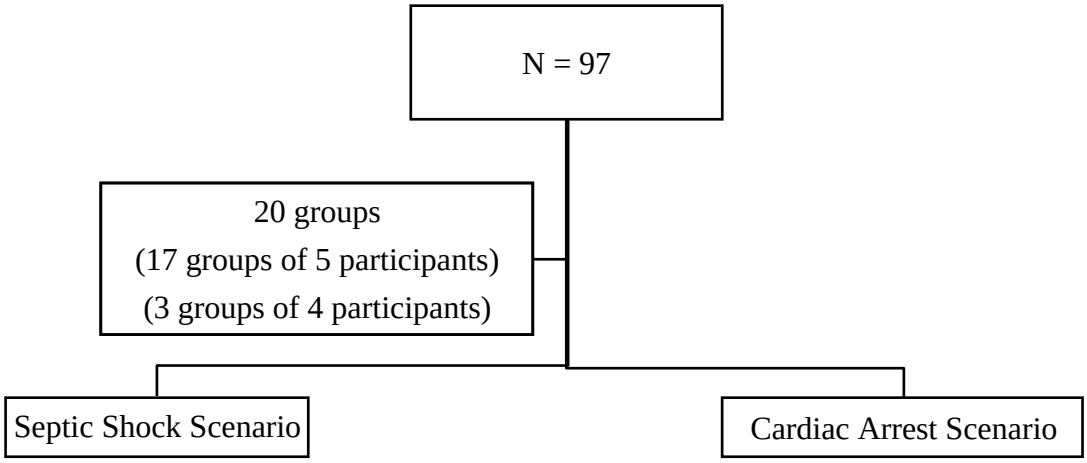
Data samples from the checklists representing group performance were proceeded to descriptive statistical analysis.

Results

A total of 125 physicians, paramedics and medical students (49 male and 76 female) had applied for the 2014 NSC. Of them, 97 (medical officers 52.8% - from emergency department; medical students 20.8%, others 20% – including nurses and medical attendants; house officers 4.8%; and, general practitioners 1.6%) attended the hands-on training session and agreed in participating in the evaluation of the Mock Code Blue simulation training. None of them were paediatricians.

Groups performed well in technical skills for both scenarios and aced in fluid resuscitation (septic shock scenario) and cardioversion (cardiac arrest scenario). The majority of teams also performed well in the basic ABCs – airway, breathing and circulation - of resuscitation and intravenous (IV) and intraosseous (IO) access (Figure 2).

Figure 2. The achievement of the 20 groups in the Septic Shock and Cardiac Arrest stations (N = number of participants)



Resuscitation items	**Successful achievement**	**%**	**Resuscitation items**	**Successful achievement**	**%**
Fluids resuscitation	20 / 20	100	Cardioversion	20 / 20	100
IV / IO / Circulation	19 / 20	95	Breathing	17 / 20	85
Airway / Breathing	18 / 20	90	IV access / Adrenaline	17 / 20	85
Inotropic support	15 / 20	75	Algorithm CPR	16 / 20	80
Team leadership	15 / 20	75	Circulation	14 / 20	70
Reassessment	10 / 20	50	Airway	13 / 20	65

Communication	7 / 20	35	Reassessment	12 / 20	60
Loop communication	6 / 20	30	Team leadership	11 / 20	55
Antibiotics	4 / 20	20	Loop communication	9 / 20	45
Glucose Check	3 / 20	15	Communication	7 / 20	35

While 65% of the groups (mean percentage of teams achivement in both scenarios) showed team leadership skills, only 38% demonstrated awareness on closing the loop. 35% demonstrated commendable team interaction skills. Appropriate considerations of clinical reassessment were only seen in about half of the participants. Less than one fifth of the participants checked blood glucose and provided antibiotics when needed (Figure 2).

Outcome measures revealed variations in teamwork. Not all participants were familiar with each other and some team leaders were not familiar with Code Blue and paediatric resuscitation. Lack of 'close the loop' communications was associated with reduced readiness and proactivity.

Discussion

While there is evidence of specific potential avoidable human factors in child deaths [16,17], outcomes for out-of-hospital paediatric resuscitation remains low. This is particularly when educational messages about bystander paediatric resuscitation are not tailored to the audience receiving them [18,19]. Although training may provide learners with required skills, we cannot define with certainty factors that mostly influence motivation to perform resuscitation. Both situational and procedural context may affect motivation and coordination.

In this study we observed that the participants' performance were hampered in either individual or collaborative tasks in an *a priori* unknown simulated learning environment. Participants were unable to clearly define their team roles and responsibilities in the Mock Code Blue simulated sessions. Perhaps being too cautious or getting lost in their 'bustle' prevented them from creating a satisfactory critical action plan. Likewise, randomisation of participants to groups that consisted of mix physicians and medical students may have affected application of non-technical skills involved in resuscitation. There is increasing evidence that team-oriented behaviour during resuscitation is as important as task-oriented approaches [20,21]**.** We found that the most significant barriers to successful skills performance and efficient resuscitation in the two paediatric Mock Code Blue scenarios were lack of communication, team work and leadership

skills. There were also a significant lack of clinical reassessment after treatment initiation and poor communication that contributed to poor outcomes. These findings are comparable to studies that revealed that non-technical skills were suboptimal in medical emergency teams [22].

There is a need for paediatric resuscitation training of non-paediatricians in pre-hospital settings, particularly focusing on non-technical skills. Tindale et al. identified team processes as a factor in explaining negative performance in 'low' performance versus 'high' performance groups. They argued that shared preferences and task presentations must be appropriate to a given situation to lead groups to make the right decisions [23]. In our experience, poorly operated group communication and incorrect influencing processes among group members could explain the varying degree to which they prefered a particular decision alternative, that in turn could explained the different outcomes in performance quality. Poor task presentation such as overlooking the need of glucose-check and urgent antibiotics administration is one aspect of poor shared preferences due to the stressful character of the scenario training. Fostering trans-active group training in simulated scenarios on a regular basis is expected to solve these problems and improve results [24,25]. Hagemann et al. highlights the effectiveness of even a single brief seminar on non-technical skills to strengthen the learning from the skill training exercise. Such combination of theory and practice may improve the quality of treating acutely ill patients and their outcomes [26]. Over the years, tool such as the Team Emergency Assessment Measure (TEAM) has been validated and shown potential to improve team training in non-technical performance [27].

There are a number of limitations in this study that needs to be highlighted. In reality, ad-hoc groups are frequently formed on a need-to-do basis to perform specific task. In such situation, Emergency Medical Service providers exercise a certain degree of influence as each one react to their own abilities and limitations. Such realisation affect decisions and outcomes. In the present study, the composition of groups and logistics were entrusted to the NSC organisers. It was evident that 'low' performing teams assumed less responsibility for their actions. In some groups where medical officers, house officers and students were working together, the juniors expected the seniors to make decisions. In cases where the senior lacked leadership skills the group performed poorly. Participants who do not know each other in an unfamiliar simulated environment may account for 'low' performance. Furthermore, although international studies have shown that students as assessors are realiable, feasible and cost-effective [11], our results should be taken with caution as local students-assessors could be influenced by what they felt rather than the true value of what had happened [28].

We address these limitations by ensuring consistency in the evaluation of participants' groups. As a standard criterion, students-assessors were only deemed eligible for assessing participants using the checklists after approval by the senior paediatricians. The scoring sheet may be sophisticated for a medical student to use, especially the subjective components. However, a review of the students' assessments by four experienced PALS

providers revealed that the score sheets were used accurately and in a standard format during training of assessors. Random observations of the students-assessors showed a nearby total agreement among the four paediatricians. However, it is acknowledged that this is subjected to subjectivity and bias.

To conclude, the implementation of a Mock Code Blue simulation in acute paediatric care is recommended in the training for all health personnel. There is a universal acceptance that proper emergency care can make an important contribution to reducing avoidable death and disability in low- and middle-income countries [29]. The findings of the present study are relevant to Malaysia and low- and middle-income countries to develop uniform training opportunities. There are several applications for improving Mock Code Blue simulation; the first step should integrate collaborative and operational values that establish ground rules for a team-directed approach including general practitioners, nurses, medical assistants, medical students and paramedics. Personnel should participate in a minimum of one Mock Code per calendar year that include a brief seminar on non-technical skills. Measurable outcomes using assessment tool such as TEAM and standardised checklist can be used to improve training of healthcare professionals. This study further adds that students or peers can take a role in evaluation of Mock Code Blue performance. We therefore urge the public boards of health and education, with respective national medical societies to initiate annual Mock Code Blue drills in hospitals and communities, and assess the team approach in meeting performance expectations. While paramedics, non-paediatric trainees and house officers are responsible for their own training and development, programme directors should advocate such educational activities. A wider availability of Mock Code Blue simulation opportunities would enhance the competence and confidence of healthcare professionals for safer management of critically ill children in a pre-hospital setting and help identify appropriate training needs and development opportunities.

Competing Interests

At the time of submission, authors were employees of Internatinal Medical University, Malaysia. There were no funding for the study.

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References:

[1] Keys VA, Malone P, Brim C, et al. Code Carnivals: resuscitating Code Blue training with accelerated learning. J Contin Educ Nurs. 2009;40:560-4.

[2] Nolan T, Angos P, Cunha AJ,et al. Quality of hospital care for seriously ill children in less-developed countries. Lancet. 2001;357:106-10.

[3] Meaney PA, Topjian AA, Chandler HK, et al. Resuscitation training in developing countries: A systematic review. Resuscitation.2010;81:1462-72.

[4] Duke T, Tamburlini G. Improving the quality of paediatric care in

peripheral hospitals in developing countries. Arch Dis Child.2003;88:563-5.

[5] Ahmed A, Moore H, Purva M, et al. G14 (P) What Do Senior Paediatric Trainees Want from Simulation in Yorkshire? Training Needs Assessment Survey. Arch Dis Child.2013;98(Suppl 1):A11-3.

[6] Boo NY. Neonatal resuscitation programme in Malaysia: an eight-year experience. Singapore Med J.2009;50:152-9.

[7] Hisamuddin NN, Hamzah MS, Holliman CJ. Prehospital emergency medical services in Malaysia. J Emerg Med.2007;32:415-21.

[8] Friedman D, Zaveri P, O'Connell K. Pediatric mock code curriculum: improving resident resuscitations. Pediatr Emerg Care.2010;26:490-4.

[9] Nishisaki A, Keren R, Nadkarni V. Does simulation improve patient safety?: self-efficacy, competence, operational performance, and patient safety. Anesthesiol Clin.2007;25:225-36.

[10] Acton RD, Chipman JG, Lunden M, et al. Unanticipated teaching demands rise with simulation training: strategies for managing faculty workload. Journal of surgical education. 2015;72:522-9.

[11] Beck S, Ruhnke B, Issleib M, et al. Analyses of inter-rater reliability between professionals, medical students and trained school children as assessors of basic life support skills. BMC medical education. 2016;16:263.

[12] International Medical University [Internet]. Malaysia: IMU Organised a National Conference on Clinical Skills Web site. Available at: http://imunews.imu.edu.my/university/imu-organise-national-conference-clinical-skills. Accessed November 30, 2015.

[13] De Caen AR, Berg MD, Chameides L, et al. Part 12: Pediatric Advanced Life Support 2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2015;132(18 Suppl 2):S526-42.

[14] Andersen PO, Jensen MK, Lippert A, et al. Identifying non-technical skills and barriers for improvement of teamwork in cardiac arrest teams. Resuscitation.2010;81:695-702.

[15] Flin R, Patey R. Non-technical skills for anaesthetists: developing and applying ANTS. Best Pract Res Clin Anaesthesiol. 2011;25:215-27.

[16] Pearson G. *Why children die, a pilot study. The Confidential Enquiry into Maternal and Child Health (CEMACH).* Dorchester: Henry Ling. 2006.

[17] Bleetman A, Sanusi S, Dale T, et al. Human factors and error prevention in emergency medicine. Emerg Med J.2012;29:389-93.

[18] Chamberlain DA, Hazinski MF, European Resuscitation Council, American Heart Association. Education in Resuscitation An ILCOR Symposium: Utstein Abbey: Stavanger, Norway: June 22–24, 2001. Circulation. 2003;108:2575-94.

[19] Kitamura T, Iwami T, Kawamura T, et al. Conventional and chest-compression-only cardiopulmonary resuscitation by bystanders for children who have out-of-hospital cardiac arrests: a prospective, nationwide, population-based cohort study. Lancet. 2010;375:1347-54.

[20] Tschan F, Semmer NK, Gautschi D, et al. Leading to recovery: Group performance and coordinative activities in medical emergency driven groups. Human Performance. 2006;19:277-304.

[21] Hunziker S, Tschan F, Semmer NK, et al. Human factors in resuscitation: Lessons learned from simulator studies. J Emerg Trauma Shock. 2010;3:389-94.

[22] Cant RP, Porter JE, Cooper SJ, et al. Improving the non-technical skills of hospital medical emergency teams: The Team Emergency Assessment Measure (TEAM™). Emergency Medicine Australasia. 2016;28:641-6.

[23] Tindale RS, Smith CM, Dykema-Engblade A, et al. Good and bad group performance: Same process—different outcomes. Group Processes & Intergroup Relations. 2012;15:603-18.

[24] Moreland RL, Myaskovsky L. Exploring the performance benefits of group training: Transactive memory or improved communication?. Organizational behavior and human decision processes. 2000;82:117-33.

[25] Andreatta P, Saxton E, Thompson M, et al. Simulation-based mock codes significantly correlate with improved pediatric patient cardiopulmonary arrest survival rates*. Pediatr Crit Care Med.2011;12:33-8.

[26] Hagemann V, Herbstreit F, Kehren C, et al. Does teaching non-technical skills to medical students improve those skills and simulated patient outcome?. International journal of medical education. 2017;8:101.

[27] Cooper S, Cant R, Connell C, Sims L, Porter JE, Symmons M, Nestel D, Liaw SY. Measuring teamwork performance: Validity testing of the Team Emergency Assessment Measure (TEAM) with clinical resuscitation teams. Resuscitation. 2016 Apr 1;101:97-101.

[28] Mat Daud, Nuraihan and Abu Kassim, Noor Lide (2011) *Students as assessors*. In: Languages Studies in the Muslim World. IIUM Press, IIUM, Kuala Lumpur, pp. 1-18.

[29] Young S, Hutchinson A, Nguyen VT, et al. Teaching paediatric resuscitation skills in a developing country: introduction of the Advanced Paediatric Life Support course into Vietnam. Emerg Med Australas.2008;20:271-5

APPENDIX 1

Scenario: A child with septic shock

Learning outcome:

Participants should be able to demonstrate the initial treatment priorities, monitoring and ongoing management of septic shock through team approach and effective communication

Clinical scenario (for participants):

Information: Felix, a 5 month old boy was brought to the emergency department for a history of being less active with high grade fever for the past 2 days. There is no history of vomiting or diarrhea. His intake has been poor over the past 18 hours. **On assessment:** You note that the infant was lying supine and appear lethargic with mottled skin.

Equipment and setup:

Infant mannequin wrapped lying on the bed. Oxygen tubings; face mask; nasal prongs; intubation and endotracheal tube set; pulse oximeter with saturation and heart rate simulation cards; cardiac monitor; glucometer reading; bladder catheter; intravenous and intra-osseous set; set of syringes One pint of normal saline, ½ Saline, dextrose 5%, and water One ampule of Ceftriaxone, Ampicillin, Dopamine, Noradrenaline, Adrenaline

Events occurring during scenario:

Infant's heart rate: 165/min; respiratory rate: 60/min; temperature: 40.1°C; blood pressure: 68/20 mm Hg; oxygen saturation: 94% on high flow oxygen; glucose concentration: 2.6mmol/l. Auscultation reveals clear lungs with good and equal air entry with a short systolic ejection murmur. After obtaining intravascular / intraosseous access, fluid resuscitation fails despite of three 20ml/kg bolus. Felix becomes unresponsive to voice and barely respond to painful stimulation. His distal pulses are no longer palpable. Participants should recognise compromise airway and consider intubation. Hypoglycemia should be corrected and broad spectrum antibiotics administered with inotropic support for fluid refractory shock.

Scenario end point

Felix continues to receive assisted ventilation while waiting to be transported to paediatric ICU, where his blood pressure and perfusion continue to improve.

APPENDIX 2

Scenario: A child with cardiac arrest

Learning outcome:

Participants should be able to demonstrate the treatment steps (including electrical and pharmacologic therapy) while recognizing the common arrest rhythms through team approach and effective communication

Clinical scenario (for participants):

Information: Harry, a 3 year old boy was brought to the emergency department after being found submerged in a monsoon drain near his house. His parents last saw him cycling his tricycle on the street 30 minutes prior to being found. **On assessment:** You see a lifeless child who is flaccid with mottled skin colour. You confirm that Harry is in cardiac arrest.

Equipment and setup:

Child mannequin (wet clothes) lying on the bed. Defibrillator; oxygen tubings; face mask; nasal prongs; intubation and endotracheal tube set; pulse oximeter with saturation and heart rate simulation cards; cardiac monitor (showing asystole then VT); glucometer reading; intravenous and intra-osseous set; set of syringes One pint of normal saline, ½ Saline, dextrose 5%, and water One ampule of Dobutamine, Dopamine, Noradrenaline, Adrenaline

Events occurring during scenario:

Participants secure the airway and assist ventilation while continuing quality CPR. Venous access, cardiac monitor and preparation of adrenaline are done with good team work. After about 3 minutes of CPR following one dose of intravenous adrenaline (0.01mg/kg), a shockable rhythm (VT) is seen on the monitor. Participants give a shock 2J/kg and restart CPR. After about 2 minutes of CPR and following the first shock, the rhythm is unchanged from before. Participants should now be delivering 4J/kg shock whilesearching for treatable possible contributing factors (e.g. tension pneumothorax). After about 2 minutes of CPR following the second shock, Harry now has a perfusing rhythm.

Scenario end point

Harry continues to receive assisted ventilation while waiting to be transported to the paediatric ICU, where his blood pressure and perfusion continue to improve.

APPENDIX 3

RESUSCITATION CHECKLIST FOR SCENARIO: A CHILD WITH SEPTIC SHOCK

Group: _____ Date: _____
Time start: _____ Time end: _____
Facilitator: _____ Assessor: _____

	Resuscitation item	Checklist (Ticked if achieved)	Comments
1	**Airway** Give oxygen Recognise compromise airway Consider intubation		
2	**Breathing** Recognise impending respiratory failure Assist ventilation Monitor pulse oximetry		
3	**Circulation** Recognition of shock Attach monitoring / defibrillator		
4	• **Establishing IV / IO access**		
5	• **Fluid resuscitation** 20ml/kg bolus of isotonic saline Up to 60ml/kg		
6	**Correct hypoglycaemia**		
7	**Antibiotics** Broad-spectrum		
8	**Inotropic support** (Fluid refractory shock) Able to differentiate a cold and warm shock Reverse cold shock by titrating dopamine Reverse warm shock by titrating norepinephrine		
9	**Reassessment** (Mention target endpoints) Blood pressure (5th percentile minimum) Quality of pulses Skin perfusion (warm, cap refill <2seconds) Mental status Urine output		
10	**Team leadership** Decision making		
11	**Communication** Team introduction Distraction avoidance Situational awareness Team work		
12	**Loop communication** Reveal roles verbally or non-verbally Task management		

Critical items numbered and highlighted

Comments: _____

APPENDIX 3

RESUSCITATION CHECKLIST FOR SCENARIO: A CHILD WITH CARDIAC ARREST

Group: _____ Date: _____
Time start: _____ Time end: _____
Facilitator: _____ Assessor: _____

	Resuscitation item	Checklist (Ticked if achieved)	Comments
1	**Airway** Give oxygen Manually open airway Clear airway Perform intubation		
2	**Breathing** Assist ventilation Monitor oxygenation by pulse oximetry		
3	**Circulation** Attach monitoring / defibrillator		
4	• **Establishing vascular access**		
5	**Paediatric Cardiac Arrest Algorithm** Quality CPR Correct sequence		
6	• **Adrenaline**		
7	• **Cardioversion**		
8	• **Reassessment** Rhythm shockable? Return of spontaneous circulation Identify reversible causes		
9	**Team leadership** Decision making		
10	**Communication** Team introduction Distraction avoidance **S**ituational awareness Team work		
11	**Loop communication** Reveal roles verbally or non-verbally Task management		

Critical items numbered and highlighted

Comments: _____

APPENDIX 4

ASSESSOR'S TRAINING RECORDING SHEET

Name: _____ Credentials: Final Year Medical Student

Date: _____ Training session: 1 / 2 / 3 / 4 / 5

At the end of this training, assessor should be able to demonstrate:

- Technical skills at both Septic Shock and Cardiac Arrest stations
- Capability to appreciate technical oversight and inaccuracies of resuscitation algorithm
- Understanding of variation in team approach to paediatric resuscitation emergencies

- ✓ Set up skills stations
- ✓ Equipment check
- ✓ Perform advanced airway management
  - Effective bag-mask ventilation
  - Endotracheal tube placement
- ✓ Algorithm and scenario awareness
- ✓ Use of oxygen with pulse oximeter and cardiac monitor
- ✓ Obtain vascular access quickly (IV/IO) for fluid resuscitation and correct hypoglycaemia
- ✓ Cardioversion
- ✓ Medication and reassessment
- ✓ Appreciate non-technical skills
  - Environmental awareness
  - Anticipation and planning
  - Assignment and articulation of leadership roles
  - Effective communication
  - Workload delegation
  - Use of all available information
  - Use of all available resources and calling for help when needed
  - Maintain professional behaviour
- ✓ Demonstrate administration of resuscitation checklist

Comments: _____

_____

_____

Educator: _____ **Additional training required: Yes / No**