Instructor's Manual

Rapid Cycle Deliberate Practice for Paediatric Life Support

Optimus
PULSE

Optimus PULSE: Rapid Cycle Deliberate Practice for Paediatric Life Support

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Introduction

Introduction by Dr Bram Welch-Horan M.D.
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He completed his fellowship in Paediatric emergency medicine at Texas Children's Hospital, and his residency in Paediatrics at New York-Presbyterian Hospital / Columbia University Medical Centre.

Dr Welch-Horan is an international expert on simulation, clinical event debriefing and has a particular passion for training using rapid-cycle deliberate practice.

"We don't get to practice enough". Many of us have felt this deficit intuitively during our schooling and/or post-graduate training in the health professions. For relatively rare, yet clinically important, behaviours, procedures and thought processes, we may read a bit about the issue at hand and then encounter it only a few times during our training years, with or without adequate opportunities for formative feedback.

Within paediatric care, some serious events are mercifully rare. In Australia, the incidence of paediatric out-of-hospital cardiac arrest is approximately 7 per 100,000 person-years[1]; in the United States and Canada, the incidence is around 8 per 100,000 person-years[2] and is likely similar in other industrialized areas of the world. But the relative rarity of cardiac arrest in children makes the problem of training, practice, and maintaining professional readiness for such events all the more compelling. Recent work in medical education research has highlighted the idea that experience is necessary, but not sufficient, to build expertise. Walter Tavares and colleagues have written that individuals and teams must have opportunities to reflect on experiences "in ways that strengthen their conceptualizations of practice and impact their future performances."[3] Meanwhile, Walter Eppich and colleagues have stated that "deliberate practice with performance feedback within mastery learning models helps learners progress toward meeting performance standards in well-defined tasks."[4] Arguably, simulation can meet the need for structured mastery learning and for optimal conceptualization of future performance. The question is, how best to operationalize our intentions?

Enter Rapid Cycle Deliberate Practice, or RCDP. Betsy Hunt, a paediatric intensivist at Johns Hopkins University, noted recurrent deficits in the ability of paediatric trainees, despite completion of a required Paediatric Advanced Life Support (PALS) course, to perform key interventions such as rapid initiation of CPR in a simulated pulseless patient, and rapid provision of defibrillation for one with a shockable cardiac arrest rhythm.[5] To address such performance gaps, which are also likely present in many fully qualified healthcare workers who treat cardiac arrest only occasionally, Hunt and colleagues created RCDP. While traditional scenario-based simulation education emphasizes the learning opportunities that occur during a reflective debriefing process, RCDP instead focuses more time and attention on practice, giving learners "multiple opportunities to 'do it right,'" and "creating muscle memory for the 'right way'" of performing key resuscitation behaviours and skills.[6]

Some educators might initially see the "pause and rewind" or "pause and reboot" strategies we use within RCDP as far removed from the reflective debriefing we value in other forms of team-based simulation. However, it turns out that this method becomes its own kind of reflection-in-action—in other words, a thoughtful interaction with a current problem as it is happening, rather than after the fact. Traditional simulation might offer, for example, a chance to discuss how best to coordinate getting the defibrillator pads on the patient while also placing a backboard and estimating patient weight via a length-based tape. RCDP,

on the other hand, offers the chance to identify and correct problems in coordinating the multiple streams of simultaneous action needed during such key moments of a resuscitation, and if necessary, to practice those parts of the event multiple times until a mastery standard is reached. Eppich and colleagues refer to the feedback loop for such moments as a form of "within-event micro-debriefing,"[4] highlighting the fact that learner-facilitator interactions within RCDP are an interactive conversation that promotes mastery learning and skill acquisition based on the actual gaps in knowledge and performance identified in the moment. Such a feedback loop, of course, often includes the opportunity to practice the skill again in real time after that brief, targeted conversation has occurred. In this sense, RCDP is rightly viewed as a flexible, time-efficient method that guides learners toward competence via real-time coaching and multiple opportunities to practice actions the "right way."

Speaking for myself, I would say that with RCDP, as with other educational activities in healthcare, the teachers often get as much out of the exercise as the participants do. Optimus PULSE is a wonderful addition to the world of simulation curricula, in that it is a user-friendly, open-access course teaching principles of cardiac arrest resuscitation via RCDP. It is relevant, streamlined and, I believe, well-positioned to help simulation facilitators target the needs of individual learners and resuscitation teams in a way that is effective. I am grateful to the authors, Louise Dodson and Tina Haffenden, for allowing me the opportunity to review their RCDP curriculum and the honour of providing an Introduction.

This work is near and dear to me, and I am sure I would not be alone in saying RCDP has changed me-- not only in terms of how I teach, but also in terms of how I care for patients. A couple of years ago, I had the rarest of opportunities - to resuscitate a child who not only had a witnessed cardiac arrest in the emergency department, but who also had a shockable rhythm. It was not easy to get him back, and in fact he was still pulseless after the second shock, prompting me to conclude we were unlikely to be successful with the resuscitation. But on the third shock (this time for ventricular fibrillation, rather than the ventricular tachycardia we saw at the two previous rhythm checks), we achieved sinus rhythm. There were many factors that could have derailed the situation - the patient was not in our shock/trauma room, he had not appeared critically ill on arrival an hour or so before, and the staff members who initially responded to the mother's cry for help were not the primary providers for that patient. There were also threats to my situational awareness as team leader— I had recently started a new job there, had heard from down the hall that the child was having a seizure (rather than an arrest), and was not one of the first providers into the room after he collapsed. But once I was there, I knew exactly what to do, and there was no hesitation - I felt something like the "muscle memory" Hunt describes. I am fortunate to have received excellent bedside teaching regarding critical illness during medical school, residency, and fellowship. However, it was not as much this teaching that got me through the patient's cardiac arrest as it was having been first a learner, and later a teacher, in simulations that provided expert-derived solutions to key problems in resuscitation, multiple opportunities for hands-on practice, and real-time feedback on performance. It was RCDP.

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Section 1 : Overview & Preparation

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Overview

What is Optimus PULSE?

- PULSE is a focussed session to **maintain** Paediatric Life Support recency and competency.
- By the end of the session the participants will engage as a high functioning team in the provision of cardio-pulmonary resuscitation, following the paediatric cardiac arrest algorithm.
- PULSE utilises an innovative educational technique called Rapid Cycle Deliberate Practice to ensure participants receive paediatric life support training utilising evidence based educational strategies for maximum long-term benefit.
- Rather than engaging in single pass or fail assessment, participants participate in multiple cycles of CPR performance of increasing complexity. In moments of suboptimal performance, participants are interrupted and coached until a high level of independent performance has been achieved.

Learning Objectives:

- Perform high-quality team-based CPR.
- Effectively perform key steps of paediatric immediate life support in a timely, sequential manner.
- Communicate effectively as a team leader and team member during resuscitation of a paediatric patient with a shockable or non-shockable rhythm.
- Demonstrate key team communication skills such as sharing mental models, closed loop communication, and clear role definition to provide rapid, coordinated action.

- These objectives will be met in accordance with the Australian and New Zealand Council on Resuscitation (ANZCOR) guidelines :
  - ANZCOR Guideline 8 – Cardiopulmonary Resuscitation (CPR)
  - ANZCOR Guideline 11.6 – Equipment and Techniques in Adult Advanced Life Support
  - ANZCOR Guideline 12.1 – Introduction to Paediatric Advanced Life Support
  - ANZCOR Guideline 12.2 – Advanced Life Support for Infants and Children: Diagnosis and Management
  - ANZCOR Guideline 12.3 – Flowchart for the Sequential Management of Life-Threatening Dysrhythmias in Infants and Children
  - ANZCOR Guideline 12.6 – Introduction to Paediatric Advanced Life Support Techniques in Paediatric Advanced Life Support

Faculty:

- Ideally 1 facilitator to coordinate and provide feedback and 1 facilitator to focus on timing performance.

Participants:

- 3 – 6, or what constitutes an authentic team within your service.
- Appropriate for all clinical staff with previous competence in CPR.

Pre-Requisites:

- OPTIMUS CORE eLearning and/or PULSE eLearning.
- The four-hour face to face CORE course is expected prior to attending PULSE.

Total session time 120 min

Pulse Course Overview

Introductions
5 mins

Mini Skills Stations

Breathing & IO Skills
10 mins

CPR and Defib
10 mins

Rapid Cycle Deliberate Practice

Orientation
10 mins

Rapid Cycle Deliberate Practice
40 mins

'Step to the Left' Scenario
40 mins

Course Closure

Thankyou & Evaluations
10 mins

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eLearning

PULSE eLearning is designed to be a short refresher on key principles of paediatric life support.

In order to keep the face-to-face course sharp and focused, participation in the eLearning ensures participants are refreshed on the fundamental principles and can focus on skills rehearsal on the day.

The eLearning, accessible through iLearn, is designed to take approximately 20 minutes.

You must use **EDGE.** if you have another browser as a default- copy & paste the link below into Edge.

- For Participants: Optimus PULSE https://ilearncatalogue.health.qld.gov.au/course/1402/chq-c-optimus-pulse
- For Faculty: Optimus PULSE TTT https://ilearncatalogue.health.qld.gov.au/course/1446/chq-r-optimus-pulse-ttt

QR Codes

Throughout this manual you will find Quick Response or QR Codes. These bar codes are easily scanned by your mobile phone and will direct you to further information and demonstrations of the various elements of the course.

The Mini Skills stations self-directed learning cards also contain QR codes to help with memory recall of the various skills for participants to practice.

If you are using the electronic version of this manual, you may also click on the QR codes with your mouse to take you to the correct link.

How to use the QR Code with your mobile phone:

- Scan the QR Code – point your phone at the QR Code to scan it.
  - The iPhone camera app has a built-in scanner.
  - Android phones such as Samsung may also have a built-in QR code scanner. The feature is turned off by default, but you can enable it by opening "Extensions" and then tapping on "Scan QR code."
- The link will either automatically open or you may need to tap on the link.
- Alternatively, for older phone models you can download a QR Scanner app.

What is Rapid Cycle Deliberate Practice?

Rapid Cycle Deliberate Practice (RCDP) is a teaching technique developed by Hunt et al at Johns Hopkins University Hospital. In essence it uses repetitive drills to find where learners are at and bring them to a high-performance standard of CPR delivery, gradually increasing complexity of the situation as the learners continue to improve.

The American Heart Association Statement on Resuscitation Education Science recommends the use of RCDP and describes it as having the following core components:

- A baseline formative assessment simulation

- Further simulations with interruptions when errors are observed

- Objective data-driven feedback

- Multiple opportunities to rewind and repeat until mastery of that concept is achieved

- Escalation of the difficulty or number of objectives as mastery occurs

RCDP is associated with improved CPR performance, shorter training times and a longer skills retention compared to standard simulation/workshop training.

While the evidence regarding RCDP's educational efficacy remains clear, many Australian CPR educators are relatively unfamiliar with the technique. We hope that through the use of this manual and the associated demonstration videos, that you will become more comfortable delivering CPR training via this technique.

What is the CPR Coach?

The PULSE eLearning and demonstration videos introduce a new role for teams providing CPR to unwell children: the CPR Coach.

We have chosen to introduce this role due to established evidence that the quality of CPR delivery in real resuscitation teams is often poor, that quality CPR is central to meaningful survival post-arrest outcomes, and emerging evidence that shows increased CPR quality utilising a CPR Coach.

The pedi-RESQ collaborative describes the CPR Coach as:

- *"A supplementary resuscitation provider that provides real time feedback to chest compressors to optimize compliance with American Heart Association (AHA) CPR guidelines and to cognitively unload the Resuscitation Leader, enabling them to focus on the PALS algorithm and reversible causes."*

They describe the role as having 6 main tasks:

- Coordinate early initiation of CPR and timely defibrillation.

- Work with the leader to define specific chest compression performance goals given the patient's age and other modifying factors.

- Provide real-time coaching to improve the quality of chest compressions (CC), incorporating data available at the bedside (e.g., arterial line, end tidal carbon dioxide (EtCO2), real time measurements of depth and rate, etc.).

- Ergonomically optimize the team's interaction with their environment (i.e., patient, bed, step stool, ventilator, defibrillator, etc.) to optimize performance.

- Ensure all procedures are coordinated with a goal of minimizing pauses in CC (e.g., placing backboard, intubation, defibrillation, neck dissection during ECMO, etc.).

- Keep the Resuscitation Leader informed, (e.g., meeting the defined goals or not, etc).

It is important to acknowledge that the addition of the CPR Coach may be impossible for rural services due to the small number of staff available for any resuscitation, or if there is no ability to provide objective feedback, e.g ETCO2, defibrillator feedback or arteral lines etc.

The inclusion of this content is not intended to imply that CPR Coaching is mandated, rather that we trust local educators to contextualise the relevance of this emerging data for their service.

We do however hope that discussion on CPR Coaching prompts consideration of incorporating this role when staff availability allows, or to use the concept as a discussion prompt to ask your service: What systemic interventions can we make in our hospital, to ensure that the CPR we are delivering is as high quality as possible?

Course Equipment

Location:
An area large enough to allow team to move around trolleys and practice as a team.

X 1 set up per participant unless otherwise indicated

Airway / Breathing Skills Station
- Paediatric airway trainer which can have airway adjuncts inserted
- Appropriately sized Oro-pharyngeal Airway to fit airway trainer
- Appropriately sized Naso-pharyngeal Airway to fit airway trainer
- Appropriately sized Nasogastric Tube to fit airway trainer
- Appropriately sized Suction catheter to fit airway trainer
- Appropriately sized Laryngeal mask airway to fit airway trainer
- Tongue depressor
- 10mL syringe
- Self-inflating bag valve + mask to fit manikin
- Airway adjuncts laminate
- Mini skills Self-Directed Learning laminates

Intraosseous / Adrenaline Skills Station
- 1 x Intraosseous driver e.g., EZI I.O
- 1 x Intraosseous needle kit (<39kg) – includes needle, extension set and dressing
- 1 x Plaster of Paris wrapped Crunchy bar/ Intraosseous training limb
- 3 x Alcohol swab
- 3-way tap + 1 extra for Intraosseous
- Drawing up needle
- 10 ml & 2ml luer lock syringe
- Adrenaline 1:10 000 pre-filled syringe or 10mL amp (add extra 10mL syringe for amp)
- 10ml amp NaCL 0.9%
- Circulation Skills Station (IO Landmarks) laminate
- Local Emergency drug preparation guide (e.g., CREDD 4kg))
- Mini skills Self-Directed Learning laminates

CPR / Defibrillation Skills Station
- Infant manikin with airway that can have adjuncts inserted – e.g., Infant QCPR manikin or ALS baby
- 1 x Paediatric Cardiac Arrest algorithm – ANZCOR or QCH
- 1 x Paediatric DRSABCD poster
- 1 x Local training Paediatric Resuscitation trolley
- 1 x Manual Defibrillator with rhythm simulator attached safely to absorb shock - a defibrillator that provides CPR quality feedback is ideal – but not essential
- 1 x Paediatric & Adult defib pads
- 1 x Self-inflating bag valve + mask to fit manikin
- Mini skills Self-Directed Learning laminates

Rapid Cycle Deliberate Practice Simulation (RCDP)
- All equipment from the defibrillation station, intraosseous, adrenaline and airway station can be added to local resus trolley if not already present.
- Infant manikin (previously used in Defib station)
- 1 L Normal saline

Step to the Left : Use RCDP set up
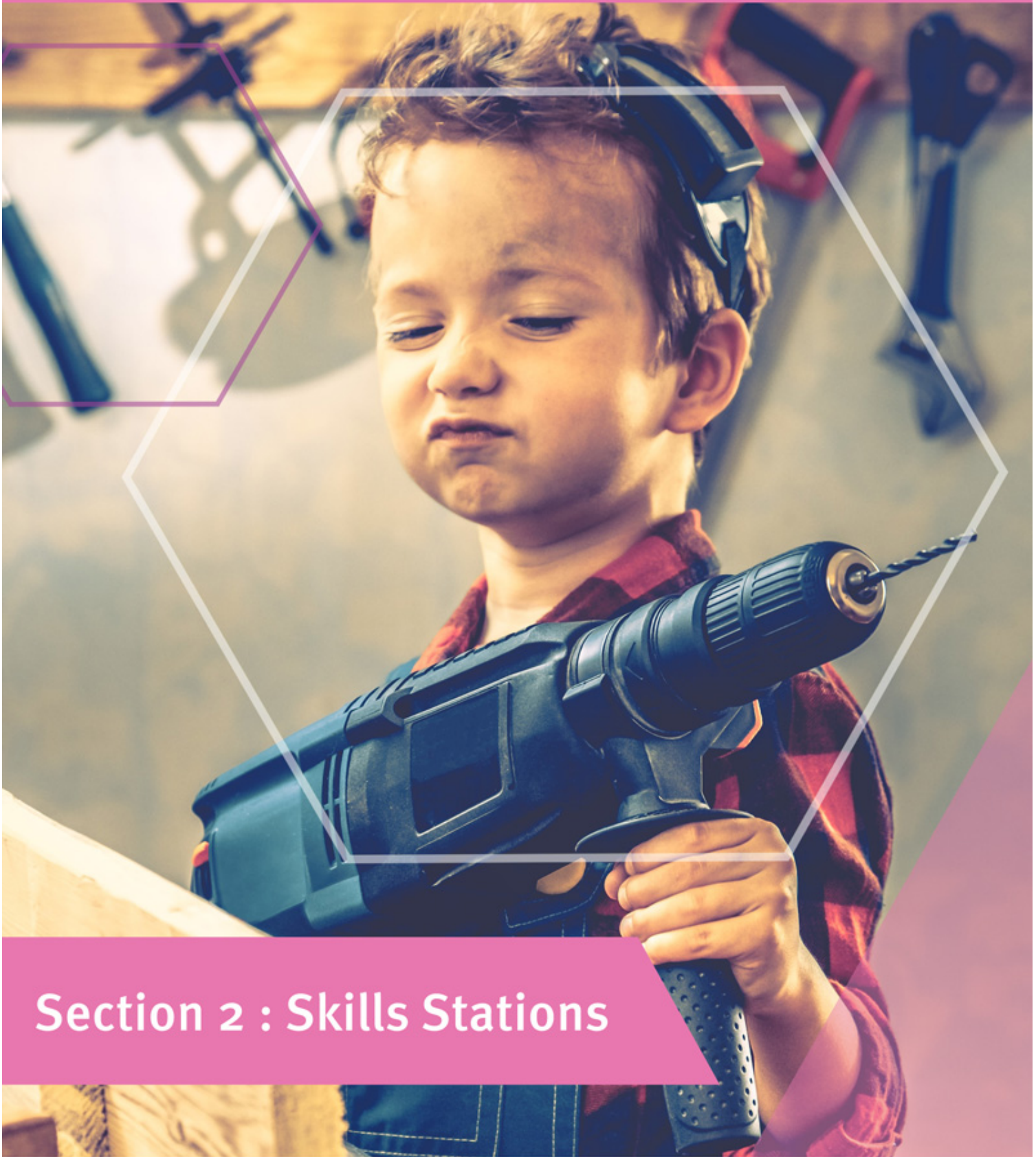
Section 2 : Skills Stations

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Station Overviews

1. Scan or click for station demo

Introduction to the Course

The introduction to the course is a quick chance to welcome the team, create some rapport and establish core elements of psychological safety.

An example script is below:

- The aim of Optimus PULSE is to refresh and maintain our paediatric life support skills. We hope that by the end of the session you will be functioning as a high-performance team in the provision of paediatric life support.
- We will start with a quick refresher on airway and breathing support; intraosseous insertion and adrenaline doses for children; CPR and safe defibrillation.
- We acknowledge your commitment to providing the best life support possible for your patients and thank you for committing time to refresh and refine your skills.
- This session is designed to provide challenges. The performance of fellow participants is not to be discussed outside of the session.

Mini Skills Stations

This station is a 'Choose your own adventure': Participants have 20 minutes to refresh their knowledge on specific equipment or procedural skills involved in paediatric resuscitation.

- Participants rotate between 2 stations at 10 minutes time, with each participant choosing what they want to practice from the skills and equipment available in each station.

- The role of the facilitator is to observe, support where needed and answer questions; as well as maintaining adherence to time limits for each station.

Divide participants into 2 groups: 10 mins each station
- **Station 1:** Airway, BVM **/** Intraosseous, adrenaline
- **Station 2:** CPR **/** Defibrillation

Station 1 Overview

Station 1	Direct group to use the self-directed learning card to guide through the station.
Mini skill Airway (5 min)	• Positioning – 2-handed BVM technique • Oropharyngeal • Nasopharyngeal • LMA
Mini skill Intraosseous insertion (5 min)	• Landmarks • Insertion technique • Adrenaline administration

Physical layout for Station 1

Airway Skill Layout	Intraosseous Skill Layout

| Station 2 Overview	
Station 2	1. Provide a quick overview of DRSABCD to all participants. 2. Demonstrate safety expectations regarding the defibrillator **3.** Invite participants to follow the self-directed learning card.
Mini skill CPR (5 min)	This is assumed knowledge. **D** – Danger…. PPE, situational awareness. **R** – Response…. Are you alright? Trapezius squeeze to elicit a central stimulus. **S** – Send for HELP! …. How is this done here? What is the phone number? **A** – Airway…. Open, clear and position – turn on to side to drain secretions if necessary. **B** – Breathing…. Look, Listen, Feel – 8 seconds, no longer…. Give 2 effective breaths. **C** – Circulation…. Check for signs of life. Pulse check no longer than 10 seconds. Key features of quality CPR - rate /depth /recoil / change compressors every 2 minutes / minimising 'time off chest'/ firm surface. **Introduce the role of CPR Coach**.
Mini skill Defib (5 min)	**D** – Defibrillation…. 4 J/Kg. We will be using a live defib today, as in reality **safety is paramount.** Provide a real time run through of the defibrillation process, including pad placement, rhythm recognition and safely disarm charge if not required (i.e., non-shockable rhythm or signs of life / return of spontaneous circulation). • Place pads • Turn defibrillator on • Select energy / joules (4J/Kg) • Continue compressions, oxygen and all others away • Top, middle, bottom clear • Charge • Stop compressions • Assess rhythm and signs of life • Shock or disarm charge (pulse check following disarming if a perfusing rhythm) • Continue compressions

Physical layout for Station 2

CPR Skill Layout

Defibrillation Skill Layout
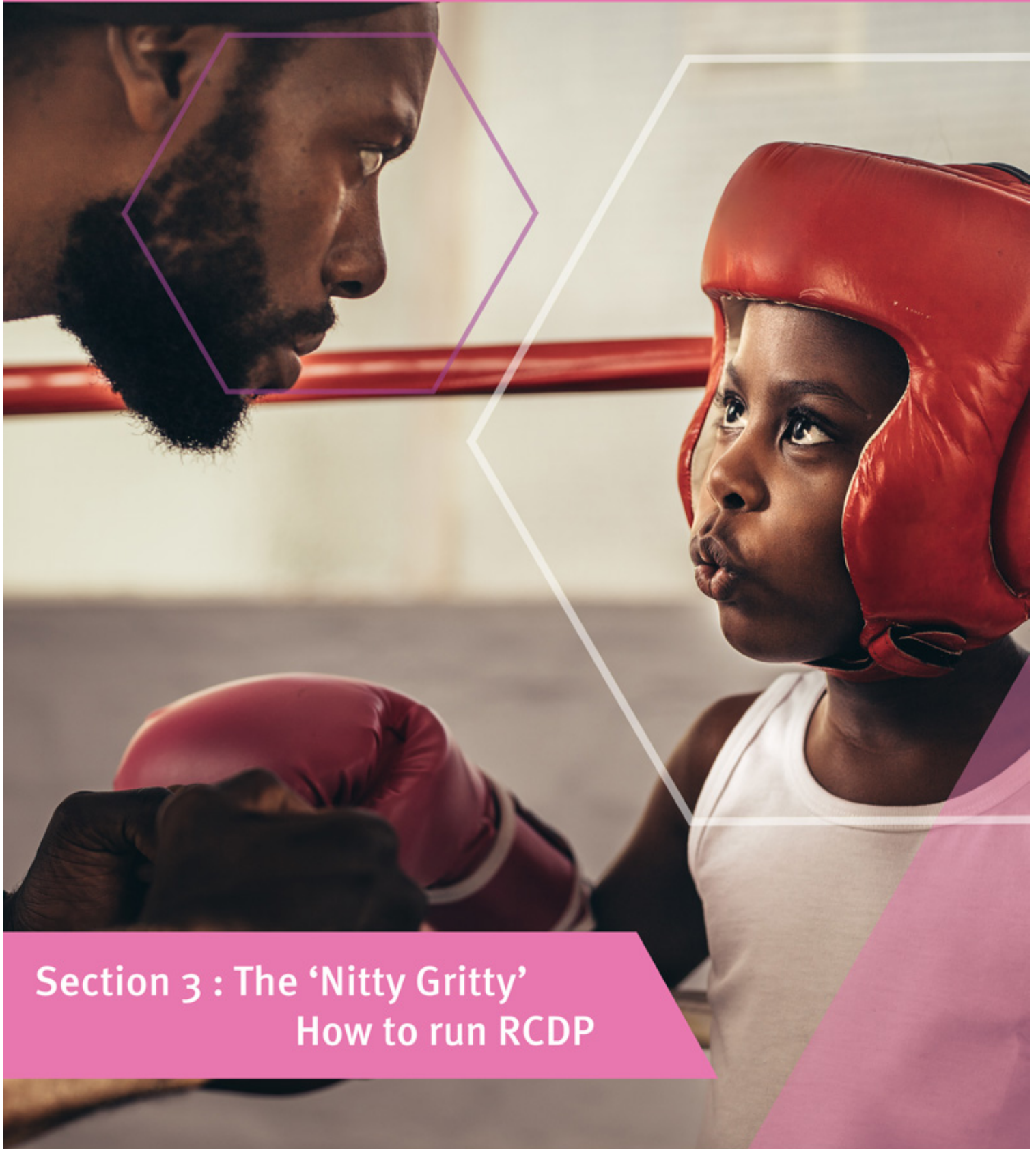
Section 3 : The 'Nitty Gritty'
How to run RCDP

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The Nitty Gritty: How to run RCDP

RCDP uses repetition to bring learners to a high standard of paediatric life support expertise.

- Rather than pass or fail a single assessment, participants work repeatedly through a scenario to demonstrate and assess essential skills for paediatric life support.

- When participants perform a sub-optimal action, the instructor pauses the scenario, highlights changes needed or strong performances and then restarts the scenario. This same process is used to highlight and embed excellent performance. This continues until the team achieves the expected level of performance in each round.

By overtraining through repeated rehearsal, critical skills become easier to deliver in times of stress.

- There is evidence that this will lead to better patient care and more consistent quality CPR. [1, 2, 3, 4]

Feedback tips for RCDP:

Feedback is direct and instructive, highlighting areas that will facilitate rapid progression and team performance in provision of key components of paediatric resuscitation based on the ANZCOR guidelines.

Within each round there will be micro feedback moments to give praise and moments to provide direct constructive feedback. Areas of focus include quality of chest compressions; quality of ventilations; minimise hands off time during rhythm check; team communication. [4, 5]

- The rewind may only need to go back 10 seconds to practice and improve a skill, for example if the defibrillator is not charged before delivering the shock; to choreograph how to place a backboard.
- A rewind may also be utilised to practice things that were performed well, to make them stick. For example: good communication; high-quality CPR.
- A rewind to the beginning of the round may be required to refocus teamwork and direction
- Team communication and shared mental models: introduce action-linked phrases and deliberate words, connecting what you observe with what you will do.
- Provide a demonstration of the key element as needed.

Progress to the next round once the objectives for each round has been met. Several rewinds may be required in each round. The aim is to provide as many practice opportunities as needed to achieve excellence.

The team may switch roles at the end of each round to facilitate practice within various roles.

Examples of feedback:

- "I noticed that the time to first shock was over 2 minutes. Evidence tells us that defibrillation occurring within 2 minutes is associated with improved survival to discharge rates. Let's rewind to the beginning with the aim to deliver the first shock in under 2 minutes." [6, 7]

- "If CPR is started within 20 seconds, survival improves significantly." [1, 8]

- "Good quality CPR improves the effects of defibrillation" [8, 9, 10]

- "Survival to discharge is significantly impacted by hands off time, one study showed that you can increase survival by 18% by each 5 second reduction in hands off time. Let's aim for a 10 second hands off time" [11]

- Using positive affirmations such as "you've got this"; "great team-work"; "I can see you improving with each round" will help to generate positive energy and promote acceptance of direct feedback.

- "By introducing a CPR Coach using a feedback device chest compression quality has been shown to increase by 70 – 80%"[13]

RCDP Pre Brief

Establishing a safe learning environment

An essential element of successful RCDP is ensuring that participants get into an 'Olympic' mindset, understanding that they are going to be actively coached to a high level of performance and that the process will involve frequent interruptions and resets. As such it is important that time is spent explaining what to expect and the motivation behind the course.

Make sure to:

1. Orientate to environment, equipment and mannequin functionality.

2. Orientate to the Rapid Cycle Deliberate Practice process. *(Example script below)*

"The aim of this section is for you to excel at providing paediatric life support using the paediatric resuscitation algorithm. We will be using a simulation method called **Rapid Cycle Deliberate Practice (RCDP).** RCDP is akin to Olympic coaching, focusing on perfecting the little things. We will be providing multiple opportunities to practice, and practice again, creating muscle memory to respond automatically and excel in performance.

Throughout the RCDP simulation I will act as your coach. I will frequently interrupt you purposefully to provide direct feedback on actions that can be improved on or to let you know when you have done something well. We all make mistakes in simulations. Any mistakes made here are between us and will not go out of this room. There is no pass or fail. If I notice something that could be done better, I will stop the simulation, let you know what that is and demonstrate how that could be improved. We'll then rewind so you get an opportunity to improve, perfect and work cohesively as a team. We will also practice the things you do well, to help that stick. It's a bit like Ground Hog Day. We will work on choreography and how we communicate with each other in these stressful moments, creating a shared mental model. This will help you to become a high functioning, coordinated team, providing an exceptionally high standard of paediatric life support.

We'd like you to behave as if this was real and perform in your usual role. This helps to translate what we learn here today to reality. *Note if there are no medical officers present, the faculty will provide orders for drugs at the end of relevant rounds*.

The scene I set may be unrealistic to your everyday practice, e.g., all waiting outside a patient room for the emergency buzzer to ring. If you can put these thoughts aside and immerse yourselves into the actual repetitive training approach, I believe much learning can be gained."

Begin RCDP

Rapid Cycle Deliberate Practice

40 mins
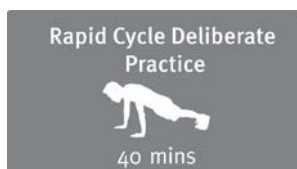
Station Tips:

Timing throughout each round is essential.
To avoid loss of momentum feedback is direct, concise and solutions focussed.
Utilise the Faculty Runsheet for Rapid Cycle Deliberate Practice to record performance times and assist with station flow.

Round 0: Diagnostic Round

Objectives: Identify level of learner's knowledge and practice gaps in relation to paediatric life support.

This is a full run through of scenario without interruption.
Use timer and record times when significant actions are made as per the required goals.
Note gaps in practice which will become key objectives to focus on the following rounds.

With all participants initially out of the room, inform them that the alert buzzer has been pressed.
Introduce patient scenario to the participants as they enter the room:

Script used to introduce Diagnostic Round:

"You have responded to a call bell by the child's carer and find a 12-month-old child (10kg) who is pale and floppy. Carer tells you that the child came in with respiratory distress, otherwise well."

Patient status: gasping breaths, bradycardic 75bpm, not responding, rapid progress to PEA, good quality CPR - EtCO2 >20mmHg, poor quality CPR EtCO2 10mmHg.

Once scenario complete:

- Provide brief feedback, include timings and answer team questions.

- Reassure that team will have the opportunity to refine these skills.

- Highlight good practice, providing feedback to continue this practice.

- Introduce key focus points for next round:
    o Aim to assess patient for responsiveness, breathing and signs of life.
    o Call for help (i.e., Emergency response).
    o Position ourselves for effective patient management.

Round 1: Basics, Airway and Breathing.

Objectives:

- Recognize unresponsiveness and apnoea in patient with a pulse
- Optimise oxygenation and ventilation – oropharyngeal, nasopharyngeal insertion
- Form a team
- Share a mental model

Recommence from the beginning of the scenario with all participants out of the room.
Repeat this round at least once to allow refinement of practice.

Script used to introduce Round 1 (same as previous round):

"You have responded to a call bell by the child's carer and find a 12-month-old child (10kg) who is pale and floppy. Carer tells you that the child came in with respiratory distress, otherwise well."

Patient status:

- Apnoeic, saturations not reading
- Bradycardic 70bpm
- Not responding.
- Chest expansion improves when airway adjuncts inserted.

Facilitation Tips:

- Prompt "you are not getting rise & fall of chest" to facilitate need for adjuncts.
- If CPR is commenced that is a good thing! But not essential for this round.
- CPR commencement time is noted for Round 2 goals.
- Aim is to achieve effective ventilations by 40 seconds. At 60 seconds stop scenario or if airway adjunct inserted prior. Note critical actions achieved and those requiring refinement.

- Micro feedback moments to consider:
    - Call for help
    - Strategies to optimise airway opening for effective ventilation (2-handed BVM technique, oropharyngeal/nasopharyngeal airway/Laryngeal mask airway)
    - Praise if CPR has commenced.
    - Use of deliberate words and action-linked phrases: e.g. "He's not breathing, I'm going to start bagging" "I can't see rise and fall of the chest, I need an oropharyngeal airway".

Round 2: Basics and CPR. Bradycardia - progresses to PEA

Objectives:

- Recognize need and commence CPR
- Provide effective compressions and ventilations
  - Ratio 15:2; rate 100 – 120 bpm; 1/3 depth chest; recoil
  - Assign a CPR coach
- Place backboard
- Share mental model

Participant Pre-brief:
- Introduce key focus points for round 2 – aim to assess patient for responsiveness, call for help and commence CPR within 20 seconds.
- Provide time CPR commenced in Round 2.
  - Note: emphasize effective CPR must not be compromised by beating the clock, rather focus on how to optimize delivery of quality CPR.

Round 2 commences from the beginning of the scenario with all participants out of the room.

Script used to introduce Round 2 (same as previous round):

"You have responded to a call bell by the child's carer and find a 12-month-old child (10kg) who is pale and floppy. Carer tells you that the child came in with respiratory distress, otherwise well."

Patient status:
- Apnoeic, saturations not reading
- PEA rate 70 bpm, no pulse, good quality CPR $EtCO_2$ >20mmHg, poor quality CPR $EtCO_2$ 10mmHg
- Not responding,

Facilitation Tips:
- Aim is to commence CPR by 20 seconds.
  - At 40 seconds stop scenario or when compressions commenced.
  - Note critical actions achieved and those requiring refinement.
- Micro feedback moments to consider:
  - Strategies to improve efficacy of CPR (optimise compressor position; CPR back board; rate; ratio; depth; recoil; Use CPR feedback device; $EtCO_2$ >20mmHg).
  - Forming a team; use of deliberate words or action-linked phrases.
  - Action-linked phrases connect what you observe with what you will do – e.g. "There is no pulse, I'm starting compressions" [12, 13]
- **Introduce CPR Coach** role to improve the performance and quality of CPR by providing corrective feedback to the chest compressor using:
  - Visual observation of rate, depth and recoil; minimising interruptions to CPR during defibrillation, intubation and provider switch.
  - Quality feedback indicators - defibrillator or manikin feedback device; $EtCO_2$ >20mmHg
  - This role cognitively offloads the Code Leader, who can focus on problem solving. This should be encouraged in real life CPR events. [13, 14.]
  - The optimal position of the CPR Coach is at the side of the patient to facilitate visualisation of chest compressions and feedback device
- Repeat this round at least once to achieve prompt CPR commencement, utilising CPR coach role to achieve quality CPR.

Round 3: Basics, CPR, recognise non-shockable rhythm, insert IO, give adrenaline.

Objectives:

- Form a team
- Attach and safely use defibrillator
- Recognize PEA rhythm (non-shockable pathway)
- Minimise hands off to analyse rhythm
- Intraosseous insertion
- Administer adrenaline 10 microg/Kg = 0.1 mL/Kg of 1:10 000 dilution immediately following recognition of non-shock rhythm
- Closed loop communication & Shared mental model
- Consider cause

Participant Pre-brief:

- Introduce key focus points for round 3 - critical elements include above and safe defibrillation process, providing defibrillation to a shockable rhythm or disarm if non-shockable by 60 seconds; insertion of an IO and adrenaline 10 microg/Kg = 0.1 mL/Kg of 1:10 000 dilution.

Round 3 commences from the beginning of the scenario with all participants out of the room.

- Aim is to achieve rhythm recognition by 60 seconds, disarming charged energy prior to recommencing CPR and to administer 1st dose adrenaline by 75 seconds.
- At 90 seconds stop scenario or when adrenaline given post rhythm recognition.
- Use a partial rewind to practice chest pad application to achieve defibrillation safety, timeliness and reduction in hands off time.
    - Suggested sequence: while 2 breaths are being provided - roll the patient, place one pad on back, roll patient back to supine and place front pad
    - A back board may be placed simultaneously when patient is on side, bearing in mind that good quality CPR and time to defibrillation are paramount to survival outcomes. Avoid delays
    - Choreography will vary and is dependent on realistic numbers of responders.

Script used to introduce Round 3 (same as previous round):

"You have responded to a call bell by the child's carer and find a 12-month-old child (10kg) who is pale and floppy. Carer tells you that the child came in with respiratory distress, otherwise well."

Patient status:

- Apnoeic, saturations not recording
- Not responding, PEA rate 70 bpm, good quality CPR EtCO2 >20mmHg, poor quality CPR EtCO2 10mmHg.
- Note if no medical officer participant, facilitator orders adrenaline
- All peripheral IV attempts are unsuccessful.

Facilitation Tips:

- Micro feedback moments:
    - Safe defibrillation with minimised time off chest
    - Shared mental model
    - Provide strategies on how to reduce pre-shock pause and then rewind so they can try again.
    - Use of deliberate words "Patient is in pulseless electrical activity PEA; I'm disarming the shock. Shock disarmed, resume CPR"." We are following the non-shockable pathway"
    - Provide demonstration of safe defib if required
    - Technique to insert IO; anticipation and administration of adrenaline; closed loop communication;

Round 4: Basics, CPR, recognise shockable rhythm, energy dose 4J/Kg, insert IO, give adrenaline

Round 4 introduces a new scenario thread and follows the shockable arm of the paediatric arrest algorithm

Objectives:

- Commence effective CPR
- Recognise ventricular fibrillation (shockable pathway)
- Select appropriate energy dose (4J/kg, unsynchronized)
- Safe defibrillation and resume CPR immediately
- Anticipate and plan for 2nd shock and adrenaline; Compressor change
- Closed loop communication
- Shared mental model

Participant Pre-brief:

- Introduce key focus points for round 4 - critical elements (*include above*), recognition of shockable rhythm and following shockable pathway.

Round 4 commences from the beginning of the scenario with all participants out of the room.

- Aim is to achieve rhythm recognition and delivery of 1st shock by 60 seconds.
- At 90 seconds stop scenario if rhythm not recognised or announced.

Script used to introduce Round 4:

> "Let's introduce another child that has presented. You have responded to a call bell by carer and find a 12-month-old child (10kg) who is pale and floppy. You know this child came in with severe dehydration from gastroenteritis."

- **Patient status**: Apnoeic, Saturations not recording, Not responding, Rhythm VF, good quality CPR EtCO2 >20mmHg, poor quality CPR EtCO2 10mmHg.

Facilitation Tips:

- Continue full rewind until team achieves defibrillation by 60 seconds.
- Partial rewind to energy charge to practice and achieve minimal hands-off chest time.
- Micro feedback moment:
  - Safe defibrillation
  - Minimise hands off defibrillation
  - Anticipation of adrenaline for administration post second shock
  - Shared mental model and team coordination
  - Use of deliberate words e.g.
    - "Patient is in VF, all clear I'm shocking, shock delivered, recommence CPR"
    - "The patient is in VF arrest, follow the shockable pathway"
    - "We need access, insert an IO and prepare adrenaline 10 microg/Kg = 0.1 mL/Kg of 1:10 000 dilution."
    - "Prepare to rotate compressors after each shock"

Round 5: Basics, CPR, recognise shockable rhythm, energy dose 4J/Kg, insert IO, give adrenaline, prepare amiodarone and discussion of possible causes using 4H & 4T.

Objectives:

- Coordinate effective CPR
- Follow shockable pathway
    - o 2nd shock and adrenaline; Compressor change at 2min
    - o Anticipate and plan for 3rd shock and amiodarone
- Closed loop communication
- Shared mental model
    - o Discussion of possible causes using 4H and 4T

Participant Pre-brief:

- Introduce key focus points for round 5 - critical elements include above 2nd shock delivery at 2 minutes; delivery of Adrenaline following 2nd shock, leadership, 4H's & 4T's and teamwork.

Round 5 recommences following delivery of 1st shock. Participants remain in roles.

- Aim is to coordinate the team to follow the shockable pathway.

    - o Achieve rhythm recognition and delivery of 2nd shock by 120 seconds
    - o Deliver 2nd shock, administer adrenaline and anticipate amiodarone following 3rd shock

- At 150 seconds stop scenario if rhythm not recognised or announced.

- Partial rewind to energy charge to:
    - o Practice and achieve minimal hands-off chest time
    - o Practice rotate compressors
    - o Practice close loop communication

Script used to introduce Round 5 (same patient as previous round):

> "We have just delivered the first shock, let's recommence and continue along the shockable pathway of the paediatric arrest algorithm."

- **Patient status**: Apnoeic, Saturations not recording, Not responding, Rhythm VF, good quality CPR EtCO2 >20mmHg, poor quality CPR EtCO2 10mmHg.

Facilitation Tips:

- Micro feedback moments:

    - o Safe defibrillation
    - o Minimise hands off defibrillation
    - o Rotate compressors
    - o Anticipation of adrenaline for administration post second shock
    - o Shared mental model and team coordination
    - o Use of deliberate words
        - ▪ "Prepare amiodarone 5mg/Kg to give following the 3rd shock"
        - ▪ "14 Kg 15-month-old in a VF arrest. Let's consider the 4H's & 4T's".

END RCDP Station

Section 3.2 : The Step to the Left Scenarios
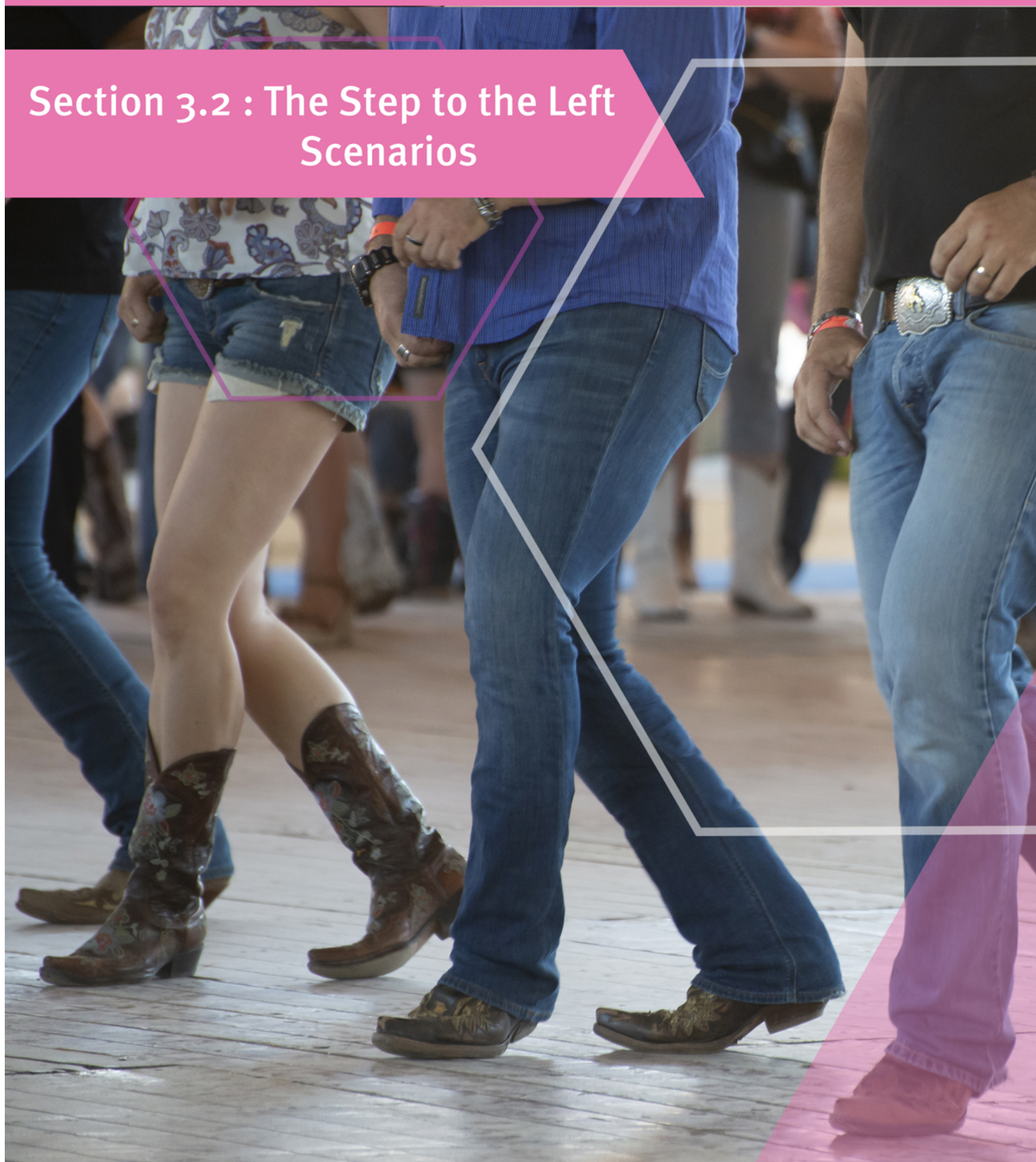
Optimus
PULSE

'Step to the Left' Scenario

What ['Step to the Left' Scenario — 40 mins] Left?

Step to the Left is the third section of the Optimus PULSE course lasting approximately 40mins. This section follows on from the Mini Skills Stations and RCDP where the participants are coached and skills are finely tuned. Step to the Left offers opportunity for participants to rotate through each role in the CPR team and simultaneously allows the facilitator time to assess each individual for competency in providing Paediatric CPR, Defibrillation and as Code Leader in following the Paediatric Cardiac Arrest Algorithm.

The participants perform paediatric life support following the arrest algorithm as a team in a low fidelity environment. Each team member assumes a resuscitation team role and performs in that role for a two-minute cycle of the paediatric life support algorithm. The Facilitator observes each participant, as they rotate through each role. After 2 minutes the whole team steps to the left i.e., stepping into a different role for a further two minutes. Continuing in this format each participant will have the opportunity to be observed in each role at least twice.

The approach of assessment for learning is utilised to identify participants who require further refinement of skills. If a participant is identified as not achieving the criteria, the scenario is paused for a micro teaching moment to refine technique, reinforce knowledge and skill prior to the assessment final round.

There are brief scenarios for facilitators provided within this section of the manual which can be contextualised to location (ie choose the ones your staff are more likely to see). The scenarios provide a cause for the cardiac arrest and the arrest rhythm, enabling both the shockable and non-shockable pathways to be followed. Facilitators will be able to engage the team in discussion points such as the reversible causes, immediate diagnostic tests, Adrenaline/Amiodarone doses to allow all the elements required for attaining Paediatric CPR competency are included.

Step to the Left Facilitator Runsheet

Facilitator describes:

- Cardiac arrest rhythms (asystole, PEA, VT & VF) – briefly show each rhythm and name
- Causes of paediatric cardiac arrest - brief
- 4H's & 4T's

Facilitator assigns:

- Assign participants roles, contextualising to an authentic team at your hospital:
    - Code Leader
    - Airway
    - CPR compressors
    - CPR coach
    - Drugs
    - +/- Documentation
    - Defibrillation
- If limited participants, faculty can supplement airway, compressor or drugs role.

Station Flow:

- Rotate participants following a 2-minute cycle of the arrest algorithm (step to the left):
    - Start a new patient scenario with each round.
    - Continue until all have rotated through each role according to scope of practice and all advanced participants have performed Defibrillation / Code Leader role for both practice and assessment.
- During the 2-minute interval of CPR the Code Leader (or Defibrillator) role follows the Paediatric Arrest Algorithm to direct what is required for next stage of the algorithm (i.e., obtain access; prep adrenaline / amiodarone; anticipate airway adjuncts / fluid bolus / considers 4H's & 4 T's).
- To facilitate practice with both shockable & non-shockable pathway, change rhythms between VT, VF, PEA & Asystole as the team rotates.

Rhythm	Age & background	Causes 4 H's & 4 T's
VT	20 Kg 4 yr. old Hx renal failure in cardiac arrest, compressions have been commenced	Hyperkalaemia
VF	25 Kg 5 yr. old Hx cardiomyopathy in cardiac arrest, compressions have been commenced	Hypoxic (low cardiac output state)
VF	15 Kg 2 yr. old Hx drowning in cardiac arrest, compressions have been commenced	Hypoxia, hypothermia
PEA	8 Kg 9month old with gastro & shock in cardiac arrest, compressions have been commenced	hypovolaemia
VT	3 Kg 7 day old 4 hours post cardiac surgery in cardiac arrest, compressions have been commenced	Cardiac Tamponade
VF	45 Kg 14 yr. old who has overdosed on tricyclic antidepressants in cardiac arrest, compressions have been commenced	Toxins
VT	50 Kg 10 yr. old Hx of Long QT syndrome admitted with respiratory illness, in cardiac arrest, compressions have been commenced	Hypoxic (low cardiac output state)
Asystole	10 Kg 1 yr. old Hx Posterior Fossa Tumour in cardiac arrest, compressions have been commenced	Hypovolaemia
Asystole	45 Kg 12 yr. old in ORS Hx trauma, ruptured spleen, haemorrhage, in cardiac arrest, compressions have been commenced	Hypovolaemia
VT	10 Kg 14-month-old in ORS Hx Local Anaesthetic reaction, in cardiac arrest, compressions have been commenced	Toxins
PEA	5 Kg 5-month-old in PACU Hx bowel resection for intussusception, in cardiac arrest, compressions have been commenced	Hypovolaemia
PEA	18 Kg 4 yr. old Hx post insertion of Hickmann's line, in cardiac arrest, compressions have been commenced	Pneumothorax

Close session with a recap of objectives and key points and evaluation.

Section 4 :
Printable Resources

Optimus
PULSE

Mini Skill Station - Airway

Scan QR codes with your phone for a video demonstration

Scenario

1 month old, 4kg baby with severe work of breathing.
The infant becomes blue, floppy and apnoeic.
Rescue breaths are given but the chest is not inflating well.

What to do

Change position and BVM technique.
Choose appropriate airway adjunct and suction mouth & nose.
Decompress the stomach with an NGT.
Share your thoughts! .... *"I can't get good rise and fall of the chest, I need to insert an oropharyngeal airway."*

Practice

Insert an oropharyngeal and naso pharyngeal airway
Practice 2 handed Bag Valve Mask technique
Practice LMA Insertion

Airway Adjuncts

Nasopharyngeal Airway

Sizing : Measure tragus of the ear to the nostril
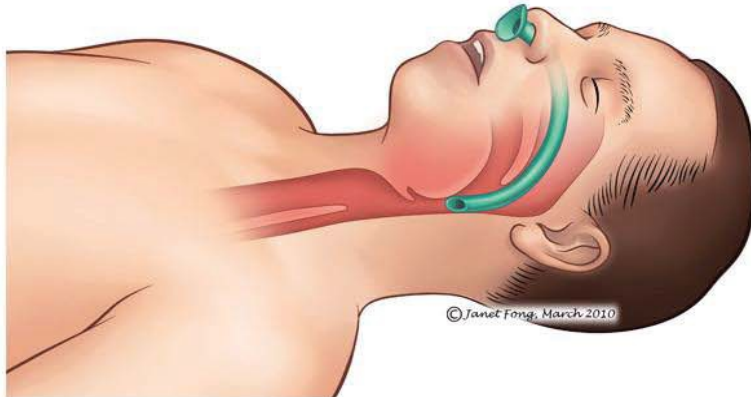
Oropharyngeal Airway

Sizing : Measure middle of mouth to angle of the jaw
Insert : Anatomically, don't twist.

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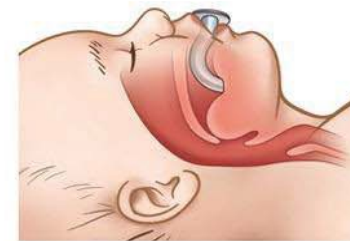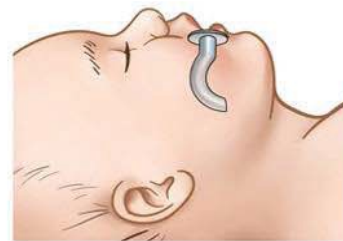
Too short
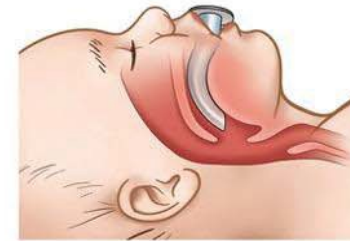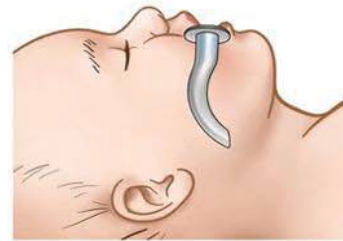
Correct

Too long

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Airway Adjuncts

Laryngeal Mask Airways
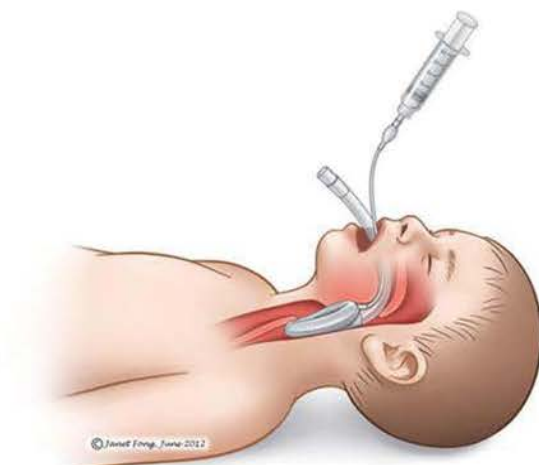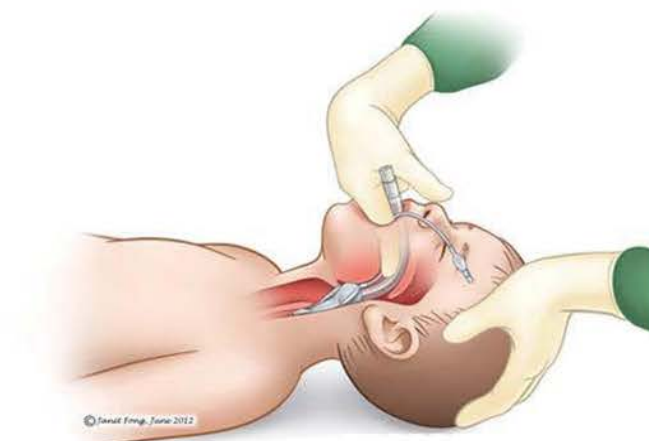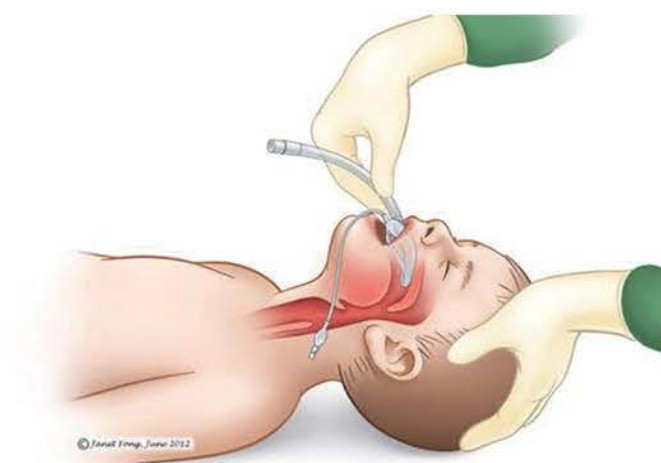
Mini Skill Station - Intraosseous

Scenario

An apnoeic 1 month old, 4kg baby is receiving bag valve mask ventilation with an oropharyngeal airway in place.
The infant is shocked and requires intravenous access.

What to do

You predict an intraosseous needle will be the fastest route.
Share your thoughts :
"This child needs vascular access.
I'm inserting an I.O."

Practice

Identify insertion sites
Choose the appropriate I.O. needle size
Insert an I.O. using the driver

Scan QR codes with your phone for a video demonstration

IO Insertion Sites

Proximal Tibia

Site of insertion is
on the tibial plateau
located distal and
medial to the tibial
tuberosity
(not on the tibial ridge)

Distal Tibia

Approximately 1-2 cm proximal to the most
prominent aspect of the medial malleolus.
Palpate the anterior and posterior borders
of the tibia to assure that your insertion site
is on the flat center aspect of the bone.

**Scan this QR
code for a
demonstration
video**

Intraosseous Needle Sizing

15mm depth
3 - 39kg range

25mm depth
› 3 kg range
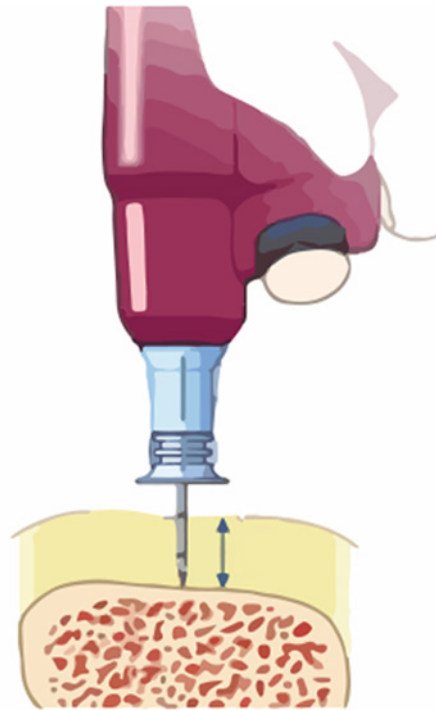
45mm depth
› 40kg
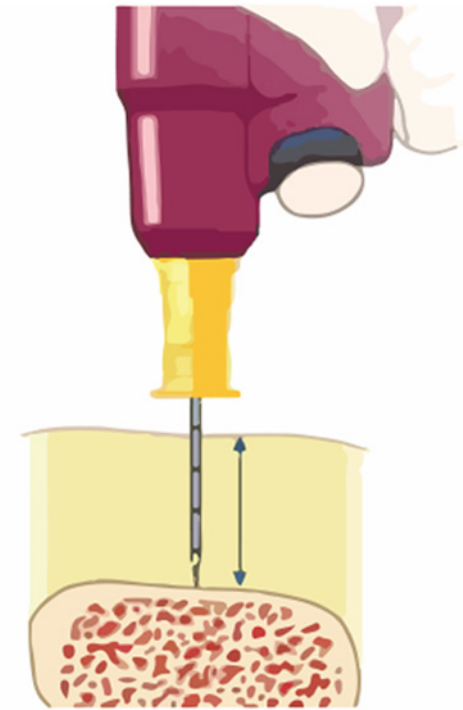
Weight range is only a guide

With the tip of the needle set touching bone, at least 1 black line must be visible above the skin.

Images and guide courtesy of The Teleflex Academy EZIO Product Education via teleflex.com

Mini Skill Station - Circulation

Scenario

An apnoeic 1 month old, 4kg baby is receiving bag valve mask ventilation with an oropharyngeal airway in place.
An intraosseous needle has been inserted in the R) tibia.

What to do

You have anticipated an arrest dose of adrenaline.
Share your thoughts :
  "I am preparing an arrest dose of adrenaline, please double check."

Practice

Use the medication resources to prepare an arrest dose of adrenaline.

Scan QR codes with your phone for a video demonstration

1:10,000 Adrenaline Preparation

Access CHQ Resus Calculators

Mini Skill Station - CPR

Scenario

An apnoeic 1 month old, 4kg baby is receiving bag valve mask ventilation with an oropharyngeal airway in place.
An intraosseous needle has been placed in the R) tibia.
An arrest dose of adrenaline has been prepared.
You cannot feel a pulse.

What to do

Commence CPR.
State clearly to your team :
    "I can't find a pulse, I'm starting chest compressions"

Practice

Use techniques to optimise CPR quality :
  - Compressor position, adjust height of bed
  - Place a back board
  - Compression depth and recoil
  - Rate and ratio of compression to breaths

Scan QR codes with your phone for a video demonstration

Mini Skill Station - Defibrillation

Scenario

An apnoeic 1 month old, 4kg baby is receiving bag valve mask ventilation with an oropharyngeal airway in place.
An intraosseous needle has been placed in the R) tibia.
An arrest dose of adrenaline has been prepared.
There was no pulse and CPR is in progress.

What to do

Use the Paediatric Cardiac Arrest Algorithm
Facilitate a rhythm check
Disarm (Asystole/PEA) or Deliver Shock (VF / Pulseless VT)
Consider causes of arrest (4H's and 4T's)

Practice

Safe defibrillation with your mini team (shock + disarm)
Pad placement for infants and children
Coordinate rhythm check to minimise hands off chest
Rhythm recognition
4H's and 4T's

Scan QR codes with your phone for a video demonstration

Pad Placement Video

Defibrillation Video

Faculty Runsheet for Rapid Cycle Deliberate Practice

Note Chain of Survival Points in Bold

This scenario to be used to introduce diagnostic round and rounds 1 – 3:

"You have responded to a call bell by the child's carer and find a 12-month-old child (10kg) who is pale and floppy. Carer tells you that the child came in with respiratory distress, otherwise well."

DIAGNOSTIC ROUND

Complete run through of cardiac arrest non-shockable pathway – stop scenario following administration of first dose of adrenaline

Time to CPR commencing	☐ Patient specifics if asked: gasping breaths; bradycardic; no IV access
Time to recognise rhythm ☐	☐ Once CPR commenced inform that "you are not getting good rise and fall of the chest" to prompt airway adjuncts
Time hands off pre-disarm shock ☐	☐ Facilitator to note times in seconds
Correct adrenaline dose ☐	☐ Use timing as goals to improve upon during the following rounds
CPR Quality:	☐ Note quality of CPR: o Depth: 1/3 depth of chest o Rate: 100 – 120 BPM o Ratio: 15 compressions: 2 breaths o Full chest recoil o Rotation of compressors
Time to rotate compressors ☐	☐ Role allocation (including Code leader +/- CPR Coach)

Stop scenario following administration of first dose of adrenaline

"Let's break it down into segments, focussing on airway then quality CPR then rhythm recognition & treatment."

ROUND 1 Activate RCDP

TIME GOAL 00:40
 	
 Recognition of need for airway adjuncts or 2 handed ventilation
 	
 ☐ **Yes**
 ☐ **No**
 	
 Time to CPR commencing
 	
 ☐ _____
	☐ D – Assess for **danger**
	 ☐ R - Check for **response/signs of life**
	 ☐ S - **Send for help**/buzzer/shout/phone
	 ☐ A – **Open /reposition**
	 ☐ B - Quickly assess look, listen, feel
	     o **Provide 2 rescue breaths**
	     o **Optimise airway and breathing**
	 ☐ Insert airway adjuncts – Oro / Nasopharyngeal
	     o OR 2-handed BVM technique
	 ☐ Bed:
	     o Moved from wall
	     o Adjust bed height
	 ☐ **Deliberate words**
	     o "I can't get rise and fall of the chest. I need an oropharyngeal airway." Or "can you squeeze the bag while I hold the airway open"
	 ☐ C – **Commence chest compressions** (optional)
	 ☐ Allocate roles + Code Leader

STOP scenario post airway management - airway adjuncts / 2-handed technique OR at 01:00

Round 2	
TIME GOAL 00:20 **Time to CPR commencing:** _____	☐ D - Assess for **danger** ☐ R - Check for **response**/signs of life ☐ S - **Send for** help/buzzer/shout/phone ☐ A - **Open** /reposition ☐ B - Quickly assess look, listen, feel o Provide **2 rescue breaths** ☐ C - **Commence quality chest compressions**
Quality of CPR **Depth:** _____ **Rate:** _____ **Ratio:** _____	☐ Bed moved from wall ☐ Adjust bed height ☐ Optimise child's position ☐ Optimise ventilations ☐ CPR backboard in place if not using encircle CPR ☐ Allocate roles + Code Leader +/- **CPR Coach** ☐ **Deliberate words** o "There is no pulse, I'm starting compressions"
STOP When compressions commenced OR at 00:40	

ROUND 3	

TIME GOAL 01:00	☐ **Defibrillation sequence**
	     o Apply chest pads
	     o Select joules
	     o Continue compressions, O_2 & all others away
	     o Top, middle, bottom clear
	     o I'm charging
	     o Stop compressions
	     o Recognise rhythm
	     o Disarm energy (PEA, Asystole)
	     o Recommence compressions
	☐ **Insert IO** – location, technique, bloods, flush
	☐ **Adrenaline dose** – 10 microg/Kg = 0.1 mL/Kg of 1:10 000 dilution.
	☐ Closed loop **communication**
	☐ **Deliberate words**
	     • "Patient is in pulseless electrical activity PEA, disarm the shock, recommence CPR and follow the non-shockable pathway"
	     • "The patient has no access. I am inserting an IO"
	     • "I am giving 10 microg/Kg adrenaline.
	     • "10 microg/Kg adrenaline given"

Team coordination notes	☐ Airway -2 handed BVM /oropharyngeal airway / LMA
	☐ Circ - IO / ABG / electrolytes/ Fluid Bolus
	☐ **CPR - alt every 2 mins**
	☐ **Use cognitive aid**
	☐ **CPR Coach** – guide quality CPR, swap compressors every 2 min
	☐ Consider reversible causes (4 H's & 4T's)
	☐ **Deliberate words**
	     o "The patient is in PEA; we are following the non-shockable pathway"
	     o "1st dose adrenaline given, continue CPR for 2 minutes before we reassess"

STOP when disarmed energy & adrenaline given OR At 01:30	

Faculty Runsheet for Rapid Cycle Deliberate Practice

Introduce 2ⁿᵈ scenario thread for Round 4 and 5:

> "Let's introduce another child that has presented. You have responded to a call bell by carer and find a 12-month-old child (10kg) who is pale and floppy. You know this child came in with severe dehydration from gastroenteritis."

Round 4

TIME GOAL 01:00
 	
Time to CPR commencing
 	
_____
 	
Time to 1ˢᵗ Shock
 	
_____
 	
Time hands off (< 10 sec)
 	
_____
 	
Team coordination notes
	☐ **Effective CPR & early Defibrillation**
	☐ Apply chest pads
	☐ Select joules
	☐ Continue compressions, O_2 & all others away
	☐ Top, middle, bottom clear
	☐ Charging
	☐ Stop compressions
	☐ Recognise rhythm
	☐ Shock **4 J /kg**
	☐ Prep Adrenaline dose -10 microg/Kg = 0.1 mL/Kg of 1:10 000 dilution.
	☐ Coordinate team, **compressor alternates every 2 mins**
	☐ **Use cognitive aide**
	☐ **Deliberate words:**
	   o "Patient is in VF"
	   o "Patient is in VF, all clear I'm shocking, shock delivered, recommence CPR"
	   o "The patient is in VF arrest, follow the shockable pathway.
	   o "Insert an IO and prepare adrenaline "
	   o "10 microg/Kg" "Prepare to rotate compressors after each shock"

STOP when 1ˢᵗ shock given OR at 01:30

> "We have just delivered the first shock, let's recommence and continue along the shockable pathway of the paediatric arrest algorithm."

ROUND 5

ROUND 5 TIME GOAL 02:30
 	
Time to 2ⁿᵈ Shock:
    _____
 	
Correct adrenaline dose   Y / N
 	
Correct amiodarone dose   Y / N
 	
Team coordination notes
	<u>Team Coordination</u>
	☐ Airway -BVM /oropharyngeal airway
	☐ Circ - IO / ABG / electrolytes/ Fluid Bolus
	☐ CPR / Coach -alt every 2 mins
	☐ Drugs - Adrenaline dose - 10 microg/Kg = 0.1 mL/Kg of 1:10 000 dilution.
	☐ Anticipate Amiodarone 5 mg /Kg (after 3ʳᵈ shock)
	☐ **Consider reversible causes (4 H's & 4T's)**
	☐ **Use cognitive aide**
	☐ Deliberate words:
	   o "Prepare amiodarone 5mg/Kg to give following the 3ʳᵈ shock"
	   o "10 Kg, 12-month-old in VF arrest. Let's consider the 4H's & 4T's"

STOP When amiodarone prepared OR at 03:00

END RCDP

Faculty Runsheet for Step to the Left

Facilitator describes:

- Cardiac arrest rhythms (asystole, PEA, VT & VF) – briefly show each rhythm and name
- Causes of paediatric cardiac arrest - brief
- 4H's & 4T's

Facilitator assigns:

- Assign participants roles, contextualising to an authentic team at your hospital:
  - Code Leader
  - Airway
  - CPR compressors
  - CPR coach
  - Drugs
  - +/- Documentation
  - Defibrillation
- If limited participants, faculty can supplement airway, compressor or drugs role.

Station Flow:

- Rotate participants following a 2-minute cycle of the arrest algorithm (step to the left):
  - Start a new patient scenario with each round.
  - Continue until all have rotated through each role according to scope of practice and all advanced participants have performed Defibrillation / Code Leader role for both practice and assessment.
- During the 2-minute interval of CPR the Code Leader (or Defibrillator) role follows the Paediatric Arrest Algorithm to direct what is required for next stage of the algorithm (i.e., obtain access; prep adrenaline / amiodarone; anticipate airway adjuncts / fluid bolus / considers 4H's & 4 T's).
- To facilitate practice with both shockable & non-shockable pathway, change rhythms between VT, VF, PEA & Asystole as the team rotates.

Rhythm	Age & background	Causes
VT	20 Kg 4 yr. old Hx renal failure in cardiac arrest, compressions have been commenced	Hyperkalaemia
VF	25 Kg 5 yr. old Hx cardiomyopathy in cardiac arrest, compressions have been commenced	Hypoxic (low cardiac output state)
VF	15 Kg 2 yr. old Hx drowning in cardiac arrest, compressions have been commenced	Hypoxia, hypothermia
PEA	8 Kg 9month old with gastro & shock in cardiac arrest, compressions have been commenced	hypovolaemia
VT	3 Kg 7 day old 4 hours post cardiac surgery in cardiac arrest, compressions have been commenced	Cardiac Tamponade
VF	45 Kg 14 yr. old who has overdosed on tricyclic antidepressants in cardiac arrest, compressions have been commenced	Toxins
VT	50 Kg 10 yr. old Hx of Long QT syndrome admitted with respiratory illness, in cardiac arrest, compressions have been commenced	Hypoxic (low cardiac output state)
Asystole	10 Kg 1 yr. old Hx Posterior Fossa Tumour in cardiac arrest, compressions have been commenced	Hypovolaemia
Asystole	45 Kg 12 yr. old in ORS Hx trauma, ruptured spleen, haemorrhage, in cardiac arrest, compressions have been commenced	Hypovolaemia
VT	10 Kg 14-month-old in ORS Hx Local Anaesthetic reaction, in cardiac arrest, compressions have been commenced	Toxins
PEA	5 Kg 5-month-old in PACU Hx bowel resection for intussusception, in cardiac arrest, compressions have been commenced	Hypovolaemia
PEA	18 Kg 4 yr. old Hx post insertion of Hickmann's line, in cardiac arrest, compressions have been commenced	Pneumothorax

Close session with a recap of objectives and key points and evaluation.

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D Check for **DANGER**
- ☑ Yourself
- ☑ Patient
- ☑ Others

R Check for **RESPONSE** ☑ AVPU

S **SEND FOR HELP**
ACTIVATE ☎ EMERGENCY RESPONSE (USE LOCAL GUIDELINE)

A Open **AIRWAY**
- ☑ Position
- ☑ Suction

B Check for **BREATHING**
☑ Absent ☑ Abnormal **Paediatric: 2 Rescue Breaths**

C Start Chest **COMPRESSIONS**

💙 Check for signs of life (no longer than 10 seconds) – if no signs of life start compressions

HEALTHCARE FACILITY (HEALTHCARE PERSONAL)		
PAEDIATRIC ▶ 15 compressions : 2 breaths	ADULT ▶ 30 compressions : 2 breaths	*Refer to local guidelines*
COMMUNITY		
PAEDIATRIC ▶ 30 compressions : 2 breaths	ADULT ▶ 30 compressions : 2 breaths	

D Attach **DEFIBRILLATOR PADS**

Continue CPR as directed by Senior Medical Officer or until patient breathing normally / responding

Modified from the Australian Resuscitation Council Basic Life Support Flowchart, Jan 2016

Queensland Paediatric Flowchart

Medical Emergency Team

Queensland Paediatric CPR Algorithm

CPR
15 compressions : 2 breaths
Minimise interruptions
Attach monitor
Assess rhythm

SHOCKABLE

Pulseless Ventricular Tachycardia

Ventricular Fibrillation

DC shock 4 J/kg (max. 200J)

2 min CPR Assess rhythm | **IO / IV access**

DC shock 4 J/kg (max. 200J)

Followed immediately by
IV/IO Adrenaline
10 micrograms/kg (max. 1mg)
0.1 mL/kg of 1:10,000

2 min CPR Assess rhythm | **Secure airway: ETT / LMA**

DC shock 4 J/kg (max. 200J)

IV/IO Amiodarone
5 mg/kg (max. 300mg)

2 min CPR Assess rhythm

DC shock 4 J/kg (max. 200J)

IV/IO Adrenaline
10 micrograms/kg (max. 1mg)

2 min CPR Assess rhythm

DC shock 4 J/kg
(max. 200J)

2 min CPR Assess rhythm | **2 min CPR Assess rhythm**

DC shock 4 J/kg
(max. 200J)

IV/IO Adrenaline
10 micrograms/kg
(max. 1mg)

NON SHOCKABLE

Asystole

PEA

IO / IV access

IV / IO Adrenaline
Immediately
10 micrograms/kg (max. 1mg)
0.1 mL/kg of 1:10,000
Then every 4 mins
i.e. every 2nd loop

Assess cardiac rhythm every 2 minutes
If rhythm organised → check pulse

Secure airway
ETT / LMA
Assess End tidal CO$_2$ | **IO / IV fluids**
NB: End tidal CO$_2$ will be low in Cardiac Arrest

Consider and Correct Reversible Causes

4H's
- Hypoxia
- Hypovolaemia
- Hypo / Hyperthermia
- Hypo / Hyperkalaemia

4T's
- Tamponade (cardiac)
- Tension Pneumothorax
- Toxins / poisons / drugs
- Thrombosis – pulmonary / coronary

Consider IV Na Bicarbonate 8.4% 1mL/kg in cases of:
- Severe metabolic acidosis
- Hyperkalaemia

1 Select Energy
4 J/kg (max. 200J) for all shocks

2 Press CHARGE
Continue CPR while charging

3
- Ask everyone to stand clear
- Reassess rhythm and absence of pulse
- Press **SHOCK**
- Immediately resume CPR for 2 min

Batt Chg
Service
ON
1
2 ENERGY SELECT
3 CHARGE
ADVISORY
ANALYZE
SHOCK
LEAD SIZE SYNC
PACER
ALARMS RATE
OPTIONS CURRENT
EVENT PAUSE
Home Screen
SELECTOR

Adapted from: Australian Resuscitation Council Guideline 12.2, 5 Protocols for Paediatric Advanced Life Support December 2010 & ILCOR Guidelines – "Paediatric Basic and Advanced Life Support" in Resuscitation (2010).

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Queensland Paediatric Flowchart

Medical Emergency Team

Management of Bradycardia

Bradycardia causes: Commonly hypoxia – preterminal sign, poisoning / toxicological causes, raised ICP, Vagal stimulation

Treat hypoxia and shock
IV / IO access   Maintain airway

SHOCK PRESENT
Attach monitor
Assess rhythm

YES → Treat hypoxia and shock

NO →
- Continue to Monitor
- Consult with PICU Consultant & Cardiologist
- Consider cause (vagal over stimulation)
  ‣ IV/IO Atropine
    20 micrograms/kg
    Min. dose 100mcg
    Max. dose 600mcg

IV/IO Adrenaline
10 micrograms/kg
0.1 mL/kg of 1:10,000 (max. 1mg)

HR <60bpm and poor perfusion – commence CPR

Continue to monitor
Notify PICU Consultant & Cardiologist

Consider Pacing Adrenaline Infusion

Provide sedation and analgesia

Press PACER

Press RATE
(60 - 100 bpm)

Press CURRENT
Start at 100mA & ↓ after capture achieved
Confirm mechanical capture by checking pulse / clinical improvement

Management of Supraventricular Tachycardia

Supraventricular Tachycardia
- P waves absent or abnormal
- HR not variable
- Infants: Rate >220/min
- Children: Rate >200/min

Attempt vagal manouevres (no delays)

SHOCK PRESENT
Attach monitor
Assess rhythm

YES

NO →
Vagal manouevres
- Infant / young child: Apply ice to face
- Older child: Valsalva manoeuvre (i.e. blow through a narrow straw or syringe, ask the child to cough) / Carotid massage

Establish large bore proximal IV access

Is the defibrillator immediately available?

Yes → **Synchronous DC shock 1 J/kg (max. 200J)**

No → **Use sedation where possible prior to cardioversion**

Synchronous DC shock 2 J/kg (max. 200J)

Consider anti-arrhythmic
e.g. IV Amiodarone
5 mg/kg over 20 min (max. 300mg)

Synchronous DC shock 2 J/kg (max. 200J)

Adenosine
100 micrograms/kg (max. dose 6mg)

2 minutes

Adenosine
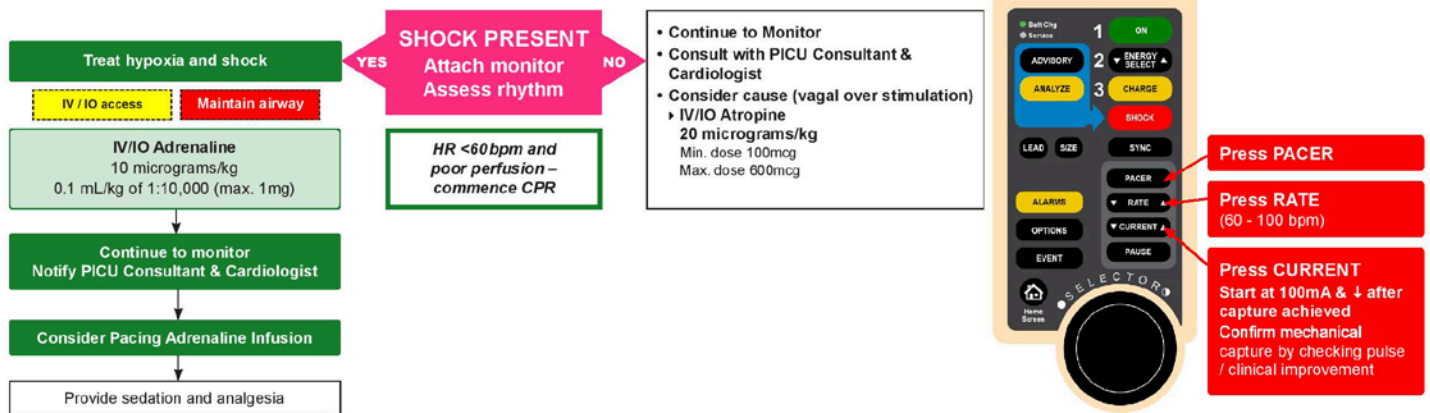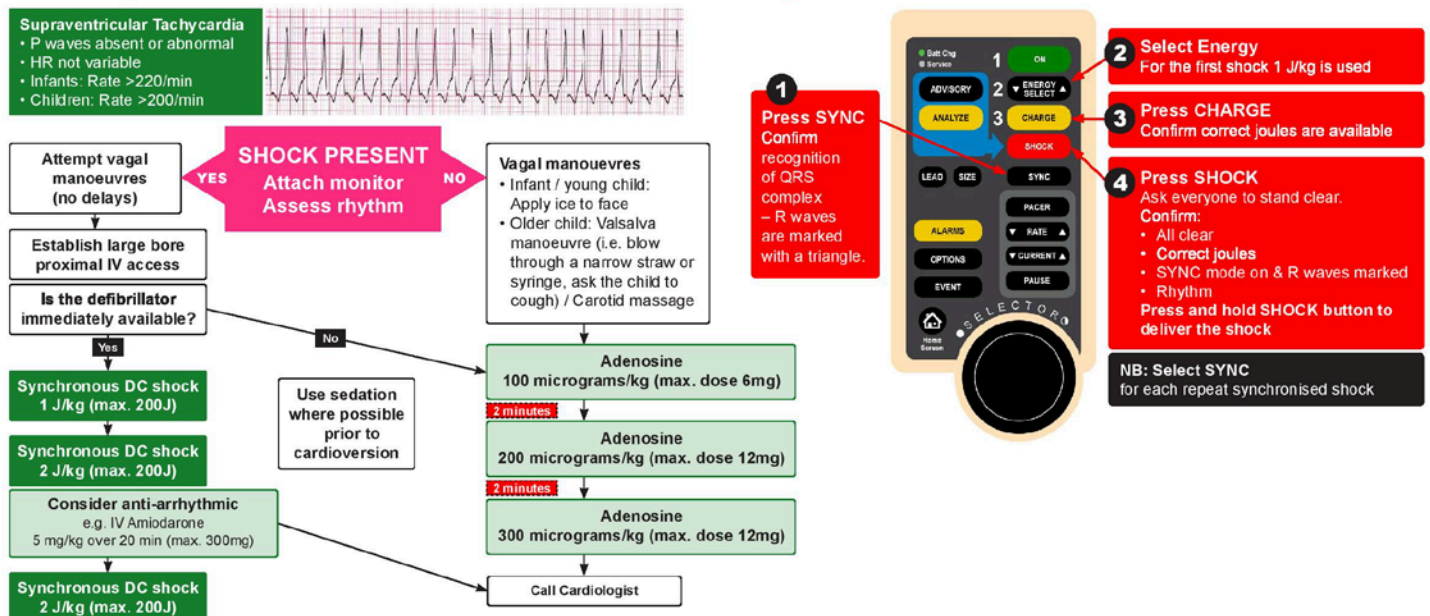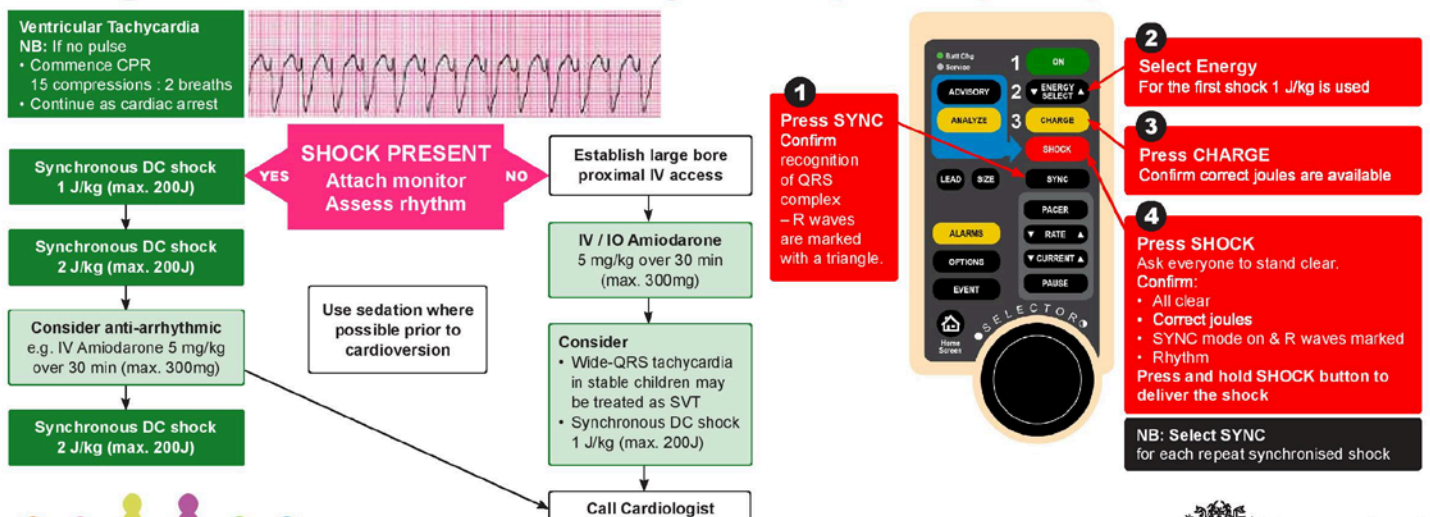200 micrograms/kg (max. dose 12mg)

2 minutes

Adenosine
300 micrograms/kg (max. dose 12mg)

Call Cardiologist

① Press SYNC
Confirm recognition of QRS complex – R waves are marked with a triangle.

② Select Energy
For the first shock 1 J/kg is used

③ Press CHARGE
Confirm correct joules are available

④ Press SHOCK
Ask everyone to stand clear.
Confirm:
- All clear
- Correct joules
- SYNC mode on & R waves marked
- Rhythm
Press and hold SHOCK button to deliver the shock

NB: Select SYNC
for each repeat synchronised shock

Management of Ventricular Tachycardia (with a pulse)

Ventricular Tachycardia
NB: If no pulse
- Commence CPR
  15 compressions : 2 breaths
- Continue as cardiac arrest

Synchronous DC shock 1 J/kg (max. 200J)

SHOCK PRESENT
Attach monitor
Assess rhythm

YES

NO →
Establish large bore proximal IV access

Synchronous DC shock 2 J/kg (max. 200J)

Consider anti-arrhythmic
e.g. IV Amiodarone 5 mg/kg over 30 min (max. 300mg)

Use sedation where possible prior to cardioversion

IV / IO Amiodarone
5 mg/kg over 30 min (max. 300mg)

Synchronous DC shock 2 J/kg (max. 200J)

Consider
- Wide-QRS tachycardia in stable children may be treated as SVT
- Synchronous DC shock 1 J/kg (max. 200J)

Call Cardiologist

① Press SYNC
Confirm recognition of QRS complex – R waves are marked with a triangle.

② Select Energy
For the first shock 1 J/kg is used

③ Press CHARGE
Confirm correct joules are available

④ Press SHOCK
Ask everyone to stand clear.
Confirm:
- All clear
- Correct joules
- SYNC mode on & R waves marked
- Rhythm
Press and hold SHOCK button to deliver the shock

NB: Select SYNC
for each repeat synchronised shock

Adapted from: Protocols for Paediatric Advanced Life Support December 2010 & ILCOR Guidelines – 'Defibrillation and Advanced Life Support' in Resuscitation (2010).

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Optimus Pulse CPR & Defib Assessment

CPR & Defib Assessment Form

Element	Performance Criteria	Achieved	Needs Further Development OR Not Applicable to level
Danger	Checks for and addresses danger to self, patient and others		
Response	Checks response by using verbal and firm central stimulus		
Shout / Send for help	Calls for help Initiates local emergency response		
Airway	Opens and clears the Airway using appropriate position for age		
Breathing	Assesses for normal breathing Demonstrates effective delivery of breaths (2)		
CPR	Assesses for Pulse/ signs of life – no longer than 10 seconds Commence CPR – Demonstrates compressions at correct depth, rate & ratio to breaths – 2 breaths:15 compressions		
Continues to call for help	Ensures continuous CPR whilst calling again for help after 1 minute if no immediate help arrives		
Pad placement and safety	Demonstrates appropriate placement of defibrillation pads Understands safety aspects of defibrillation		
Pre-charge	Charge defibrillator to 4J/kg (Rounding up if required) CPR continues whilst charging Oxygen removed Others away		
Rhythm Recognition	Recognise rhythm to determine the need for defibrillation or disarming of energy		
Shock delivery	Delivers shock safely – clearly articulating and ensuring that all are clear Disarms shock if not required prior to CPR recommencing Recommences CPR immediately, minimising hands-off time CPR continues for 2minutes before reassessing rhythm and presence of pulse Defibrillator is pre-charged prior to end of 2-minute cycle		
Fluids & medications	Knowledge of fluid resuscitation (fluid type and volume) – 10mL- 20mL/Kg 0.9% Sodium Chloride Knowledge of drug dose – utilises resources as appropriate. - Adrenaline 10mcg/kg for administration following 2nd shock. Or immediate if non-shockable rhythm		

Element	Performance Criteria	Achieved	Needs Further Development OR Not Applicable to level
	- Amiodarone 5mg /kg following 3rd shock		
Communication	Uses communication strategies such as closed loop, allocation of roles, recapping, SBAR. Considers 4H's & 4T's in directing interventions.		

Paediatric Resuscitation Assessment		**Achieved:** ☐ **Needs further development:** ☐	

Comments / Recommendations:

Date:

Assessee: (Print Full Name)

Signature:

                                                    Designation:

Personal Assignment No/s:

                                                    Work Location:

Line Manager: (Print Full Name)

Assessor: (Print Full Name)

Signature: **Designation:**

OPTIMUS CORE Attendance List

We appreciate your help getting everyone to complete our STORK OPTIMUS Course Attendance and Feedback form. **Please utilise the following QR code to sign on and provide feedback electronically to capture accurate data reflecting the use and outcomes of our courses.**
To continue with your current attendance process for your records (in alignment with your local policy) a template attendance list is provided on the following page.

OPTIMUS CORE Attendance List

Name	Department

Please contact your site's STORK Simulation Coordinator at Stork.Planning@health.qld.gov.au to provide faculty feedback.

Children's Health Queensland Hospital and Health Service

Section 5 : Curriculum & Further Reading

Optimus
PULSE

Queensland
Government

Section 5: Curriculum and Further Reading

Additional Reading on CPR and Rapid Cycle Training

Paediatric Cardiorespiratory Arrest Flowchart
ANZCOR

Video : What's New in Paediatric Resuscitation?
Dr Jason Acworth, APLS PAC 2018

Optimus PULSE eLearning
Requires ilearn account

Blog Post : The CPR Coach
A Paradigm Shift in Resuscitation Teams

Rapid Cycle Deliberate Practice Lecture
Dr Betsy Hunt

This package is designed for **individuals** to refresh and retain the following skills learned in previous OPTIMUS courses.

Optimus **CORE**	Optimus **PRIME**	Optimus **PULSE**
Paediatric Life Support Algorithm	Assessing a critically unwell child	Paediatric Life Support Algorithm
Cardiopulmonary Resuscitation	Teamwork Communication	Cardiopulmonary Resuscitation
Paediatric Defibrillation	Shared medal models	Paediatric Resuscitation
Airway management		Airway management
Intraosseous access		Intraosseous access

This package is designed to offer your **department** a systems level check regarding:

Access to paediatric resources on: • ALS training • Paediatric Arrest Algorithm	
Equipment Check: • Use of Defibrillator in manual mode • Availability of paediatric BVM, LMA, I.O needles	
Departmental Protocols for: • Paediatric cardiac arrest • Paediatric resuscitation medications – adrenaline, amiodarone	

If you would like any assistance obtaining access or advice for any of the above issues, please contact STORK@health.qld.gov.au

About the Optimus Curriculum

The Optimus Curriculum is a suite of courses designed to provide healthcare staff with training on paediatric resuscitation.

- CORE is a course for first responders to a paediatric emergency, and teaches recognition of the deteriorating patient, Children's Early Warning Tools, and resuscitation competencies.

- PRIME is a course for mid phase responders who look after unwell patients while awaiting retrieval or escalation to an Intensive Care. It aims at contextualising Seizure Management, Intubation and Inotrope Administration within host hospital's real clinical environments in order for healthcare teams to generate their own practice improvement strategies as well as link peripheral hospitals with high quality resources.

- PULSE refreshes CPR and BLS skills using Rapid Cycle Deliberate Practice.

- BONUS was proposed as a solution to skill and knowledge decay after these courses are run. Individual scenario packages are provided to hospitals to refresh fundamental learning objectives, rehearse skills and systems test departments around disease specific cases.

The courses have been designed in response to:
- Paediatric coronial investigations in Queensland, Australia.
- Clinical skills issues revealed through In Situ Translational simulations in hospitals throughout Queensland.
- Quality and Safety Initiatives

About STORK

In 2014, Children's Health Queensland funded the 'Simulation Training Optimising Resuscitation for Kids' service. STORK is a paediatric education team focused on improving healthcare outcomes for children throughout the state.

The team flies throughout the state of Queensland to deliver paediatric resuscitation training and resources for healthcare practitioners caring for sick children.

If you would like to know more information about STORK or acquire copies of our resources, please contact us at STORK@health.qld.gov.au .

Acknowledgements:

Ms Tina Haffenden: Course Development Lead
RGN, RSCN, GradDipPaed UK, GradCertSimEd,
Simulation Co-Ordinator STORK, Specialist Paediatric Retrieval Nurse (CHQRS), Clinical Nurse in Paediatric Intensive Care.

Tina originally trained as a Registered General Nurse in the UK back in 1992. After a short period, Tina realised big people were not her thing so decided to move into the world of paediatrics. She has gained much experience in general, emergency, high dependency and critical care paediatrics around the world. Tina is passionate about ensuring the patient and family journey through emergency and critical care services are as smooth as possible and believes that maximising staff education through the delivery of courses such as Optimus PULSE will help to achieve this goal.

Ms Louise Dodson: Course Development Lead
BHlthSc, GradCertClinSim
Nurse Educator for STORK, Queensland Children's Hospital

Louise has been a Simulation Leader since establishing the Simulation Program for the Royal Children's Hospital in Brisbane over 10 years ago. She co-created the original Optimus CORE course in 2013 to improve paediatric resuscitation training throughout Queensland. The course has been delivered to more than 5000 health care professionals throughout Queensland since that time. Louise has a background in paediatric emergency nursing and tries to keep her left foot in clinically. She has also completed a grad cert in simulation and clinical education.

Dr Carolina Ardila: eLearning and Multimedia
@caroelearning
MBBS, MPH(TH), GradDipHlthMgt

Dr Ardila is a medical doctor from Colombia with an award-winning skill set in eLearning development. Carolina has been working on eLearning for the last 4 years at the Royal Brisbane and Women's Hospital and Children's Health Queensland. During these years she has developed extensive knowledge in designing, developing and implementing engaging courses and launching award winning paediatric eLearning. She has a special interest in emergency and neonatology and in her spare time loves making videos and improving her animation and drawing skills.

Dr Ben Symon: Multimedia design, eLearning development & manual editor
@symon_ben
RACP PEM, MBBS, BAnim
Simulation Consultant and Paediatric Emergency Physician
Queensland Children's Hospital and The Prince Charles Hospital

Dr Symon is a PEM Physician and Simulation enthusiast with a passion for translating clinical and educational research to front line health care workers. He is co-producer of the podcast 'Simulcast' and facilitates the Simulcast Online Journal Club, an online journal club for simulation educators throughout the world. He is faculty on the APLS Educational Skills Development Course and is international faculty for the Master Debriefer Course by the Debriefing Academy. His original degree in Animation has proved surprisingly useful in his career in medical education.

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