



Clinical Practice Guidelines: Resuscitation/Adult (Non-traumatic)

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Resuscitation – Adult (Non-traumatic)

August, 2022

Out-of-hospital cardiac arrest (OHCA) is a time critical emergency characterised by the sudden cessation of mechanical cardiac function and associated haemodynamic collapse, requiring immediate resuscitative therapies.^[1,2]

Adult OHCA cases are predominately attributable to a non-traumatic aetiology. Common causes include cardiovascular disease, respiratory conditions, asphyxial related events and toxicology exposure.

The Queensland Ambulance Service (QAS) attends approximately 5,200 non-traumatic adult OHCA cases annually. This represents 90% of all OHCA cases attended state-wide.

The prognosis of survival following these events has traditionally been poor, however can be ameliorated through an interlinked system-of-care approach.^[3-5] In clinical practice, this can be conceptualised as a resuscitation care bundle that when followed, optimises patient outcomes.

The resuscitation care bundle incorporates the principles of high-performance cardiopulmonary resuscitation (CPR) and prioritises:

- Continuous high-quality compressions
- Correct pad placement
- Early airway management
- Refined pharmacological prioritisation
- Emphasis of non-technical skills
- Clinical case review and debrief



Continuous high-quality compressions

- The provision of continuous high-quality cardiac compressions facilitates a level of perfusion within the body that can temporarily sustain patient survivability. Ambulance clinicians should aim to **minimise all interruptions to 5 seconds or less** to increase the likelihood of survival.^[6,7]
- Minimising interruptions can be achieved through:
 - (i) **Minimising rotation interruptions** is a central determinant of effective resuscitation. The rotation of officers performing compressions should always occur using a synchronised and controlled technique. This is achieved through positioning the relieving officer laterally ('shoulder to shoulder') to the individual who is actively performing compressions. The relieving ambulance clinician should prepare to commence compressions by extending their arms and interlocking their hands. In a choreographed manner, clinicians should exchange hand positions and continue compressions.
 - (ii) **Anticipatory defibrillation charging** involves pre-emptively preparing the defibrillator to deliver a direct current counter-shock as the end of the compression cycle approaches. If the patient is determined to be in a non-shockable rhythm following analysis, the defibrillation charge should be manually cancelled.
 - (iii) **Succinct rhythm analysis** ensures interruptions to compressions are minimised. During rhythm analysis, the ambulance clinician performing compressions should deliberately position their hands a safe distance above the patient's chest. Following analysis and/or defibrillation, compressions should immediately recommence.

Correct Pad Placement

- Optimal defibrillation pad positioning ensures transmucosal current density is maximised when defibrillation occurs. Incorrect or sub-optimal pad placement has been demonstrated to negatively impact shock efficacy.^[8]
- Clinicians should deliberately pause and visualise the intended area of placement prior to defibrillation pad application. This ensures the first defibrillation attempt has the highest likelihood of success. Interruptions to chest compressions should be minimised while pad placement occurs.
- When applying the defibrillation pads, ambulance clinicians should ensure the centre of the apex (lateral) pad is positioned over the 5th intercostal space on the mid-axillary line (the position of V6 when a 12-Lead is performed). The sternal pad should be positioned to the right of the sternum, below the clavicle.
- Defibrillation pads should be applied clear of any breast tissue and care must be given to ensure maximum adhesion to the skin of the patient.^[9] Ambulance clinicians must be vigilant in ensuring no creases or folds are present when applying the defibrillation pads.
- Ambulance clinicians should have a low threshold for alternating the position of the pads (anterior/posterior) and/or applying fresh pads if early defibrillation attempts are unsuccessful.

Early Airway Management

- Establishing and maintain a patient airway that facilitates adequate ventilation is an essential component of successful resuscitation.
 - Current international guidelines recommend a stepwise approach to airway management that begins with basic adjuncts such bag-valve mask ventilation or i-gel[®] device insertion and progresses to endotracheal intubation if required.^[10]
 - Ambulance clinicians are encouraged to exercise informed clinical decision-making to determine the most appropriate basic airway adjunct to be used during resuscitation. Clinicians should be cognisant of potential predictors of airway complications and consider the patient's facial anatomy, body mass index and the presence or likelihood of airway soilage.
 - In patients who present with a patent airway clear of vomitus and secretions, it is reasonable and appropriate for ambulance clinicians to consider the early insertion of an i-gel[®] device instead of providing ventilations with a bag-valve mask. The insertion of this device should occur concurrently with ongoing resuscitation and should not interrupt chest compressions.
 - Determining which airway adjunct is appropriate should be assessed on a case by case basis, with consideration to the available resources and clinical skillset of ambulance clinicians present on scene.
 - Once inserted, ventilations through the i-gel[®] should occur at a rate of 10/minute and be performed during uninterrupted compressions. If patent and ventilating well, an i-gel[®] should not be removed unless evidence of regurgitation occurs.
- In comparison with bag-valve-mask ventilation, the i-gel[®] provides a higher degree of airway protection, limits gastric inflation and provides superior ventilations. Clinicians should have a low threshold for performing gastric decompression following i-gel[®] insertion.
 - This patient specific approach to airway management is based on contemporary literature that has demonstrated that the i-gel[®] can be rapidly inserted with a high first pass success rate in novice airway clinicians.^[11-13]
 - Clinicians should consider the perceivable risks and benefits of endotracheal intubation against the need to interrupt chest compressions.
 - When performing intubation, chest compressions should only be briefly paused when the tube is passed through the vocal cords. Clinicians should aim to minimise **all interruptions to a period of 5 seconds or less.**^[10]
 - Where scene resourcing permits, BVM ventilation should be performed using the two-person technique to facilitate appropriate ventilation.
 - Patients that present with a history of suspected foreign body airway should be managed in accordance with *CPG – Foreign Body Airway Obstruction* with immediate laryngoscopy performed.

Refined Drug Pharmacology Prioritisation

- Recent literature that has explored the use, efficacy and potential benefit of adrenaline in cardiac arrest; guidelines now vary depending on the identified cardiac rhythm identified.
- In patients that present in a non-shockable rhythm, adrenaline (epinephrine) should be administered as soon as feasible. **This however should not be prioritised over the performance of continuous high-quality chest compressions or timely defibrillation.**
- The administration of adrenaline (epinephrine) has been found to improve rates of return of spontaneous circulation (ROSC) in patients that present in a non-shockable rhythm. Additional positive trends have also been observed regarding long-term survival outcomes; however, these effects are less pronounced.^[14-16]
- In patients that present in a shockable rhythm, adrenaline (epinephrine) should be withheld until three shocks have been delivered.
- Patients that are resistant to three defibrillation attempts are considered to be in a refractory shockable rhythm. This cohort of patients should be administered amiodarone as a priority over adrenaline as this pharmacological agent directly attempts to reverse the underlying malignant cardiac rhythm.
- The administration of amiodarone to patients in a refractory shockable rhythm have been found to have a time-dependant relationship, with early administration improving the likelihood of subsequent survival.^[17]
- All drugs administered during arrest should be followed by a 10–20 mL flush of sodium chloride 0.9%. Ambulance clinicians should however avoid the routine infusion of large doses of normal saline.

- Intravenous access is the preferred route of administration for all medication. Intraosseous should only be considered if intravenous access is unachievable.

Emphasis of Non-Technical Skills

- Non-technical skills (NTS) are considered a vital component of effective resuscitation and consist of cognitive, social and interpersonal attributes that collectively augments clinical performance.
- NTS encompasses a broad spectrum of qualities that can be categorised into a three overarching themes, these being scalable clinical leadership, interpersonal communication and mutual performance monitoring.^[18-20]
- Clinical leadership is a complex behaviour that involves effective communication, informed decision-making and appropriate resource management. During a resuscitation attempt, the delineation of scene leadership should be considered a dynamic process that is determined by the clinical skillset and leadership experience of the ambulance clinicians on scene. It is reasonable and expected that upon arrival on scene, the most highly qualified QAS Clinician assumes the role of clinical leader.
- Ambulance clinicians are encouraged to adopt a multifaceted approach to clinical leadership that encompasses both directive and empowering leadership styles. This approach should facilitate clear distribution of clinical responsibilities in conjunction with direct instructions and encouragement. Clinical leaders should attempt to create an interactive hierarchy where all clinicians feel supported and involved in the clinical decision-making.

- Where scene resourcing permits, the clinical leader may consider adopting a hands-off clinical leadership approach to directing resuscitation interventions as required, or appoint a less qualified clinician to the role, with the use of the OHCA Checklist.
- Effective scene leadership has been shown to improve cardiac arrest performance through minimising interruptions to chest compressions and ensuring that timely defibrillation occurs.^[21]
- Communication between ambulance clinicians should primarily occur using closed-loop communication. This form of communication removes ambiguity from task delegation thereby minimising potential miscommunication and ensuing accurate information exchange.
- Closed loop communication consists of three distinct components; (i) the sender provides a message (*'call-out'*); (ii) the receiver verbalises acknowledge of the information provided (*'checkback'*); (iii) the sender confirms the message has been interpreted correctly (*'closing the loop'*).
- During resuscitation ambulance clinicians should be cognisant of the tasks and roles of others on scene. This allows for subsequent mutual performance monitoring to occur and ensures situation awareness is maintained.
- Mutual performance monitoring is a dynamic clinical assurance process where peers observe each other's performance. This process is a mechanism to ensure patients are receiving the best possible clinical care. Its objective is not punitive, but rather fosters an environment of mutual respect and accountability between clinicians regardless of clinical hierarchy or experience.
- The use of cognitive aids during resuscitation has been found to improve clinical performance and reduce human error.^[22,23] Ambulance clinicians are encouraged to use the QAS adult non-traumatic OHCA checklist during resuscitation.

Clinical Case Review and Debrief

- Following OHCA attendance, ambulance clinicians are encouraged to collaboratively undertake a clinical debrief and case review.
- Debriefing is a process that facilitates reflection on clinical care provided and allows individuals to analyse all aspects of their performance.
- Appropriate debriefing is a vital learning process that is associated with improving future performance.^[24,25]
- Debriefs should incorporate information contained within the corpuls CPR summary, notably the number of interruptions to chest compressions and compression metrics.
- This process should typically be led by the clinical leader and involve all clinicians that provided clinical care. The structure and content of the case review will vary depending on the incident but should include or address the following topics:
 - Were the roles and responsibilities clearly understood?
 - What aspects of the resuscitation went well and were there any aspects that were less than optimal from which we can learn?
 - Was there anything that could be done differently next time?
 - What was the most useful or valuable learning you've taken from this case/discussion/patient presentation

Clinical features



History or presenting injury suggests a suspected medical cause of cardiac arrest; characterised by:

- **No signs of life:**
 - Unresponsive
 - Inadequate respirations
 - Carotid pulse cannot be confidently palpated within 10 seconds, **OR**
- **Signs of inadequate perfusion**
 - Unresponsive
 - Pallor or central cyanosis
 - Pulse less than 40 BPM

+ Additional information

- The first rhythm analysis should be conducted using the AED defibrillator mode. There are however certain circumstances where a defibrillator may not correctly identify a shockable rhythm. Examples of this include:
 - Agonal respirations
 - Movement of the patient or any part of the defibrillator
 - Electrical artefacts
 - Pacemaker spikes
- In these circumstances, the clinician must immediately employ the defibrillator manual mode function and provide a shock at the appropriate joule setting without delay.



Adult: Non-traumatic OHCA Checklist

INDICATIONS

- History consistent with a suspected medical cardiac arrest i.e.:
 - Cardiovascular disease
 - Respiratory conditions
 - Asphyxial related events
 - Exposure to toxins

Intra-resuscitation Checks

- Appropriate resources available on scene
- 360° patient access & equipment optimally positioned
- Prioritised resuscitation care bundle:
 - **Continuous high-quality compressions**
 - minimise all interruptions to < 5 seconds
 - succinct rhythm analysis (hover hands)
 - continue compressions during defibrillator charging
 - **Correct and appropriate pad placement**
 - lateral pad – V6 12-lead position
 - sternal pad – below the clavicle
 - positioned clear of breast tissue; full adhesion to skin
 - **Early airway management**
 - stepwise approach; consider early i-gel® insertion if patient airway clear of vomitus and resourcing permits
 - when intubating, ensure interruptions to compressions are < 5 seconds
 - **Refined pharmacological prioritisation**
 - Shockable*
 - prioritise amiodarone administration in refractory rhythms
 - no adrenaline until 3 shocks are delivered
 - Non shockable*
 - early adrenaline administration
 - **Non-technical skills utilisation**
 - promote closed loop communication
- Consider special circumstances and reversible causes
 - Hypokalaemia/hyperkalemia
 - Toxins
 - Thrombus (coronary/pulmonary)
- Consider contacting the QAS Clinical Consultation & Advice Line for case specific management advice
- Create extrication plan; ensure family are supported
- Notify receiving hospital

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OHCA Hospital Handover

Name: _____ DOB/Age: _____

Estimated body weight (kg): _____

Presenting history: _____

Event witnessed: Yes No

Estimated downtime: _____

Bystander CPR performed: Yes No Effective: Yes No

Initial rhythm: _____

Time ROSC achieved: _____

Drugs/Interventions:

	Time	Dose/Size	Notes
Adrenaline			
Amiodarone			
Rocuronium			
DCCS			
MCCD			
i-gel®			
ETT			

Vital signs:

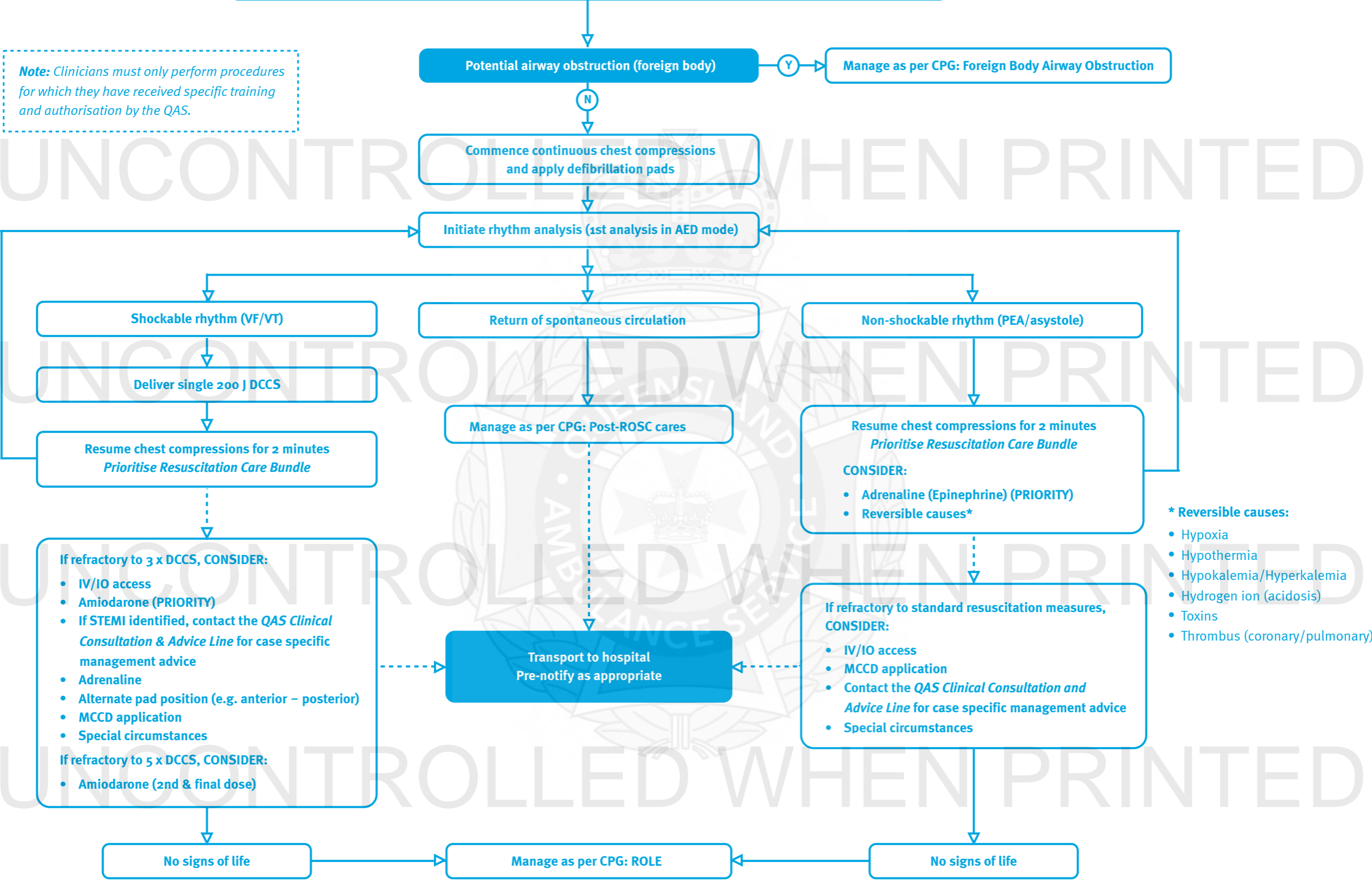
Time:			
ECG rhythm			
GCS			
HR			
RR			
BP			
Temp			
BGL			
SpO2			
EtCO2			

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Suggested medical aetiology OHCA (history, injuries or mechanism do not suggest traumatic cause of cardiac arrest)

Note: Clinicians must only perform procedures for which they have received specific training and authorisation by the QAS.



- * Reversible causes:**
- Hypoxia
 - Hypothermia
 - Hypokalemia/Hyperkalemia
 - Hydrogen ion (acidosis)
 - Toxins
 - Thrombus (coronary/pulmonary)