



HIGHLIGHTS AT A GLANCE

1 ADULT BASIC LIFE SUPPORT

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ETHICAL ISSUES

- The use of extracorporeal CPR (ECPR) for cardiac arrest
- Intra-arrest prognostic factors
- Review of evidence about prognostic scores for preterm infants
- Prognostication for children and adults after cardiac arrest
- Function of transplanted organs recovered after cardiac arrest

SYSTEMS OF CARE AND CONTINUOUS QUALITY IMPROVEMENT

- A universal taxonomy of systems of care
- Separation of the adult Chain of Survival into 2 chains: one for in-hospital and one for out-of-hospital systems of care
- Review of best evidence on how these cardiac arrest systems of care are reviewed, with a focus on cardiac arrest, ST-segment elevation myocardial

ALTERNATIVE TECHNIQUES AND ANCILLARY DEVICES FOR CPR

- The routine use of the impedance threshold device (ITD) as an adjunct to conventional CPR is not recommended.
- A recent randomized controlled trial suggests that the use of the ITD plus active compression-decompression CPR is associated with improved neurologically intact survival for patients with OHCA.
- The routine use of mechanical chest compression devices is not recommended, but special settings where this technology may be useful are identified.
- The use of ECPR may be considered for selected patients in settings where a reversible cause of cardiac arrest is suspected.

1 ADULT BASIC LIFE SUPPORT AND CPR QUALITY: LAY RESCUER CPR

- The crucial links in the out-of-hospital adult Chain of Survival are unchanged from 2010, with continued emphasis on the simplified universal Adult Basic Life Support (BLS) Algorithm.
- The Adult BLS Algorithm has been modified to reflect the fact that rescuers can activate an emergency response (ie, through use of a mobile telephone) without leaving the victim's side.
- It is recommended that communities with people at risk for cardiac arrest implement PAD programs.
- Recommendations have been strengthened to encourage immediate recognition of unresponsiveness, activation of the emergency response system, and initiation of CPR if the lay rescuer finds an unresponsive victim is not breathing or not breathing normally (eg, gasping).
- Emphasis has been increased about the rapid identification of potential cardiac arrest by dispatchers, with immediate provision of CPR instructions to the caller (ie, dispatch-guided CPR).
- The recommended sequence for a single rescuer has been confirmed: the single rescuer is to initiate chest compressions before giving rescue breaths (C-A-B rather than A-B-C) to reduce delay to first compression. The single rescuer should begin CPR with 30 chest compressions followed by 2 breaths.
- There is continued emphasis on the characteristics of high-quality CPR: compressing the chest at an adequate rate and depth, allowing complete chest recoil after each compression, minimizing interruptions in compressions, and avoiding excessive ventilation.
- The recommended chest compression rate is 100 to 120/min (updated from at least 100/min).
- The clarified recommendation for chest compression depth for adults is at least 2 inches (5 cm) but not greater than 2.4 inches (6 cm).

- Bystander-administered naloxone may be considered for suspected life-threatening opioid-associated emergencies**.

** In Canada, Naloxone is a Prescription Only Medicine (POM) listed on Health Canada's Prescription Drug List. Naloxone can only be dispensed with a prescription. Legally, a prescribed drug may only be administered to the person named on the prescription, not a third party

ADULT BASIC LIFE SUPPORT AND CPR QUALITY: HCP BLS

- These recommendations allow flexibility for activation of the emergency response system to better match the HCP's clinical setting.
- Trained rescuers are encouraged to simultaneously perform some steps (ie, checking for breathing and pulse at the same time), in an effort to reduce the time to first chest compression.
- Integrated teams of highly trained rescuers may use a choreographed approach that accomplishes multiple steps and assessments simultaneously rather than the sequential manner used by individual rescuers (eg, one rescuer activates the emergency response system while another begins chest compressions, a third either provides ventilation or retrieves the bag-mask device for rescue breaths, and a fourth retrieves and sets up a defibrillator).
- Increased emphasis has been placed on high-quality CPR using performance targets (compressions of adequate rate and depth, allowing complete chest recoil between compressions, minimizing interruptions in compressions, and avoiding excessive ventilation).
- Compression rate is modified to a range of 100 to 120/min.
- Compression depth for adults is modified to at least 2 inches (5cm) but should not exceed 2.4 inches (6 cm).
- To allow full chest wall recoil after each compression, rescuers must avoid leaning on the chest between compressions.

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- Criteria for minimizing interruptions is clarified with a goal of chest compression fraction as high as possible, with a target of at least 60%.
- Where EMS systems have adopted bundles of care involving continuous chest compressions, the use of passive ventilation techniques may be considered as part of that bundle for victims of OHCA.
- For patients with ongoing CPR and an advanced airway in place, a simplified ventilation rate of 1 breath every 6 seconds (10 breaths per minute) is recommended.

2 ADULT ADVANCED CARDIOVASCULAR LIFE SUPPORT

- The combined use of vasopressin and epinephrine offers no advantage to using standard-dose epinephrine in cardiac arrest. Also, vasopressin does not offer an advantage over the use of epinephrine alone. Therefore, to simplify the algorithm, vasopressin has been removed from the Adult Cardiac Arrest Algorithm–2015 Update.
- Low end-tidal carbon dioxide (ETCO₂) in intubated patients after 20 minutes of CPR is associated with a very low likelihood of resuscitation. While this parameter should not be used in isolation for decision making, providers may consider low ETCO₂ after 20 minutes of CPR in combination with other factors to help determine when to terminate resuscitation.
- Steroids may provide some benefit when bundled with vasopressin and epinephrine in treating IHCA. While routine use is not recommended pending follow-up studies, it would be reasonable for a provider to administer the bundle for IHCA.
- When rapidly implemented, ECPR can prolong viability, as it may provide time to treat potentially reversible conditions or arrange for cardiac transplantation for patients who are not resuscitated by conventional CPR.
- In cardiac arrest patients with nonshockable rhythm and who are otherwise receiving epinephrine, the early provision of epinephrine is suggested.
- Studies about the use of lidocaine after ROSC are conflicting, and routine lidocaine use is not recommended. However, the initiation or continuation of lidocaine may be considered immediately after ROSC from VF/pulseless ventricular tachycardia (pVT) cardiac arrest.
- One observational study suggests that β -blocker use after cardiac arrest may be associated with better outcomes than when β -blockers are not used. Although this observational study is not strong-enough evidence to recommend routine use, the initiation or continuation of an oral or intravenous (IV) β -blocker may be considered early after hospitalization from cardiac arrest due to VF/pVT.

POST-CARDIAC ARREST CARE

- Emergency coronary angiography is recommended for all patients with ST elevation and for hemodynamically or electrically unstable patients without ST elevation for whom a cardiovascular lesion is suspected.
- TTM recommendations have been updated with new evidence suggesting that a range of temperatures may be acceptable to target in the post-cardiac arrest period.
- After TTM is complete, fever may develop. While there are conflicting observational data about the harm of fever after TTM, the prevention of fever is considered benign and therefore is reasonable to pursue.
- Identification and correction of hypotension is recommended in the immediate post-cardiac arrest period.
- Prognostication is now recommended no sooner than 72 hours after the completion of TTM; for those who do not have TTM, prognostication is not recommended any sooner than 72 hours after ROSC.
- All patients who progress to brain death or circulatory death after initial cardiac arrest should be considered potential organ donors.

ACUTE CORONARY SYNDROMES

- Prehospital ECG acquisition and interpretation
- Choosing a reperfusion strategy when prehospital fibrinolysis is available
- Choosing a reperfusion strategy at a non-PCI-capable hospital
- Troponin to identify patients who can be safely discharged from the emergency department
- Interventions that may or may not be of benefit if given before hospital arrival

SPECIAL CIRCUMSTANCES OF RESUSCITATION

- Experience with treatment of patients with known or suspected opioid overdose has demonstrated that naloxone can be administered with apparent safety and effectiveness in the first aid and BLS settings. For this reason, naloxone administration by lay rescuers and HCPs is now recommended, and simplified training is being offered. In addition, a new algorithm for management of unresponsive victims with suspected opioid overdose is provided.
- Intravenous lipid emulsion (ILE) may be considered for treatment of local anesthetic systemic toxicity. In addition, a new recommendation is provided, supporting a possible role for ILE in patients who have cardiac arrest and are failing standard resuscitative measures as the result of drug toxicity other than local anesthetic systemic toxicity.
- The importance of high-quality CPR during any cardiac arrest has led to a reassessment of the recommendations about relief of aortic caval compression during cardiac arrest in pregnancy. This reassessment has resulted in refined recommendations about strategies for uterine displacement.

3 PEDIATRIC BASIC LIFE SUPPORT AND CPR QUALITY

- Reaffirming the C-A-B sequence as the preferred sequence for pediatric CPR
- New algorithms for 1-rescuer and multiple-rescuer pediatric HCP CPR in the cell phone era
- Establishing an upper limit of 6 cm for chest compression depth in an adolescent
- Mirroring the adult BLS recommended chest compression rate of 100 to 120/min
- Strongly reaffirming that compressions and ventilation are needed for pediatric BLS

4 PEDIATRIC ADVANCED LIFE SUPPORT

- In specific settings, when treating pediatric patients with febrile illnesses, the use of restrictive volumes of isotonic crystalloid leads to improved survival. This contrasts with traditional thinking that routine aggressive volume resuscitation is beneficial.
- Routine use of atropine as a premedication for emergency tracheal intubation in non-neonates, specifically to prevent arrhythmias, is controversial. Also, there are data to suggest that there is no minimum dose required for atropine for this indication.
- If invasive arterial blood pressure monitoring is already in place, it may be used to adjust CPR to achieve specific blood pressure targets for children in cardiac arrest.
- Amiodarone or lidocaine is an acceptable antiarrhythmic agent for shock-refractory pediatric VF and pVT in children.
- Epinephrine continues to be recommended as a vasopressor in pediatric cardiac arrest.

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- For pediatric patients with cardiac diagnoses and IHCA in settings with existing extracorporeal membrane oxygenation protocols, ECPR may be considered.
- Fever should be avoided when caring for comatose children with ROSC after OHCA. A large randomized trial of therapeutic hypothermia for children with OHCA showed no difference in outcomes whether a period of moderate therapeutic hypothermia (with temperature maintained at 32°C to 34°C) or the strict maintenance of normothermia (with temperature maintained 36°C to 37.5°C) was provided.
- Several intra-arrest and post-cardiac arrest clinical variables were examined for prognostic significance. No single variable was identified to be sufficiently reliable to predict outcomes. Therefore, caretakers should consider multiple factors in trying to predict outcomes during cardiac arrest and in the post-ROSC setting.
- After ROSC, fluids and vasoactive infusions should be used to maintain a systolic blood pressure above the fifth percentile for age.
- After ROSC, normoxemia should be targeted. When the necessary equipment is available, oxygen administration should be weaned to target an oxyhemoglobin saturation of 94% to 99%. Hypoxemia should be strictly avoided. Ideally, oxygen should be titrated to a value appropriate to the specific patient condition. Likewise, after ROSC, the child's Paco₂ should be targeted to a level appropriate to each patient's condition. Exposure to severe hypercapnia or hypocapnia should be avoided.

5 NEONATAL RESUSCITATION

- The order of the 3 assessment questions has changed to (1) Term gestation? (2) Good tone? and (3) Breathing or crying?
- The Golden Minute (60-second) mark for completing the initial steps, reevaluating, and beginning ventilation (if required) is retained to emphasize the importance of avoiding unnecessary delay in initiation of ventilation, the most important step for successful resuscitation of the newly born who has not responded to the initial steps.
- There is a new recommendation that delayed cord clamping for longer than 30 seconds is reasonable for both term and preterm infants who do not require resuscitation at birth, but there is insufficient evidence to recommend an approach to cord clamping for infants who require resuscitation at birth, and a suggestion against the routine use of cord milking (outside of a research setting) for infants born at less than 29 weeks of gestation, until more is known of benefits and complications.
- Temperature should be recorded as a predictor of outcomes and as a quality indicator.
- Temperature of newly born nonasphyxiated infants should be maintained between 36.5°C and 37.5°C after birth through admission and stabilization.
- A variety of strategies (radiant warmers, plastic wrap with a cap, thermal mattress, warmed humidified gases, and increased room temperature plus cap plus thermal mattress) may be reasonable to prevent hypothermia in preterm infants. Hyperthermia (temperature greater than 38°C) should be avoided because it introduces potential associated risks.
- In resource-limited settings, simple measures to prevent hypothermia in the first hours of life (use of plastic wraps, skin-to-skin contact, and even placing the infant after drying in a clean food-grade plastic bag up to the neck) may reduce mortality.
- If an infant is born through meconium-stained amniotic fluid and presents with poor muscle tone and inadequate breathing efforts, the infant should be placed under a radiant warmer and PPV should be initiated if needed. Routine intubation for tracheal suction is no longer suggested because there is insufficient evidence to continue this recommendation. Appropriate intervention to support ventilation and oxygenation should be initiated as indicated for each individual infant. This may include intubation and suction if the airway is obstructed.

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- Assessment of heart rate remains critical during the first minute of resuscitation and the use of a 3-lead ECG may be reasonable, because providers may not assess heart rate accurately by auscultation or palpation, and pulse oximetry may underestimate heart rate. Use of the ECG does not replace the need for pulse oximetry to evaluate the newborn's oxygenation.
- Resuscitation of preterm newborns of less than 35 weeks of gestation should be initiated with low oxygen (21% to 30%) and the oxygen titrated to achieve preductal oxygen saturation approximating the range achieved in healthy term infants.

6 EDUCATION

- Use of a CPR feedback device is recommended to assist in learning the psychomotor skill of CPR. Devices that provide corrective feedback on performance are preferred over devices that provide only prompts (such as a metronome).
- The use of high-fidelity manikins is encouraged for programs that have the infrastructure, trained personnel, and resources to maintain the program. Standard manikins continue to be an appropriate choice for organizations that do not have this capacity.
- BLS skills seem to be learned as easily through self-instruction (video or computer based) with hands-on practice as through traditional instructor-led courses.
- Although prior CPR training is not essential for potential rescuers to initiate CPR, training helps people to learn the skills and develop the confidence to provide CPR when encountering a cardiac arrest victim.
- To minimize the time to defibrillation for cardiac arrest victims, the deployment of an AED should not be limited to trained individuals (although training is still recommended).
- A combination of self-instruction and instructor-led courses with hands-on training can be considered as an alternative to traditional instructor-led courses for lay providers.

- Precourse preparation that includes review of appropriate content information, online/precourse testing, and/or practice of pertinent technical skills may optimize learning from adult and pediatric advanced life support courses.
- Given the importance of team dynamics in resuscitation, training with a focus on leadership and teamwork principles should be incorporated into advanced life support courses.
- Communities may consider training bystanders in compression only CPR for adult OHCA as an alternative to training in conventional CPR.
- Two-year retraining cycles are not optimal^{***}. More frequent training of basic and advanced life support skills may be helpful for providers who are likely to encounter a cardiac arrest.

^{***} Heart and Stroke Foundation BLS Certifications are registered for a 1-year period

7 FIRST AID

- The use of stroke assessment systems can assist first aid providers with identifying signs and symptoms of stroke.
- While glucose tablets are preferred for care of mild hypoglycemia, they may not be readily available. In these cases, other forms of sugar found in common dietary products have been found to be acceptable alternatives to glucose tablets for diabetics with mild symptomatic hypoglycemia who are conscious and are able to swallow and to follow commands.
- It is acceptable for a first aid provider to leave an open chest wound open and uncovered. If a dressing and direct pressure are needed to control bleeding, care should be taken to ensure the dressing does not inadvertently convert to an occlusive dressing.
- There are no single-stage concussion assessment systems to aid first aid providers in the recognition of concussion.

2015

CANADIAN RESUSCITATION

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FIRST AID GUIDELINES

- When reimplantation of an avulsed tooth will be delayed, temporary storage of the tooth in an appropriate solution may help prolong viability of the tooth.
- First aid education delivered through public health campaigns, focused topics, or courses resulting in certification can increase survival rates, can decrease severity of injury and time in the hospital, and can resolve symptoms of injured and ill persons.
- When caring for an unresponsive person who is breathing normally, and in the absence of major trauma such as to the spine or pelvis, placing the person into a lateral, side-lying position may improve airway mechanics. The modified High Arm in Endangered Spine (HAINES) recovery position is no longer recommended.
- There continues to be no indication for the routine administration of supplementary oxygen by first aid providers. For those first aid providers with specialized training in the use of supplementary oxygen, administration of oxygen can be beneficial for persons with decompression injury. Other situations when administration may be considered include suspected carbon monoxide poisoning and for lung cancer patients with dyspnea coupled with hypoxemia.
- The recommendations still state that while awaiting the arrival of EMS providers, the first aid provider may encourage a person with chest pain to chew aspirin if the signs and symptoms suggest that the person is having a heart attack and the person has no allergy or contraindication to aspirin, such as recent bleeding. However, the update of this recommendation notes that if a person has chest pain that does not suggest that the cause is cardiac in origin, or if the first aid provider is uncertain about the cause of the chest pain or uncomfortable with administration of aspirin, a first aid provider should not encourage the person to take the aspirin.
- Epinephrine is recommended for the life-threatening condition of anaphylaxis, and those at risk typically carry epinephrine auto-injectors, often as a 2-dose package. When symptoms of anaphylaxis do not resolve with an initial dose of epinephrine, and EMS arrival will exceed 5 to 10 minutes, a second dose of epinephrine may be considered.
- The primary method to control bleeding is through the application of firm, direct pressure. When direct pressure is not effective for severe or life-threatening bleeding, the use of a hemostatic dressing combined with direct pressure may be considered but requires training in proper application and indications for use.
- Use of cervical collars by first aid providers is not recommended. For injured persons who meet high-risk criteria for spinal injury, the ideal method for a first aid provider to help prevent movement of the spine requires further study but may include verbal prompts or manual stabilization while awaiting arrival of advanced care providers.
- Topics covered in the 2015 Guidelines Update that have no new recommendations since 2010 include the use of bronchodilators for asthma with shortness of breath, toxic eye injury, control of bleeding, use of tourniquets, treatment of suspected long bone fractures, cooling of thermal burns, burn dressings, and spinal motion restriction.