

Emergency Preparedness in the OR

Cardiac Arrest and the 2010 Advanced Cardiac Life Support Guidelines—Part IV

Darlene Hutton, BScN, MSN, RN

In October 2010, the American Heart and Stroke Foundation published the 2010 *Advanced Cardiac Life Support (ACLS)* guidelines (American Heart Association). The guidelines are updated every 5 years, and these new guidelines advocate for improved patient outcomes through simplification of treatment algorithms. The guidelines address the unique environments where cardiac arrests may occur, and they stress the importance of maintaining positive outcomes with the addition of a comprehensive postarrest cardiac care management section. This article will provide a case-based scenario rel-

evant to the postoperative patient experiencing a cardiac arrest situation with discussion on management according to the key changes of the 2010 *ACLS* guidelines.

CASE SCENARIO

You respond to a postoperative patient's oxygen saturation alarm. This patient is a 65-year-old man, who has just undergone a laparoscopic adjustable gastric band procedure. At the bedside you note that this patient is unresponsive to verbal and touch stimuli. What do you do next?

Discussion

The biggest change in the new *ACLS* guidelines centers on the sequence of immediate actions when finding a patient unresponsive. The current sequence is now circulation, airway, and breathing (C-A-B) (see Figure 1). The C-A-B approach replaces the previous airway, breathing, circulation (A-B-C). The rationale for this major change is established on evidenced-based findings. First, lay people responding to an unresponsive victim were often found not doing any cardiopulmonary resuscitation (CPR), as

they reported that they did not want to open the airway and deliver rescue breaths (Field et al., 2010), and if they chose not to do mouth to mouth, they would not have done compressions either as, they felt that one without the other was ineffective. Second, when coming across a victim and doing a head-tilt, chin lift to check for obstruction (A), assessing for breathing, giving two breaths (B), and then doing a pulse check for 10 s (C), this entire process could take up to 45 s to perform. Meaning, no compressions were even started during this initial A-B-C assessment. Valuable time was lost and decreased the successful chance of a positive outcome. Third, in the new guidelines, more focus has been placed on the importance of effective compressions in improving outcomes. The four key concepts of effective compressions include compressing at least 100 beats/min, at an increased depth of 2 in., with full check recoil, and minimal interruptions to no greater than 10 s. By ensuring that these compression guidelines are being used, the airway and breathing component is passively being taken care of. This means that if this cardiac arrest is occurring in an area with

Darlene Hutton, BScN, MSN, RN, is a Critical Care Nurse, with 27 years of experience in coronary care unit, intensive care unit, postanesthesia care unit, and emergency as a bedside nurse, educator, manager, and research nurse. She founded QRS Educational Services in 1985 and provides educational sessions, including *Advanced Cardiac Life Support* certification and recertification courses as an *Advanced Cardiac Life Support* Course Director throughout Canada.

The author reports no conflicts of interest.

Address correspondence to Darlene Hutton, BScN, MSN, RN, QRS Educational Services Inc., 2683 Ellesmere Road, Suite 308, Toronto, Ontario, Canada M1E 5E9 (e-mail: Darlene@qrseducation.com).

DOI: 10.1097/PSN.0b013e31823c38c3

Adult BLS Algorithm HCP 2010

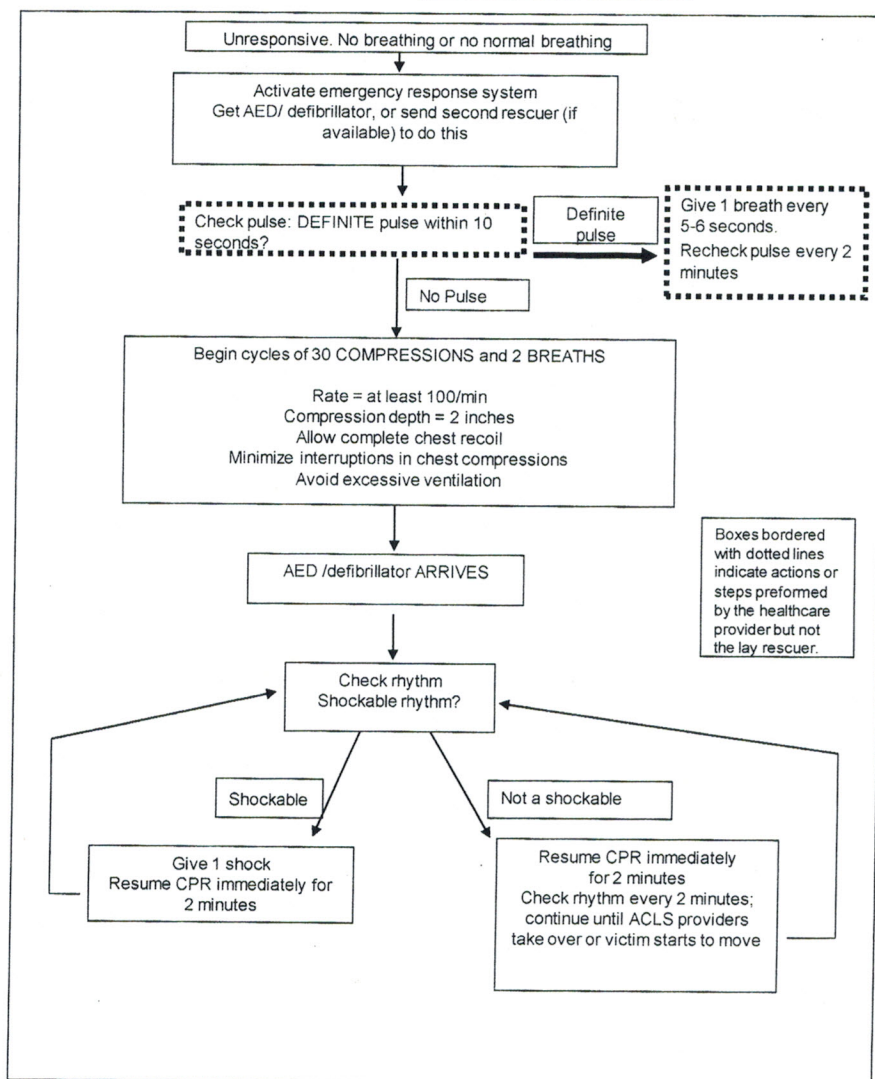


Figure 1. Basic life support focuses on early identification of an unresponsive, pulseless victim, immediate hands-only compression followed by defibrillation for shockable rhythms.

compressions every 2-min cycle. While compressions are continuing, the defibrillator or AED will need to be retrieved and, if appropriate, the patient will need to be defibrillated immediately. Rhythms that need to be defibrillated are ventricular fibrillation, pulseless ventricular tachycardia, and torsades de pointes, which is a polymorphic-type ventricular tachycardia (Neumar et al., 2010). The only time compressions are to stop during this entire process is while the process of defibrillation is occurring.

In this particular case, the patient was found to be in ventricular fibrillation. Compressions continued uninterrupted, while the other team member applied the multipurpose pads, and prepared to defibrillate. As soon as the defibrillator had reached its charging potential, the “all clear” command was loudly announced twice, compressions stopped at this time, and the patient was defibrillated once. The order to resume hands-only compressions was given and another 2-min round of CPR commenced. As help arrived, the airway was fully assessed for any obstruction, an oral airway was inserted, and manual bag-mask-valve ventilations were delivered. Once ventilations with an oral airway occurred, the compression rate was still 100 per min; however, after 30 compressions were reached, two breaths were then delivered. This 30:2 compressions/ventilation cycle was repeated five times to reach a time period of 2 min. A rhythm/pulse check done at the end of 2 min showed the patient to be in ventricular fibrillation, compressions were resumed while the defibrillator was charging, and a second shock was delivered. Cardiopulmonary resuscitation was resumed for another 2-min cycle and in this 2-min cycle, 1 mg of epinephrine, intravenous push was given. At the end of this

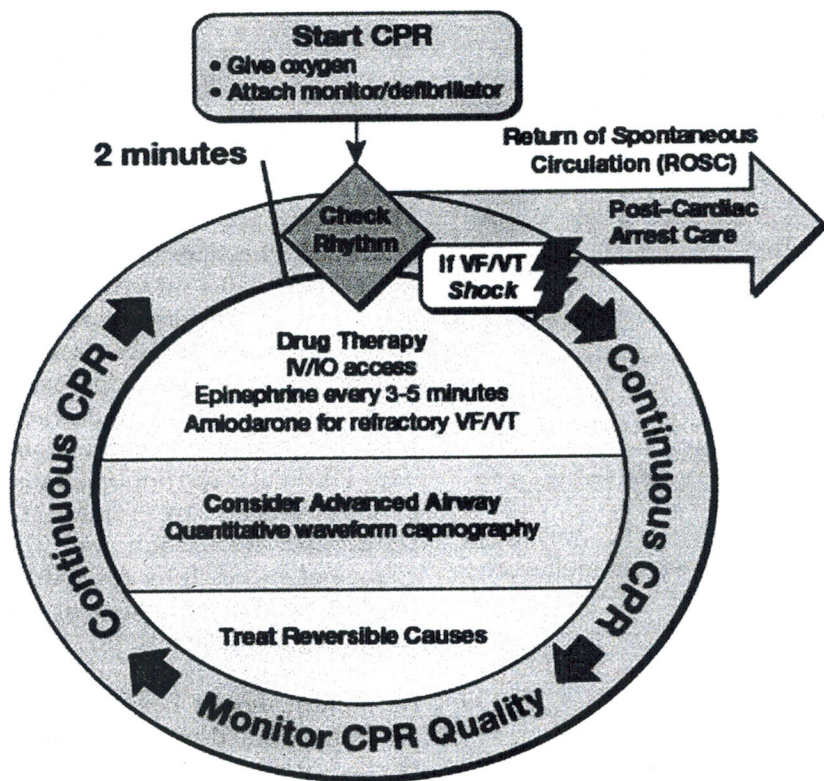
limited personnel to assist, hands-only CPR is the first priority. Airway and breathing are assessed only when the patient has been placed on the cardiac monitor or automatic defibrillator (AED) and defibrillated, if warranted.

Action

You have observed this patient to be unresponsive. Your first priority is to call for help.

Second priority is to check for a pulse; no more than 10 s. If you are unsure whether there is a pulse, do not take more than 10 s to assess. Commence hands-only

compressions at a rate of 100 per min. Even if the patient has a weak pulse and compressions are started, injury resulting from this rarely occurs (Field et al., 2010). Continue doing compressions until help arrives. With all cardiac arrests, compressions are done in 2-min cycles with a rhythm/pulse check at the end of each 2-min cycle. If more than 2 min has passed by the time help arrives, you will need to have them resume hands-only compressions after a 10-s pulse check is done. Because the effectiveness of compressions deteriorates over time, personnel should alternate doing



The 2010 Adult Cardiac Arrest Circular Algorithm

Figure 2. Algorithm for pulseless adult.

2-min cycle, the rhythm was ventricular fibrillation and the patient was defibrillated a third time. Cardiopulmonary resuscitation for another 2-min cycle was started and in this 2-min cycle, amiodarone, 300 mg iv, was given (Figure 2). The patient had return of circulation after the third defibrillation and postresuscitation care was started.

Postresuscitation Care

The 2010 ACLS guidelines have established a fifth chain of care to optimize patient outcomes postarrest. The rationale for the addition of this new treatment chain results from data demonstrating that most deaths postcardiac arrest occur during the first 24 hr related to postarrest syndrome leading to neurological complications and multiorgan dysfunction (Peberdy et al., 2010). The salient points in the postcardiac arrest care section

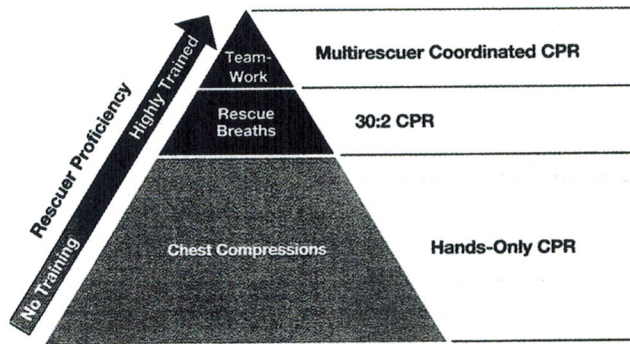
include optimizing ventilation and oxygenation; treating hypotension; considering therapeutic hypothermia; coronary reperfusion; and transfer to an advanced critical care center. The level of evidence for the initiation of therapeutic hypothermia on a patient who has return of spontaneous circulation but remains comatose is the same as defibrillating a patient who is in ventricular fibrillation (Peberdy et al., 2010). Therefore, even in the postsurgical setting, initiating therapeutic hypothermia could be considered en route to transferring the patient. The core temperature to reach when performing therapeutic hypothermia is between 32°C and 34°C for 12 or 24 hr or even longer (Peberdy et al., 2010). The temperature range can be reached by infusing cold saline intravenously, applying cold packs to the axilla and groin or applying a cooling blanket. The process of therapeutic hypother-

mia should be initiated beginning minutes to an hour after return of spontaneous circulation (Peberdy et al., 2010).

The Unique Environment and the Building Blocks

The 2010 ACLS guidelines address the unique health care environments that exist today ranging from specialized, high-acuity hospitals to remote and private clinics. The building blocks of CPR provide a conceptual framework to help guide rescuers to the priorities during a cardiac arrest when alone or with another rescuer or in a multiteam environment (Travers et al., 2010). What is your priority if you are working in a clinic and are alone with the patient when the patient arrests? Your first priority is to call for help by either activating the code-blue switch or dialing 9-1-1 if you are in a private clinic. The next priority is to get the crash cart or AED, apply the pads, and quickly defibrillate the patient, if appropriate. Your next priority is to then commence hands-only compressions at 100 beats/min. Remember to ensure that rescue personnel have access to the clinic. See the bottom of the triangle in Figure 3.

If you are working in a setting where there are only two of you initially present until more help arrives, which will take between 3 and 5 min, one of you will need to call for more help and obtain the crash cart while the other immediately commences hands-only compressions. While compressions continue, the multipurpose pads are placed on the patient's chest. If the patient requires defibrillation, this is to be done immediately. Hands-only compressions are to immediately resume after the patient is defibrillated. The next priority is to ensure that an adequate intravenous access route has been established. If the patient does not have a patent intravenous,



The Building Blocks of CPR: All rescuers, regardless of training, should provide chest compressions to all cardiac arrest victims. Because of their importance, chest compressions should be the initial CPR action for all victims regardless of age. Rescuers who are able, should add ventilations to chest compressions. Multirescuer coordinated CPR includes working together to coordinate care and perform the 5 links of the Chain of Survival.

Figure 3. This conceptual framework identifies the priorities faced by rescue personnel if they are alone, or with another responder, or in a multirescuer team environment.

insert one at this time. It is important to have intravenous access early in the arrest as the chance of successfully accessing a vein is better than further along in the cardiac arrest when circulation has been greatly compromised. If 2 min of compressions has occurred, the rhythm will be reassessed and the patient defibrillated a second time. Compressions resume for another 2-min cycle. Airway and ventilation may now be assessed if not already done. In the new guidelines, airway and ventilation are assessed when more than one rescuer is present and the patient has been defibrillated. See the middle portion of the triangle in Figure 3.

If you are working in a hospital recovery room with multiple responders, a team approach is taken and priorities are reached by multiple team members. Compressions are immediately started by one team member after identifying that no pulse exists, the second member needs to determine the rhythm and defibrillate immediately if warranted. The third member verifies a patent airway, inserts an oral airway, and starts manual ventilations at a

compression-to-ventilation ratio of 30:2. Another member will ensure that the required medications are prepared and given. The team will need to assess that the patient has a large-bore intravenous catheter. During a cardiac arrest, it is necessary to have an intravenous catheter in the antecubital vein or a central catheter to ensure best delivery of medications. Medications to be prepared for ventricular fibrillation or pulseless ventricular tachycardia cardiac arrests are epinephrine, 1 mg every 3 to 5 min, and amiodarone 300 mg iv, which may be repeated with another 150 mg. Another member will be the recorder. When multiple personnel are available, an advanced airway such as an endotracheal tube or a laryngeal mask airway will be inserted earlier in the cardiac arrest. Once an advanced airway is inserted, the sequence of 30:2 compressions to ventilations will change again. Compressions will continue at 100 per min and ventilations will now occur at one breath every 6–7 s for a rate of 8–10 breaths/min. Compressions are not halted when an advanced airway is in place. See the top portion of the triangle in Figure 3.

SUMMARY

The chance of a successful outcome with any cardiac arrest is prompt initiation of hands-only compression at a rate of at least 100 per min, to a depth of 2 in., with full chest recoil, and no more than a 10-s interruption of compressions. The priority, regardless of being in a private clinic or in a facility using a team approach, is to start compressions and maintain effective compressions with minimal interruptions. Most cardiac arrests are related to ventricular fibrillation and the chance of successfully defibrillating this rhythm is highest at the beginning of the arrest. For every minute a patient is in ventricular fibrillation, his or her chance of survival greatly decreases (Travers et al., 2010). This is why it is extremely important to defibrillate immediately. Once a patient has return of spontaneous circulation, postresuscitation care needs to be implemented. The biggest reason for a patient to develop ventricular fibrillation is an acute coronary syndrome, and this is why the new guidelines have outlined transferring a postarrest patient to a cardiac catheterization laboratory to perform an emergency angiogram and angioplasty. Part of this postarrest management also includes therapeutic hypothermia in those patients who remain comatose after return of spontaneous circulation. This article has reviewed a case study of a postoperative patient who developed ventricular fibrillation and the priorities of care according to the 2010 ACLS guidelines. Watch for more ACLS-based case studies in upcoming articles.

REFERENCES

- Field, J., Hazinski, M., Sayre, M., Chameides, L., Schexnayder, S., Hemphill, R., et al. (2010) Part 1: Executive summary—2010 American Heart Association guidelines for

cardiopulmonary resuscitation and emergency cardiovascular care. *Circulation*, 122(Suppl. 3), S640–S656.

Neumar, R., Otto, C., Link, M., Kronick, S., Shuster, M., Callaway, C., et al. (2010). Part 8: Adult advanced cardiovascular life support—2010 American Heart Association guidelines for cardiopulmonary resusci-

tation and emergency cardiovascular care. *Circulation*, 122, S729–S767.

Peberdy, M., Callaway, C., Neumar, R., Geocadin, R., Zimmerman, J., Donnino, M., et al. (2010). Part 9: Post cardiac arrest care—2010 American Heart Association guidelines for cardiopulmonary resuscitation and

emergency cardiovascular care. *Circulation*, 122, S768–S786.

Travers, A., Rea, T., Bobrow, B., Edelson, D., Berg, R., Sayre, M., et al. (2010). Part 4: Overview: 2010 American Heart Association guidelines for cardiopulmonary resuscitation and emergency cardiovascular care. *Circulation*, 122, S676–S684.

Call for Journal Editorial Board Members

PSN seeks editorial board members who have experience in writing and publishing, expertise in an area of interest to the journal, and a commitment to developing and promoting *PSN* as nursing's preeminent broad-based journal.

The composition of the editorial board is designed to reflect diversity in geography, position, education, ethnicity, and areas of expertise.

Qualifications:

1. Registered professional nurse, master's degree in nursing preferred.
2. Experience: considerable expertise in plastic surgical nursing including reconstructive and/or aesthetic nursing.
3. Writing: Documented writing ability as evidenced by publication.
4. ASPSN involvement: Membership for a minimum of 1 year.

Responsibilities:

1. The appointment is for a 2-year term.
2. Providing feedback and recommending changes for improving the journal.
3. Consults with the editor on the direction and focus of the journal.
4. Reviews manuscripts when asked.
5. Writing/coauthoring or soliciting one manuscript per issue or contributing to a Quarterly Department topic per issue.
6. Promoting *PSN* as a vehicle for publishing to colleagues.
7. Promoting *PSN* to the nursing, health care, and public communities.
8. Attend editorial board meetings.

If you are interested in joining the *PSN* Editorial Board, please submit a current curriculum vitae to psn@aspsn.org or fax to 416-323-6325.