4

Triage and Response

Quick Look

The stress of suddenly having to respond, diagnose, and treat a patient having a cardiovascular emergency can be daunting. We are expected to think clearly and act decisively. Unfortunately, we are calling on skills and knowledge that we may use infrequently.

The first three chapters reviewed the building blocks necessary to manage cardiovascular emergencies. This chapter integrates the building blocks into a powerful yet simple approach to the initial emergency care of any patient.

The strength of this universal framework rests in it's ability to quickly triage patients into one of three main categories: stable, unstable and pulseless (dead). Treating pulseless and unstable patients can be chaotic or systematic. For stable patients, time is on your side.

Cardiac emergencies often appear and feel overwhelming. This chapter is included to enable you to view and respond to these events using a framework to create order out of the chaos.

The classification of the constituents of a chaos,
nothing less here is essayed.

Herman Melville, from Moby

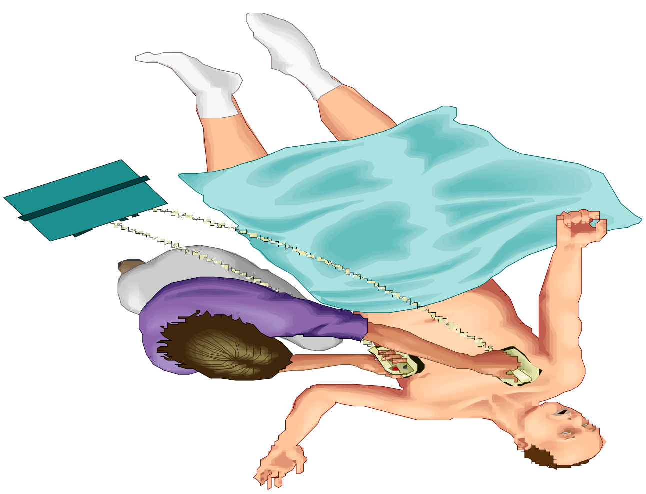
Overview

The overall objectives of emergency cardiac care center on preserving life, maintaining abilities and preventing further complications. Presented with the wide array of primary mechanisms that lead to acute cardiac events, most of us are left feeling either overwhelmed or at least a bit nervous when called upon quickly to manage emergencies. Hurst's "The Heart", an overview of cardiac pathologies is 2700 pages in size. It is no wonder that many find acute cardiac care daunting.

But just as most of Hurst's "The Heart" is about non-emergency cardiac conditions, so will most presentations of cardiac pathologies also afford us time to consult, confer and assess further. For these patients who are not in any imminent danger, time is on your side. Unfortunately, these patients also present with the largest range of issues where the full scope of cardiac medicine is called upon.

The episodes that warrant immediate concern are those that require an urgent or emergent response. As mentioned in chapter 2, for those in ventricular fibrillation, the likelihood of a returning pulse diminishes by 7-10% for each minute that the arrest persists. Time to treatment is the most important determinant of a successful resuscitation.

Figure 4.1 Cardiac Emergency



With time such an important consideration and the possible outcome for the patient quite ominous, a systematic and simple course of action is necessary. In order to optimize time to response, responses must be concise and efficient. Because cardiac emergencies are not a daily occurrence even for practitioners in busy emergency departments, the steps must be easy to remember.

Universal Algorithm for Cardiac Emergencies

Cardiac emergencies can be defined as pathological cardiovascular events that require an urgent response to sustain life or to prevent serious complications. Patients experiencing cardiac emergencies are usually either hemodynamically unstable or are in the midst of a cardiac arrest. The universal algorithm provided in figure 4.2 (page 80) addresses the essentials necessary to manage cardiac emergencies.

This algorithm begins with a suspected or potential acute cardiac event. This may present in many ways. For example, the patient may be unresponsive, not breathing and pulseless (appears to be dead). Unstable (alive) patients often present with signs and symptoms of poor cardiac output. Most patients present with non-critical signs and symptoms such as chest pain relieved with rest or non-lethal dysrhythmias. These patients are hemodynamically stable.

Basic Life Support Algorithm

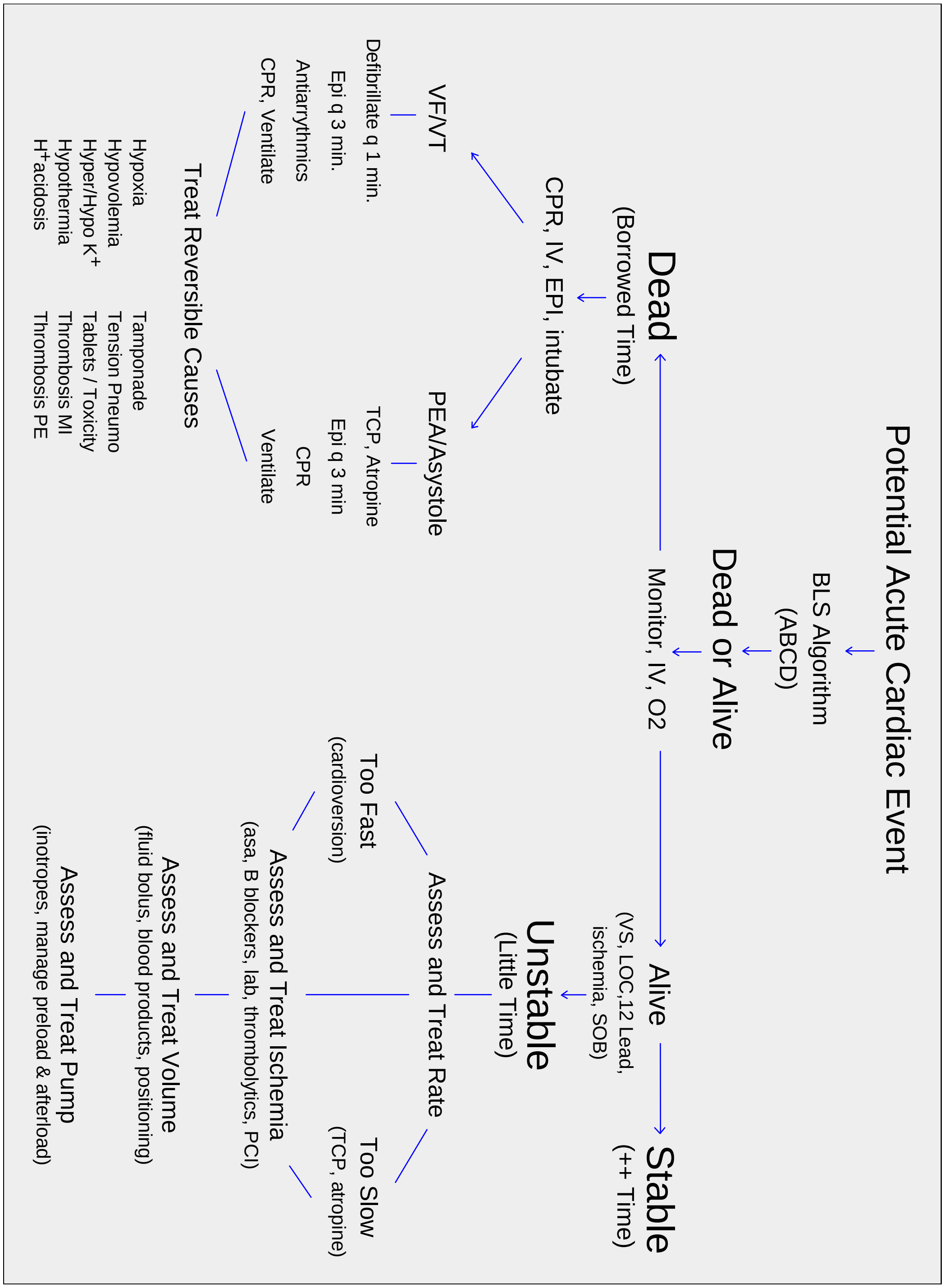
To determine the nature and the seriousness of the cardiac event (if indeed it is a cardiac event), the basic life support (BLS) algorithm is first performed, albeit unconsciously at times (see figure 4.3 on page 81). Assuming that all health care professionals have completed a Standard First Aid course or CPR prior, we will not go into great detail examining the BLS algorithm. However, BLS forms the core initial actions of any critical care episode, and its major steps require mentioning.

While the focus of this book is to manage cardiac emergencies in a hospital setting, the vast majority of acute cardiac events take place outside of hospital. Wherever you and the patient might be, first determine that the scene is safe for you to respond. For example, if noxious gas or downed electrical wires are present, it is prudent to limit the casualties by not adding to them (with yourself). Take measures to make the scene safe. Calling 911 may be the only response available.

If the scene is safe, the next crucial step is to determine if the patient is responsive. If the patient is unresponsive, immediately call for help. This may be accomplished by calling 911, pushing the emergency call button or calling "Code Blue".

Determining that the patient is responsive also immediately answers the question, "Is the patient alive?" An unresponsive patient needs help regardless of the cause. A patient may be unresponsive due to hypoglycemia, post-seizure recovery, a stroke, respiratory failure, hypothermia, shock or being pulseless. While the topic here is cardiac arrest, other possible causes of unresponsiveness should be considered.

Figure 4.2 Universal Algorithm

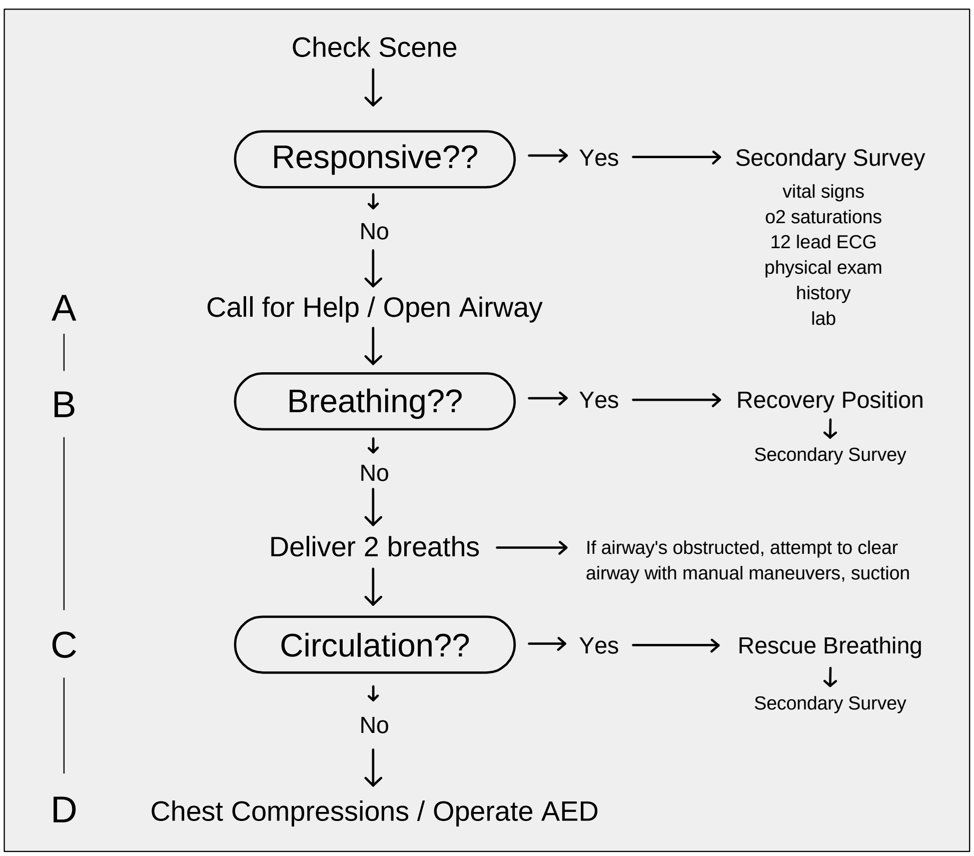


Accessing a defibrillator may be the most important action of the BLS algorithm. The majority of non-responsive patients experience a sudden cardiac death. The definitive treatment for ventricular fibrillation or pulseless ventricular tachycardia is defibrillation. With time to defibrillation being the primary life or death determinant, the directive is clear: immediately access the team that can defibrillate.

Activate the emergency response team (ambulance or arrest team) as soon as the patient is deemed unresponsive. Time to defibrillation is the most important determinant of a successful resuscitation.

If for some reason you are alone with a non-responsive patient, you need to immediately leave the patient to get help. Exceptions exist. For unresponsive victims of submersion, trauma, drug intoxication or in the late stages of respiratory failure, provide one minute of rescue breathing and if required, chest compressions before calling 911. These special cases may not have had sudden cardiac death and may benefit more from CPR than from early defibrillation.

Figure 4.3 The Basic Life Support Algorithm

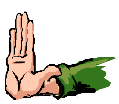


To quickly review, upon the discovery that the patient may be experiencing an acute cardiac event: 1) check the scene for danger; 2) check responsiveness; 3) call for help particularly if the patient is unresponsive. The next step prompts you to assess and treat the primary ABCDs - airway, breathing, circulation and rapid defibrillation if necessary.

When dealing with a non-emergency situation, this part of an assessment tends to be automatic. You introduce yourself to a patient. If they are awake and answer appropriately, then they have an open airway, are breathing, and have a pulse. Defibrillation is certainly unwarranted. You then move on to a more thorough secondary assessment.

Completing the ABCDs with an unresponsive patient is expectably more intense. Using the head tilt, chin life (if no spinal cord injuries are suspected) open the patient's airway. Bend down so that your ear is over the patient's mouth looking toward the patient's chest. Look, listen and feel for a breath.

If the patient is breathing, place the patient in a recovery position and begin a secondary survey. If the patient is not breathing, provide slow breaths (each breath should take about 2 seconds) with a breathing device. We are not encouraging you to engage in mouth to mouth respiration in the hospital setting. An easy-seal mask, a pocket mask or a bag-valve-mask should be readily accessible.



If you are unable to successfully deliver a breath due to a possible airway obstruction, reposition the head and jaw (head tilt, chin lift or **modified jaw thrust**) and attempt another breath. If the breath does not enter the lungs on the second attempt, begin maneuvers to clear the obstruction. This includes a series of 15 chest compressions, a visual check inside the mouth and an attempted breath. As long as the breath does not go in, this routine is repeated. The use of suction or **Magill forceps** may be useful.

A circulation check is then performed. Also called a pulse check, assessing for circulation involves checking a carotid pulse (femoral pulse is also acceptable), and completing a visual check for the presence of cyanosis and the absence of any body movement. All in all, a circulation check determines whether the patient is **clinically dead** and whether an automatic external defibrillator should be connected to the patient (clinical death is defined on page 85).

If the patient is not breathing but does have a pulse, rescue breathing is required. Begin a secondary survey and continue to monitor the patient for any further deterioration i.e. loss of pulse. Continue on through the universal algorithm (see figure 4.2, page 80).

Check the pulse for a full 10 seconds. Even health care professionals have considerable difficulty taking a **carotid pulse** during an emergency when the patient's blood pressure is low. In a study conducted with medical students and nurses, the majority could not detect a carotid pulse with a blood pressure of 70 mm Hg systolic. As a general rule, the presence of a carotid pulse suggests that the patient has a blood pressure of at least 60 systolic, a **femoral pulse** is found with systolic pressures of 70 mm Hg or more and a **radial pulse** is present with systolic pressures of 80 mm Hg or more.

If the patient is pulseless, begin chest compressions and ventilations in a 15:2 ratio (both one and two person adult CPR). Unless the patient is already in a critical care unit, a monitor-defibrillator and an arrest team will probably not arrive for a few more minutes. If an AED is available, connect the pads to the patient and turn on the machine. Follow the verbal prompting from the AED.

If the patient is in ventricular fibrillation or ventricular tachycardia (VF/VT), the AED will deliver as many as three escalating shocks. Ensure that no one is touching the patient, the bed or the stretcher . After the 3 shocks are delivered or if the cardiac rhythm changes to one that is not VF/VT, the AED will prompt you to again check a pulse. The AED will subsequently demand that CPR be continued if a pulse is absent.

The BLS algorithm is rapid sequence of first assessing the ABCs and then quickly treating the ABCDs if warranted. Because time is at such a premium for the pulseless patient, the focus of BLS is to reestablish perfusion with CPR and to treat reversible causes - primarily lethal dysrhythmias (VF/VT) that respond to defibrillation. Ideally, defibrillation is performed within the first few minutes for a reasonable chance of a successful resuscitation.

Secondary Survey

Completion of the primary ABCDs follows with the secondary survey. This secondary survey is applied upon finding that the patient has a pulse. Primarily, the objectives of the secondary survey is to develop a differential diagnosis i.e. reversible causes for this critical event and to identify any potential risk factors that may lead to further complications.

Note that the AHA 2000 guidelines provide the alphabetical acronym of ABCD for a secondary survey during a cardiac arrest:

- •A = advanced airway management i.e intubation
- •B = breathing assessment at an advanced level includes making certain that the secure airway is in place (end tidal CO2 detectors, chest auscultation)
- •C = ongoing circulation assessment for a return of pulse, the use of cardiac drugs and IV access
- •D = differential diagnosis for the cause of the arrest

Rather than the secondary ABCD survey outlined by the AHA, the use of the secondary survey in the BLS context applies primarily to the patient with a pulse who is experiencing some form of critical health event. For the pulseless patient in a cardiac arrest, the AHA's version of the secondary survey is applicable.

In the context of the BLS, steps to arrive at a differential diagnosis include:

- •taking vital signs (temperature, pulse, respiratory rate, blood pressure and oxygen saturations)
- •12 lead ECG
- •head-to-toe physical exam
- •history
- •lab work and other diagnostics

A secondary survey is an ongoing process over minutes to hours during and soon after the initial acute episode. It includes monitoring the patient for any subsequent rhythm or hemodynamic disturbance.

Stable, Unstable or Dead

The universal algorithm models a rapid sequence of events. It covers areas to assess and treatment measures. It also provides a mechanism to quickly triage patients using a simple formula. Simply, is the patient hemodynamically stable, unstable or dead. Answering this question forms the basis of the next portion of the algorithm.

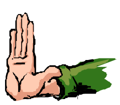
Most of us take exception to the term 'dead'. It is often contrary to out raison d'être. We do not use it lightly here. For you, your patients, their family and friends this episode is quite serious and most often overwhelming. But from a clinical perspective, a patient who is unresponsive, is not breathing and is pulseless is clinically dead. Without the benefit of a cardiac monitor, this person would appear to be lifeless.

Cardiopulmonary resuscitation (CPR) courses about a decade ago delineated between clinical death and biological death. Clinical death was confirmed by the absence of breathing and circulation. Biological death was the cessation of cellular function throughout the body. CPR is performed to help sustain the cells (from a biological death) until advanced measures could produce a pulse once again.

Why not just say pulseless instead of dead? You can if this suits you better. Recent evidence, though, questions our pulse checking abilities. Perhaps because we usually are not in the habit of taking carotid or femoral pulses, our ability to assess for a pulse during a cardiac emergency is often inadequate.

The CPR standards have now broadened the pulse check to also include checking for cyanosis and to correlate your findings with a visual check for any body movement. As mentioned earlier, the pulse check is now called a circulation check. While health care professionals are still encouraged to check a pulse, many of us have difficulty getting a pulse on patients who are either peripherally shut down and/or hypotensive. A pulseless patient may be stable, unstable or dead.

After hundreds of ACLS courses and participating in a like number of cardiac emergencies, we believe that the management of these acute cardiac events begins with establishing whether the patient is either stable, unstable or dead - from a hemodynamic perspective. The BLS algorithm enables us to quickly arrive at this designation.



Note that the designations of stable and unstable are not always black and white nor are they permanent. A patient may experience subtle signs that are quite serious (i.e. silent myocardial infarction) or may be borderline between stable or unstable i.e systolic blood pressure in the 80s but conscious when in trendellenberg position. Also, patients can quickly move from stable to unstable condition. Monitor your patient closely with attention to any trends in the patient's health status.

By designating an initial classification for the patient (stable, unstable or dead), you can move on with some clarity - order out of chaos - as to what measures are required and to the urgency of these measures. For example, if the patient is hemodynamically stable, the bottom line is that you and the patient have time to confer, consult and assess further.

The left side of the universal algorithm deals with the patient who has experienced a sudden cardiac death. This patient typically falls into one of three possible groups: the patient is in VF/VT, is in asystole or has pulseless electrical activity. Whatever the cause, the dead patient requires CPR, an IV, epinephrine and intubation. Chapter 5 examines this part of the algorithm in detail.

All patients that are or have recently experienced potential cardiac events should be placed on a monitor, receive supplemental oxygen and have intravenous access established. If the patient is pulseless (dead), treatment generally includes CPR, IV, epinephrine and intubation irrespective of the cause.

The right side of the universal algorithm deals with the patient who is alive and most likely has a pulse. The hemodynamically stable patient is not ignored but monitored and assessed further. Time to treatment is not as crucial for the stable patient.

The unstable patient is treated often in a hierarchy of actions addressing first rate, then cardiac ischemia, blood volume and finally the pumping ability of the heart. While treatment does not always occur in such a rigid linear fashion, patients are generally treated in this order. This order serves primarily as a guide to the possible causes of hemodynamic compromise. Efforts are made concurrently to arrive at a differential diagnosis.

What constitutes an unstable patient? In general, an unstable patient is experiencing signs and symptoms of inadequate cardiac output:

- Altered LOC
- Shortness of breath
- Chest pain or other signs and symptoms of ischemia
- Hypotension
- Pulmonary edema
- Decreased urine output

While the stable and dead patient is often clearly defined, the unstable patient may only experience subtle signs. Note that any signs or symptoms of ongoing cardiac ischemia places the patient in the hemodynamically unstable group. Time to treatment is urgent. The clinical management of the unstable patient experiencing cardiac emergencies is explored in greater detail in Chapter 6.

In a Nut Shell

The initial management of patients having cardiac emergencies can be structured around a short list of questions. First, is the patient responsive? Second, is the patient breathing? Third, does the patient have a pulse? Fourth, is the patient stable, unstable or dead? Fifth, is the cardiac rhythm too fast or too slow? Sixth, is the patient having cardiac ischemia?

Responsive?? Breathing?? Pulse??

Stable, Unstable or Dead??

Rate Too Fast or Too Slow?? Ischemia??

These six questions will often be sufficient to direct you within the first 10 minutes of most cardiac emergencies. Of course, various actions swirl around these questions. The key is to understand why you are asking these questions and what treatments are warranted.

The emergency management of acute cardiac events (unstable and pulseless patients) does not need to be complicated. Treatment involves correcting the problem quickly and safely. For example, if the patient is pulseless with a rate that is too fast (i.e. VF/VT), electricity in the form of defibrillation is required. If the patient is unstable with rates that are too fast, electricity is similarly required in the form of electrical cardioversion (synchronized to prevent R-on-T phenomenon).

Since rates that are too fast or too slow are often associated with port cardiac output states, these rates are often treated first because ischemic states might be caused from the extreme rates. One respected emergency room physician and ACLS instructor likens emergency management to the story of the three bears. If the porridge is too hot (rates are too fast), cool it down. If the porridge is too cold (rates are too slow), warm it up.

Again, be mindful of how time is an important consideration for any patient experiencing an acute cardiac event. By mentally placing the patient in one of three groups - stable, unstable or dead - you are also correlating their care to the time factor. If patient is stable, “We have time to look further.” If patient is unstable, “We have little time. Act fast to prevent death.” If patient is dead, “We are on borrowed time.”

In a nutshell, you have the tools to organize and manage cardiac emergencies. Ask the crucial questions, act concisely, and focus on your patient.

Case Study

A patient was found collapsed at home by her son after he became concerned when she did not answer his regular mid morning phone call. The paramedics found the patient semiconscious with a weak carotid pulse and no obtainable blood pressure. The pulse was noted to be rapid and irregular at 170-200 BPM. She was then transported to your hospital.

Lets look at the core questions in relation to this case. This patient has a pulse, and is unstable as demonstrated by the altered level of consciousness, the thready carotid pulse and the hypotension. After attaching the patient to a cardiac monitor the rhythm is identified as having a narrow QRS. You also ensure that oxygen is delivered via nasal prongs to keep her oxygen saturations over 95%. You initiate an intravenous access and run normal saline.

Due to her unstable status and her fast rate you quickly organize your team to sedate the patient, manage her airway and prepare for electrical cardioversion. After synchronized cardioversion with 100 Joules, your patient is cardioverted into a sinus tachycardia with a rate of 110 BPM. Unfortunately she remains semiconscious now with a blood pressure of 76/40.

Continue to apply the rate-ischemia-volume-pump approach to the patient. You have corrected the patient's rate problem by cardioverting. You order another 12 lead ECG (the first ECG is ordered prior to cardioversion). Blood work sent earlier reveal that her cardiac enzymes are normal. The 12 lead ECG is also unremarkable. Serial blood work and 12 lead ECGs are ordered.

Next assess her volume status. She is thin, frail and has a dry oral mucosa. She also has no jugular venous distention (JVD) laying supine. Her chest auscultation reveals no adventitious sounds. A 500 ml fluid challenge is ordered.

Since her vital sounds remain unchanged and her chest remains clear, a second 500 ml bolus is given. Soon after she develops a moderate JVD while laying in a low fowlers position with no chest crackles. Her blood pressure is now at 94/60. She requires close monitoring. She is also answering questions. A more thorough physical assessment and a history can now be completed.

This is one example of the application of the universal algorithm to an acute cardiac event. The algorithm provides the structure to confidently and competently assess, plan, treat and continuously evaluate your patient. The algorithm guides you to what steps are necessary and the order of implementation. Practice using it. Be ready for the moment that you are called on to act decisively.

Summary

This chapter outlined a systematic method to manage cardiac emergencies. The focus of the algorithm is to provide effective and efficient measures. After checking the scene, check for patient responsiveness. If unresponsive call for help. Perhaps the most important early action is accessing advanced life support and a defibrillator. Begin assessing the patient using the ABCs.

A talking patient quickly confirms that the ABCs are present. The patient has an open airway, is breathing and has a pulse. Nevertheless, the quality of one's airway, breathing and circulation remains to be answered through a secondary survey.

The unresponsive patient requires a more hands on approach. The airway is opened, breathing is assessed, and two slow breaths are provided if the patient is not breathing. A barrier device is strongly encouraged with a one-way valve when delivering ventilations. Next, a carotid pulse check determines whether CPR is necessary. For those without a pulse, an automatic external defibrillator is used (if available). Otherwise, a cardiac monitor-defibrillator is required.

Based on the findings of the BLS algorithm, the patient is mentally placed in one of three groups: hemodynamically stable, unstable or dead. Advanced life support measures include attaching the patient to a cardiac monitor-defibrillator, initiating an IV access, and delivering supplemental oxygen.

The stable patient is not addressed here - a stable patient is not currently experiencing what could be deemed a cardiac emergency. The unstable patient - who generally presents with signs and symptoms of poor cardiac output - is assessed and treated for possible extreme heart rates, ischemia, volume and pump issues. Metabolic and neurological issues may also contribute to the patient's hemodynamic compromise.

The pulseless patient receives immediate attention. Following the measures of the BLS algorithm, this patient would also receive CPR, IV access, epinephrine and be intubated. Of course, if attempts to defibrillate the patient in VF/VT has not already occurred, this is the first course of action. A pulseless patient is generally found in VF/VT, asystole, or pulseless electrical activity.

The universal algorithm is a tool to be learned, practiced and used for maximum benefit to your compromised patients.

Chapter Quiz

1. CPR is performed on the pulseless (dead) patient to:

a) prevent ventricular fibrillation from deteriorating to asystole
b) increase the likelihood of a successful defibrillation
c) preserve brain function
d) improve survival
e) all of the above

2. After ensuring that the scene is safe, next you would determine if the patient is (responsive, breathing).

3. All patients with a potential acute cardiac event should receive:

a) IV access
b) cardiac monitoring
c) supplemental oxygen
d) all of the above

4. When dealing with cardiovascular emergencies, attempt to quickly triage the patient into one of three possible groups called
____.

5. For grossly unstable patients with a heart rate of 200/minute, synchronized cardioversion is required irrespective of whether the QRS is narrow or wide.

True or False

6. Upon finding an unresponsive patient, your next step is to:

a) open the airway
b) connect and turn on the AED
c) deliver 2 slow breaths
d) call for help

Answers: ***1.*** *e);* ***2.*** *responsive;* ***3.*** *d);* ***4.*** *stable, unstable and dead;* ***5.*** *True;* ***6.*** *d);* ***7.*** *10%*

7. For a victim in sudden cardiac death, every minute that the arrest continues is associated with a (3%, 5%, 10%, 15%) reduction in the chances of a successful resuscitation.

8. Signs and symptoms of an unstable patient reflect the effects of low cardiac output. List 4 signs and/or symptoms of poor cardiac output.

1.______________________ 2.______________________

3.______________________ 4.______________________

Suggested Readings and Resources

American Heart Association(2000). Guidelines 2000 for Cardiopulmonary Resuscitation and Emergency Cardiac Care. Circulation. August 22, 2000. 102 (8).

Currents Online Newsletters. (2002). American Heart Association. Found at http://www.cpr-ecc.org/currents_issues.html

Grauer, Ken. (1996). ACLS: Rapid Review and Scenarios. 4th ed. St. Louis, Missouri: Mosby.

Hazinski, M. et al.(2000). 2000 Handbook of Emergency Cardiovascular Care. American Heart Association.

What's Next?

Now that the basic framework for managing cardiac emergencies has been outlined, management of the pulseless patient is examined in more detail in Chapter 5. Using the universal algorithm as the master template, specific algorithms on VF/ pulseless VT, asystole and pulseless electrical activity (PEA) are presented.

Answers: ***8.*** *hypotension; shortness of breath; altered level of consciousness; ischemia; low urine output; fatigue;*