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Code blue

Do you know what to do?

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MANY HEALTHCARE FACILITIES have implemented rapid response teams (RRTs) in response to the Institute for Healthcare Improvement's 100,000 Lives Campaign.¹ By addressing a patient's deteriorating clinical status before a full-blown crisis, RRTs may reduce in-hospital cardiopulmonary arrests or "codes," typically called code blues.² Consequently, although nurses in hospitals are required to have basic life support training, they may have few opportunities to practice these skills before needing to perform them on a patient in crisis. This lack of practice makes it difficult to maintain proficiency.³

It's been estimated that after a code blue is called, 3 to 5 minutes may elapse before the code team arrives at the bedside.⁴ Because those minutes are critical to the patient's survival, even nurses on non-ICU units need to be proficient at responding to a code blue and using resuscitative equipment and skills. This article reviews the appropriate actions and interventions clinicians must perform during a code blue in adults with a focus on the nurse's role. It also discusses the importance of ongoing education and hands-on training, including participation in mock codes, to keep nurses' skills sharp.

Initiating a code blue

A code blue in adults should be called immediately for any patient who's unresponsive, apneic, and/or pulseless. Under American Heart Association (AHA) guidelines, calling for help and initiating CPR should be done simultaneously.⁵ Protocols for summoning a code team vary depending on facility policy; all staff should be familiar with the procedure for calling a code blue in their facility.

Calling out loudly for help is the initial request for assistance, and locally responding assistants are designated to formally call the code blue through the facility-wide response system.⁶ While awaiting members of the hospital-wide code team to arrive, a nurse should initiate CPR and other interventions. Members of the code team should identify themselves and their role upon entering the room with statements such as “I’ll take the airway” or “I’ll document.” A staff member at the nurses’ station should contact the patient’s healthcare provider as soon as the code is called.

The key to running an effective code blue is the quality and timeliness of the interventions. Early, high-quality CPR and rapid defibrillation, if indicated, before advanced cardiovascular life support (ACLS) interventions are two essential principles in beginning the resuscitation phase. Despite the fact that healthcare professionals with advanced education and training know the pathophysiology behind cardiopulmonary arrest, in the heat of the moment they often forget that the most important first step is restoring perfusion through effective chest compressions. The AHA has put forth the mantra of “push hard and fast” in their bystander CPR program.⁷

Starting with the compressor, the following discussion outlines the role of each member of the code blue team.

Compressor

The first healthcare provider to respond assumes the role of “compressor” and immediately begins chest compressions at a rate of at least 100



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compressions per minute; the beat of the Bee Gees’ tune “Staying Alive” is just the right cadence for the effective timing of compressions.⁸ Don’t wait for a backboard to be placed to begin compressions; it can be placed when additional personnel arrive who will then switch compressor roles approximately every 2 minutes (or after about 5 cycles of compressions and ventilations at a ratio of 30:2) to prevent decreases in the quality of compressions.

Make sure the depth of chest compressions is at least 2 inches (5 cm) with complete chest recoil after each compression to allow the heart to fill completely before the next compression. Minimize the frequency and duration of interruptions in compressions to maximize the number of compressions delivered per minute.⁹ Chest compressions cause air to be expelled from the chest and oxygen to be drawn into the chest due to the elastic recoil of the chest. Because ventilation requirements are lower than normal during a cardiac arrest, oxygen supplied by passive delivery

should be sufficient for several minutes after the onset of cardiac arrest in a patient with a patent upper airway.⁵ Research studies support the delay of airway management and institution of ventilations until additional help arrives.⁷

Airway manager

While the first responder begins compressions, a second responder manages the airway. Using AHA guidelines:

- give the patient two ventilations for every 30 compressions using the bag-mask device attached to an oxygen source. Most patient rooms have a bag-mask device immediately available, typically located at the head of the bed.
- set the oxygen level on the flow meter at 15 L/min and, if applicable, fully open the reservoir on the bag-mask device to ensure that each breath is delivered with 100% oxygen.
- bag-mask device ventilation is most effective when performed by two trained and experienced providers. One provider opens the airway and seals the mask to the face while the other squeezes the bag.⁵
- make sure each compression of the bag causes the chest to rise (a tidal volume of approximately 600 mL delivered over 1 second). An oropharyngeal airway can be placed to help ensure airway patency when delivering ventilations with a bag-mask device.
- during CPR, minimize interruptions in compressions when delivering ventilations.
- although ventilation with a bag-mask device is acceptable during CPR, be prepared to assist a qualified anesthesia provider with endotracheal intubation because there are times when ventilation with a bag-mask device is inadequate.⁵

Continuous waveform capnography, in addition to clinical assessment, is considered to be the most reliable method of confirming and monitoring correct endotracheal tube placement.⁵

Defibrillator manager

In addition to compressions, the only other therapy proven to increase survival is defibrillation.⁹ Rapid defibrillation for “shockable rhythms,” which are pulseless ventricular tachycardia and ventricular fibrillation, is critical, and the ability to recognize a shockable rhythm is a required skill. Vascular access, drug delivery, and advanced airway placement shouldn’t cause interruptions in chest compressions or delay defibrillation.⁵

Placement of hands-free defibrillation pads versus traditional handheld defibrillation paddles is recommended as a safer option and allows for more rapid defibrillation. The patient should be connected to a 3- or 5-lead cardiac monitor; if the hands-free pads have monitoring capabilities, they can be used to monitor the cardiac rhythm. Often both methods of cardiac monitoring are used during a code.

Nurses should be trained in dysrhythmia recognition and ACLS or have an expert on the clinical unit immediately available to help them identify dysrhythmias. If no expert is immediately available, consider using the automated external defibrillator (AED) function on the defibrillator, if available, to ensure early defibrillation when indicated before the code team arrives.

Because defibrillators are manufactured as either monophasic or biphasic, the nurse must know which type of defibrillator is on the unit. A monophasic defibrillator is generally set to deliver 360 joules for defibrillation, and a biphasic defibrillator is initially set to deliver between 120 and 200 joules, depending on the manufacturer’s recommendations.⁵

Once a shockable rhythm is identified, the defibrillator manager sets the energy level on the defibrillator, as directed by the team leader, using “closed loop” communication to ensure understanding of the order before defibrillation. Using this technique, the

Safety guidelines for defibrillation

- Know your monitor/defibrillator.
- Know where the defibrillation cables and pads are kept.
- Use hands-free defibrillator pads whenever possible.
- Make sure defibrillator pads are fully in contact with the patient’s bare chest.
- The pad marked “sternum” should be below the right clavicle in the midclavicular line (right anterior chest wall position).
- The pad marked “apex” should be placed between the fourth and fifth intercostal space on the left anterior axillary line (left axillary position).
- If necessary, pads may be placed anteriorly on the right side of the patient’s sternum and posteriorly below the left scapula and lateral to the spine.
- If the patient has an implanted pacemaker, position pads so that they’re not directly over the device.
- Don’t place pads on top of a transdermal medication patch. Remove the patch and wipe the area clean before applying a defibrillator pad.
- Ensure that oxygen flow isn’t directed across the patient’s chest.
- Announce “Charging defibrillator to (specified number of joules)” and press the defibrillator charge button.
- When the defibrillator is fully charged, announce “I am going to shock on three,” then count and announce “ALL CLEAR.” Chest compressions should continue until this announcement is made.
- After visually confirming all staff is clear of the patient and bed, press the defibrillator shock button.
- Immediately after the shock is delivered, resume CPR beginning with compressions.
- Make sure defibrillator supplies are restocked and the defibrillator is plugged into the wall outlet for recharging after code is complete.⁴

team leader gives the order, such as “defibrillate with 200 joules,” the defibrillator manager repeats, “Charging to 200 joules.” The defibrillator manager then announces the delivery of 200 joules after the shock is delivered. (See *Safety guidelines for defibrillation*.)

As soon as the shock is delivered, resume chest compressions immediately; don’t delay resumption of chest compressions to recheck the rhythm or pulse. Even resumption of a normal heart rhythm won’t initially produce enough cardiac output for adequate perfusion, so CPR should continue.⁵ After about 5 cycles of CPR (about 2 minutes), ending with compressions, the cardiac rhythm should be checked during the change of compressor roles. If an organized electrical rhythm is present, check for return of spontaneous circulation (ROSC) by checking the carotid pulse.

Crash cart manager

Most units have a crash cart or code cart available for use in resuscitation. The crash cart contains emergency medications and equipment, such as a monitor/defibrillator or AED and airway adjuncts.

ACLS guidelines support early administration of vasopressors in cardiac arrest, but medications are secondary to high-quality CPR and rapid defibrillation, when indicated.⁵ Use caution when administration of medications during a code blue; miscommunication is a common problem leading to administration of incorrect medications or doses during codes.¹⁰ One way to prevent miscommunication is using “closed loop” communication, as described earlier. (This method should be used for every intervention during a code, not just medication administration.) For example, the nurse who receives an order to administer a medication repeats the medication name and

dosage out loud before administering it and then announces the medication name and dosage again after it's been given.⁵ It's also helpful if crash carts are stocked consistently across the facility. For example, all the I.V. epinephrine should be located in the same drawer of all the crash carts in the facility.

The crash cart manager should be positioned on the same side as the patient's venous access and have room to open the crash cart drawers for easy access to the contents.

Code team leader

The code team leader directs resuscitation efforts, communicates with all team members, and monitors the patient's cardiac rhythm. The code team leader needs to be in a position to effectively observe all aspects of the resuscitation efforts. This role may be taken by a physician or an advanced care provider.

Because most patient rooms are relatively small, especially those with two patient beds, it's essential to manage the space in the room. This may involve moving furniture or temporarily moving a patient's roommate to another room. Some people who respond with the intention of helping may not find a role that needs to be filled. In this case, the code team

leader may direct them to wait outside the room until further help is needed, help move the patient's roommate, or check on other patients on the unit who may need assistance.

In many institutions, policy allows family presence during resuscitation efforts; if so, family should be offered the option of being in the room with a staff support person. If no policy exists or families don't wish to be present, they should be directed to a private waiting area. A staff support person should be available to stay with the family and serve as a liaison between medical personnel and the family until a patient disposition is determined.¹¹

The recorder

The recorder documents the entire resuscitation process. Documentation during a code blue differs from facility to facility. Different electronic health record systems have specific methods for code documentation.

During the code, the recorder reminds the code team leader every 2 minutes when it's time for a compressor role switch and the time, name, and dose of the last medication administered. It's also important for the recorder to document the cardiac rhythm before a shock is delivered and that compressions were immedi-

ately resumed after the shock. The recorder also notes that 100% oxygen is being delivered and that the patient has good rise and fall of the chest with ventilations. Assessment findings such as end-tidal CO₂ values should be recorded. Print cardiac rhythm strips or the code summary from the monitor/defibrillator for the patient's medical record. Clearly identify all documentation with the patient's name, date of birth, medical record number, and date and time. Note the time that resuscitation efforts were discontinued, patient disposition, and time of death if applicable.⁹

Postcode care

Nurses need to prepare to transfer the patient for further stabilization or treatment. If the arrest was due to cardiac causes, the patient may be taken to the cardiac catheterization lab (if the facility has one) or to the ICU. Attach the monitor/defibrillator and continuously monitor the cardiac rhythm during transfer to the designated unit. Someone who can effectively manage the airway should also accompany the team transferring the patient. Handoff of care communication should follow established facility policy and procedure.

Patient care considerations include optimizing ventilation, oxygenation, and BP to maintain vital organ perfusion. Patients may require an I.V. vasopressor such as epinephrine, dopamine, or norepinephrine to obtain and maintain a systolic BP of at least 90 mm Hg. To optimize neurologic function and improve the chance of survival to hospital discharge, therapeutic hypothermia may be considered for patients with ROSC who are unresponsive.⁵ The pastoral care team, nursing supervisor, or charge nurse may need to contact the family if they weren't present at the time of the arrest and inform them about the change in the patient's clinical status.

Postcode debriefing

At a convenient time after the code, staff should gather for a debriefing

Reviewing mock code skills

- Initiate the code blue per facility policy.
- Start CPR (one- and two-person rescuer).
- Position the bag-mask device and attach it to oxygen.
- Place the backboard.
- Bring the crash cart to the room.
- Arrange the room for best patient and crash cart access.
- Locate supplies and equipment on the crash cart.
- Attach ECG leads.
- Attach defibrillation pads.
- Charge the defibrillator and defibrillate.
- Administer medications.
- Set up equipment for intubation (endotracheal tube, stylet, laryngoscope, suction).
- Set up continuous waveform capnography.
- Assume various roles.
- Coordinate the code.
- Collaborate with other healthcare team members (respiratory therapist, physician, anesthesia provider, pharmacist, patient care technicians).^{3,5,6,11}

session to discuss the code. Participants should be careful not to criticize each other's performance but rather provide an objective review of things that went well and things that could be improved. Newer staff members may find their first code distressing, so provide support as needed. Areas for improvement are ideal topics for staff education.

Maintaining knowledge and skills

A challenge for nurses is maintaining resuscitation skills, especially if they work on a unit where codes rarely occur. Participating in mock codes, reviewing crash cart contents, practicing setting up equipment, and attending staff development workshops related to resuscitation can help staff maintain knowledge and skills. Static or high-fidelity manikins can be used for mock codes to provide realism. Before participating in mock codes, nurses should prepare by reviewing CPR skills, facility policies, equipment, and medica-

tions. This can be done through self-study modules or by attending review sessions offered by staff educators. (See *Reviewing mock code skills*.)

A successful code

Recognizing that you'll care for patients who experience cardiopulmonary arrest, it's important to know the expected roles and responsibilities during a code blue. Nurses need to understand the multifaceted aspects of providing care during and after a code blue as well as the importance of maintaining their resuscitation skills to provide patients with a better chance for survival. ■

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The authors and planners have disclosed no potential conflicts of interest, financial or otherwise.

DOI-10.1097/01.NURSE.0000463651.10166.db

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