CODE BLEU : QUE FAIRE?

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RÉSUMÉ

L'arrêt cardiaque peut survenir à tout moment d'une cirurgie. L'objectif de cet article est de permettre au lecteur de reconnaître et participer à la gestion d'un arrêt cardiaque peropératoire. Les patients à risque d'arrêt cardiaque peropératoire et plusieurs différents types d'arythmie sans pouls sont identifiés. Les rôles que peuvent assumer le personnel périopératoire ainsi que la démarche pour noter l'événement sont également traités.

Les normes de l'AIISOC relatives à cet article se trouvent dans les *Normes de pratique recommandées, lignes directrices et énoncés de position pour la pratique en soins infirmiers périopératoires (8e édition)* de l'Association des infirmières et infirmiers de salle d'opération du Canada (AIISOC) (2007), module 4, page 41, norme 8.3.

CODE BLUE: WHAT TO DO?

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ABSTRACT

Cardiac arrest may occur intraoperatively at any time. The purpose of this article is to help the reader recognize and assist in the management of an intraoperative cardiac arrest. Patients who are at risk for cardiac arrest in the OR are identified and different types of pulseless arrythmias are identified. Roles of perioperative personnel are suggested and documentation during the code is discussed.

Introduction:

Cardiac arrest may occur in the OR at any time. Many intraoperative situations put the patient at an increased risk for cardiopulmonary arrest. Occurrences such as vagal stimulation, hypoxia, anaphylaxis, and hypovolemia all place the patient at a higher risk for a cardiac event. In the OR, patients undergo many procedures including placement of invasive monitoring lines, endotracheal intubation, tissue manipulation, and sometimes prolonged hypothermia. Patients are, understandably, afraid of and apprehensive about their surgery. This anxiety also contributes to their risk for cardiac arrest. Many patients arrive in the OR with pre-existing risk factors such as cardiac disease, hypertension, coronary artery disease, congestive heart failure, arrhythmias or a history of angina. Risk of an intraoperative cardiac arrest is even greater for patients with these pre-existing factors.

In smaller health care facilities the perioperative role is to manage the cardiac arrest until a resuscitation team arrives. In larger facilities the resuscitation team often compromises personnel in the surgical suite. In both types of facilities perioperative personnel need to recognize and manage a code blue at its onset. The purpose of this paper is to help the reader recognize, and assist in the management of, an intraoperative cardiac arrest at its onset.

Defibrillation is discussed in association with a manually operated defibrillator and not an automatic external defibrillator (AED).

Recognizing Cardiac Arrhythmias:

The electrocardiogram (EKG) is used to monitor the precise sequence of electrical events in the cardiac cycle. The EKG monitor provides continuous information about the heart's *electrical activity* only. In order to determine if the heart is actually beating in response to this electrical activity, the patient's pulse needs to be monitored. In a code situation, the best way to ensure the heart is actually beating in response to its electrical activity is to *palpate for a pulse.*

There are several arrythmias which indicate a cardiac arrest:

1. Asystole refers to the total absence of ventricular activity. Some activity may be

occurring in the atria, but there are no electrical impulses conducted to the ventricles, and as a result there is no cardiac output. The EKG waveform is almost a flat line. Asystole is associated with a low rate of survival unless the cause is reversed immediately.[1]

2. Ventricular Fibrillation (VF) is a chaotic pattern of electrical activity in the ventricles. Electrical impulses may arise from many different foci. The ventricles quiver and produce no effective ventricular contraction and no cardiac output. Ventricular fibrillation is a very treatable rhythm when treated immediately with defibrillation.[2]

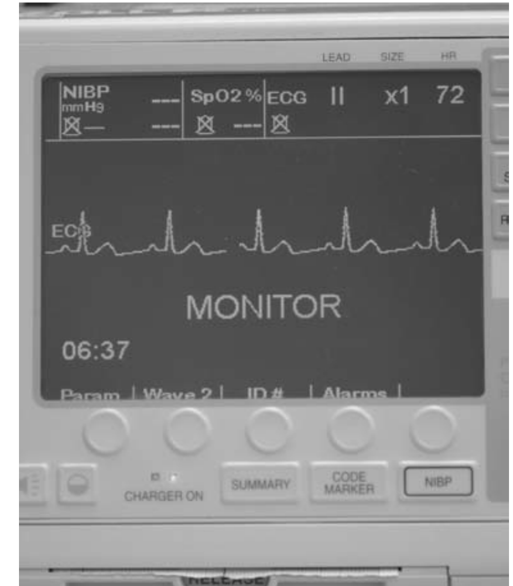
3. Pulseless Ventricular Tachycardia (VT) is a rapid tachycardia (160-250 beats/minute) where the ventricles are contracting too rapidly to allow blood to enter from the atrium. As a result, blood is not circulated. VT can be monomorphic, where the electrical impulse arises from the same origin, or polymorphic, where the sites of impulse origin changes. Pulseless VT is also a very treatable rhythm, and is managed in the same manner as VF.[1]

4. Pulseless Electrical Activity (PEA) is isolated electrical activity in the heart which occurs sporadically. The ventricles do not contract in response. The EKG monitor will show electrical activity, but the patient's heart is not beating. PEA is commonly caused by clinical conditions that can be reversed if quickly identified.[1]

All Cardiac Arrest Situations:

The anesthetist may choose to verify the rhythm in another lead along with checking lead and cable connections. No matter what rhythm is displayed on the EKG monitor, the presence of cardiac arrest is confirmed with a pulse check. In any cardiac arrest situation the following activities take place in the following order:

1. Call the code. In all intraoperative cardiac arrest situations, the very first thing to do is to *call the code*. This will ensure that help and the defibrillator arrive as quickly as possible. Effective time management is critical.



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PEA (pulseless electrical activity) may appear in any form, even normal sinus rhythm

2. Begin CPR. If the patient has no pulse, *begin CPR*. Effective and timely CPR improves survival rates. Consider ABCD, which represents airway, breathing and circulation, and defibrillation.[4]

A: In most intraoperative cardiac arrest situations the patient is intubated and on a ventilator, but this is not always the case. It may be necessary for the patient to be ventilated using a bag-valve-mask until an endotracheal tube or a laryngeal mask airway is inserted.

B: When breaths are given by bag-valve-mask, the rate is 2 breaths for every 30 chest compressions. Once an endotracheal tube or a laryngeal mask (advanced airway) is in place, breaths are given independently from compressions at a rate of one breath every 6 to 8 seconds.

C: In order to perform effective compressions, the patient must be in a supine position. There will be some situations where the patient will need to be re-positioned.

Many mattresses on OR beds will compress to allow effective cardiac compressions. In some situations, if the mattress is very thick, a cardiac

board will need to be positioned under the patient first.

The compressor needs to be positioned directly over the patient's chest in order to give effective compressions.[2] With the OR bed at its lowest, and with an adult patient lying on top of it, most compressors will need to climb on a standing platform to get the height required above the patient. Only deep compressions with full chest recoil will physically force blood out of the ventricles, and recoil creates the vacuum in the heart which will pull more blood in. Effective compressions ensure that oxygenated blood is circulated to the brain and that the coronary arteries continue to perfuse the heart muscle to keep it viable until other treatment can commence.

D: Defibrillation, when warranted, is initiated as soon as the defibrillator arrives. The earlier defibrillation begins, the greater the patient's chances of survival. The heart's electrical activity is transmitted to the defibrillator either via its own cardiac leads or via a synchronizing cable from the anesthetic machine's EKG system.

<u>Treatment</u>:

1. Asystole is easily recognizable on the EKG screen as a flat line. Because a flat line can also be observed if EKG leads become displaced, it is important to rule out equipment malfunction. One quick and effective way to do this is to *palpate for a pulse*.

Once asystole is confirmed, call the code and begin CPR. If your role is to assist the anesthetist with medications, draw up epinephrine, vasopressin and atropine.[4] Epinepherine and vasopressin will induce vasoconstriction and facilitate blood flow to the coronary and cerebral circulation during CPR. Atropine, among other effects, increases SA node automaticity.

Nursing staff often assist the anesthetist with medication administration. This is performed under the direct supervision of the anesthetist, or other physician, and is acceptable practice, in a cardiac arrest situation, in most facilities.

Transcutaneous or transvenous pacing may also be considered if drug therapy is not effective.

2. Ventricular Fibrillation (VF) is also an easily recognized rhythm on the EKG monitor because it has no pattern or regularity. The ventricles are quivering. Coarse fibrillation waves indicate more electrical energy in the ventricles than fine fibrillation waves. If VF continues it will eventually lead to ventricular asystole. The greater the amount of electrical energy in the ventricles, the greater the chance of successful defibrillation. Rule out equipment malfunction or artefact by *palpating for a pulse*. The anesthetist may also verify the rhythm in another lead.

Once VF is confirmed call the code and begin CPR. The only effective treatment for VF is early defibrillation. Shocks are followed by administration of epinephrine and/or vasopressin and antiarrhythmic drugs such as amiodarone or lidocaine, or magnesium sulfate early in the code.[5] After each shock *palpate for a pulse.*

3. Pulseless Ventricular Tachycardia (VT) demonstrates a regular and rapid ventricular rhythm. Monomorphic VT is more common than polymorphic VT. The atrial rhythm is unmeasurable in both the monomorphic and the polymorphic VT. Because of the short ventricular filling time, cardiac output is decreased and the patient has no pulse. Confirm pulseless VT by *palpating for a pulse*.

Treatment for pulseless VT is the same as it is for VF. Call the code, begin CPR and assist with defibrillation as soon as possible. Prepare epinephrine, vasopressin amiodarone and possibly lidocaine for administration early in the code.[5]

4. Pulseless Electrical Activity (PEA) will appear differently on the EKG monitor for each patient. The monitor will show some type of electrical

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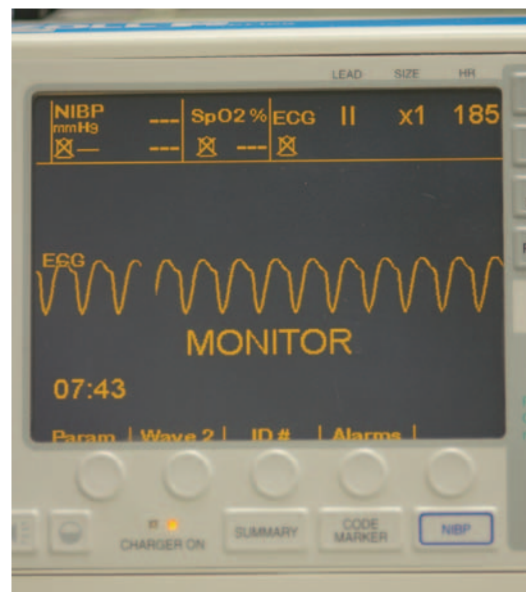
activity, other than VF or VT, but *the patient will have no pulse*. The first priority of treatment is to determine the underlying cause and to treat it quickly. Hypovolemia is the most common cause of PEA. Other causes include hypoxia, hypothermia, hyperkalemia, drug overdoses, tension pneumothorax, and acidosis.

When a cardiac arrest is confirmed, call the code and begin CPR. Prepare drugs such as epinephrine, vasopressin and atropine for administration at the beginning of the code.[9] Other medications will be required depending on the cause of the PEA arrest. Assist the anesthetist in treating the cause and continue to *palpate for a pulse* every couple of minutes.

PEA is the most common rhythm following defibrillation.[5]

Routes of Access for Drugs:

Drugs are often given intraoperatively via the intravenous (IV) or endotracheal (ET) route. New research has reprioritized these access routes.[5] ET absorption of drugs is inefficient and optimal drug dosage, if administered via this route, is not known. When IV access is unavailable, the intraosseous (IO) route is recommended.[5] Prioritization of drug administration routes are now IV first, then IO and, lastly, the ET route.



Ventricular tachycardia appears as a regular and rapid ventricular rhythm

By/par J. Porteous

A peripheral IV is preferred for drug and fluid administration during a code blue situation. Attempting to insert a central line while performing effective CPR is very difficult and the risk of complications is high.

If a drug is given by the peripheral venous route it is usually done so via bolus injection and followed by a 20mL bolus of IV fluid. Elevation of the extremity for 10-20 seconds facilitates circulation of the drug.

Intraosseous cannulation provides safe and rapid access to a non-collapsible route for drugs, blood, etc. The technique utilizes a rigid needle, preferably one designed specifically for intraosseous access, which is loaded onto an insertion device.

The endotracheal route is the least preferable route for drug administration because optimal drug dosages are not known and typical doses are 2 to 2.5 times the IV dosage. Epinepherine, vasopressin, atropine and lidocaine may be given via the ET route. The drug is diluted in 10ml of water or saline and injected directly into the trachea.

Roles of Theatre Personnel:

During a code blue, team members must act quickly and efficiently. One option for role assignment of theatre personnel at the beginning of a code is as follows:[3]

1. Director of the Code: Often the anesthetist will direct the intraoperative code.
- a. Confirm the code;
- b. Direct interventions such as medication administration and defibrillation; and
- c. Initiate the insertion of monitoring lines and IV access, if not already available.

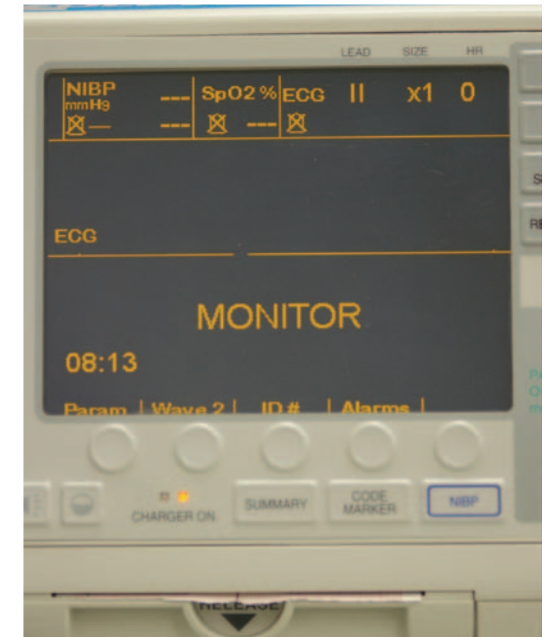
2. Circulating Nurse #1:
- a. Initiate the code;
- b. Activat the code alarm system which will call for cardiac arrest supplies;

- c. Help to reposition the patient if required;
- d. Ensure CPR is initiated and find the compressor a platform on which to stand. This helps to assure forceful downward compressions;
- e. Ensure a clear entry route for the code supply cart;
- f. Connect the defibrillator either to the anesthetic machine with a synchronizing cable or to the patient with cardiac leads;
- g. Prepare necessary equipment;
- h. Control traffic;
- i. Give the scrub team supplies as needed; and
- j. Maintain counts, blood loss measurements, documentation of personnel involved, etc .

3. Circulating Nurse #2:
- a. Assist the anesthetist;
- b. Prepares and assists with medication administration as required;
- c. Assist with intravascular line insertions; and
- d. Document medications and procedures performed. In an ideal situation a third circulating Nurse would be available to handle only the documentation, but if not this task would fall to Circulating Nurse #2.

4. Scrub Nurse:
- a. Protect the integrity of the sterile field;
- b. If the patient needs to be re-positioned for CPR the Scrub Nurse would cover the incision with a sterile drape;
- c. Keep track of all counted items;
- d. Keep all unnecessary instruments off the sterile field;
- e. Attend to the needs of the surgical team; and
- f. Perform closing counts as required.

5. Surgeon:
- a. Treat the cause of the arrest as required;
- b. Control bleeding, reduce vagal stimulation if caused by retractors, etc;
- c. Perform chest compressions on the sterile field; and
- d. Perform internal defibrillation if necessary.



Pattern for asystole shows a total absence of ventricular activity

By/par J. Porteous

6. Charge Nurse:
- a. Support the team as required;
- b. Assist and assign personnel to assist when necessary; and
- c. Alert other disciplines, such as radiology, as needed.

Documentation:

ORNAC's guidelines for documentation during a Code Blue situation include the following:
- Time of arrest;
- Time the code was called;
- Time of arrival of code members;
- Time CPR was initiated and by whom;
- Times of medication administration and dosages;
- Names of individuals administering medications;
- Times and types of Infusions and Transfusions; and
- Patient outcome.[6]

One should also document the times, power settings (joules) and outcomes of all defibrillation attempts. An Occurrence Report should also be completed for any cardiac arrest.

After the Code:

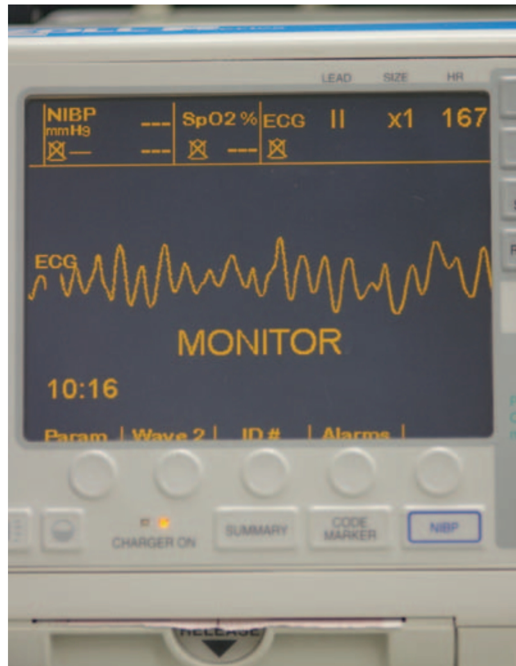
If the patient's condition becomes stable, he or she is then transferred to a critical care unit, and care is administered depending on the cause and duration of the arrest. In other situations resuscitation attempts may be discontinued depending on cerebral and cardiovascular status. The patient's family are notified of the patient's condition and the plan for postoperative care by the surgeon. If the patient did not survive the code, the surgeon will meet with the family. The nursing and anaesthesia members of the code team also often assist and support family members of the deceased patient in the immediate postoperative period. Clergy and supervisory/administrative personnel may also become involved.

Following a code, it is important to acknowledge the efforts of team members and to immediately re-stock supplies and re-test defibrillators. Some OR departments organize a cardiac arrest process review involving the anesthetist, nurses and surgeon. The experiences and documentation are reviewed and discussed to identify what worked well, any processes requiring improvement, and needs for future education.

Conclusion:

As with everything, practice makes perfect. Mock intraoperative codes provide excellent learning opportunities for OR personnel. A formal debriefing process, following each code, allows for the discussion of events and the opportunity to improve practice. The efficiency of the chain of events that occur during an intraoperative cardiac arrest plays a crucial role in patient survival. The importance of recognizing preoperative risks, being familiar with basic drug therapies and the operation of defibrillators cannot be overemphasized. In the event of a cardiac arrest, **everyone should know what to do**.

ORNAC Standards pertaining to this article can be found in the Operating Room Nurses Association of Canada (2007) (ORNAC). *Recommended Standards, Guidelines, and Position Statements for Perioperative Registered Nursing Practice* (8th edition). In Module 4, p. 41, Standard 8.3.



By/par J. Porteous

Ventricular fibrillation rhythm has no pattern or regularity

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