



Additional information to accompany presentations

**PACU Learning and Teaching Resource
CIRCULATION : MANAGEMENT**

©BARNA.2022

Presentation : Circulation management

Introduction

- The overall plan of management for CVS in PACU must be to ensure that CVS is efficient to deliver blood and nutrients to tissues, and to transport waste products away from the tissues for elimination.
- An understanding of the risks of anaesthesia, surgery, patient factors are vital in pre-empting complications. If complications occur, intervention must be swift and appropriate. As ever, management depends on accurate observation, swift and appropriate intervention and then re-assessment and so on. Hypovolaemia is a common reason for hypotension in the PACU and often fluid resuscitation is the appropriate treatment – however, it should not be assumed always to be the case or to be a single factor in hypotension. Logical analysis of the many factors which may contribute to hypotension together with their physical and monitored signs should always be ongoing. Clinical status may change rapidly, sometimes one treats first and analyses later.
- We will first examine routine CVS management for the ‘normal’ patient – ie. one whose journey through PACU presents no red flags or cardiovascular challenges but whose CVS function must always be optimised.

Routine CVS management

- On patient arrival : immediate assessment of airway, breathing and circulation.
- **Cardiovascular assessment** : immediate estimation of CVS status, feel peripheries, check the HR from pulse oximeter which will be set up immediately, observe patient colour. All this information gained prior to obtaining a blood pressure.

- **Anaesthetic, surgical handover** : this will confirm patient's status intraoperatively, fluid status, any major problems or cardiac history to note. Parameters for fluid administration should be handed over at this stage if needed. Surgical handover will advise on wound, dressing, possible fluid loss. While this is ongoing, the patient is attached to all monitoring, lines, ECG monitored, drains and catheter secured.

Full assessment – patient care planning : completed when patient set up and nurse is satisfied with anaesthetic handover. The physical assessment will reveal the patient's clinical status. A risk appraisal, using the anaesthetic chart for intra operative information will inform the critical assessment & the patient care plan. For the young, fit patient undergoing surgery with minimal fluid loss or potential for pain, the risk of circulatory disturbance is minimal. Homeostatic mechanisms to counterbalance the effects of anaesthetic agents on the CVS will kick in fast. For the aged cardiac patient undergoing complex surgery, understanding the risks will alert the nurse to ensure they do not become complications : careful fluid therapy to restore any deficit, and gradually warm and perfuse the peripheries without stress the heart. Judicious pain management to ensure pain and stress again reduce sympathetic stimulation to the heart muscle.

- **Airway** : Breathing : always first priorities in care
- Regular observation of **vital signs** every 10 – 15 minutes.
- **Position** – once the patient is awake and airway intact – position in semi Fowlers position when able. Avoid sudden changes of movement [sitting up too fast / putting patient head down] this may destabilise the circulation as autonomic receptors which control vasodilation and constriction are blunted following GA.
- **Oxygen** : all patients receive oxygen post operatively. This helps to eliminate anaesthetic agents, offsets Nitrous Oxide displacement of oxygen and boosts respiratory, cardio vascular function, ensuing tissues receive enough oxygen.

- **Fluid management** is a mainstay of treatment. Many patients are underfilled [even if they sustain no surgical blood or clear fluid loss]. Starvation, and vasodilation can leave vessels underfilled. Ensure that fluid balance is managed – losses noted, drains marked and measured regularly. All drains should be marked and regular inspection of drainage notes. Similarly wound dressings need to be observed regularly for signs of fluid loss.
- **Thermoregulation** : Warming blanket in situ : patient should have been warmed intraoperatively to ensure perfusion to toes. This should be continued in the PACU. If patient peripherally constricted, warm and fill gradually until all vessels are open to patient warm to toes.
- **Pain controlled** with regular analgesia and reassurance to allay both pain and anxiety. patient combination of drugs / techniques. Patient comfort assured, reassurance given.
- The patient may be returned to the ward as soon as criteria for discharge have been met. For the circulation, this means that their cardio-vascular status is stable, they are warm and well perfused, orientated, passing good hourly volume of urine.

We will now examine the management of hypertension followed by hypotension, two commonly encountered problems in the PACU.

Cardiovascular complications

Hypertension

- If the patient is hypertensive, check the preoperative BP. Has the patient a history of hypertension? Is he on anti-hypertensive medication? When was it last taken? Does he need a dose now? What were the trends for BP and HR during the procedure? What is his fluid balance? Is he overfilled? Is he in pain? Has he got discomfort? Full bladder? Is

hypothermia contributing to hypertension? Hyperglycaemia? Hypoxia? Has he had vasopressors intraoperatively? These factors need to be investigated and corrected wherever possible with anaesthetic supervision.

- If correction of the cause settles the patient and the BP falls that is a good outcome. If the BP does not settle however, anti-hypertensive medication must be given : B Blockers, Ca antagonists, vasodilators, ACE inhibitors. There are a variety of drugs suitable to treat this condition. The patient should be supervised to assess whether the drug has been effective.
- If hypertension is acute with a systolic greater than 180 and diastolic above 105 mmHg associated with tachycardia and recurrent ventricular ectopic beats, these are sinister signs of cardiac instability. An elevated diastolic, denotes increased resistance to stroke volume. Tachycardia places huge demands on the heart's oxygen supplies. The heart muscle will quickly tire. If the patient has a history of cardiac disease, he is at great risk of cardiac incident. Pain and anxiety release sympathetic nerve activity and increase the heart rate. Overfilling again will increase venous return and the fluid the heart has to pump round. All possible contributory reasons for this status must be corrected, anti-hypertensive and analgesia medication given. Fluids administered according to parameters set by the anaesthetist. A 12 lead ECG will confirm any cardiac changes. Any signs of ischaemia, should be treated with glyceryl trinitrate given sub-lingually.

Hypotension is a common post operative complication. May be caused primarily by any one of these factors

1. Residual hypotension : anaesthetic cocktail

Residual hypotension is caused by the cocktail of drugs, and agents given in GA. Volatiles, opioids and anaesthetic drugs can depress the myocardial contractility and cause vasodilation. If the patient is underfilled these factors become more important. However, if the pressure is settling around 90/100 systolic and steady and the patient is alert, pink, well perfused, then no active treatment is needed. Patient just needs time for normal CVS homeostasis to return.

2. Bradycardia/arrhythmia

Arrhythmias, tachy and bradycardia are common in perianaesthetic practice. The ECG will reveal this. Is the arrhythmia compromising the BP? Tachycardia is often associated with pain, anxiety and discomfort so ensure that these are corrected. If associated with fluid loss, give fluids. Bradycardia may be due to increased vagal tone. Neostigmine causes bradycardia and must be given with glycopyrrolate was this given, is another dose needed? This is easily corrected. Is bradycardia due to Beta Blockade or is the patient young fit, with a normal HR of 40 needing no treatment? The appearance of multiple ventricular ectopic beats must alert the nurse that the myocardium is unstable. This may be due to hypoxia, or K⁺ imbalance. Both should be investigated.

3. Hypovolaemia

There are many contributory factors here. Was the patient starved over many hours? What surgery was performed, did it involve excessive fluid loss? Has this been replaced? Check intra-operative fluid balance and patient history. Are drains in situ and are they actively draining? Is the dressing dry or still oozing? Is there a naso-gastric tube in situ draining? Has regional anaesthesia been employed with residual vasodilation? Does the patient need more filling? Fluid resuscitation is carried out under the anaesthetist's directions. Continuous monitoring of signs to evaluate the effect of intervention is essential. The patient should be kept supine, warm and receive oxygen.

4. Regional : epidural / spinal

Check details of regional techniques employed : often a spinal or an epidural are given with GA with associated vasodilation. Any patient who has received regional blockage must have an intra venous infusion in place. The question must be asked as to whether fluid regimen is successfully filling dilated vessels here. Sometimes a vasopressor i.e. epinephrine is needed. Check efficacy – it may need repeating. Care with positioning of spinal, epidural patients.

5. Cardiac event

If no reason from the above list can be found for continued hypotension, question whether the patient has sustained a cardiac event. Consider the patient's previous medical history and age. Injury can be silent and pain free. The patient

may appear stable with moderate hypotension for which no other cause can be found. At the other extreme the patient may develop cardiogenic shock, peripheral shut down, left ventricular failure with pulmonary oedema and fading levels of consciousness.

In both extremes urgent investigation of cardiac status must be sought. A 12 lead ECG and bloods should be taken for cardiac enzymes. ABG's should be taken. Check the ECG for signs of myocardial strain – raised ST segments – or 'q' waves indicate infarction. In the extreme example the patient may require urgent ventilation and immediate transfer to ICU. The standard treatment for cardiac incidents such as these is to deliver optimal levels of oxygen, diuretics to off load fluid. Diamorphine will analgesia and rest the heart muscle. Inotropic support may be needed to boost contractility, reduce afterload and rest the work of the heart. The patient will be transferred to HDU or coronary care unit.

When should hypotension be treated? As a general rule, if the BP is less than 20% of preoperative value, then treatment for any of the above situations is indicated. Again, this depends also on physical signs and risk analysis.



Trainer's notes on power point presentations

Circulation : Management

©BARNA.2022

Management Presentation

Sides 3-4 : A revision of the anaesthetic and surgical factors that cause cardiovascular problems in the PACU. A reminder of the multiple factors that can impact on the cardio vascular system. These should be very familiar by now.

5-6 : First we examine what the routine management is for the circulation in a normal recovery. Note the importance of checking for risk factors and including them into the nursing care plan. Again stress how important it is to make full use of the anaesthetic chart. Even when the patient circulation appears stable, be ever vigilant for the small changes in vital signs that may lead to complications. The presentation will now focus on the two common cardio-vascular complications in the PACU – hyper and hypotension.

8 : Hypertension. There are many reasons, factors which cause, or contribute to hypertension. Some are well known [pain anxiety], some more obscure [hypoglycaemia, CO₂ retention]. It helps to start off with an understanding of these factors which will inform the management of this condition.

9: What is hypertension – a guideline here is 20% above preoperative BP. This is a useful guide as it acknowledges individual differences in BP. The dangers of hypertension are also listed here.

10: There are again some definitive guidelines on when this condition needs treating, essential to inform decision making.

11-12: Establishing and treating the cause of hypertension is the mainstay of treatment without or before introducing anti-hypertensive drug therapy.

13: Intractable hypertension exists when no cause for hypertension has been found. Use of anti-hypertensive drugs is usually fast and efficient.

14: Hypotension : there are many reasons for hypotension in the post anaesthetic period. To make this easier to understand, 5 main causes of post anaesthetic hypotension have been listed and will be worked through.

15-16: Demonstrates the continuum of hypotension from mild to severe, when the patient is in shock.

17: No matter what the specific cause, these classic interventions are common to all conditions.

18: A reminder about the function of the circulation to deliver oxygen to tissue cells. Cardiac output is essential, along with the other factors listed, in oxygen delivery to the tissues.

19: A useful slide which gives clear indicators of when to intervene to treat hypotension.

21: Lists the 5 major reasons for hypotension in post operative care. This analysis will help students to analyse possible reasons for this common condition without jumping to the usual conclusion that the patient needs more fluids.

22: Residual mild hypotension : due to mix of anaesthetic drugs. The treatment is to wait and see until the cocktail wears off. Patient may need some fluid before return to the ward but often sent to the ward to complete the return to full circulatory homeostasis.

23-24 : Arrhythmias are common in post anaesthesia and can compromise blood pressure. Tachycardia is common and may be caused by pain, anxiety, hypovolaemia or a mixture of the three. Careful assessment is needed here to eliminate possible causation factors. A classic arrhythmia is bradycardia often associated with administration of Neostigmine and

may require an extra dose of atropine to restore rate. The question that must always be asked is whether the arrhythmia is compromising the circulation. Refer to the anaesthetist for guidance on treatment.

25: Regional anaesthesia : spinal and epidural cause vasodilation. This is a well understood risk and treated with fluid and vasopressors. Intra venous infusion should be in situ for these patients routinely.

26: This slide is a general guide to hypovolaemic hypotension which is common and caused by many medical and surgical factors listed here. All should be familiar by now. Again, the risk to those already with cardiac disease is evident. The next slides consider mild, then severe hypovolaemia in turn.

27 : Mild hypovolaemia is considered first. Look for the small signs [increase in HR] before the fall in BP. Early fluid management will prevent this condition from deteriorating.

28-30: Severe hypovolaemia – here the signs are clear that peripheral vasoconstriction has set in, shock is established. The respiratory system tries to compensate to meet the tissue demands for oxygen. Urine output is decreasing, patient appears confused, disorientated. Fall in BP can be a late sign.

31: Management guidelines are specific for acute hypovolaemia – oxygen, fluids strict observation of input and output, keep patient warm – if hypovolaemia due to surgical cause – the surgeon must be summoned and the patient returned to theatre.

32: A quick check list identifying how to check for excessive bleeding for these surgeries with potential for excess blood loss.

33-34 : Cardiac event. Can be difficult to diagnose – it is usually the last reason for hypotension to be considered. Nevertheless, a silent MI is a real possibility especially for the high risk patient. Depending on the severity, the signs can

range from mild hypotension to shock. Whatever the severity this is an emergency and medical direction is needed. The heart must be rested, diamorphine is given IV and fluids restricted. Oxygen is administered and the patient may be intubated and ventilated and transferred to ICU or Coronary Care.

35-36 : Shock resembles the acute cardiac event, but can develop in any of the above categories for hypotension. Remember it can happen slowly. Always suspect the increased HR, RR. Keep a constant watch for peripheral perfusion and mental alertness.

36 : The key to avoiding circulatory complications is to be on the alert always for sudden swings in metabolism as the body slowly regains normal homeostasis. If you understand the science underpinning the circulation, together with complex assault on the cardio-vascular system evoked by surgery and anaesthesia this will greatly empower you to realise the risks and take steps to avoid them becoming complications.