

WARM HANDS WARM FEET



DETECTING DETERIORATION, EVALUATION, TREATMENT,
ESCALATION, AND COMMUNICATING IN TEAMS

2ND EDITION 2009

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AIM

The aim of this chapter is to equip you with some practical knowledge of cardiovascular physiology and shock; a simple approach to the clinical assessment of the cardiovascular system and causes of shock; knowledge of simple haemodynamic monitoring; and some simple treatment interventions.

<i>Early Warning Signs</i>	
Poor peripheral circulation	pH 7.2–7.3
SBP 80–100 mmHg	Base deficit –5 to –8 mmol/L
Pulse rate 40–49 or 121–140/min	C/O chest pain
SBP 181–240 mmHg	> Expected blood loss
Note of decreased urine output	New bleeding any site
Urine output <200 mL/8hrs	> Expected drain fluid loss
Alteration in mentation	SpO ₂ 90–95%

Table 9

<i>Late Warning Signs</i>	
* Cardiac arrest	* Unresponsive to verbal command
* SBP <80 mmHg	pH <7.2
* Pulse rate <40 or >140 bpm	Base Deficit <–8mmol/L
SBP >240 mmHg	* Failure to reverse variable within 1hr
Urine output < 200 mL/24 hours Anuric	Excess blood loss unable to be controlled by local staff
SpO ₂ <90%	

Table 10

*= Common MET call criteria

PRACTICAL PHYSIOLOGY

Adequate blood pressure is sufficient blood pressure to provide adequate perfusion. That is, an adequate organ blood flow to supply oxygen needs and remove toxic metabolites including CO₂. Inadequate blood flow to the organs to meet metabolic demands is called **SHOCK**. Under normal circumstances blood flow to important organs such as the brain and kidney is autoregulated. That is,

it stays constant in spite of changes in systemic blood pressure within a certain range. This helps to maintain oxygen supply over a range of systemic blood pressures. Outside that range organ blood flow is dependent on blood pressure (see Figure 2, below). The key goal is to provide adequate oxygen to the tissues but this is not a goal we can readily measure so we use surrogates.

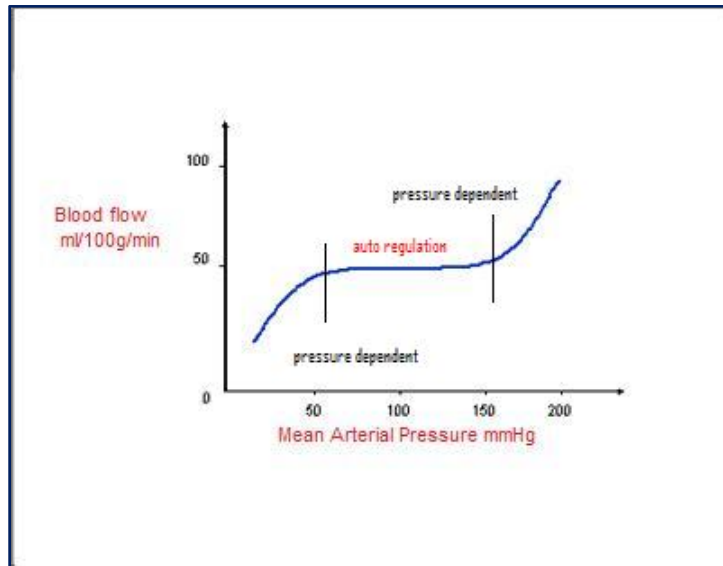
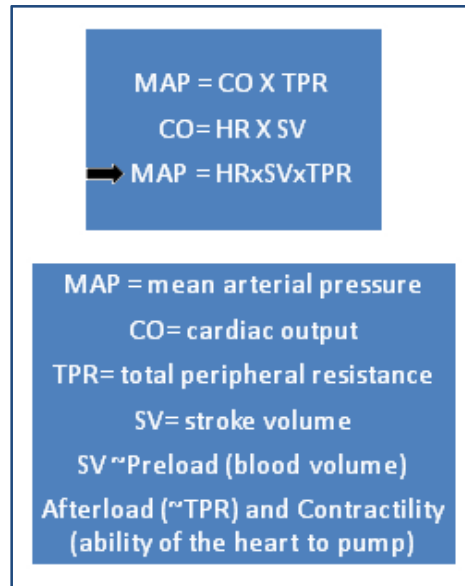


Figure 2: Auto Regulation Curve

Circulation of adequate blood supply to organs is essentially related to three things, the ability of the heart to pump, the capacity and state of the blood vessels, and the blood volume. Hypotension is related to abnormalities of one or all of these. These physiological relationships are summarised in the table below.



Essential Haemodynamic relationships

The majority of hypotension in hospital patients will be related to low blood volume. If the cause is cardiac failure or ischaemia or pulmonary embolism there will usually be associated signs: breathlessness, elevated JVP (Figure 3), peripheral reduced capillary refill or cold extremities, breathlessness, chest pain, abnormal pulse.



Virtually all patients without cardiac causes of low BP will benefit from a 500 mL fluid infusion over 20 minutes.

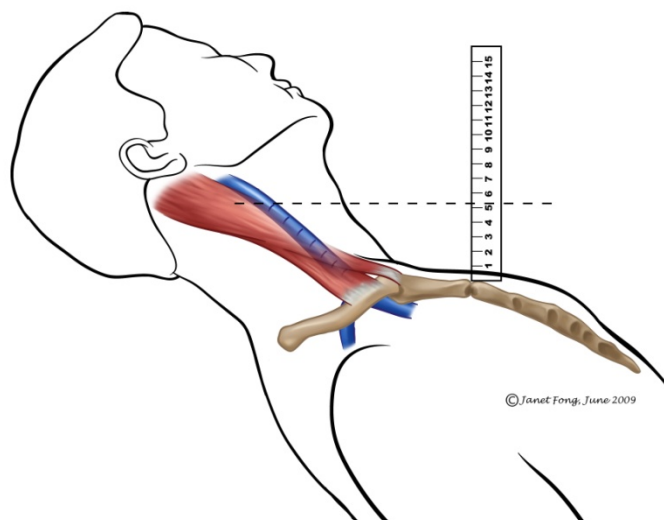


Figure 3: Measuring Jugular Venous Pressure

Low blood volume may not be associated with hypotension initially and early on the diastolic pressure may rise. Therefore blood pressure should not be your only surrogate indicator of oxygen supply to tissues. Use **repeated** clinical examination to assist you in working out the problem and the response to treatment. Confusion, agitation, tachycardia, cold extremities, poor capillary refill and low urine output may precede hypotension as signs of low blood volume. Poor peripheral perfusion with cool pale peripheries is associated with increased risk of death. Many other early and late warning signs of deterioration are relevant to assessment of **shock** and **hypotension** and are listed in the tables at the beginning of this chapter (Tables 9 and 10, p 42).

IMMEDIATE ACTION

- Check airway, breathing and conscious state
- Lie patient flat if not breathless
- Give oxygen
- Check for a radial pulse - is it strong or weak? Check pulse rate over 30 seconds.



If there is no palpable pulse and the patient is unconscious commence CPR and call a cardiac arrest.

ASK ABOUT SYMPTOMS AND EXAMINE YOUR PATIENT

The history gives important clues as to the cause of the hypotension.

- Is there pain in the chest? If yes, (especially radiated pain) send for the ECG machine.
- Has the patient had an operation? If yes, consider bleeding.
- Does the patient have a fever? If the temperature is not recorded, measure it. If fever is present, consider sepsis.
- Does the patient have vomiting or diarrhoea? Check the patient and fluid charts. If yes, hypovolaemia is likely.
- Has the patient received a drug or had a procedure recently? Consider drug reaction and anaphylaxis.
- Feel feet and knees. If the feet and knees are warm the cardiac output is nearly always OK.
- Check the capillary refill time (nail bed pressure for 5 seconds, refill should occur in 2 seconds).
- Check blood pressure manually if a manual device is available.
- If an IV is present check the site and if ok increase fluids making sure the bolus fluid line hasn't got additives, residual drugs, potassium, or piggy backed lines running. If there are additives, cease that infusion and use a plain (no additives) fluid bolus.

- Give a fluid bolus of 500 mL of crystalloid solution (e.g. 0.9% normal saline).
- Reduce bolus to 250 mL if you suspect cardiac failure and be prepared to repeat your fluid bolus and reassess.

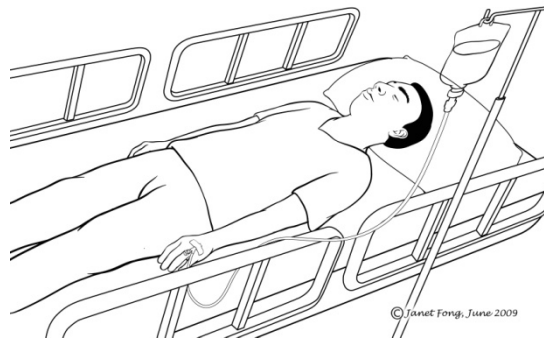
REVIEW THE CHARTS

- Hypotension developing over some time indicates fluid depletion or sepsis as likely causes. If onset is rapid a cardiac event or adverse drug reactions are more likely.
- Has the patient had a recent event, procedure (especially CVP or chest drain insertion), drugs, or operation? Think of complications related to these procedures that can cause hypotension and shock (e.g. pneumothorax, bleeding, anaphylaxis).
- Are there abnormal fluid losses? CHECK ALL DRAINS.



Call the Rapid Response Team

- Establish IV insertion as a priority.
- If possible, establish ECG and pulse oximeter monitoring.



Establish IV

DIAGNOSIS

Patients who have the right thing done should get better.

If they are not getting better is it:

- Ischaemia or infarction?
- Infection?
- Bowel obstruction?
- Bowel perforation?
- Thrombosis?

- f. Drugs?
- g. Something we have done?
- h. A problem with the operation?
- i. Inadequate or incomplete history?

THINGS TO TELL THE RESPONDING TEAM

Use ISBAR Communication and include:

- Age and diagnosis
- Symptoms - slow onset or rapid onset
- Recent operation or medication
- Breathlessness
- Drains or abnormal losses
- Blood pressure measurement including tricks and traps
- Cold hands/ cold feet

A SIMPLE APPROACH TO ARRHYTHMIAS

- First Question = Is there a pulse?



If there is no pulse, call a **cardiac arrest** and institute CPR.

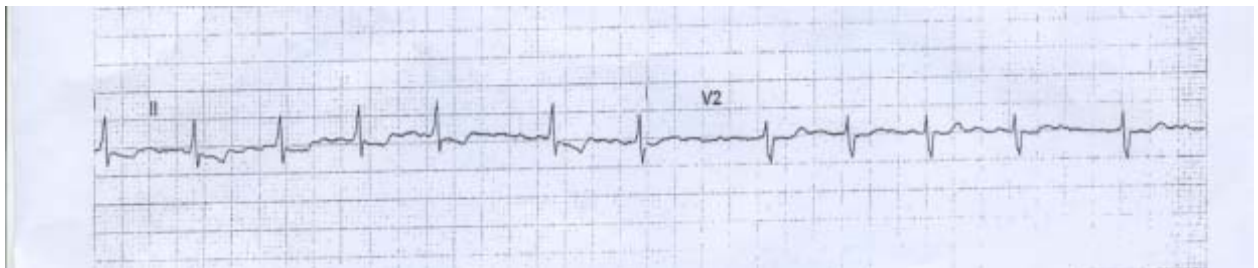
- Use the ABCDEFG algorithm, give oxygen, position the patient, and monitor ECG and blood pressure
- Is the pulse fast or slow?
- Regular or irregular?
- Are P-waves present?
- Are P-waves present for every QRS complex?
- Is the QRS normal or long?
- Check electrolytes urgently such as K⁺, Mg⁺⁺, PO₄₋₃, Ca⁺⁺, KH₂PO₄ acid-base
- Check volume status. Is it high or low?
- Could a drug have caused this arrhythmia?
- Which drugs should you use to treat? – Keep it simple and defend the blood pressure!

A detailed analysis of cardiac arrhythmias is beyond the scope of this programme.

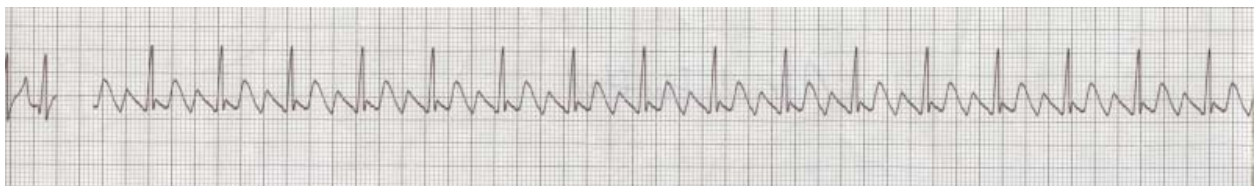
You should assess cardiac arrhythmias using the ABCDEFG algorithm and DETECT assessment and assess the physiological impact of the arrhythmia on the patient. The treatments break down to support of the airway, breathing and circulation with use of cardioversion or pacing and drugs, correction of metabolic and electrolyte abnormalities and fluid management.



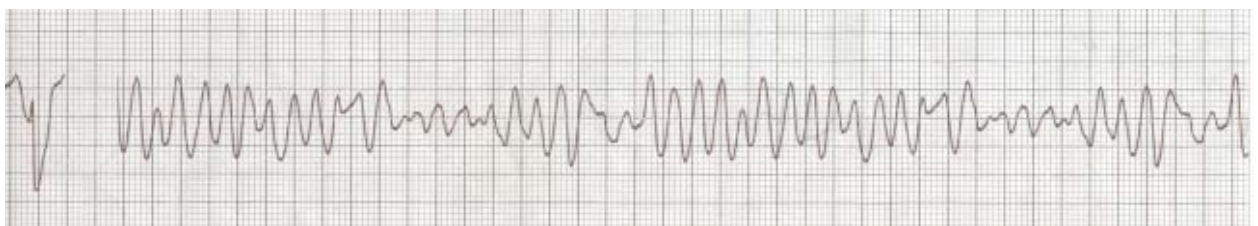
Sinus Tachycardia



Atrial Fibrillation



Atrial Flutter



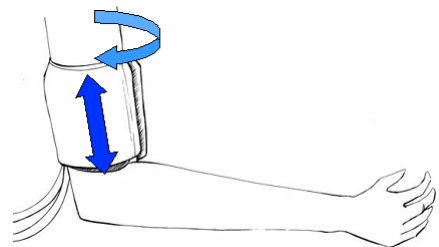
Ventricular Fibrillation

SPHYGMOMANOMETER CHECK

- Is mercury at zero?
- Are connections sound?
- Is cuff size appropriate? If the patient is normal adult size use 35 cm cuff, if a large adult size, use 42 cm cuff.
- Cuff width should be more than 40% arm circumference.
- Mercury should rise rapidly and fall smoothly.
- Arm is to be supported horizontally at the level of the heart.
- Position the cuff 2–3 cm above the brachial artery. Palpate the radial or brachial pulse until the pulse disappears.
- Listen over the brachial artery.
- Deflate slowly and smoothly.
- Systolic BP is at the first appearance of sounds.
- Diastolic is where the sounds disappear.

AUTOMATED NON-INVASIVE BLOOD PRESSURE MEASUREMENT

Automatic blood pressure machines are widely used in the wards. They should not detract from clinical assessment of your patient or completion of vital signs observations, e.g. the respiratory rate. They provide intermittent automated blood pressure and usually heart rate measurements. They are subject to inaccuracy, overestimating blood pressure at low pressures and underestimating at high blood pressures. Therefore it is wise to check blood pressure with a manual device. The more unstable your patient is the more likely these devices are to be inaccurate. Like the manual devices the width of the cuff should be 40% of the circumference of the arm and the length should be twice the arm circumference. Too narrow cuffs will overestimate and too wide will underestimate blood pressure. If the arm is lower than the heart the device will measure higher and if the device is above the heart, e.g. if the upper arm is in left lateral position, the device will underestimate the pressure.



Check blood pressure manually

KEY KNOWLEDGE AND SKILLS

- Develop a practical approach to assessment of the cardiovascular system.

- Describe the clinical features of shock.
- Be able to measure arterial blood pressure correctly using the manual method.
- Understand the limitations of automated blood pressure measurement.
- Have a simple approach to the diagnosis and management of arrhythmias.

CASE STUDIES

CASE 1

You are the ward nurse called to see a 70 year old man because he is complaining of dizziness. He had a transurethral prostatectomy yesterday. Outline your initial assessment including the questions you would ask him, and the observations you would do.

You check his blood pressure and find it to be 90 mmHg systolic and you notice his urinary catheter output has become more heavily blood stained. What simple treatment measure do you start yourself?

You call the ward resident to review the patient.

You are now the ward resident who has come to see this patient. Run through your assessment giving priorities, and outline some simple interventions you initiate. What instructions do you give the ward nurse who called you?

CASE 2

An 80 year old woman from a nursing home was admitted two days ago for an elective hip replacement tomorrow. She presses the call button because she is feeling hot and light-headed. She has had an intravenous catheter put in because of poor oral intake.

You are the ward nurse answering the call. Outline your initial assessment including the questions you would ask her and the observations you would do.

You notice the intravenous site is red and painful. You call the resident to replace it.

You are now the ward resident. The nurse informs you the patient has a temperature of 38 degrees, a heart rate of 100 and a blood pressure of 90 mmHg systolic. Do you replace the drip as requested and leave? What else should you do?