Arterial Blood Pressure Monitoring

Learning Module
## INDEX

<table>
<thead>
<tr>
<th>Contents</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td></td>
</tr>
<tr>
<td>Objectives</td>
<td></td>
</tr>
<tr>
<td>Introduction</td>
<td></td>
</tr>
<tr>
<td>Insertion</td>
<td></td>
</tr>
<tr>
<td>Insertion equipment &amp; procedure</td>
<td></td>
</tr>
<tr>
<td>Complications</td>
<td></td>
</tr>
<tr>
<td>Technical information</td>
<td></td>
</tr>
<tr>
<td>Zeroing the transducer</td>
<td></td>
</tr>
<tr>
<td>Phlebostatic axis</td>
<td></td>
</tr>
<tr>
<td>Your responsibilities</td>
<td></td>
</tr>
<tr>
<td>Flushing &amp; the square waveform</td>
<td></td>
</tr>
<tr>
<td>Waveforms &amp; the ECG trace</td>
<td></td>
</tr>
<tr>
<td>Troubleshooting</td>
<td></td>
</tr>
<tr>
<td>Arterial line blood sampling</td>
<td></td>
</tr>
<tr>
<td>Removal of the arterial line</td>
<td></td>
</tr>
<tr>
<td>Post-test</td>
<td></td>
</tr>
</tbody>
</table>
INTRODUCTION
Welcome to the learning module on Intra-arterial haemodynamic monitoring. Haemodynamic monitoring is a common occurrence in the critical care environment, therefore the nurse must have knowledge and skill to maximise optimal patient care and management. This module aims to introduce nurses to the fundamentals of arterial line management.

Please attempt all questions throughout the package as active participation encourages retention and aids learning.

OBJECTIVES
Nurses will be able to:

1. Safely and competently prepare for and assist the M.O with the insertion of an arterial line.

2. State a minimum of 4 common complications of arterial line monitoring.

3. Demonstrate knowledge of troubleshooting techniques.

4. Demonstrate knowledge of care and responsibilities of nursing an arterial line.
Arterial Blood Pressure Monitoring

Critically ill patients require close and constant monitoring so that changes in their condition can be detected early and treated. One way to closely monitor a patient’s physiological condition is to insert an intra-arterial line which monitors changes in blood pressure continuously.

One advantage to having an arterial line in situ is frequent blood tests can be taken without having to resort to phlebotomy or arterial stabs. There are also inherent risks to having an arterial line in situ; therefore the nurse must be knowledgeable and competent to maintain safe and effective use of this valuable monitoring tool.

Arterial blood pressure monitoring is an invasive system that is inserted into an artery and is therefore a reflection of the blood pressure that comes directly from the left ventricle. Arterial lines (Art lines) are able to capture a beat to beat measurement of systolic, diastolic and mean arterial blood pressures, which realistically gauges alterations in cardiac output and fluid volume.

Insertion

Arterial lines are usually inserted for two reasons; to accurately measure and monitor blood pressure on a beat to beat basis and secondly, to take frequent bloods/blood gases (Urden, Stacy & Lough 2014). It’s easy to see that it is important that the art line remains patent.

The decision to insert and the insertion of arterial lines are the domain of Medical Officers only. Nurses have the responsibility to set up and manage the art line.

Art lines are commonly inserted into the radial artery; however the femoral, brachial and the dorsalis pedis arteries can also be used. The radial artery is usually the preferred site as it is superficial, easily palpated, easily accessed and it doesn’t limit the patient’s mobility.

Before the cannula is inserted into the radial artery, adequate circulation to the hand via the ulnar artery needs to be assessed. The Medical Officer performs the ALLEN’s test. It’s a simple test where both the radial and ulnar arteries are occluded and the patient is asked to clench and unclench their hand several times until the hand is blanched. Pressure is released from the ulnar artery only and then the hand is observed for colour to return. If the hand remains blanched for longer than approximately 15 seconds, then the ulnar artery is insufficient to perfuse the hand and the radial artery will not be cannulated.

http://www.egymedicine.net/forumsx/t25516.html
Irrelevant to where the art line is inserted, the procedure is a sterile technique. ALL components of the art line set up are prepared taking care not to contaminate them. If you think you may have contaminated any part of the set up, please discard it. The connecting tubing/lines should be assembled and primed carefully prior to the cannula being inserted into the artery to prevent contamination and remove any air from the line and transducer. Failure to do this has the potential to be life threatening to the patient.

**Equipment**

- Sterile dressing pack + sterile gloves
- Skin prep (Chlorhexidine 2% or persist plus)
- Catheter/Cannula of choice: 20G Insite (long or short) or an Arrow Arterial Set, or a single lumen CVC / long line for femoral access
- 1 pkt of Steri-strips
- Opsite 3000®/tegaderm
- Consider Fixomull® / hyperfix (to tape around the edges of the opsite and to secure tubing)
- 500mL/1000mL IV bag of 0.9% Sodium Chloride
- Pressure bag/cuff
- Transducer monitoring set
- Monitor pressure cable connected to monitor
- Arm board
- Medical officer may request 1% lignocaine (+ 25G needle & syringe)

**Procedure**

1. Wash hands
2. Open the pressure transducer kit. Tighten connections either side of the transducer.
3. Check, label & date the 0.9% Sodium Chloride
4. Attach ‘arterial’ label near the transducer
5. Spike the bag using the transducer line & carefully prime the line. Be vigilant and expel ALL air bubbles. Remove the priming cap on access port of transducer and replace with non vented cap.
6. Insert flush bag into pressure bag, hang and inflate to 300mmHg
7. Connect pressure cable to monitor and transducer
   - Access the monitor and label the channel ‘arterial’ and check the scale/alarm limits
8. Open dressing pack, sterile equipment and dressings
   - Medical Officer inserts cannula into artery; assist M.O to connect transducer line to cannula- ensure connection is secure. Steri-strips are used to secure cannula & connection. The entire site is covered in Opsite.
9. Take the transducer line over the palm of the patient and pass it between the thumb and forefinger; bring the line back over and run it up the forearm
10. Use fixomull / hyperfix to secure around the edges of the Opsite and the transducer line

Reviewed 11/13
11. Secure the transducer itself, as near as the insertion site as practical
12. Secure the patient’s wrist in an extended position (wrist bent backwards) using the arm board.

13. **ZERO** the transducer *(NB see section ‘Zeroing the Transducer’)*

The waveform needs to look like this:

![Waveform Image]

**Flush bags are changed every 24hrs**

Arterial line transducer set & Flush bags are changed every 7 days. If a new arterial catheter is required earlier, a new fluid bag and transducer set must be prepared

<table>
<thead>
<tr>
<th>Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Haemorrhage/ Haematoma</strong></td>
</tr>
<tr>
<td><strong>Air Embolis</strong></td>
</tr>
</tbody>
</table>

(Urden et.al 2014)
### Infection - local/systemic

Assess the patient for signs of local or systemic infection e.g. fever, chills, localised redness/tenderness, swelling, heat, purulent discharge or pain. The patient is a risk of being exposed to potential pathogens during insertion, each time the art line is accessed and during dressing changes. Aseptic technique needs to be adhered to and wash your hands before accessing the lines.

### Thromboembolism / compromised circulation

The patient is also at risk of having a clot form around the cannula. This clot can break off and travel to any part of the body including the brain, heart, lungs or limbs. It is also recommended that the limb distal to the insertion site is checked regularly for colour, warmth, movement and sensation.

### Extravasation / Infiltration

The art line insertion site needs to be checked regularly (ideally hourly) for signs that fluid / blood isn’t collecting in the tissues around the insertion site.

Infiltration by Sodium Chloride
<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occlusion</td>
<td>This is evidenced by inaccurate readings, dampened waveforms and an inability to aspirate or flush the cannula. Occlusions are usually cause by the <strong>cannula being kinked or a thrombus</strong> (clot). The risk of this occurring can usually be mitigated by immobilising the limb/hand in an extension position (bend the wrist back and secure it to a padded arm board).</td>
</tr>
<tr>
<td>Medication Administration</td>
<td>Mixing the art line up with a peripherally inserted intravenous catheter and injecting medications is always a risk. Utilise the ‘Arterial line’ labels found in the transducer packaging to <strong>clearly label the art line near the transducer</strong> to mitigate the risk of inadvertent administration of medications into the artery. Know where your lines are and what is going into them.</td>
</tr>
<tr>
<td>Vasospasm</td>
<td>Arterial walls are smooth muscle and are therefore susceptible to contractions. Withdraw blood <strong>slowly</strong> when taking samples to reduce the possibility of this occurring.</td>
</tr>
<tr>
<td>Arterio-venous Fistula</td>
<td>It usually occurs when an artery and vein that are side-by-side are damaged, and the healing process results in the two becoming linked. The surrounding veins become bulging and discoloured.</td>
</tr>
<tr>
<td>False Aneurysm</td>
<td>Where the wall of the artery is injured and the blood is retained in the surrounding tissues; a pulsating fibrous sac communicating with the artery is eventually formed. (Also known as a pseudoaneurysm)</td>
</tr>
</tbody>
</table>
The technical information (briefly)

There are 4 parts to getting a physiological event, such as blood coming out of the heart, into something that is displayed on a monitor.

- A cannula is inserted into the artery of a patient.
- The cannula is connected to a fluid filled transducer.
- The transducer is connected to a cable that is plugged into a monitor.
- The monitor converts the signal it receives into a waveform that is displayed on the screen.

The transducer is primed and connected to a bag of Normal Saline (flush bag). The flush bag is kept in a pressure bag which has to be kept pumped up to 300mmHg. Check this regularly, usually 1-2 hourly. When the pressure bag is pumped to 300mmHg, it delivers about 3mL per hour to keep the line patent and prevents a backflow of blood into the line.

The flush bag plays a vital role in preserving the accuracy of arterial blood pressure readings by preserving the integrity of the transducer. The transducer is an external, disposable, fluid-air interface which detects changes of pressure in the artery. It is able to detect these pressure changes because there is a column of fluid between the blood in the artery and a diaphragm within the transducer. This diaphragm conveys the fluctuations in pressure to a silicon chip which, when amplified can be displayed on a monitor as an arterial waveform with the correlating blood pressure (Daily & Schroeder, 1995). Air bubbles and blood in the transducer alter this fluid filled column and therefore lead to inaccurate readings. To prevent this, the transducer has a quick flush mechanism which is connected to the pressure bag so that air bubbles and blood can be flushed out of the system via an exit port to ensure accurate readings. (Turner, K.)

To make sure the reading that appears on the monitor is accurate, two actions must be taken:

1. The transducer must be zeroed to atmospheric pressure
2. The transducer must be levelled at the phlebostatic axis

Zeroing the Transducer

This is done:
- On insertion,
- AT commencement of shift.

- Turn the stopcock on the transducer ‘OFF’ to the patient
- Open the access port to air
- Access the monitor, and ‘zero’. Check the ‘waveform’ is a flat line that is on ‘0’ on the scale.
- Turn tap back to open to the patient
- Cap access port

You should then see a waveform that looks like this:
Technically what you are looking at is the ejection phase of left ventricular systole. (Urden et.al 2014,)

When you zero the line you are negating atmospheric pressure, thus ensuring that the measurements reflect only those of the pressure in the ventricle. Essentially we are establishing that atmospheric pressure is zero and only monitor pressures that come directly from the heart.

**Phlebostatic Axis**

Transducers need to be zeroed AND levelled. Levelling the transducer to the phlebostatic axis gives the only accurate reading. Position the transducer too high and you get a false low reading or too low and changes in hydrostatic pressure mean that you will be documenting false high reading.

The phlebostatic axis is a physical reference point on the chest that is used as a baseline for consistent transducer height placement (Urden et. al 2014)

**Phlebostatic Axis: 4th intercostal space, mid axilla line.**

This point is approximately mid atria.

When a patient is supine and flat in bed, the transducer on their forearm is approximately where it needs to be. However when the patient is upright in bed, and the transducer is down the forearm, there is a discrepancy between phlebostatic axis and the transducer. Some pressure monitoring systems have long tubing between the patient and the transducer and the transducer is mounted to an IV pole. A spirit level is used to move the transducer up and down the IV pole as the patient (and the phlebostatic axis) moves.

If you don’t have long tubing and the patient is upright, move their arm until the transducer is near the phlebostatic axis, and document the blood pressure reading. The patient can put their arm down again, just be aware that the reading on the monitor is not absolutely accurate.
As you can see when the patient is sat upright, the phlebostatic axis moves with the patient. This is why it is important to level the transducer when zeroing or taking a reading. This principle is also used when Central Venous Pressure (CVP) monitoring is in use.

**Your Responsibilities**

- Educate the patient – care of, insertion etc
- Prepare the equipment & assist with insertion – secure cannula, line & wrist to arm board
- Check the waveform
- Set alarms and scale on monitor
- Level and zero: on insertion, at least once per shift & when the patient is positioned
- Check the limb distal to insertion for colour, warmth, movement & sensation 1-2 hourly (I put the SpO2 probe on that hand/limb. Good trace = perfused hand/limb)
- Check the insertion site hourly (see complications)
- Keep the cannula arm/site in view at all times
- Maintain aseptic technique when accessing the line or changing the dressing (make a note in the care plan to change the dressing every 7 days, or before if required)
- Check the accuracy of the reading against a non-invasive BP (allow for a disparity of between 5-20mmHg)
- Check pressure on flush bag remains at 300mmHg, hourly
Flushing

Normally the arterial line infuses around 3mL/hr; however flushing the line is actually not only acceptable, it is one way to assist with determining if there is trouble with the line. Urden et al (2014) discusses that when flushing the line, use the manual or fast flush system on the transducer. The flush creates a rapid increase in pressure and this is displayed on the monitor. You are looking to see a square waveform.

The normal dynamic response shows a square pattern with one or two oscillations before returning to the baseline. Figure A.

If the system is dampened or over dampened, a sloped waveform is seen. Figure B. This usually occurs when air bubbles, clots or kinks are in the system.

If the system is underdamped, extra oscillations are seen. Figure C.

![Fig. 15-66](urden2014.png) Fast-flush square wave test. A, Normal dynamic response. B, System overdamped. C, System underdamped.

An overdamped waveform will look like this on the monitor (Urden et.al. 2014.).

![Overdamped waveform](urden2014.png)

If a trace is underdamped or showing overshoot/fling it tends to look like this on the monitor. All aspects of the trace are over exaggerated.

![Underdamped waveform](urden2014.png)

(Urden et.al 2014))
What you’ll notice on the monitor is the ECG and the arterial waveform (and SpO2) all correlate. The ventricular complex on the ECG happens just prior to the arterial waveform.

The sharp upstroke of the arterial waveform represents the rapid ejection of blood from the left ventricle. The peak of the wave is the systolic pressure. As the pressure in the ventricle falls below that in the aorta, the aortic valve closes. This closure is displayed on the descending waveform as the ‘dicrotic notch’.

Pulsus Paradoxus is a decrease of more than 10mmHg in the arterial waveform during inhalation. It’s caused by a decrease in cardiac output as a result of an increased negative pressure in the thorax during inhalation. It can also occur if the patient has a cardiac tamponade, pericardial effusion or constrictive pericarditis. It commonly also
occurs in hypovolemic patients that are mechanically ventilated or a non ventilated patient who is breathing really deeply.

Fig. 15-61  Simultaneous ECG and arterial pressure tracings show ventricular bigeminy in which every other ventricular beat is poorly perfused on the arterial pressure waveform in the first part of the tracing. In the second half of the tracing, there is a well-perfused arterial pressure tracing as the patient converts to normal sinus rhythm.

Fig. 15-62  Simultaneous ECG and arterial pressure tracings show atrial fibrillation, which results in irregular atrial pulsations. They create differences in beat-to-beat ventricular upstroke volume, resulting in diminished or absent ventricular output, as seen on the arterial waveform.
### Troubleshooting

Attempt to troubleshoot the problem before notifying the Medical Officer.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Reason</th>
<th>Troubleshooting / Prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over Damped waveform</td>
<td>Air bubbles</td>
<td>Completely &amp; carefully flush and prime the line prior to insertion.</td>
</tr>
<tr>
<td></td>
<td>Clots</td>
<td>Secure wrist in extended position on an arm board.</td>
</tr>
<tr>
<td></td>
<td>Cannula or line kinked</td>
<td>Aspirate air bubbles or clots, then <strong>flush thoroughly</strong></td>
</tr>
<tr>
<td></td>
<td>Loose connection/s</td>
<td>Check &amp; tighten connections</td>
</tr>
<tr>
<td></td>
<td>Empty flush bag</td>
<td>Replace flush bag if needed</td>
</tr>
<tr>
<td></td>
<td>Pressure bag deflated</td>
<td>Inflate pressure bag to 300mmHg</td>
</tr>
<tr>
<td></td>
<td>Patient position</td>
<td>Check non-invasive BP- allow 5-20mmHg discrepancy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check roller clamp open and stopcock positioned open to the patient</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gentle traction on the line to check if it is against a vessel wall.</td>
</tr>
<tr>
<td></td>
<td>Cannula is clotted or kinked</td>
<td>Check cannula and lines for kinks. A kinked cannula will not give accurate readings and will most likely need replacing. Kinked tubing, if unable to be straightened can be replaced with a new transducer set &amp; flush bag.</td>
</tr>
<tr>
<td></td>
<td>Stopcock is not positioned correctly</td>
<td>Manipulate the stopcock</td>
</tr>
<tr>
<td></td>
<td>Cannula is against vessel wall</td>
<td>Check connections</td>
</tr>
<tr>
<td></td>
<td>Patient/wrist position</td>
<td>Gently extend wrist/gentle traction to move cannula away from vessel wall</td>
</tr>
<tr>
<td></td>
<td>Vasospasm</td>
<td>Secure the wrist in an <strong>extended</strong> position. (A flexed wrist prevents the saline infusing to keep the line open.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Slowly aspirate</td>
</tr>
<tr>
<td>Unable to asperse blood</td>
<td></td>
<td>Check blood loss especially if significant.</td>
</tr>
<tr>
<td>Haemorrhage</td>
<td>Loose connections</td>
<td>Tighten connections prior to insertion to prevent disconnection.</td>
</tr>
<tr>
<td>Document estimated blood loss</td>
<td>Accidental removal</td>
<td>Apply dressing and secure site.</td>
</tr>
<tr>
<td>insertion especially if</td>
<td>Arterial oozing at insertion site</td>
<td>Use arm board to help prevent accidental removal.</td>
</tr>
<tr>
<td>significant</td>
<td></td>
<td>Keep arterial line in view</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Support line when moving patient to prevent inadvertent traction on the line.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Keep the stopcock off to the access port unless taking blood.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If bleeding around insertion site after insertion continues, take old dressing down and put small absorbent dressing around insertion site and cover with occlusive transparent dressing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If line is removed (accidentally or</td>
</tr>
</tbody>
</table>

Reviewed 11/13
<table>
<thead>
<tr>
<th>Problem</th>
<th>Reason</th>
<th>Troubleshooting / Prevention</th>
</tr>
</thead>
</table>
| Normal waveform with abnormal high or low pressure readings | • Transducer is above or below phlebostatic axis  
• Check patient status: awake /anxious /pain /sedated  
• Consider side effects of medications | • Reposition the transducer and zero the line.  
• Check the monitor that the waveform returns to zero on the scale.  
• Assess patient – treat accordingly (give pain relief, reposition, sedate etc)  
• Check medication infusions for any accidental bolus / errors / disconnections  
• Identify possible side effects of medications |
| Loss of waveform | • Loose connections.  
• Cable not connected  
• Stopcock is off to the patient  
• Monitor not set up correctly  
• Clot  
• Pressure bag deflated  
• Cannula against vessel wall | • Check all connections including the monitoring cable.  
• Inadequate securing of the insertion site & line may have caused the cannula or line to be kinked.  
• Check that the stop cock on the transducer is open to the patient.  
• It is possible that the cannula has ended up on the vessel wall; gentle traction, flush the line.  
• Check roller clamp is open and pressure bag inflated  
• Attempt aspiration of blood |
| Underdamped waveform (overshoot or fling) | • ?Use of non compliant tubing | • Level and zero  
• Use transducer line only  
• Check non-invasive BP  
• Fast flush line |
Taking blood (Arterial Line Blood Sampling)

There needs to be an order or indication.

1. Collect equipment:
   - Non sterile gloves / PPE
   - 3 or 5 mL syringe for discard
   - Syringe or vacutainer for sampling
   - Alco wipes
   - Gauze square(s)
   - New sterile non vented cap (NOT A BUNG)

Syringe method:
2. Silence monitor alarms
3. Wash hands and apply standard precautions
4. Remove cap from access port
5. Wipe access port with alcohol wipe
6. Attach 3 or 5 mL syringe, turn stopcock open to the patient /off to the transducer and aspirate 3-5mL
7. Partially turn the stopcock back towards the access port, disconnect and discard this syringe
8. Attach syringe for blood sample, turn stopcock back off to the flush bag / open to the patient and aspirate required amount of blood, remove syringe
9. Turn stopcock off to the patient and flush residual blood from the access port into the gauze squares
10. Turn stopcock off to the access port
11. Wipe access port with alcohol wipe
12. Put new sterile non vented cap on (not a bung!)
13. Flush the line thoroughly
14. Observe monitor for return of appropriate arterial waveform
15. Document/label syringe/vacutainers & pathology form at the bedside-document ‘arterial sample’ on pathology form

Vacutainer method:
Similar as procedure above
Use a vacutainer to remove saline from line and throw away, instead of a 5 mL syringe
Collect samples in order of draw
Collect ABG last; remove vacutainer and replace with blood gas syringe

Prepare arterial blood gas syringes by pulling the plunger back approx 1 mL then removing the cap. Once connected, allow the syringe to fill passively.
Removal of Arterial line

1. Gather equipment: gloves, goggles, dressing pack, transparent dressing, sterile gauze, Saline, stich cutter if needed, bluey
2. Provide patient education
3. Silence alarm monitor
4. Remove dressing
5. Clean insertion site
6. Remove steri-strips
7. Withdraw cannula and apply pressure with gauze until bleeding stops
8. Clean any residual blood and apply dressing
9. Document removal

*Cannula tip may be sent for cultures if requested
** Pressure for more than 5 minutes may be required if the patient is on anticoagulants.
*** Femoral lines will require 20 minutes of firm digital pressure under direct vision
Post test – Arterial lines
Name: ___________________________ Date: ___________________________

Please return this test to the Nurse Educator as soon as possible and prior to any competency sign off. Pass is 90%

Please circle the one correct response.

1. What fluid is used to prime and flush an arterial line?
   a. Hartmann’s
   b. 5% Dextrose
   c. 0.9% Normal Saline
   d. Heparinised Saline

2. During monitoring the arterial waveform represents:
   a. stroke volume of the heart
   b. ejection phase of right ventricular diastole
   c. cardiac output
   d. ejection phase of left ventricular systole

3. Identify the approximate volume of blood ejected from the heart with each beat.
   a. 80 mls
   b. 20 mls
   c. 100 mls
   d. 5 mls

4. When the Registered Nurse measures blood pressure by the two methods of invasive monitoring and auscultation (NiBP), a disparity occurs. Identify the disparity:
   a. 2 to 5 mm Hg
   b. 5 to 20 mm Hg
   c. 50 mm Hg
   d. No disparity

5. Normally, the arterial line infuses ____ ml/hr?
   a. 10
   b. 15
   c. 3
   d. does not infuse

6. List three potential complications that can occur with intra-arterial monitoring.
   ……………………………………………………………………………………………………………………………………………………..
   ……………………………………………………………………………………………………………………………………………………..
   ……………………………………………………………………………………………………………………………………………………..

7. Where is the phlebostatic axis?
   a. 4th intercostal, mid axilla line
   b. 2nd intercostal, mid clavicular line
   c. 5th intercostal, mid axilla line
   d. 4th intercostal, mid clavicular line
8. How many mmHg is required in the pressure bag?
   a. 150
   b. 300
   c. 200
   d. 350

9. List 3 sites where an arterial line may be inserted.
   …………………………………………………………………………………………………………
   …………………………………………………………………………………………………………
   …………………………………………………………………………………………………………

10. Which of the following would you consider to be a normal arterial waveform?
   a. 
   b. 
   c. 

   ![Arterial Waveform Image]
11. Over damping of the arterial waveform results in:
   1. diminished amplitude
   2. sharply defined dicrotic notch
   3. poorly defined dicrotic notch
   4. false low systolic pressure
   a. 1, 2
   b. 1, 2, 3
   c. 1, 3, 4
   d. 1, 2, 3, 4

12. Identify 2 potential causes of arterial waveform damping.

13. What evaluation and nursing management would you use to troubleshoot in an attempt to resolve these issues?

14. Zeroing the arterial line is:
   a. calibrating the system
   b. negating the effect of atmospheric pressure on the readings
   c. negating the effect of ventricular pressures
   d. has no effect

15. What is the pressure that needs to be maintained in the pressure bag?
   a. 150 mmHg
   b. 250 mmHg
   c. 300 mmHg
   d. 350 mmHg

16. What is the point where the transducer is levelled at called?
   a. Pilonexis axis
   b. Mid ventricular level
   c. Phrenic angle
   d. Phlebostatic axis

17. What does the dicrotic notch represent?
a. Ventricular fill time  
b. Cardiac output  
c. Aortic valve closure  
d. Mitral valve closure  

18. State 4 potential complications of an arterial line.

…………………………………………………………………………………………………
…………………………………………………………………………………………………
…………………………………………………………………………………………………
…………………………………………………………………………………………………(4)

19. When do you level and zero the arterial line?

…………………………………………………………………………………………………
…………………………………………………………………………………………………
…………………………………………………………………………………………………
…………………………………………………………………………………………………(3)

20. What observations would you do hourly when a patient has an arterial line in situ?

…………………………………………………………………………………………………
…………………………………………………………………………………………………
…………………………………………………………………………………………………
…………………………………………………………………………………………………(4)

21. How would you know that the patient’s arterial blood pressure reading is accurate?

…………………………………………………………………………………………………
…………………………………………………………………………………………………
…………………………………………………………………………………………………
…………………………………………………………………………………………………(4)

22. Look at the following arterial waveform trace and describe what you would see on the corresponding ECG trace.

…………………………………………………………………………………………………
…………………………………………………………………………………………………
…………………………………………………………………………………………………
…………………………………………………………………………………………………
…………………………………………………………………………………………………
…………………………………………………………………………………………………
…………………………………………………………………………………………………
…………………………………………………………………………………………………(4)

Score: /30       Pass / Fail

Signed: ………………………………………….
Nurse Educator
Reference:

Reviewed 11/13


Queensland Health, Cairns & Hinterland Health Service District, Cairns Hospital Intensive Care Unit, Arterial Catheter (Adult) Insertion & Care, Doc No Cardiovascular 3.1, April 2013.

Queensland Health, Cairns & Hinterland Health Service District, Competency 3.5 Provides Nursing Care for the Patient Requiring Haemodynamic Monitoring. Jan 2008.


Queensland Health, Transition to Practice Nurse Education Program- Intensive Care (Adult), Cardiac Haemodynamic Monitoring Module Phase 4, July 2010.

Queensland Health, Transition to Practice Nurse Education Program- Intensive Care (Adult), Cardiac Haemodynamic Monitoring Module Phase 3, October 2010.

Queensland Health, Transition to Practice Nurse Education Program- Intensive Care (Adult), Cardiac Haemodynamic Monitoring Module Phase 2, October 2010.


