

Blood Pressure Measuring – Using an Automated Digital Device





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“

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Phillipa Wilson

Founder & Managing Director of Premium Health

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BLOOD PRESSURE USING AN AUTOMATED DIGITAL DEVICE WORKBOOK

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WHEN YOU SEE THIS ICON:

Scan QR Code using your mobile phone camera to access video content.

WHAT YOU NEED TO KNOW ABOUT YOUR COURSE

Welcome

This resource provides support workers with the essential knowledge and skills to undertake a blood pressure measurement using an automated blood pressure device.

Evaluation of the course

Your feedback is vitally important to us as we use this as part of our continuous improvement cycle. We especially value any personal comments you would like to make.

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BLOOD PRESSURE



WHAT IS BLOOD PRESSURE?

Normal Blood Pressure



Blood pressure is the force that the blood exerts on the walls of the blood vessels (arteries) as it is pushed through the body by the heart.

The importance of having your blood pressure checked is well recognised. Many people do not know they have high blood pressure until they have it measured as part of a routine check-up at the doctors.

During a blood pressure check, we measure the actual blood pressure in your arteries, as the heart beats as well as in between the beats. This between phase is when the heart is relaxed and refilling ready to contract again. The pressure in the arteries will be higher when the heart beats, and then lessen in the arteries between the beats, and these two pressure measurements are called your systolic and diastolic blood pressure. This is not a pulse.

Therefore, your blood pressure will always consist of two numbers, for example 120 when the heart beats which means the peak of your heart contracting (called systolic), and then 80 is the pressure when the heart is fully relaxed (called diastolic).

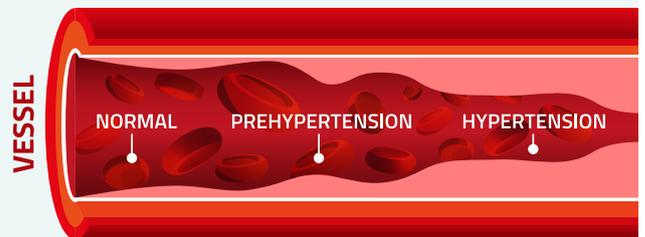
Blood pressure is often written like a fraction, like 120/80, and your doctor might use the term 'over' when talking about what your result is. Our example would be said "120 over 80". There is normally a gap of around 20-40 between the two numbers.

Blood pressure is measured in units of mercury and therefore you will often see the numbers above written as 120/80mmHg, the mmHg is the unit meaning millimetres of mercury.

Blood pressure changes all the time throughout our day, it depends on what you are doing, how you are feeling and how your body is functioning. For example, sleeping reduces the amount of work the body is doing and so a reading may be low during this time and equally the blood pressure will rise when exercising as the demand for the amount of blood means the heart has to create more pressure on the arteries to fuel and oxygenate the body.

Blood pressure is usually at its highest level when we exercise and at its lowest level when we sleep.

Systolic Pressure → is measured between when the heart contracts



Diastolic Pressure → is measured between beats when the heart relaxes

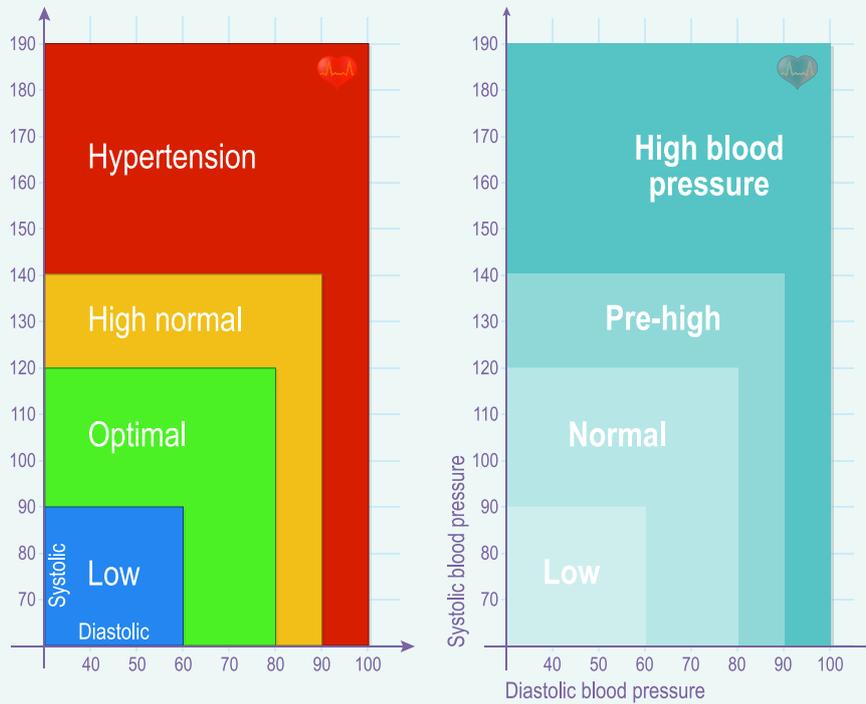
BLOOD PRESSURE AND HEART RATE

While your blood pressure is the force of your blood moving through your blood vessels, your heart rate (measured by a pulse) is the number of times your heart beats per minute.

Heart rate and blood pressure do not necessarily increase at the same rate.

A rising heart rate does not cause your blood pressure to increase at the same rate. Even though your heart is beating more times a minute, healthy blood vessels open up (dilate) to allow more blood to flow through easily. When you exercise, your heart rate speeds up so blood can reach your muscles. It may be possible for your heart rate to double safely, while your blood pressure may respond by only increasing a modest amount.

Blood Pressure Range



Blood pressure range

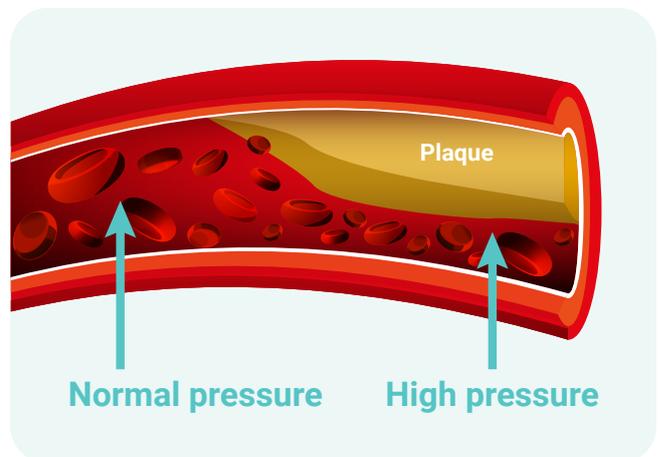
Checking your blood pressure range

Top number (systolic) mmHg and bottom number (diastolic) mmHg is a measurement of mercury used in medicine, like grams of flour or butter when talking about recipes and litres when we measure fluid, this measurement is about blood pressure.

Most doctors consider blood pressure too low only if it causes symptoms. Some experts define low blood pressure as readings lower than 90 mm Hg systolic or 60 mm Hg diastolic. If either number is below that, your pressure is lower than normal.

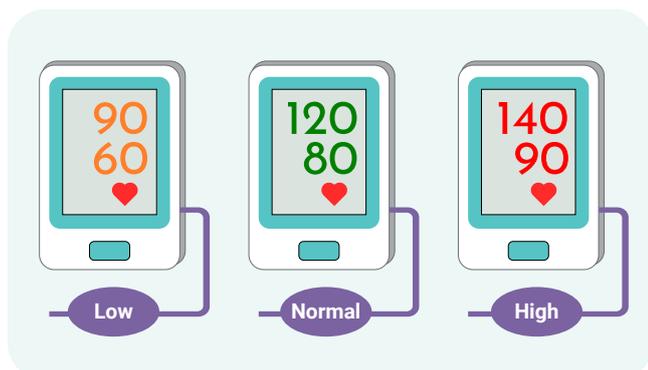
A sudden fall in blood pressure can be dangerous. A change of just 20 mmHg, for example a drop in the systolic number from 110mmHg to 90mmHg— can cause dizziness and fainting when the brain fails to receive enough blood. And big drops, such as those caused by uncontrolled bleeding, severe infections or allergic reactions, can be life-threatening.

HIGH BLOOD PRESSURE



High blood pressure develops slowly over time and can be related to many reasons, in most cases high blood pressure cannot be cured, however it can be managed effectively through lifestyle changes and when needed, medication.

Finding a list of definitive signs and symptoms of high blood pressure is not possible because in most cases, there are none. High blood pressure otherwise known as hypertension is often called the “silent killer”. Many people with high blood pressure do not even know they have it.



Myth: People with high blood pressure will experience symptoms, like nervousness, sweating, difficulty sleeping or facial flushing.

Truth: High blood pressure is a largely symptomless “silent killer”. If you ignore your blood pressure because you think a certain symptom or sign will alert you to the problem, you are taking a dangerous risk.

Symptoms and causes of high blood pressure

High blood pressure develops slowly over time and can be related to many reasons. High blood pressure is known as Hypertension. In most cases high blood pressure cannot be cured, however, it can be managed effectively through lifestyle changes and when needed, medications.

Causes of high blood pressure can include:

- genetics
- kidney and/or glandular disease
- high salt intake
- high alcohol intake
- overweight or obese BMI classification
- sedentary lifestyle

High blood pressure is often symptomless and a silent ongoing condition that can cause long term health complications.

The long-term health complications, of non-managed high blood pressure include; damage to the arteries especially in the kidneys and eyes. High blood pressure also increases an individuals’ risk of experiencing a stroke, heart attack and other cardiovascular diseases. While heart disease is still the No. 1 killer in the Australia and around the world, death rates have decreased significantly. Earlier and better treatment of high blood pressure has played a key role in that decrease.

When an individual’s blood pressure, spikes suddenly and severely (known as a hypertensive crisis), the individual may experience:

- severe headache
- blurred vision/vision changes
- severe anxiety
- chest pain
- shortness of breath
- nose bleed

If a client experiences any of the following symptoms, immediately check blood pressure reading, consult health care plan and call for immediate medical assistance.

Low blood pressure

Low blood pressure is determined when the blood pressure falls much lower than is normal for an individual. Each of us are different; it is fine to have a naturally low blood pressure which does not cause any problems, but if that blood pressure becomes lower than usual, it can cause symptoms such as dizziness and fainting.

The medical name for low blood pressure is hypotension. Most forms of hypotension happen because your body can't bring blood pressure back to normal or can't do it fast enough.

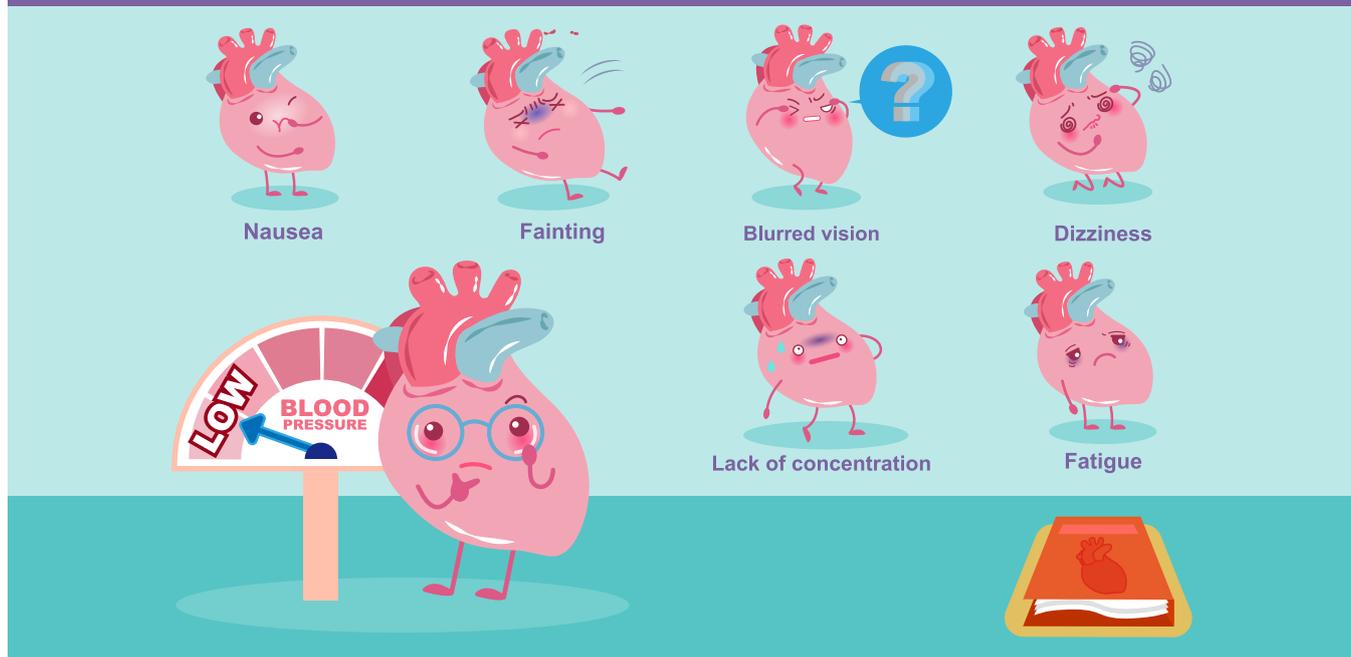
Hypotension can happen for a variety of reasons such as medication or an underlying health condition.

For some people, low blood pressure is normal. They have it all the time, with no symptoms or negative side effects.

In other people, abnormally low blood pressure is caused by certain medical conditions or factors. When this happens, less blood and oxygen flow to the body's organs.

There's no recognised cut-off level for low blood pressure that applies to everyone. For instance, a systolic pressure of 90 may be too low for some people, but normal for many young, healthy adults. Low blood pressure is usually only considered to be a problem if there are symptoms.

Signs and Symptoms



Symptoms and causes of low blood pressure

Many different conditions and situations can cause low blood pressure, from standing up too fast to being pregnant. Sometimes, low blood pressure can be linked to an underlying problem. Signs and symptoms of low blood pressure can include:

- dizziness
- diarrhoea
- pale skin
- fainting
- clammy and sweaty
- nausea
- headache
- fatigue
- dehydration
- blurred vision
- rapid shallow breathing
- depression over time

Hypotension can be a sign of serious heart, endocrine (glands which secrete hormones or other products directly into the blood) or neurological conditions (that affect the brain as well as the nerves found throughout the human body and the spinal cord).

If left untreated, the brain and other vital organs do not get the oxygen and nutrients they need. In extreme cases, this can cause shock, a life-threatening condition.

Low blood pressure can occur with many other conditions, says the American Heart Association.

Some causes of low blood pressure are:

- prolonged bed rest, in which circulation decreases due to lack of movement
- heart problems that prevent the heart from being able to circulate enough blood
- endocrine problems, such as an under-active thyroid gland
- pregnancy as blood pressure often drops in the first 24 weeks of pregnancy
- decrease in blood volume from trauma, dehydration or internal bleeding
- certain medicines; medications that treat hypertension, heart conditions, Parkinson's disease and depression can lower blood pressure
- nutritional deficiencies, such as a lack of vitamin B-12 and folic acid may lead to anaemia, which can cause low blood pressure
- severe infections like septic shock, when bacteria enter the blood stream
- severe allergic reaction (anaphylaxis) that causes problems with breathing and sudden drop in blood pressure
- postural (orthostatic) hypotension, a rapid blood pressure drop when standing from a sitting or lying down position
- neural mediated hypotension, which is a blood pressure drop after standing for long periods

MANAGEMENT STRATEGIES

There are some simple steps to help limit the symptoms of common types of hypotension.

- Stand up slowly from sitting or lying down
- If spending a long time in bed, sit up each day and even do some exercises in bed
- Take care getting out of hot baths or showers. It may be best to avoid very hot baths
- Drink plenty of fluid to reduce dehydration
- Raising the head of the bed a little

If symptoms of hypotension occur after a meal, there may be some relief by;

- Eating smaller meals more frequently, with less carbohydrates (that is, less sugar and starchy food such as rice, bread and pasta).
- Lying down, or at least avoid sudden standing after a meal.

If feeling faint occurs in certain situations, it's a good idea to try and avoid these circumstances, it is suggested to immediately sit or lie down.

WHEN SHOULD BLOOD PRESSURE BE CHECKED?

Blood pressure should be checked as part of the routine initial assessment of temperature, pulse and respirations. This sets a baseline against which we can compare changes. Often when taking a blood pressure people can sometimes feel very anxious and this anxiousness often causes a rise in blood pressure, so the first reading might be misleadingly high.

You should always check a high first reading sometime later, after the person has relaxed. Note also that other factors, such as recently smoking a cigarette or taking a high quantity of alcohol, can also raise the blood pressure temporarily.

The frequency of checking will vary according to the person's general health state. People who are obese (a cause of high blood pressure) or who have a history of high blood pressure should be checked frequently. Some people who are undergoing investigations for high blood pressure might be attached to a machine that measures the pressure continuously over a 24-hour period. The times to check the blood pressure will be set out in the client's care plan.

MEASURING A BLOOD PRESSURE



There are two basic ways a blood pressure can be checked, manually with an aneroid machine and a stethoscope, or automatically with a digital machine. This battery-powered device has a pressure sensor and electronic display. The display may be numerical, or a circular or linear bar graph. No stethoscope is needed.

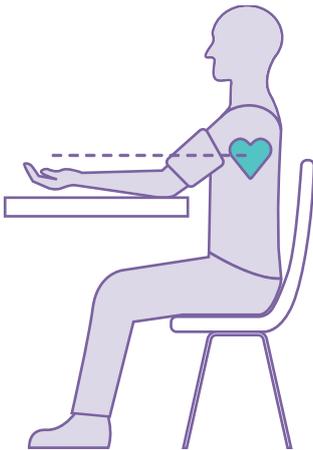
Both methods use a measuring device attached to an inflatable cuff that is placed around the client's upper arm, the cuff is inflated to block off the artery that is sitting under it and then released in a controlled manner.



Before taking a blood pressure measurement using an automated device, consider the following points:

- is there a specific time to undertake the recording/s?
- is the arm injured or sore?
- if the client has just exercised, wait 30 minutes before undertaking the recording, otherwise 5 minutes.
- use the blood pressure testing device to the product manufacturer's instructions to check the systolic blood pressure value and diastolic blood pressure value

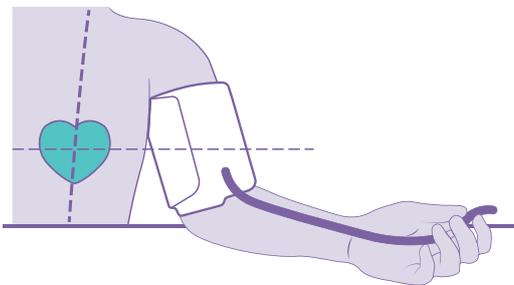
Arm selection and client position



Blood pressure (BP) should initially be measured using both arms, after which, the arm with the higher reading(s) should be used for subsequent measurements. Although a difference in BP measurements between the

arms can be expected in 20% of clients, if this difference is $>20\text{mmHg}$ for the systolic or $>10\text{mmHg}$ for the diastolic measurement, BP should be measured on both arms for the next reading. If these differences are seen in three consecutive readings (with a one-minute gap between each), further investigation may be indicated.

The client's arm should be supported while BP is measured; if it is unsupported, muscle contraction in the arm can lead to an incorrect increase in the BP reading by as much as 10%. It is best that the arm is bare when taking a measurement although a light shirt would be acceptable.



The arm should be positioned at heart level: if it is lower than the heart, this can lead to overestimation of the pressure, while being above the level of the heart can lead to an underestimation of the pressure. This error may be as great as 10mmHg (O'Brien, 2015). If seated, the client should not cross their legs as this can lead to an increase in blood pressure.

1



- Check equipment is clean and in working order
- Client to rest for 5 minutes before taking their blood pressure
- They should be relaxed, not moving and instructed to remain quiet

2



- Wash hands for at least 20 seconds

3



- Identify client
- Explain procedure, inform them that the arm will feel tight and not to be alarmed
- Gain consent

4



- Make sure the client's arm is supported at the level of the heart.
- If in bed place the outstretched arm on a pillow and if seated place the arm on a desk/table
- The cuff size should be appropriate for the client
- Ensure no tight clothing constricts the arm

Blood Pressure Measurement Procedure

5



- Choose the correct arm for the reading as indicated on the health care plan
- Find the middle of the crease in the elbow

11



- Document findings on BP log and review parameters for client
- Turn off device
- If abnormal, repeat reading and report to Supervisor
- Store device

6



- Place the cuff on neatly 2cm above the crease in the elbow (over the brachial artery) and align the 'artery mark' and secure
- The cuff should encircle at least 80% of the arm but not more than 100%

12



- Wash hands

8



- Attach device lead to cuff if not already connected

10



- Switch on BP machine and allow to calibrate
- Follow device prompts
- Warn client of cuff becoming tight

BLOOD PRESSURE

Check the results against the client's health care plan for parameters of a normal measurement.

If within the normal parameters remove the cuff, perform hand hygiene and document the results on the blood pressure record chart.

If an abnormal reading is taken consult the client's health care plan for required follow up management steps. This may include: another measurement, a call to the doctor and reporting to a supervisor.

Recording

The blood pressure record sheet is filled out by support staff. This will act as a reference to keep an accurate track of the health of the client. This chart will monitor the trends, patterns and variations of blood pressure levels over a given period and will assist doctors to determine the client's overall health.

Always follow the organisation's policies and procedures on recording and reporting.

BLOOD PRESSURE RECORD

Client name:

Device	Date	Time	Arm Used	Systolic (upper) number	Diastolic (lower) number	Action	Sign

Example Blood pressure record sheet

BLOOD PRESSURE LOG SHEET

Name:

Sex/Age:

Date	Time	Blood Pressure		Time	Blood Pressure	
	AM	Systolic (Upper Number)	Diastolic (Lower Number)	PM	Systolic (Upper Number)	Diastolic (Lower Number)

Acknowledgement: Unissons' Blood Pressure Log Sheet 2020

Causes of incorrect measurement readings

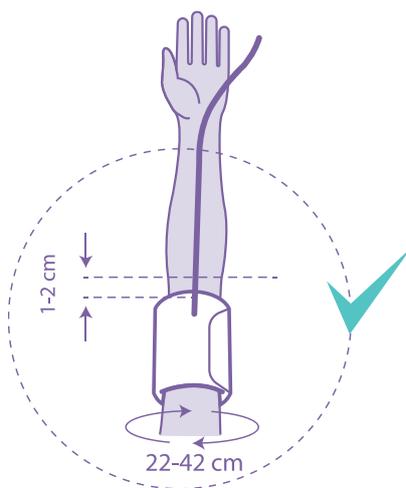
Have you ever visited the doctor's office and discovered your blood pressure was higher than you expected? Most people do not realise their blood pressure is constantly changing minute by minute in response to mood, activity and body position. Other than defective equipment, incorrect cuff size and recording errors, simple bodily responses can cause blood pressure to fluctuate between 5 and 40 mmHg.

Here is a list of factors that can temporarily cause significant deviations in blood pressure measurements.

Factor	Magnitude of systolic/diastolic blood pressure discrepancy (mmHg)
Talking or active listening	10/10
Distended bladder	15/10
Cuff over clothing	5-50/unknown
Smoking within 30 minutes of measurement	6-20/unknown
Back unsupported	6-10/unknown
Arm unsupported, sitting	1-7/5-11
Arm unsupported, standing	6-8/unknown

There are other causes of errors in blood pressure measurements, including:

- client not being rested and relaxed when the blood pressure is measured
- defective equipment – for example, leaky tubing or a faulty valve
- too-rapid deflation of the cuff
- use of incorrectly sized cuff
- cuff not being on a level with the heart
- poor technique
- ‘Digit preference’ – rounding a reading up to the nearest 5mmHg or 10mmHg
- irregular pulse (as can occur with, for example, atrial fibrillation, bradycardia, muscle tremors, a weak pulse or profound shock) – in some automated devices, this can lead to inaccurate measurement



Machine maintenance

All BP measuring equipment should be regularly checked and calibrated in accordance with the manufacturer's instructions (MHRA, 2019). Cuffs and their hoses should be regularly inspected and replaced as necessary; excessive air leakage from damaged cuffs, hoses and tubing connectors may reduce the accuracy of the readings. If re-usable cuffs are used, they should be cleaned between clients in accordance with the manufacturer's instructions, ensuring that cleaning fluid does not enter the cuff bladder or hoses.

Faulty devices can lead to inaccurate measurements, with significant effects on client care. Healthcare providers have a responsibility to ensure adequate maintenance arrangements are in place (MHRA, 2019). The date of next servicing and calibration should be clearly marked on the device (6-12 monthly according to device used).

Aneroid devices are particularly prone to inaccuracies (Coleman et al, 2005); the MHRA (2019) recommends these are checked and calibrated at least twice a year. Hand-held devices used in the community are particularly prone to shocks and drops, but devices that incorporate anti-shock mechanisms may be more resilient to this type of wear and tear.

It is considered good practice to occasionally check the device against another validated device (BIHS, 2017).

INFECTION CONTROL CONSIDERATIONS



When taking a client's blood pressure, be sure to refer to your organisation's infection control policies. Take note of the client's current health status as, if they are currently in isolation awaiting test results for an infectious illness, they should be managed with the appropriate infection control measures.

Routinely, taking a client's blood pressure should only require standard precautions.

Standard precautions are work practices designed to achieve a basic level of infection control and are designed to minimise the risk of infection amongst people. It is recommended that you treat everyone, including yourself, as if infectious. Standard work practice precautions achieve a basic level of infection control.

Standard precautions include a range of practices:

- personal hygiene practices
- personal protective equipment
- handling and disposing of sharps and other clinical waste
- reprocessing of reusable equipment and appropriate use of disinfectants
- environmental controls including cleaning, blood and body spills management.

The best way to protect yourself and client is to practise good personal hygiene by:

- making sure you clean your hands thoroughly
- clean your hands for at least 20 seconds with soap and water or an alcohol-based hand rub
- cover your nose and mouth when coughing or sneezing with a tissue or flexed elbow
- avoid close contact with anyone with cold or flu-like symptoms

SUMMARY

Blood pressure can be affected by a range of lifestyle and medical factors including; adrenal and kidney diseases, sedentary lifestyle and diet choices. At times to address high blood pressure a doctor will recommend lifestyle changes, and when needed might progress to prescribing medications.

Monitoring blood pressure for a client, may be needed to ensure the client does not experience long term adverse health conditions, or immediate health crises such as lack of oxygenation to vital organs.

It is important to be familiar with a client's health care plan to know when to take a client's blood pressure, how often to measure and what to do if the measurement is outside of normal range.

Maintaining a healthy blood pressure range, ensures that a client's long term health risk factors remain low and quality of day to day life remains high.

APPENDIX 1

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APPENDIX 3

BLOOD PRESSURE CONSIDERATIONS

ACTION	RATIONALE
<ul style="list-style-type: none"> ➤ Explain procedure to client, gain verbal consent. ➤ Ensure infection prevention and control practices are used throughout. ➤ Wash or sanitise hands. 	<ul style="list-style-type: none"> • to ensure that the client understands the procedure and gives his/her informed consent • to minimise the risk of infection
<ul style="list-style-type: none"> ➤ The client should be rested for at least 5 minutes prior to the reading. ➤ Relaxed and not moving or speaking when taking the reading (where possible). 	<ul style="list-style-type: none"> • to ensure an accurate reading is obtained. Normally blood pressure readings are taken with the client in a sitting position, however for a person lying in a semi recumbent position this position is acceptable
<ul style="list-style-type: none"> ➤ The arm must be supported at the level of the heart, on a table if upright and on a pillow or cushion if in bed. ➤ Ensure no tight clothing constricts the arm. 	<ul style="list-style-type: none"> • to obtain a correct reading
<ul style="list-style-type: none"> ➤ Place the cuff on neatly with the centre (cuff artery index marker), approx. 2 cm above the bend of the elbow. ➤ The bladder should encircle at least 80% of the arm (but not more than 100%). 	<ul style="list-style-type: none"> • to ensure the cuff is in the correct position and to prevent an inaccurate reading due to pressure being exerted on the brachial artery by the cuff
<ul style="list-style-type: none"> ➤ Ensure client's heart, cuff and monitor are at the same level. 	<ul style="list-style-type: none"> • to ensure an accurate reading is obtained
<ul style="list-style-type: none"> ➤ Choose appropriate setting to inflate cuff. Some monitors allow blood pressure setting selection where you choose the appropriate setting. Other monitors will automatically inflate and re-inflate to the next setting if required. 	<ul style="list-style-type: none"> • to ensure an accurate reading is obtained
<ul style="list-style-type: none"> ➤ For the number of readings please consult the Health Care Plan. 	<ul style="list-style-type: none"> • two or more readings are often taken to represent a normal blood pressure • taking more than one reading can reduce anxiety and provide a more accurate reading
<ul style="list-style-type: none"> ➤ Compare with previous readings, if the BP reading is outside the client's normal parameters, take appropriate action. 	<ul style="list-style-type: none"> • trends often show correct readings, when to repeat a blood pressure measurement and when to call for assistance
<ul style="list-style-type: none"> ➤ Document in the client's record, document which arm was used any irregularities and actions taken. 	<ul style="list-style-type: none"> • to ensure adequate record keeping, establish an audit trail and enable good communication and continued care of the client
<ul style="list-style-type: none"> ➤ Remove equipment, store away for client and wash or sanitise hands. 	<ul style="list-style-type: none"> • minimise the risk of infection



Premium Health has a range of health care, first aid and mental health training programs conducted by our nurses, paramedics or mental health practitioners.



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