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THE NURSE'S CLINICAL SKILLS POCKETBOOK

3RD EDITION

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CLINICAL MEASUREMENT

CAROLINE DOBSON AND TREVOR SIMPSON

Fundamental steps for all clinical measurements

What is normal?

Understanding your patient's history and plan of care will ensure you are completing the relevant measurements for your individual patient and it will also help in understanding the individual's normal parameters. Parameters will vary from individual to individual based on many factors such as age, gender, underlying pathology, current medications or treatment or stress. Understanding what is normal is also important so you are able to recognise a deteriorating patient. A systematic approach is utilised in order to undertake a comprehensive assessment of your patient. Therefore, developing the skills and knowledge required to undertake clinical measurements and an A-E assessment is fundamental to all clinical nurses. An A-E assessment facilitates prompt recognition of life-threatening pathology and rapid treatment of deteriorating patients (Japp and Robertson, 2018).

Before you start

Before commencing with any nursing procedure, you need to ensure that you gain informed consent from your patient. In order to do this, you need to establish whether your patient understands what it is they are consenting to by giving them a full explanation of the procedure, including how and why it is being performed. Once an explanation has been given it is important to allow time for any questions they may have, and gauge their understanding by asking them open-ended questions.

Essential equipment

The equipment required will vary depending on the clinical measurement being performed. The most common equipment required is listed below:

- alcohol hand rub or soap and water
- non-sterile gloves
- apron
- fob watch
- waste bag
- measuring equipment, for example manual sphygmomanometer or thermometer.

Field-setting considerations

Anyone over the age of 16 can consent for themselves unless there is evidence to suggest they do not have capacity. However, age, their condition or behaviours should not be considered as a sole deciding factor. If a patient aged under 16 is deemed to understand and have the capacity to consent, they are able to do so (Mental Capacity Act 2005, s.4).

Local policies and procedures

Local policies and procedures may vary depending on where you work, however policies and procedures should always be evidence-based. It is important to familiarise yourself with the local policies and procedures in order to safeguard yourself and your patients. They may require you to undertake a further assessment of competence which will be recorded as part of your continuing professional development.

Care-setting considerations

The guidance for undertaking a procedure in the community may vary from an acute setting due to the staffing and resources available. As the patient's home is not a clinical setting it can be more challenging to provide safe and effective care. Infection prevention policies may differ due to the environment the procedure is taking place in. Risk assessments will be undertaken to determine the level of PPE required to protect both yourselves and your patients (Ward, 2017).

Clinical measurement guidelines

Pre-procedure

1

Introduce yourself to your patient, and identify you have the correct patient by verifying with the patient and/or checking their wrist band against patient documentation

This promotes patient safety and reduces risk.

2

Explain the procedure and offer your patient a rationale of why it is required so you can gain informed consent from your patient or carer

If you are unsure whether your patient has capacity seek advice from your practice assessor or supervisor.

3

Collect required equipment. Ensure it is working correctly and calibrate if required

All equipment will need cleaning in between patient use to prevent the spread of infection. Some equipment, such as blood glucose monitoring strips, will have expiry dates, so ensure all equipment is in date before use. Out of date or uncalibrated equipment may provide incorrect readings which may result in failure to recognise a deteriorating patient.

4

Wash hands with soap and water using the correct procedure as directed in Infection Prevention and Control

If in a community setting where this is not an option, use alcohol hand gel before the procedure.

5

Consider the use of PPE such as non-sterile gloves and aprons if appropriate in order to prevent cross contamination

6

Always maintain your patient's privacy and dignity

They may wish to have the curtains drawn, or doors shut. Offer a chaperone if required to promote holistic patient-centred care, taking into consideration cultural and religious needs.

7

Ensure they are in a comfortable position before starting the procedure

It may be that you require them to be sat in a chair or laid supine to complete the procedure, for example completing a lying and standing blood pressure. If this is the case explain your rationale to your patient prior to starting.

Post-procedure

- 1 Discuss the result of the clinical measurement with your patient**
If they require further information about required interventions seek advice from your practice assessor or supervisor.
- 2 Discard any PPE in an appropriate waste disposal container or bag**
- 3 Ensure your patient is comfortable and can access help if required**
This may be providing them with a call bell in the acute setting or making sure they can reach the telephone or alert bell if in the community.
- 4 Wash hands with soap and water using the correct procedure as directed in Infection Prevention and Control (pp. 1-3)**
If in a community setting where this is not an option, use alcohol hand gel after the procedure.
- 5 Document all clinical measurements in your patient's notes**
If there are abnormal findings, escalate to the registered nurse caring for that patient. This is extremely important to ensure there are no delays in recognising and treating deteriorating patients. Failure to do so may result in a worsening of their condition and possibly death (Lister et al., 2020).

Respirations

What is normal?

Adults - 12-18 breaths per minute (bpm)

0-1 year - 30-60 bpm

1-3 years - 24-40 bpm

3-5 years - 22-34 bpm

5-15 years - 18-30 bpm

15-17 years - 12-16 bpm

Before you start

When undertaking an assessment of your patient's respiration you need to assess not only the rate of their respirations but also the rhythm and depth. Look at movement of their chest; is it rising and falling equally and bilaterally? Unilateral breathing may indicate your patient has a pneumothorax, which is when the lung has collapsed and is unable to inflate as normal. Is their breathing shallow, indicating they are unable to take a full breath? Shallow breathing could be due to respiratory conditions such as asthma, or other medical conditions such as anxiety. If it is the latter, it may be that you need to provide your patient with some time before measuring their respirations to get an accurate measurement. Talk to them and help them in relieving their anxieties before proceeding. When looking at the chest you can also look for the use of accessory muscles; this can be a good indicator of dyspnoea. Looking at your patient's face can tell a lot about their breathing: note the colour of their skin, look for sign of cyanosis (blue tinge around the lips), this is a sign of hypoxia, or lack of oxygen. You may observe that they are mouth breathing, pursing their lips or flaring their nostrils when breathing. All of these can be signs that they are having difficulty in breathing. Document any findings in your patient's notes.

Essential equipment

You will need a fob watch with a second hand to measure your patient's respirations.

Field setting considerations

Consider your patient and what their normal parameters should be. If you are monitoring respirations on a child, the normal parameters will be higher than an adult. Understand any underlying conditions such as COPD if assessing an adult. The normal parameters will vary due to their condition as well as age.

Care-setting considerations

Many patients are affected by 'white coat' syndrome. This is when anxiety levels increase due to fear of clinical settings or procedures. This is more common if working in an acute setting due to the unfamiliar environment. Discuss any past medical history with them and ensure your patient is relaxed and comfortable before commencing.

Respiratory rate guidelines

1

Consider steps 1-7 of Clinical measurement guidelines: Pre-procedure (p. 9)

When gaining informed consent observe if your patient is able to speak in full sentences. Inability to do so can indicate a difficulty in breathing.

2

Hold your patient's wrist as if checking their pulse

Often when a patient is informed you are counting their breath, they will unconsciously alter their breathing, so acting as if you are checking their pulse whilst counting their respirations will prevent this happening. You can then go on to count their pulse after recording their respirations.

3

Count their breaths for one full minute

Do not reduce the time as your patient's breathing may not be regular and insufficient time measuring respiration will not capture this.

4

When counting the respirations, observe your patient's chest, looking at the rhythm of the breathing

Rapid, deep breaths are often displayed in patients with diabetic ketoacidosis. It is the body's way of trying to get rid of the excess CO₂ and re-establish the homeostatic balance. This is called Kussmaul breathing and can be noted in both adults and children.

5

Observe and document the depth of the breathing. Is it shallow or deep?

Shallow breathing can indicate respiratory distress. You may need to feel the chest if shallow breathing is difficult to visualise. Shallow breathing could be due to fractured ribs or other causes of chest pain. Deep breathing can indicate a neurological injury.

6

Look to see if the chest is rising and falling equally and bilaterally. Check to see if they are using accessory muscles or signs of recession

Accessory muscles include the sternocleidomastoid, scalene, and trapezius muscles in the neck and shoulders. This may suggest that the intercostal muscles and diaphragm are not working sufficiently to aid pulmonary ventilation (Paton and Elliot, 2017).

7

Whilst recording the breaths per minute also listen for sounds such as stridor, wheeze or gurgling which could indicate obstruction or fluid in the airways

8

Perform steps 1-5 of Clinical measurement guidelines: Post-procedure (p. 10)

Pulse/heart rate

What is normal?

Adult:

- 60-100 beats per minute (bpm)

Child:

- neonate (birth to 28 days) - 100-180 bpm
- infant (28 days to 1 year) - 100-160 bpm
- toddler (1-3 years) - 80-110 bpm
- pre-school child (3-5 years) - 70-110 bpm
- school-aged child (5-15 years) - 65-110 bpm
- adolescent (15-17 years) - 60-90 bpm.

Before you start

Your patient should ideally have rested for 10-20 minutes before recording a pulse as exercise or emotional distress may give a false measurement. Consider the site you are going to palpate, for example the radial artery runs closer to the surface of the skin, so it is easier to palpate. It also is easier to access, supporting you in maintaining your patient's dignity whilst undertaking the measurement.

Essential equipment

You will need a fob watch with a second hand to measure your patient's respirations, and a stethoscope (if indicated).

Field setting considerations

For neonates and infants, you may need to use a stethoscope to record the apical heart rate. The stethoscope should be placed between the sternum and mid-clavicular line. When checking the pulse in toddlers and pre-school children the brachial artery is often the preferred site to establish the pulse.

Care setting considerations

Consider the environment and document any factors that may affect the patient's pulse, such as stress and time spent resting prior to recording the pulse. If your patient has been running late for an appointment it may be that their pulse will be raised above their normal parameters, so document and re-record after a period of rest.

Pulse/heart rate guidelines

1

Consider steps 1-7 of Clinical measurement guidelines: Pre-procedure (p. 9)

2

Placing their arm on a cushion will support them whilst you record their pulse

3

Place your index and middle fingers over the selected artery at the most appropriate site and apply light pressure until you feel the pulse

Do not use your thumb as you may feel your own pulse, rather than your patient's. You do not need to apply excessive pressure. For the apical heart rate place the stethoscope as discussed above.

4

Count the pulse for a full 60 seconds, noting the regularity and strength of the pulse

If the rate is too fast or too slow the cardiac output may be reduced, so document any changes and consider it when assessing other vital signs such as blood pressure.

5

You can also use the time to assess your patient's skin condition, for example is it cold, sweaty or clammy to touch

6**Palpation of a radial pulse in an adult can indicate that their systolic blood pressure is above 90mmHg**

If you are unable to find a radial pulse, consider palpating the brachial, carotid or femoral arteries

7**Perform steps 1-5 of Clinical measurement guidelines: Post-procedure (p. 10)**

Manual blood pressure

What is normal?

Age	Systolic	Diastolic
Neonate	60-90 mmHg	20-60 mmHg
Infant	87-105 mmHg	53-66 mmHg
Toddler	95-105 mmHg	53-66 mmHg
Preschool child	95-110 mmHg	56-70 mmHg
School aged child	97-112 mmHg	57-71 mmHg
Adolescent	112-128 mmHg	66-80 mmHg

This table identifies the accepted normal blood pressure values for children and young people, depending upon age.

Low blood pressure (hypotension) is defined as a systolic pressure of below 100 mmHg.

High blood pressure (hypertension) is defined as a systolic pressure of 140 mmHg or higher.

Before you start

It is important to assess whether your patient has any of the following conditions/surgeries due to the risk of lymphoedema, further trauma or pain or incorrect readings:

- mastectomy
- arteriovenous fistula
- trauma/surgery

- intravenous infection
- stroke.

Essential equipment

- automatic or manual sphygmomanometer
- stethoscope.

Field setting considerations

Ensure you have the correct size cuff for your patient; they come in varying sizes from neonate to lower limb cuffs. The cuff should be positioned directly onto the skin where possible to gain an accurate recording. Common errors that can affect the reading are positioning the cuff incorrectly, faulty equipment, applying the stethoscope incorrectly and poor positioning of the arm.

Care-setting considerations

Both automatic and manual sphygmomanometers can be used in both acute and community settings, however the use of manual sphygmomanometers is becoming more common within community settings. Automatic sphygmomanometers should be maintained on a regular basis and failure to do so may lead to incorrect BP measurements. Automatic sphygmomanometers should also be avoided in patients with irregular heartbeats due to inaccuracy, so it's important to record a manual pulse prior to starting. It's essential that nurses have the underpinning knowledge and are competent in undertaking manual blood pressures should automated machines not be indicated or available.

Manual blood pressure guidelines

1

Consider steps 1-7 of Clinical measurement guidelines: Pre-procedure (p. 9)

2

Place their arm on a cushion at heart level

If the arm is lower than the heart it can give a false, high reading. Ask your patient to empty their bladder if possible before proceeding as a full bladder may also cause an increase in blood pressure.

3

Wrap the correct size cuff around the upper arm approximately 2-3 centimetres superior (above) the elbow

If you are unable to use an upper limb you can consider using a lower limb cuff on the thigh.

4

Ask your patient to remain quiet and still if possible. Movement may affect the reading

5

Palpate the brachial artery whilst inflating the cuff. Once the pulse can no longer be felt, rapidly inflate the cuff another 20-30 mmHg

6

Slowly deflate the cuff and when you feel the pulse again, note the reading

This is the estimated systolic pressure. By completing these two steps you are locating the correct position of the brachial artery to apply the stethoscope. Also by estimating the systolic it ensures that when the cuff is re-inflated you are not causing unnecessary discomfort to your patient by overinflating it.

7

Apply the diaphragm of the stethoscope to the location where the brachial artery was palpated - ensure the stethoscope is switched as per the manufacturer's instructions

Earpieces must be cleaned in between use and inserted facing forwards so the Korotkoff sounds can be heard clearly.

8

Inflate the cuff 20-30 mmHg above the estimated systolic blood pressure

9

Slowly release the air in the cuff at a rate of 2-3 mmHg for pulsation. When you hear the first pulsing sound (Korotkoff sounds), note the reading. This is the systolic blood pressure

10

Continue deflating the cuff until you can no longer hear the Korotkoff sounds. When the last sound disappears note the reading. This is the diastolic pressure

11

Fully deflate the cuff and remove from the patient's arm

12

Perform steps 1-5 of Clinical measurement guidelines: Post-procedure (p. 10)

Measuring body temperature

What is normal?

Normal adult range: 36.0-37.0° C.

Normal child range: 36.6-37.7° C.

Essential equipment

The correct thermometer for the site you are using. A number of different types are available: tympanic, oral, temporal and axillary are the sites most often used.

Field-setting considerations

You need to carefully consider which site is the most appropriate to use to measure your patient's temperature. Tympanic thermometers are thought to be the most frequently used, but you would not use this site if a patient had wax, an infection in their ear canal, or if they are younger than 3 months old.

Do not take the temperature of a young child immediately after they have had a bath or been wrapped in blankets, as this is unlikely to give an accurate recording.

Care-setting considerations

Temperature can be measured in any care setting. It is generally non-invasive and is relatively quick to undertake.

Consider the environmental temperature's effect on the patient. It may feel warm to you, but the patient may be immobile and ill, so will need more clothing to keep them warm.

If the patient's temperature is raised, consider removing excess clothing.

What to watch out for and action to take

Assessing your patient's temperature involves observation and feeling, as well as measurement. If the patient's temperature is elevated, they may appear flushed and sweaty. When you are feeling their skin such as by holding their hands, they may feel hot to the touch. Alternatively, if they are cold, they may be shivering, wrapped in clothing or blankets and look pale, and their peripheries may feel cold to the touch.

Temperature guidelines

1

Perform steps 1-7 of Clinical measurement guidelines: Pre-procedure to prepare the patient and yourself to undertake the skill (p. 9)

2

Tympanic: This has become the most commonly used method of measuring temperature in adults, as it is quick, minimally invasive and gives a rapid indication of a change in core temperature as the tympanic membrane is close to the hypothalamus

- a Remove the thermometer from the base unit and switch on the device - refer to the instructions as required. (Note: some tympanic thermometers have a setting for use with adults and children)
- b Check that the probe tip is clean and intact
- c Press the probe tip into the disposable probe cover without touching the cover
- d Gently pull the pinna (top of the ear) slightly upward and backwards, so that the ear canal is straightened
- e Gently insert the thermometer into the ear canal until it is sealed by the ear canal
- f Press the scan button on the thermometer and wait for it to beep
- g Gently remove the thermometer from the ear canal and read the temperature displayed on the device
- h Dispose of the probe cover by pressing the RELEASE or EJECT button while holding over a clinical waste bag
- i Return device to the base unit. (Note: for some devices the base unit will charge the device whilst not in use)
- j Accurately record the temperature on the patient documentation
- k Avoid using this site if there has been a recent ear infection or there is wax in the ear canals as this can affect readings. Ask patients to remove any hearing aid if there is one in the ear to be used. Use the same ear for readings as anatomical differences can account for a 1°C difference. If the ear canal is not straightened, the reading will not be accurate

3

Temporal:

- a The temporal artery thermometer is held over the forehead to sense infrared emissions radiating from the skin
- b Hold in this position for the specified amount of time (refer to device instructions)

- c Read the temperature displayed
- d Accurately record the temperature on the patient documentation
- e Is quick to use but it has been shown to underestimate temperature

4

Oral:

- a The oral thermometer probe is commonly connected to a handheld display which also acts as a measuring device. The probe is commonly covered by a disposable plastic sheath. This sheath should be removed and disposed after each reading
- b Digital or disposable thermometers can be used to take oral temperatures
- c For digital oral thermometers, press the probe tip into the disposable probe cover without touching the cover
- d Place the device under the tongue. The patient or the carer may need to hold the probe in position whilst the temperature is being sampled
- e Leave in this position for the specified amount of time (refer to manufacturer's instructions)
- f Read the temperature displayed
- g For digital oral thermometers, dispose of the probe cover by pressing the RELEASE or EJECT button while holding over a clinical waste bag. For disposable thermometers, dispose of the probe cover into a clinical waste bag
- h Accurately record the temperature on the patient documentation

5

Axillary:

- a Digital or disposable thermometers can be used to take axillary temperatures
- b For digital axillary thermometers, press the probe tip into the disposable probe cover without touching the cover
- c Place the device into the centre of the axilla and place the patient's arm close to their chest wall
- d Leave in this position for the specified amount of time (refer to manufacturer's instructions)
- e Read the temperature displayed
- f For digital axillary thermometers, dispose of the probe cover by pressing the RELEASE or EJECT button while holding over a clinical waste bag. For disposable thermometers, dispose of the probe cover into a clinical waste bag

- g Accurately record the temperature on the patient documentation
- h Not as reliable as tympanic measurements for estimating core temperature as there are no main blood vessels around the axilla. Environmental temperature and perspiration can affect accuracy

Ensure that the patient is safe, comfortable and receiving the appropriate care; the results have been documented in the patient's records; the equipment is clean and in working order.

6

Perform steps 1-5 of Clinical measurement guidelines: Post-procedure (p. 10)
