CLINICAL SKILLS

AN INTRODUCTION FOR NURSING AND HEALTHCARE

ROBIN RICHARDSON
JOANNE KEELING

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Contents

Detailed contents

List of procedures

Preface

This book is primarily aimed at students of nursing, to help them as they develop the ability to safely perform nursing procedures using the communication and relationship management skills as set out in Annexe A and B of the *Future Nurse: standards of proficiency for registered nurses*, published by the Nursing and Midwifery Council in 2018.

The book may also be useful to students of other healthcare professions who are required to carry out procedures when caring for people in a clinical environment. We were anxious that this book should not merely be a manual or set of instructions for performance, but be more comprehensive in enabling students to reflect upon their own values and beliefs whilst developing proficiency in a range of caring activities.

Consequently, the book incorporates the use of scenarios and activities to allow students to consider and develop their knowledge, values and experiences in order to care for people in a person-centred and compassionate way.

You are likely to encounter some unfamiliar words and phrases as you work your way through the individual chapters. Words that appear in **bold** type will be found, along with their definitions, in the Glossary near the end of the book.

We are grateful to the many healthcare professionals who contributed to this book, all of whom are experienced educators and clinicians. We hope that this book will be used as a supportive text and will act as a guide to students as they seek to achieve and demonstrate proficiency and professionalism in caring for and about others.

Robin Richardson

Joanne Keeling

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Abbreviations

A&E	accident and emergency
ACE	angiotensin-converting enzyme
ACLS	advanced cardiac life support
ACVPU	Alert, Confusion (new onset), alert to Voice, alert to Pain, Unconscious
AED	automated external defibrillator
BAPEN	British Association for Parenteral and Enteral Nutrition
BBV	blood-borne viruses
BLS	basic life support
BMA	British Medical Association
BMI	body mass index
BNF	British National Formulary
bpm	beats per minute
BRASS	Blaylock Risk Assessment Screening Score
BUN	blood urea nitrogen
BVM	bag, valve and mask
CD	controlled drug
CHM	Commission on Human Medicines
COPD	chronic obstructive pulmonary disease
COSHH	Control of Substances Hazardous to Health Regulation
CPR	cardiopulmonary resuscitation
CRP	C-reactive protein
CVP	central venous pressure
DH	Department of Health
DIC	disseminated intravascular coagulation
DNAR	do not attempt resuscitation
DPI	dry-powder inhaler
ECG	electrocardiogram
FBC	full blood count
FFP	fresh frozen plasma
FiO_2	fraction of inspired oxygen
FOB	faecal occult blood
GCS	Glasgow Coma Scale
GI	gastrointestinal
GP	general practitioner
GSL	general sale list (medicine)
GTN	glyceryl trinitrate
HCAI	healthcare-associated infections
IDDM	insulin-dependent diabetes mellitus
IV	intravenous
LMA	laryngeal mask airway
LMP	last menstrual period
MDI	metered-dose inhaler
MDT	multidisciplinary team
MHRA	Medicines and Healthcare products Regulatory Agency
MRSA	methicillin-resistant *Staphylococcus aureus*
MUST	Malnutrition Universal Screening Tool
NEWS	National Early Warning Score
NEWS2	National Early Warning Score 2 (updated 2017)
NG	nasogastric
NICE	National Institute for Health and Care Excellence
NMC	Nursing and Midwifery Council
NSAID	non-steroidal anti-inflammatory drug
OP	oropharyngeal
PCA	patient-controlled analgesia
PCC	prothrombin complex concentrate
PDP	personal development plan
PEA	pulseless electrical activity
PEARL	pupils equal and reacting to light
PEG	percutaneous endoscopic gastrostomy
PGD	Patient Group Direction
POM	prescription-only medicine
PONV	post-operative nausea and vomiting

PPE	personal protective equipment
PSS	post-sepsis shock
RBCs	red blood cells
RCN	Royal College of Nursing
RCP	Royal College of Physicians
RPS	Royal Pharmaceutical Society of Great Britain
SAP	Single Assessment Process
SICP	standard infection control precautions
SLT	speech and language therapist
SOAD	second opinion approved doctor
TED	thromboembolus-deterrent
TENS	transcutaneous electrical nerve stimulation
TILE	task, individual capability, load, environment
TWOC	trial without catheter
U&Es	urea and electrolytes
UTI	urinary tract infection
VF	ventricular fibrillation
VT	ventricular tachycardia
WHO	World Health Organization

CHAPTER 5

05 Observations

LEARNING OBJECTIVES

In this chapter you will develop the skills and knowledge required to:

- record someone's temperature, pulse, respirations and blood pressure accurately and efficiently
- obtain an oxygen saturation measurement
- understand the principles and practice of neurological observations
- monitor a person's blood glucose.

Scenario: Teresa White

Ms Teresa White is a 45-year-old woman who enjoys a healthy, active lifestyle. She has had no significant medical problems.

While driving to the local golf club Teresa is involved in a minor road traffic collision. She is admitted to the emergency department of her local hospital. She is alert and orientated and can remember the details of the accident. She is aware that she hit her head on the windscreen and reports no other injuries apart from a developing headache and a degree of blurred vision.

Teresa is admitted to the assessment unit for observation overnight.

5.1 Introduction

ALERT

All observations must be recorded accurately. Any observations outside the normal range should be reported to the nurse in charge immediately who will then consider the appropriate course of action.

Recording someone's temperature, pulse, respiratory rate and blood pressure is commonly referred to as 'taking observations'. They are a key part of nursing assessment on admission, and regular measurements are made of these functions so that any changes are noted quickly – this is vital for the early detection of any deterioration in a person's condition.

Taking observations also provides a good opportunity to communicate with the person and to determine their condition. Interpretation of the data is crucial, but it is also important to look at the person's needs holistically. Taking observations enables you to talk to the person, to see whether they are in pain, if they are worried or if they are uncomfortable. Verbal informed consent should always be obtained from the person before starting observation procedures.

Interpretation of the temperature, pulse, respiratory rate and blood pressure data helps to determine the level of care a person requires and is a basis for providing treatment or other intervention and preventing someone's condition deteriorating.

Scenario: Teresa White

While in the assessment unit overnight, the nurse assigned to Teresa's care starts by measuring her temperature, pulse, respiration rate and blood pressure. The results are noted on her chart:

- temperature – 37.5°C
- pulse – 62 bpm
- respiration rate – 12 resps per minute
- blood pressure – 135/85 mmHg.

The observations are repeated every thirty minutes to check for any deterioration. After four hours Teresa is beginning to show signs of becoming confused, and after six hours, Teresa becomes bradycardic and hypertensive, and it quickly becomes clear that Teresa is developing signs of raised intracranial pressure.

5.2 Temperature

Body temperature represents the balance between heat gain and heat loss and can be measured at various sites on the body using a variety of methods.

5.2.1 Places to measure temperature

Temperature can be measured at any of the following sites:

- *Axilla*: under the arm in the armpit – the thermometer is positioned next to the skin and well underneath the arm. Generally this gives a reading up to 1°C lower than oral, tympanic or forehead readings.
- *Oral*: under the tongue – if you are worried that the person (such as a confused person) may try to bite the thermometer, then use another method.
- *Tympanic membrane*: in the outer ear (external auditory canal) – this requires a special type of digital thermometer (see *Section 5.2.2*); do not be tempted to insert an ordinary thermometer into someone's ear.
- *Rectal*: in the rectum (rarely used nowadays).
- *Forehead*: some thermometers are simply heat-responsive strips that are placed on the forehead. You may also encounter electronic devices that measure body temperature on the skin surface.

5.2.2 Types of thermometer

There are many different types of thermometer available, with different operating techniques (*Figure 5.1*). It is not possible to give a description of every type of thermometer here, but the principal ones are:

- oral digital (*Figure 5.2*)
- tympanic membrane
- thermoresponsive strips (forehead or sublingual).

You should ensure that you are familiar with the main types of thermometer used in your clinical placement.

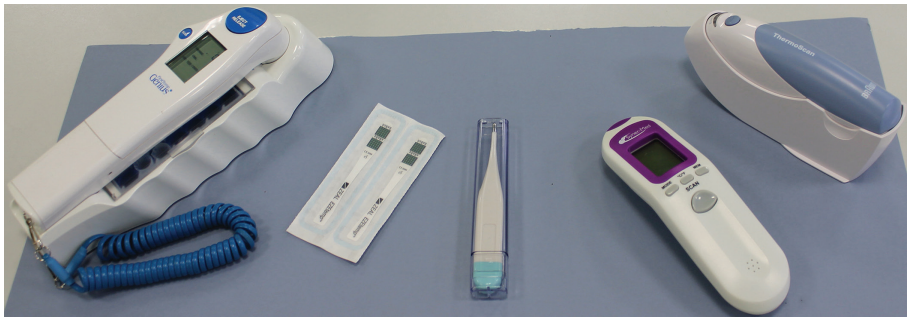


Figure 5.1 Examples of thermometers.

5.2.3 Methods of measuring temperature

There are several ways to measure temperature; the major methods are described in this section.

Procedure 5.1: Measuring oral temperature

STEP 1 Confirm the person's identity, explain the procedure and gain their consent.

STEP 2 Wash hands.

STEP 3 Place thermometer sleeve over the thermometer.

STEP 4 Place the thermometer under the person's tongue and leave for the required time (the time required varies from 15 to 60 seconds, depending on brand of thermometer, so make sure you check the instructions before carrying out this step).

STEP 5 Remove the thermometer, check the reading and write it down in the person's notes.

STEP 6 Remove the protective sleeve and dispose of it.

STEP 7 Wash hands.

STEP 8 Inform senior staff of any abnormal readings.

Procedure 5.2: Measuring temperature using a tympanic membrane thermometer

STEP 1 Confirm the person's identity, explain the procedure and gain their consent.

STEP 2 Wash hands.

STEP 3 Remove the thermometer from the base/charging unit.

STEP 4 Place a disposable cover over the probe.

STEP 5 Gently place the probe in the ear canal (remember to use the same ear as before if you have taken the person's temperature before). The probe must fit snugly in the ear canal; this can be achieved by pulling the pinna back slightly.

STEP 6 Point the thermometer slightly towards the nose, with the pinna gently pulled back to help position the probe so that it focuses on the tympanic membrane.

STEP 7 Press and release the scan button.

STEP 8 Wait for the thermometer to confirm the reading and remove the probe from the ear.

STEP 9 Record the temperature in the person's notes.

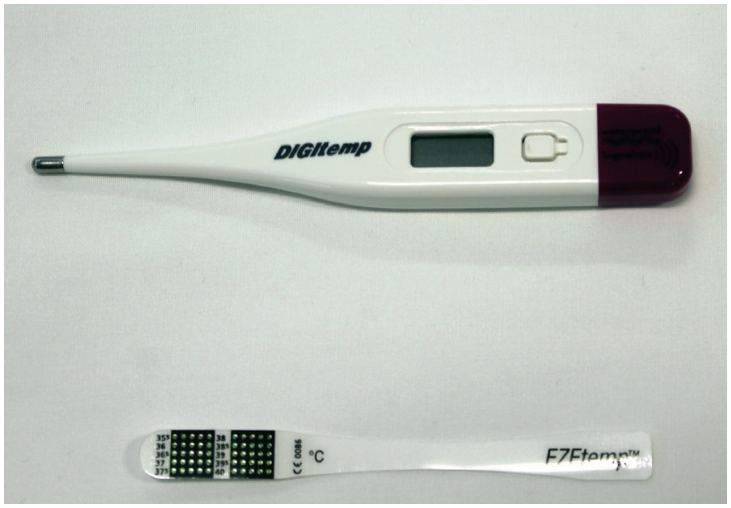
STEP 10 Eject the probe cover into the bin.

STEP 11 Clean the thermometer per local guidelines and replace the thermometer in the base unit.

STEP 12 Wash hands.

STEP 13 Inform senior staff of any abnormal readings.

Figure 5.2 Oral thermometers.



5.2.4 Normal range for temperature

The normal range of temperature is 36.0–37.5°C.

A temperature *below* 36.0°C is called **hypothermia**. A low body temperature is usually a physiological response to the person's local environment (hypothermia is common in the very young and older people who are less able to control their temperature, especially when exposed to cold external environments), rather than a response to illness.

A temperature *above* 37.5°C is a condition called **hyperthermia** or **pyrexia**. A high body temperature can be due to the environment (e.g. heatstroke), but is more likely to indicate the body's response to illness, which might be to raise an immune response to fight off infection, for example in meningitis.

ALERT

An inaccurate low body temperature reading can be caused by:

- the person taking a cold drink 15 minutes or less before their temperature is measured
- the temperature being taken under the arm (remember that temperatures taken here can be as much as 1°C lower than an oral temperature in the same person)
- excess sweating.

An inaccurate high body temperature reading can be caused by:

- the person taking a hot drink 15 minutes or less before their temperature is measured
- the person having smoked a cigarette 15 minutes or less before their temperature is measured
- ovulation – women who are ovulating have a temperature that is typically 0.6°C higher than normal.

Remember to observe and assess the person and not just rely on the thermometer. You may need to check their temperature again, possibly using a different method, or seek advice from a senior colleague. If the temperature measurement is still outside the normal range, report this to the nurse in charge.

5.3 Pulse

The pulse is a pressure wave caused by the contraction of the ventricles of the heart. It is sometimes felt by **palpation** at a point where an artery crosses a bony prominence.

5.3.1 Places to measure pulse

Sites of possible pulse palpation (*Figure 5.3*) include:

- *Radial*: on the inside of the wrist on the same side as the thumb. This is the most common place to take the pulse for a routine reading because it is usually easily accessible (see *Figure 5.4*).
- *Brachial*: on the inside of the elbow and on the opposite side from the radial pulse (the inner aspect of the arm). This is where the pulse is felt prior to taking a blood pressure.
- *Carotid*: beside the trachea; an important site to remember because this is used to feel for a pulse during a cardiac arrest. Take unilaterally, i.e. just on one side, not both sides at once since the carotid arteries supply a lot of blood to the brain.
- *Temporal*: on the temple.
- *Femoral*: the inner thigh, at the mid-inguinal point. The pulse is often taken here if a pulse from the wrist cannot be obtained.
- *Popliteal*: just behind the knee. This is not often used as a site for taking the pulse but it can be useful if you are trying to assess the extent of the blood supply to the lower leg, after a leg injury, for example.
- *Posterior tibial*: just behind the ankle. This is often used if poor circulation to the feet is suspected.
- *Dorsal pedis*: on the top of the foot. Often checked post-operatively in people who had injuries to the foot or when there is a problem with circulation.

ALERT

Do not use your thumb to take a pulse, as you are more likely to record your own pulse than that of your patient!

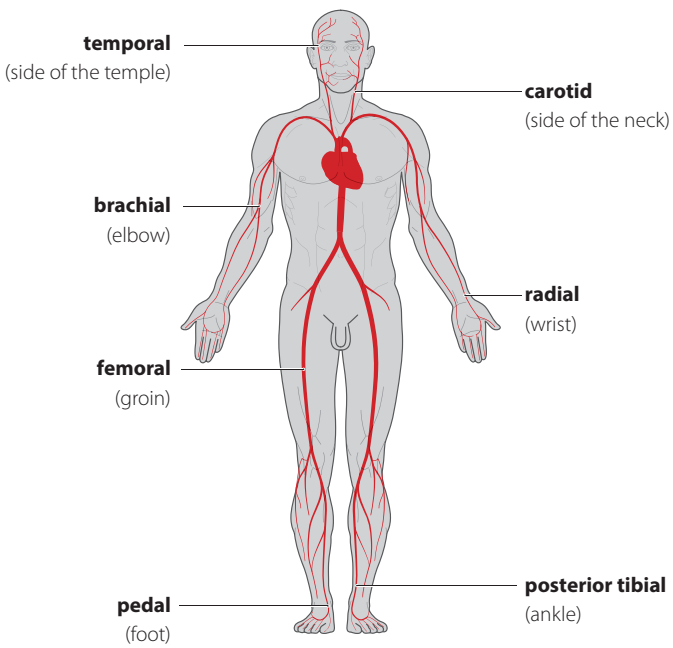


Figure 5.3 Sites of possible pulse palpation. Adapted from Minett, P. and Ginesi, L. *Anatomy & Physiology: an introduction for nursing and healthcare* (2020), Lantern Publishing.

Procedure 5.3: Taking a pulse by palpation

STEP 1 Obtain consent from the person.

STEP 2 Wash hands.

STEP 3 Place the fingers over the site of the artery; you may need to move your fingers around until you find the pulse.

STEP 4 Using a watch that shows seconds, count the number of beats felt within a 60 second period.

STEP 5 Record the pulse rate (in beats per minute) on the person's notes.

When taking the pulse it is important not only to measure the beats per minute (bpm) but also to assess the rhythm (regular or irregular) and the quality (weak or bounding) of the pulse.

5.3.2 Normal range for pulse rate

The normal range of pulse in adults is from 60 to 100 beats per minute (bpm).

A pulse rate of less than 60 bpm is referred to as **bradycardia** and can be caused by:

- raised intracranial pressure
- certain drugs, such as beta-blockers
- higher than average physical fitness (for example, some athletes have a resting pulse rate of just 40–50 bpm).

A pulse rate of more than 100 bpm is called **tachycardia** and can be caused by:

- low circulating blood volume (the heart beats faster to keep up the blood pressure), which can be the result of dehydration
- stress, shock or pain, all of which cause the release of adrenaline, which raises the heart rate.

An irregular pulse (i.e. the pulse is not beating in consistent time intervals, or the pressure is changing between beats) is a sign of irregular heart contractions (known as an **arrhythmia**).

A weak pulse may indicate decreased cardiac function, dehydration or shock.

Any irregularities in a person's pulse must be documented and reported to a qualified nurse.

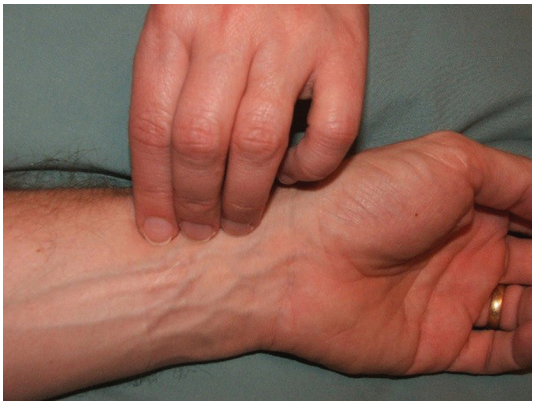


Figure 5.4 Taking a radial pulse.

5.4 Respiration rate

Hint for practice

Practise assessing someone's respiration while appearing to take the radial pulse. This subterfuge will help you to gain an accurate respiratory rate.

The function of the respiratory system is to supply the body with oxygen and to remove carbon dioxide. One respiration consists of a breath in and a breath out, that is, an inspiration and an expiration. When observing respirations, you are not only assessing the rate and the rhythm, but also the effort that is required by the person.

Respiratory distress (increased effort required to breathe) is often an early sign of other problems. People often report shortness of breath in the 24 hours before a respiratory or cardiac arrest.

Procedure 5.4: Assessing respirations

When measuring respiration rate it is important to ensure that the person is not aware of what you are doing, because the rate can increase if the person is aware that they are being observed.

STEP 1 While the person is unaware that you are monitoring them, count the number of times their chest rises in 60 seconds; remember that one respiration is the time taken for the chest to rise (inspiration) and fall (expiration).

STEP 2 Record in the person's notes the respiration rate as the number per minute.

STEP 3 Assess how much effort is required for the person to breathe, i.e. are they short of breath, is there any audible noise or are they using abdominal muscles to assist with air intake?

STEP 4 Next, assess whether each side of the chest is moving equally.

STEP 5 Listen for extra noises such as wheezing, grunting, **stridor** (a harsh vibrating noise), snoring, sighing or gasping.

STEP 6 Factors such as flaring of the nostrils and blueness (**cyanosis**) around the lips and extremities should also be observed. In the case of a dark-skinned person cyanosis can more easily be observed on the gums and fingertips.

STEP 7 Record in the person's notes all findings of significance.

STEP 8 Report any abnormalities to senior staff.

5.4.1 Normal range for respiration

The normal range for respiration in a healthy adult is 12 to 20 respirations per minute. Report observations outside this range to the nurse in charge.

Reduced respiration rate is called **bradypnoea** and can be caused by:

- opiate analgesia
- head injuries.

Increased respiration rate is called **tachypnoea** and can be caused by:

- stress
- fever
- cardiac failure
- respiratory diseases
- airway obstruction.

5.5 Blood pressure

Blood pressure is the force blood exerts on the wall of an artery. It is measured in millimetres of mercury (mmHg). Two measurements are recorded, written in the form 120/80 mmHg:

- systolic pressure (the top number in the reading) is the maximum pressure the blood exerts against the wall of the artery during ventricular contractions
- diastolic pressure (the bottom number in the reading) is the minimum pressure of blood against the wall of the artery following closure of the aortic valve.

Blood pressure determination is one of the most important measurements in clinical practice, and is still one of the most inaccurately performed. Healthcare professionals must be aware that devices for measuring blood pressure must be properly validated and maintained and regularly recalibrated according to the manufacturer's instructions (NICE 2011).

Blood pressure can be taken manually using a device called a **sphygmomanometer**; it is important to develop an expert manual technique. Electronic devices are also used and, if you come across these in your clinical placements, ask your supervisor exactly how they work; the basic procedure is provided below, but different models may require slight modifications to this.

Procedure 5.5: Measuring blood pressure manually

Before commencing you must ensure (NICE 2011):

- that the environment is relaxed and temperate
- that the person is quiet and seated, with their arm supported outstretched in line with the mid-sternum.

It is important to remember to estimate the systolic pressure first. Doing this allows you to avoid over-inflation of the cuff, which can cause unnecessary pain. The systolic beat can be estimated as follows (see also *Figure 5.5*):

STEP 1 Ensure that the upper arm is not covered with any clothing or, if this is not possible, that any clothing underneath the cuff is a thin single layer and not creased.

STEP 2 Place the blood pressure cuff over the middle third of the upper arm.

STEP 3 While watching the sphygmomanometer dial, feel for the radial pulse.

STEP 4 Pump the cuff up slowly until the radial pulse disappears; the reading at which the radial pulse disappears is the approximate systolic blood pressure.

Then take the blood pressure measurements:

STEP 5 Check that the cuff is still around the middle third of the upper arm.

STEP 6 Place the diaphragm (flat) side of the stethoscope on the radial pulse point (above the brachial artery).

STEP 7 Close the valve on the pump – doing this while keeping the stethoscope in place involves a lot of dexterity and requires practice! One of the keys to taking a reliable reading is to learn to control the valve when pumping the cuff up and letting it down.

STEP 8 Place the stethoscope in your ears (with the ear attachments facing slightly forwards as this follows the line of the ear canal) and use the flat side of the stethoscope to listen for sounds.

STEP 9 Pump the cuff up 10–20 mmHg above the level of the systolic reading that you estimated earlier. Then let the air out of the cuff slowly. If the cuff is let down too fast, you may not hear the sounds at the correct time, resulting in an inaccurate reading; if it is let down too slowly, then the high pressure in the cuff can cause a lot of discomfort to the person.

STEP 10 With the stethoscope still over the brachial artery, listen for the brachial pulse. When you hear the first clear pulse sound, the reading on the sphygmomanometer corresponds to the systolic pressure. As you continue to release air from the cuff, you will be able to hear the pulse. The level at which you can no longer hear the pulse through the stethoscope corresponds to the diastolic pressure.

STEP 11 Document accurately the readings when the pulse sound appears (systolic) and then disappears (diastolic).

STEP 12 Remove the cuff from the person's arm.

STEP 13 If the reading is higher than expected, you may wish to allow the person to relax and then repeat the measurement.

STEP 14 Report any abnormalities to senior staff.

Figure 5.5 Taking a blood pressure reading manually.

Hint for practice

Keep the stethoscope away from the sphygmomanometer tubes because this will create excessive noise. Ensure that the head of the stethoscope is aligned in the correct way (flat side down) in order to hear properly.

As described in the procedure, the cuff must be over the middle third of the upper arm. If the cuff is too small or too large this is not possible. Using a cuff that is too small gives a falsely high reading in people with large upper arms (Vidt 2010). Most hospitals will keep cuffs in a range of different sizes. The ideal cuff should have a bladder length that is 80% of the arm's circumference and a width of at least 40% (Pickering 2005):

Arm circumference (cm)	Cuff description	Cuff size (cm)
22–26	Small adult	12 × 22
27–34	Adult	16 × 30
35–44	Large adult	16 × 36
45–52	Adult thigh	16 × 42

5.5.1 Normal range for blood pressure

Normal blood pressure generally ranges from 100/60 to 140/90 mmHg. Measurements outside this range should be reported to the nurse in charge.

A low blood pressure (i.e. below 100/60 mmHg) is referred to as **hypotension** and can be caused by:

- low circulating blood volume (**hypovolaemia**)
- decreased cardiac output
- dehydration
- shock (see *Section 5.5.2*).

A high blood pressure (i.e. above 140/90 mmHg) is known as **hypertension** and can be caused by:

- raised intracranial pressure
- cardiovascular disease
- stress
- pain.

ALERT

1. The use of electronic devices is often a major part of taking observations. The reliance on a machine for taking observations may be detrimental to nursing care if other obvious cues to the person's condition are not picked up, and may contribute to a superficial assessment.
2. Do not take a blood pressure on the arm of a person who has an A–V shunt for kidney dialysis, or on the affected side of a person who has had their lymph nodes removed for diseases such as breast cancer. Lymphoedema can affect readings after mastectomy.
3. Several factors can cause deviations in measured blood pressure, including room temperature, exercise, alcohol or nicotine consumption, positioning of the arm, muscle tension, bladder distension, talking and background noise (Pickering 2005). People should be enabled to sit quietly for at least five minutes before their blood pressure is measured (Vidt 2010).

5.5.2 Shock

Shock means that the circulatory system is not able to work effectively to provide the required circulation to the tissue, and can also cause the blood pressure to drop. Types of shock (see *Section 6.4.1*) include:

- **cardiogenic** shock (may be caused by a heart attack, also known as a myocardial infarction)
- hypovolaemic shock (caused by massive blood loss or severe dehydration)
- septic shock (due to a severe systemic infection)
- **anaphylactic** shock (caused by a severe allergic reaction)
- **neurogenic** shock (possibly caused by meningitis).

Shock-induced hypotension (low blood pressure) is usually accompanied by a rapid pulse (tachycardia). However, if the hypotension is accompanied by a reduced pulse (bradycardia), then this can indicate neurogenic shock, which could indicate meningitis.

5.6 Oxygen saturation

Oxygen saturation in peripheral blood (SpO_2) is a measure of the amount of oxygen being carried round the body by haemoglobin in the blood expressed as a percentage of the total oxygen-carrying capacity. A person with 100% saturation has oxygen molecules on all the haemoglobin. Oxygen saturations fall when a reduced amount of oxygen is circulating through the body. 'O_2 sats' are routinely measured in most people.

5.6.1 Normal range for oxygen saturation

The normal range for oxygen saturation in a healthy adult is between 95% and 98%.

A low oxygen saturation (i.e. below 95%) is referred to as **hypoxaemia** and is caused by:

- depressed respiratory effort
- low circulating blood volume
- shock.

People with COPD have a lower oxygen saturation than healthy people. A range of 88–92% would be considered normal for a person with COPD.

Measurements below the expected range should be reported to the nurse in charge.

5.6.2 Oxygen saturation monitoring

Oxygen saturation is monitored by pulse oximetry, which detects hypoxaemia before clinical signs become apparent. The monitor is an electronic device that clips onto a finger or ear lobe, or foot in the case of a small child, and gives a reading of the percentage of circulating haemoglobin that has oxygen molecules attached to it (*Figure 5.6*).

How saturation monitoring works

- When haemoglobin is well saturated with oxygen it is red and absorbs more light from the infrared probe on a saturation monitor.
- When haemoglobin has a lower oxygen concentration, the blood changes to a bluer colour and the amount of light absorbed from the red and infrared light that passes through the skin is reduced.
- The amount of light absorbed enables the pulse oximeter to detect changes in blood oxygen concentration.
- The light-emitting part of the probe is placed on the top of one part of the body, for example the finger, and a photodetector is placed directly opposite the light source on the underside of the finger. The red and infrared light passes through the skin, is picked up by the photodetector and interpreted.

Figure 5.6 (a) Saturation monitor, and **(b)** fingertip monitor in use.

Scenario: Teresa White

Following Teresa's deterioration, further radiological investigation is carried out and a diagnosis reached of a subdural haematoma. Teresa is transferred to the operating department for surgery. After successful removal of the haematoma, Teresa is monitored closely, and supplemental oxygen administered at a concentration of 40% via a simple face mask. To record her oxygen saturation, a probe is attached to her finger and her oxygen saturation levels monitored.

Procedure 5.6: Measuring oxygen saturation

STEP 1 Explain the procedure to the person and obtain their consent.

STEP 2 Make sure the area where you are going to place the probe is clean; remove any nail polish from the fingernail to minimise potential interference.

STEP 3 Place the probe on the index finger, ensuring it is positioned the right way up, and plug the cable into the oximeter.

STEP 4 The probe and lead can be secured with tape if necessary.

STEP 5 Position the person to minimise the effect of movement or slight tremors.

STEP 6 Check that the oximeter is displaying a normal waveform or graph (machines vary in whether they produce a waveform or bar graph).

STEP 7 Check that the oximeter alarm settings are correct for the person – a senior colleague will normally have advised these levels.

STEP 8 Note on the person's chart the time the reading was started and the location of the probe.

STEP 9 Report any abnormalities to senior staff.

STEP 10 Change the location of the probe at least every two hours to avoid inaccurate readings and reduce the effects of constant pressure on the digit.

Considerations for monitoring oxygen therapy

When monitoring and recording a pulse oximetry reading, you should ensure an appropriate amount of light and that the person is not moving. Misinterpretation of readings may occur for the following non-medical reasons:

Cause of misinterpretation	Reason	Effect on reading
Too much light	Surrounding environment is too bright Spotlight placed directly over the person	Sensor would be unable to detect blood flow
Too little light	Surrounding environment is too dim Probe not in the correct position Probe the wrong size for the person	Sensor unable to detect blood flow
Motion artefact	Person moving hand around	Increased blood flow causes incorrect reading
Venous pulsation	Sensor fitted too tightly Non-invasive blood pressure monitoring device on same limb as sensor	Increased blood flow causes incorrect reading
Change in light absorbency of blood	IV dyes for investigations, e.g. methylene blue, isosulfan blue and indocyanine green	Difficulty in detecting blood flow
Sensor function impaired	Nail varnish, false nails, dirty skin or nails	Difficulty in detecting blood flow
Note that the monitor will give an abnormally high reading in people who have suffered carbon monoxide poisoning as it cannot differentiate between carbon monoxide and oxygen molecules attached to haemoglobin.		

Professional responsibilities

Although the oxygen saturation monitor can detect hypoxaemia more quickly than the nurse caring for the person, it is crucial the nurse uses previous experience and observation skills to detect any changes in the person's condition. Saturation monitors should be used in conjunction with nursing skills and should not replace them.

ALERT

Damage to the skin is a potential problem when using an oxygen saturation probe with children and neonates, who have sensitive skin.

ALERT

An oxygen saturation probe should never be used to take the pulse rate because it cannot assess the rhythm and quality. It also does not replace the respiratory rate observation because it measures blood oxygenation, not ventilatory function.

5.7 Neurological observations

Scenario: Teresa White

Teresa has a head injury so it is important that her neurological status is assessed, and this requires a set of neurological observations to be undertaken.

In Teresa's case the observations indicate that she is now bradycardic and hypertensive. Her respiratory rate has also decreased.

Neurological observations consist of the Glasgow Coma Scale (GCS), pupil size and reactions, limb movements, temperature, pulse, blood pressure, respirations and blood oxygen saturation. This section focuses on the GCS, pupil size and reactions, and limb movements; the other observations have been covered earlier in the chapter.

Any person who is at risk of deteriorating neurologically should have neurological observations carried out. Such people include:

- people who have had (or are suspected of having) a head injury, especially if they have lost consciousness
- people who have had a stroke
- those with known or suspected brain tumours
- those at risk of cerebral infection such as meningitis.

5.7.1 Glasgow Coma Scale

The GCS evaluates three categories that most closely reflect activity in the higher centres of the brain. These are:

- eye-opening response
- verbal response
- motor response.

The individual components of the GCS should be described in all communications and should always accompany the total score (NICE 2014). A GCS of 15 indicates that the person is functioning cerebrally. A deterioration of one point in the motor response or two points overall is clinically significant and must be reported to a senior member of staff. The GCS responses are as follows:

Eye-opening response (E):

- spontaneously – without the need for speech or touch (4 points)
- to speech – eyes open when spoken to (3 points)
- to pain – eyes open when pain evoked (2 points)
- none – no eye opening (unless closed due to injury) (1 point)

Verbal response (V):

- orientation – able to say the current year and month, where they are and why, and who they are (5 points)
- confusion – does not answer the above correctly (4 points)
- inappropriate words – random words (3 points)
- incomprehensible sounds – for example grunting, moaning or crying (2 points)
- none – not even following verbal or painful stimuli (1 point)

Motor response (M):

- obeys commands – does what they are asked to do (6 points)
- localises – moves limb towards where pain is coming from (5 points)
- withdraws from pain – bends arm at the elbow but does not locate the pain (4 points)
- flexion to pain – flexes the upper arm and rotates the wrist (3 points)
- extension – characterised by straightening of the elbow and internal rotation of the shoulder and wrist (2 points)
- none – no response to pain (1 point)

Pain should only be applied if the person does not respond to firm and clear commands (Lister 2020). A trapezium squeeze is recommended – using your thumb and two fingers, hold 5 cm of the trapezium muscle where the neck meets the shoulder.

The three responses of the GCS should be reported separately: for example, E4, V4, M5. If a total score is recorded or communicated it should be based on a total out of 15, and to avoid confusion this denominator should be specified, so for example E4, V4, M5 gives a total score of 13/15 (NICE 2014).

5.7.2 Pupil size and reactions

Pupils are assessed to see if they are equal and if they react to light; if they are equal and both react, you might sometimes hear the acronym 'PEARL' (pupils equal and reacting to light) used. Alterations in reaction, shape or size are a late sign of raised intracranial pressure.

5.7.3 Limb movement

Also called motor response, this part of the set of observations assesses whether there has been any damage of the nervous system between the brain and the spinal cord. Each limb must be tested separately.

5.7.4 Head injury

Hint for practice

Neurological observations are extremely important and are essential in monitoring a person's health status. Take every opportunity to work with a range of professionals in assessing and documenting observations as you work towards obtaining proficiency.

Head injury refers to any trauma to the head other than superficial injuries to the face. Because the skull is a very hard retaining structure there is little room within the skull to accommodate additional material, such as blood clots, tumours or **oedema**. It is important to detect any neurological problems early so that the appropriate treatment can be performed, and possible brain damage prevented or minimised.

The National Collaborating Centre for Acute Care guidelines for the management of people with head injuries, updated as NICE Clinical Guideline 176 (NICE 2014), state that neurological observations should be carried out:

- half-hourly until the GCS is 15
- for people with GCS of 15, half-hourly for two hours
- hourly thereafter for four hours
- two-hourly thereafter.

Should a person with GCS 15 deteriorate at any time after the initial two-hour period, observations should revert to half-hourly and follow the original schedule (NICE 2014). These are minimum requirements: if you are worried about someone's condition, you should increase the regularity of the observations.

In-hospital observations of a person with a head injury should only be conducted by professionals competent in the assessment of head injury. However, as a student, you should take the opportunity to watch neurological observations being carried out while you are in practice, and this section will help you to understand the procedure.

Procedure 5.7: Neurological observations

STEP 1 Introduce yourself, explain the procedure to the person and obtain consent.

STEP 2 Assess the GCS.

- Assess eye opening to check level of consciousness.
- Assess verbal response by asking the person to tell you where they are.
- Assess motor response by asking the person to do something and assess their ability to carry out your instructions.

STEP 3 Check pupils using a pen torch, looking specifically for size and reaction to light – ensuring that both pupils react equally.

STEP 4 Assess limb movement starting with the arms, by asking the person to push against your hands with theirs. Lower limb movement should be assessed in a similar manner.

STEP 5 Record the results on the neurological observations chart (see *Figure 5.7*) and report any deterioration.

A doctor should urgently review the person if any of the following occurs:

- the development of agitation or abnormal behaviour
- a drop in GCS of one point for over 30 minutes (greater weight should be given to a drop of one point in the motor score)

- any drop in GCS of three or more points in the eye-opening or verbal response or two or more points in the motor response score
- the development of severe or increasing headache or persistent vomiting
- new or evolving neurological signs such as unequal pupils, asymmetry of limb or facial movements (NICE 2014).

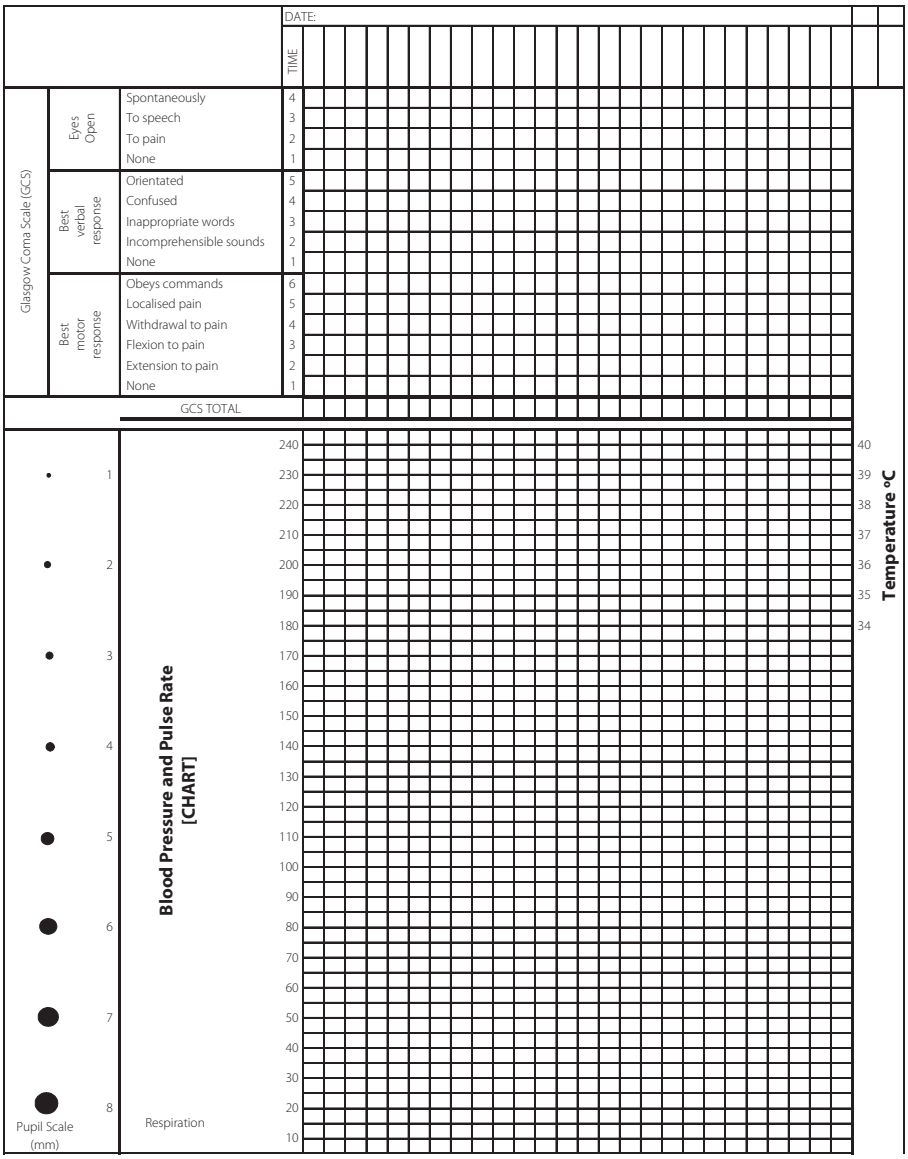


Figure 5.7 An example of a neurological observation chart.

ALERT

Neurological bleeds are unlike other bleeds in the body. The bleeding does not cause a lowered blood volume and tachycardia but, instead, causes a raised blood pressure. Often the systolic blood pressure increases while diastolic stays the same and the heart rate drops. The respiratory rate becomes irregular. The combination of these three factors is called Cushing's triad.

5.8 Blood glucose monitoring

Blood glucose level is the amount of sugar (needed for cell metabolism) in the bloodstream.

Procedure 5.8: Monitoring blood glucose

STEP 1 Introduce yourself, check the person's identity, explain the procedure and obtain consent.

STEP 2 Wash hands and put on gloves.

STEP 3 Take a small prick of blood from the person, from the side of a clean finger, using a lancet.

STEP 4 Place the drop of blood on to a blood glucose testing strip (checking manufacturer's instructions first); you may need to gently squeeze the finger above the puncture site if the drop of blood is not immediately forthcoming.

STEP 5 Insert this into the glucometer (an electronic device which 'reads' the testing strip), which will then give a measurement.

STEP 6 Ensure that the person is not left bleeding afterwards by applying pressure directly over the puncture site with cotton wool or gauze.

STEP 7 Dispose of the lancet in a sharps bin.

STEP 8 Dispose of gloves and wash hands.

STEP 9 Record the measurement in the person's notes.

STEP 10 Report any abnormalities to senior staff.

As with thermometers, there are so many different glucometers on the market that it would be impossible to describe each one in this book. However, they all work in a similar way and so you should familiarise yourself with the type of blood glucose monitor that is used in your clinical area so that you are confident of taking accurate measurements.

5.8.1 Normal range for blood glucose

The normal range for blood glucose level in a non-diabetic adult is between 4.0 mmol/L (pre-prandial) and 7.8 mmol/L (two hours post-prandial). Report measurements outside this range to the nurse in charge.

A low blood glucose level (i.e. less than 4 mmol/L) is called **hypoglycaemia** and occurs when the blood glucose level is insufficient to meet the metabolic demands of the body. It can be caused by factors such as:

- starvation
- renal insufficiency, which can cause infection
- liver failure
- insulin-secreting tumours
- salicylate (aspirin) poisoning
- excess insulin in a diabetic person.

A high blood glucose level (i.e. higher than 7 mmol/L) is called **hyperglycaemia** and occurs when the body is unable to produce insulin, such as in people with diabetes mellitus. During illness, surgery, infection or stress, the blood sugar levels may rise in people with diabetes. Some people may be diabetic and be unaware of it.

Scenario: Teresa White

Teresa's head injury had caused a subdural haematoma (bleeding on the brain) and this resulted in an increased intracranial pressure – this clinical diagnosis was made following the confusion, raised blood pressure and bradycardia and irregular respirations noted by the nurse looking after Teresa.

Teresa required surgery to relieve the intracranial pressure and was then monitored on a neurosurgical unit (see *Chapter 18* for more about pre- and post-operative care) until her discharge 10 days later. In the first 48 hours after her operation, observations (including neurological observations) were taken every two hours; once it was clear that there was no deterioration in any of the observations, the measurements were reduced.

Activity

Practise the skills of observation as often as you can to improve and maintain your proficiency. For example:

- Using a thermometer, record your own temperature and that of a friend. Assess the difference, after two minutes, between a temperature taken under the arm and a temperature taken orally.
- With a friend, practise locating the different places used to take a pulse, particularly the brachial, radial and carotid (remember to ask for permission before beginning). Count each other's pulse for a minute assessing rate, rhythm and quality.
- Using a manual sphygmomanometer, practise taking a manual blood pressure whenever possible.
- When you are in clinical practice, look at the blood pressure, pulse, respirations and temperature of the people under your care. Note how the observations relate to each other and to their medical history.

Summary

Key points from this chapter:

- Accurate observations are vital in determining the person's condition and the level of care the person requires.
- Taking observations provides a good opportunity to get to know someone.
- You must obtain consent from people before conducting observations.
- Document your measurements accurately.
- Talk to your supervisor immediately if you have a concern about a person's condition.

Further reading

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