Jarvis's Health Assessment

Fourth edition

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Australia and New Zealand edition

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Details Inside

Jarvis's Health Assessment

Fourth edition

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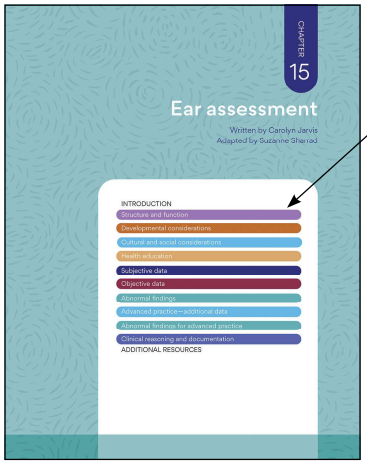
Contents

Text Features

Colour-coded structure

All health assessment chapters (Chapters 11–30) provide a clearly identified colour-coded structure to define the seven major sections of health assessment

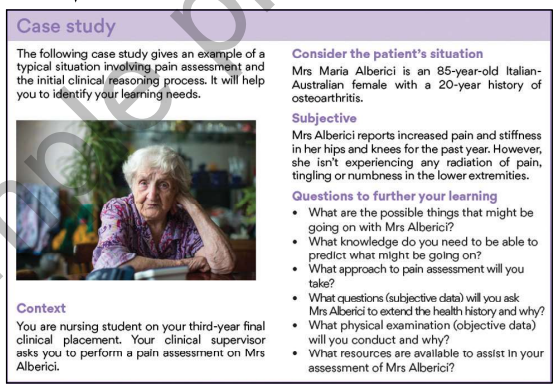


Easy navigation tabs

Highlight the section within each chapter

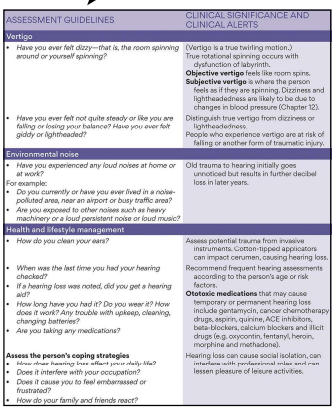
Case Studies

Most chapters use a case study early in the chapter to prompt the reader to adopt an inquiry based approach to their learning.



Clear headings

User-friendly design makes the text easy to use



Highly illustrated

Full colour illustrations show detailed anatomy and physiology, and demonstrate physical examination techniques and abnormal findings

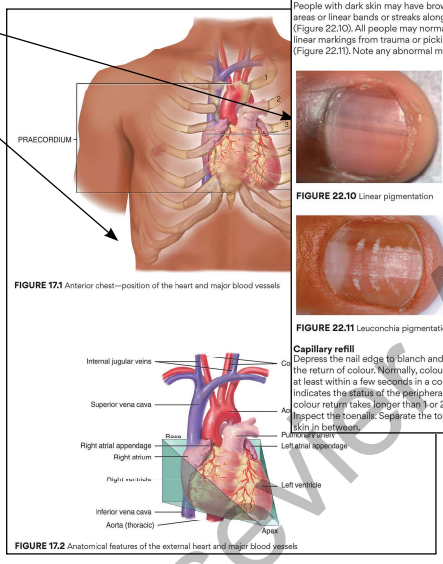
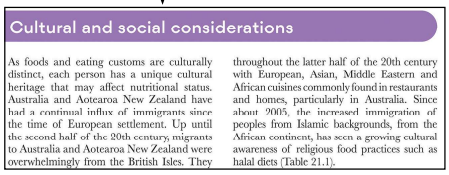


FIGURE 17.1 Anterior chest—position of the heart and major blood vessels

FIGURE 17.2 Anatomical features of the external heart and major blood vessels

Cultural and social considerations

Highlights specific cultural and social considerations relevant to the Australian and New Zealand context

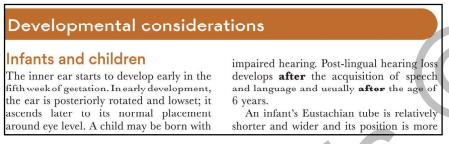


Cultural and social considerations

As foods and eating customs are culturally distinct, each person has a unique cultural heritage that may affect nutritional status. Australia and Aotearoa New Zealand have had a continual influx of immigrants since the time of European settlement. Up until the second half of the 20th century, migrants to Australia and Aotearoa New Zealand were overwhelmingly from the British Isles. They throughout the latter half of the 20th century with European, Asian, Middle Eastern and African cuisines commonly found in restaurants and homes, particularly in Australia. Since about 2005, the increased immigration of peoples from Islamic backgrounds, from the African continent, has seen a growing cultural awareness of religious food practices such as halal diets (Table 21.1).

Developmental considerations

Highlight the needs of specific age groups



Developmental considerations

Infants and children

The inner ear starts to develop early in the fifth week of gestation. In early development, the ear is posteriorly rotated and lowset; it ascends later to its normal placement around eye level. A child may be born with impaired hearing. Post-lingual hearing loss develops **after** the acquisition of speech and language and usually **after** the age of 6 years.

An infant's Eustachian tube is relatively shorter and wider and its position is more

Health education

Provides health education information for key health concerns

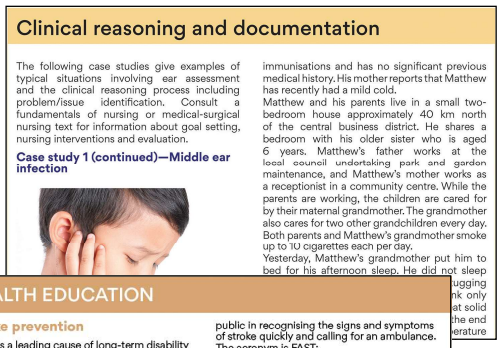
Health Assessment Videos

The enhanced eBook features the following videos:

Abdominal Assessment
Respiratory Assessment
Cardiac Assessment
Neurological Assessment
Vital Signs (electronic)
Vital Signs (manual)

Clinical reasoning and documentation

Continues the clinical case study from early in the chapter, and illustrates the initial parts of the clinical reasoning process and documentation of health assessment.



Clinical reasoning and documentation

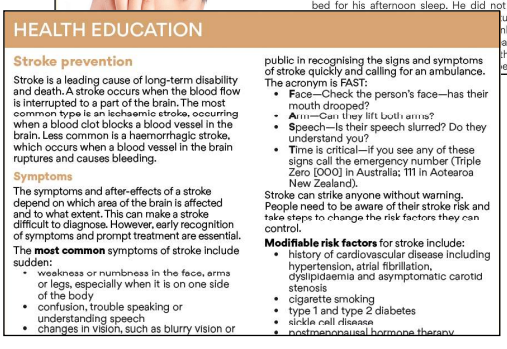
The following case studies give examples of typical situations involving ear assessment and the clinical reasoning process including problem/issue identification. Consult a fundamentals of nursing or medical-surgical nursing text for information about goal setting, nursing interventions and evaluation.

Case study 1 (continued)—Middle ear infection

immunisations and has no significant previous medical history. His mother reports that Matthew has recently had a mild cold.

Matthew and his parents live in a small two-bedroom house approximately 40 km north of the central business district. He shares a bedroom with his older sister who is aged 6 years. Matthew's father works at the local council undertaking park and garden maintenance, and Matthew's mother works as a receptionist in a community centre. While the parents are working, the children are cared for by their maternal grandmother. The grandmother also cares for two other grandchildren every day. Both parents and Matthew's grandmother smoke up to 10 cigarettes each per day.

Yesterday, Matthew's grandmother put him to bed for his afternoon sleep. He did not sleep



HEALTH EDUCATION

Stroke prevention

Stroke is a leading cause of long-term disability and death. A stroke occurs when the blood flow is interrupted to a part of the brain. The most common type is an ischaemic stroke, occurring when a blood clot blocks a blood vessel in the brain. Less common is a haemorrhagic stroke, which occurs when a blood vessel in the brain ruptures and causes bleeding.

Symptoms

The symptoms and after-effects of a stroke depend on which area of the brain is affected and to what extent. This can make a stroke difficult to diagnose. However, early recognition of symptoms and prompt treatment are essential.

The **most common** symptoms of stroke include sudden:

- weakness or numbness in the face, arms or legs, especially when it is on one side of the body
- confusion, trouble speaking or understanding speech
- changes in vision, such as blurry vision or

public in recognising the signs and symptoms of stroke quickly and calling for an ambulance. The acronym is FAST:

- **F**ace—Check the person's face—has their mouth drooped?
- **A**rm—Can they lift both arms?
- **S**peech—Is their speech slurred? Do they understand you?
- **T**ime is critical—if you see any of these signs call the emergency number (Triple Zero [000] in Australia; 111 in Aotearoa New Zealand).

Stroke can strike anyone without warning. People need to be aware of their stroke risk and take steps to change the risk factors they can control.

Modifiable risk factors for stroke include:

- history of cardiovascular disease including hypertension, atrial fibrillation, dyslipidaemia and asymptomatic carotid stenosis
- cigarette smoking
- type 1 and type 2 diabetes
- sickle cell disease
- postmenopausal hormone therapy

Preface

Health assessment is central to nursing practice. By practising and developing the knowledge and skills of health assessment you will develop confidence and competence in understanding and responding to each person's health situation. You need to listen to the cues from the person; these will guide and direct your questioning and physical examination. Whether you are an undergraduate nursing student, a newly qualified registered nurse or an experienced nurse seeking to advance your scope of practice, this text holds the content and resources you need to develop and refine your health assessment skills.

As a learner you should use this text in conjunction with the skills videos for self-directed learning. Also, you need to actively participate in formal on-campus skills development sessions and clinical placements. You need to be continuously reflecting on your learning and on the feedback provided by your learning facilitators and clinicians to refine your health assessment skills and knowledge. The fourth edition of this text is contextualised to suit the Australian and Aotearoa New Zealand healthcare environments. We hope this text will become an invaluable part of your professional library, and we look forward to ongoing feedback from you, our readers.

NEW TO THE FOURTH AUSTRALIAN AND NEW ZEALAND EDITION

The fourth ANZ edition of *Jarvis's Health Assessment* (note new title) has been fully revised and updated for the Australian and Aotearoa New Zealand contexts. It has been structured to enhance learning for undergraduate and postgraduate students, nurse practitioner candidates and clinicians.

This text differs from other health assessment texts by adopting a unique person-centred, enquiry-focused approach. In addition:

- Learners are provided with opportunities to adapt their assessment skills and to form clinical judgements by identifying the person's actual or potential health problems.
- The content has been restructured to support learning by using case studies and probing questions.
- There has been significant revision of the chapters on screening for family violence (Chapter 5) and screening for substance misuse (Chapter 6).
- The chapter on communication skills has also been significantly revised, with a new title and content on person-centred communication in health assessment.
- Approaches to gender diversity and inclusion have also been further developed.

APPROACH TO LEARNING HEALTH ASSESSMENT

This text, written by leading academics and clinicians, is the ideal learner guide to conducting health assessments in a range of healthcare settings. The learner will be guided to seamlessly apply their biomedical and nursing knowledge with clinical assessment and communication skills. Chapters have a logical structure covering key knowledge, frameworks and techniques, as well as specific areas of human structure

and function, and finally, application of health assessment knowledge and skills in the clinical setting.

This text identifies the foundational knowledge and clinical skills every nurse needs to assess clients in a range of healthcare settings. Chapters 11–29 are divided into two main sections: entry-level health assessment expected of a newly graduated nurse; and an advanced knowledge and skills section for nurses wishing to advance their scope of practice.

This text applies an enquiry approach to learning, with a person-centred focus using case studies. Case studies in Chapters 2, 5–9 and 11–30 provide a clinical context to assist the learner to develop a deep understanding of the ways in which health assessment skills must be adapted relative to each person's needs. This approach is supported by probing questions aimed at guiding investigation of the impact of an altered health state on each person's day-to-day function.

KEY FEATURES

- Fully updated for the Australian and Aotearoa New Zealand contexts, reflecting current practice and guidelines
- Ideal for nursing students and those studying for advanced practice roles
- Clear separation of knowledge and skills—easy for teachers and students to identify content relevant to their level of learning
- An enquiry approach to learning with a person-centred focus
- Health education, inclusive practice and lifespan considerations embedded throughout
- Includes case studies to illustrate the initial parts of the clinical reasoning process and documentation of health assessment findings
- Easy to navigate—clearly structured and colour-coded
- Extensive use of learning and teaching resources, with illustrations to clarify important anatomical and physiological concepts to help learners grasp key concepts
- Accompanying resources include QR codes, Australian-produced videos showcasing physical examination skills, PowerPoints and a summative MCQ question bank

INSTRUCTOR RESOURCES ON EVOLVE

- Instructor teaching and learning guide
- PowerPoint presentations
- Skills videos
- Image collection
- Test bank
- New semester planner—embedding Elsevier solutions into your course
- New mapping guide—cross-references Elsevier foundation content

STUDENT AND INSTRUCTOR RESOURCES ON EVOLVE

- Australian-produced skills videos include vital signs measurement (manual and electronic), respiratory assessment, cardiac assessment, abdominal assessment and neurological assessment
- Access to Elsevier resources on Evolve including an eBook version of the text

ACKNOWLEDGEMENTS

We would like to acknowledge the people who made the fourth Australian and New Zealand edition of this text possible:

- Melinda McEvoy (Senior Content Strategist) for her support and leadership in developing this edition.

- Matt Davies (Editor) for his professional editorial skills.
- Shruti Raj (Content Project Manager) for her efforts in transforming the manuscript into a textbook.
- Deakin University, School of Nursing and Midwifery, who generously made simulation centre space available for the video shoot.

We would also like to thank our families for supporting us in developing this text over the past two and a half years. We thank our families and friends for their support, encouragement and for the endless cups of tea.

We would like to dedicate this edition to the nursing students and registered nurses who will use this text to develop their clinical skills. We encourage you to continually strive to develop and refine your health assessment skills. Your efforts will contribute to improving the person's experience and the overall quality and safety of nursing care.

To nursing curriculum designers, we encourage you to prioritise health assessment knowledge and skill development by ensuring a strong focus, particularly in undergraduate curricula. To the nursing lecturers, we thank you for your continuing motivation and encouragement of student learning in this critical area of nursing practice.

The publisher and editors would also like to thank each of the chapter authors and reviewers who ensured the relevance, accuracy and strong clinical application of the content. In this new edition we would also like to acknowledge past contributors and reviewers who provided a strong foundation on which we could build.

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CHAPTER 12

Neurological assessment

Written by Carolyn Jarvis
Adapted by Josh Allen

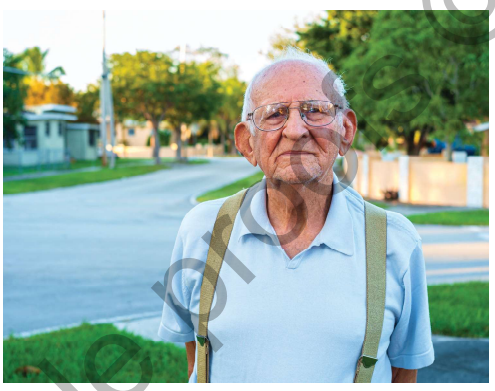
INTRODUCTION

The nervous system can be divided into two parts—central and peripheral. The **central nervous system** (CNS) includes the brain and spinal cord. The **peripheral nervous system** (PNS) includes the 12 pairs of cranial nerves, the 31 pairs of spinal nerves and all their branches. The PNS carries (afferent) messages *to* the CNS from sensory receptors, motor (efferent) messages *from* the CNS out to muscles and glands, as well as autonomic messages that govern the internal organs and blood vessels. This chapter focuses on assessing core neurological functions. Specific assessment of pain (Chapter 13), vision (Chapter 14) and hearing (Chapter 15) is covered in the following chapters. It is important to note that assessment of neurological function is often conducted concurrently with assessment of the peripheral vascular system (Chapter 16).

To be able to perform a neurological assessment, identify potential or actual problems and plan care, detailed knowledge of structure and function, developmental and cultural considerations are necessary.

Case study 1

The following case study gives an example of a typical situation involving ongoing neurological assessment and the clinical reasoning process including problem/issue identification.



Context

It is bedside handover at change of shift. You are the registered nurse undertaking a baseline assessment of Mr Stanislaw Adamik's neurological status in conjunction with the nurse who has been caring for him on the morning shift.

Consider the patient's situation

Mr Adamik is 80 years old, a retired builder who lives with his son in a single-storey house. He was previously living independently performing his activities of daily living without assistance. He was referred to the hospital neurosurgery department after a 2-month history of increasing confusion and generalised malaise. A CT scan showed a left-sided cerebral lesion. He is scheduled to undergo a craniotomy and removal of the left temporal parietal lesion later today.

Questions to further your learning

- What are the possible things that might be going on with Mr Adamik?
- What knowledge do you need to be able to predict what might be going on?
- What approach to Mr Adamik's health assessment will you take?
- What questions (subjective data) will you ask Mr Adamik to extend the health history and why?
- What physical examination (objective data) will you conduct and why?
- What resources are available to assist in your assessment of Mr Adamik?

Resources available

You will find additional resources at the end of this chapter. This chapter also has a video available demonstrating objective data collection related to a neurological screening assessment. You will find a QR code in the objective data section, which enables you to access the video easily on your device.

Structure and function

The head and neck are important structures to consider when assessing neurological function. These structures support and protect parts of the nervous system.

The head

The **skull** is a rigid bony box that protects the brain and special sense organs, and it includes the bones of the cranium and the face (Figure 12.1). Note the location of these **cranial bones**: frontal, parietal, occipital and temporal. Use these names to describe any of your findings in the corresponding areas.

The adjacent cranial bones unite at meshed immovable joints called the **sutures**. The bones are not firmly joined at birth; this allows for the mobility and change in shape needed for the birth process. The sutures gradually ossify during early childhood. The **coronal** suture crowns the head from ear to ear at the union of the frontal and parietal bones. The **sagittal** suture separates the head lengthwise

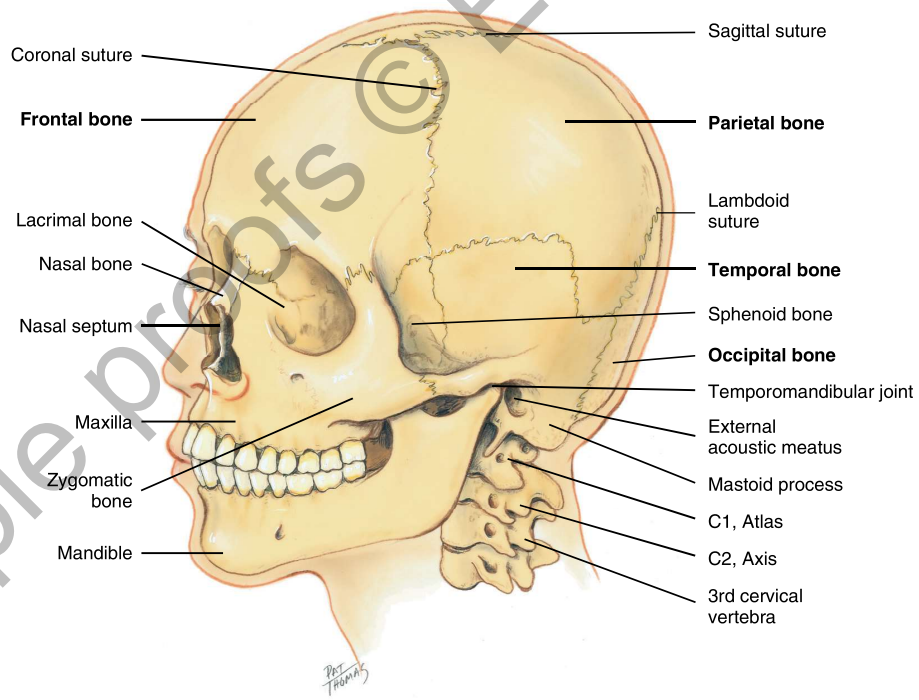


FIGURE 12.1 The skull

the suprasternal notch. The **posterior triangle** is behind the sternocleidomastoid muscle, with the trapezius muscle on the other side and with its base along the clavicle below. It contains the posterior belly of the omohyoid muscle. These triangles are helpful guidelines when describing findings in the neck.

The central nervous system

The brain is made up of three main parts: prosencephalon (or forebrain), consisting of the cerebrum, thalamus, hypothalamus and limbic system; mesencephalon (or midbrain), consisting of the tectum and tegmentum; and rhombencephalon (or hindbrain), consisting of the cerebellum, pons and medulla.

PARTS OF THE CENTRAL NERVOUS SYSTEM

Cerebral cortex

The cerebral cortex is the cerebrum's outer layer of nerve cell bodies, which looks like 'grey matter' because it lacks myelin. Myelin is the white insulation on the axon that increases the conduction velocity of nerve impulses.

The cerebral cortex is the centre for humans' highest functions, governing thought, memory, reasoning, sensation, language and voluntary movement (Figure 12.4). Each half of the cerebrum is a **hemisphere**; the left hemisphere is dominant in most people (95%), including those who are left-handed.

Each hemisphere is divided into four main **lobes**: frontal, parietal, temporal and occipital. The lobes have certain areas that mediate specific functions.

- The **frontal** lobe has areas concerned with reasoning, concentration, personality, behaviour, emotions and intellectual function. The frontal lobe also contains the frontal eye fields, responsible for vision.
- The precentral gyrus of the frontal lobe is the primary centre involved in voluntary contralateral movement.

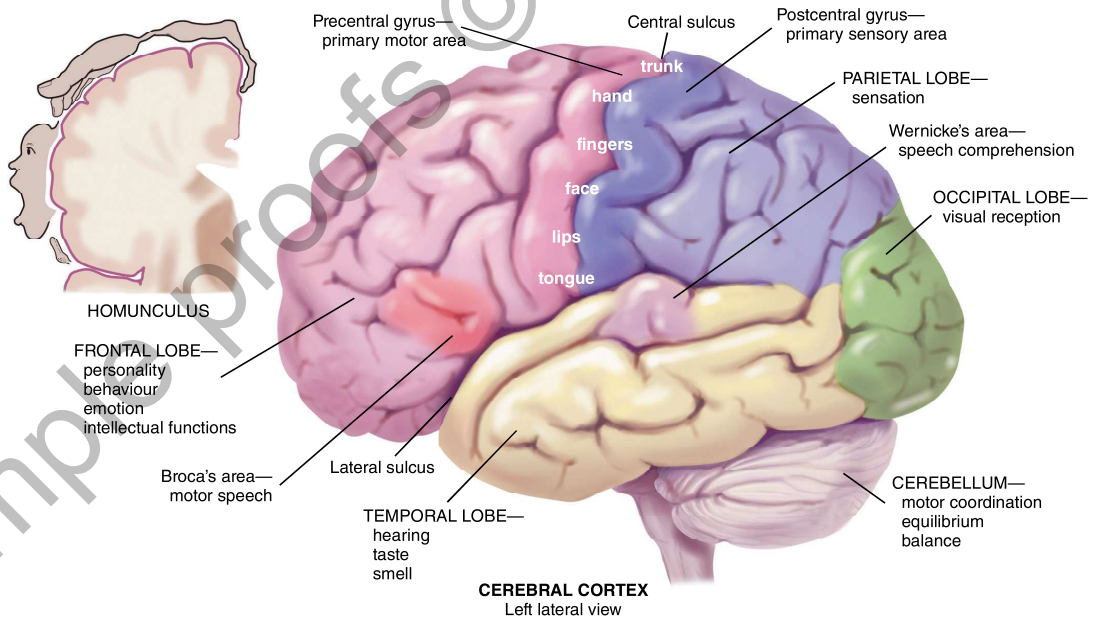


FIGURE 12.4 Cerebral cortex—left lateral view

- The **parietal** lobe's postcentral gyrus is the primary centre for the interpretation of contralateral sensation. Also, in the non-dominant hemisphere it is important in visual/proprioception and in the dominant hemisphere it is important in calculation.
- The **occipital** lobe is the primary visual receptor centre, some visual reflexes and involuntary smooth eye movements.
- The **temporal** lobe behind the ear has the primary auditory reception centre, language function, learning and memory.
- **Wernicke's area** in the temporal lobe is associated with language comprehension. When damaged in the person's dominant hemisphere, *receptive* or *Wernicke's aphasia* results. The person hears sound but it has no meaning, like hearing a foreign language.
- **Broca's area** (inferior part of the dominant frontal lobe) in the frontal lobe mediates motor speech. When injured in the dominant hemisphere the person may experience *expressive aphasia* (cannot talk at all) or *expressive dysphasia* (difficulty in communicating). The person can understand language and knows what they want to say but cannot express what they want to say.

Damage to any of these specific cortical areas produces a corresponding loss of (usually contralateral) function: motor weakness, paralysis, loss of sensation or impaired ability to understand and process language. Damage occurs when the highly specialised neurological cells are affected by trauma or deprived of their blood supply, such as when a cerebral artery becomes occluded or when vascular bleeding or vasospasm occurs.

Basal ganglia

The basal ganglia are large bands of grey matter buried deep within the two cerebral hemispheres that form the subcortical associated motor system (the extrapyramidal system) (Figure 12.5). They help to initiate

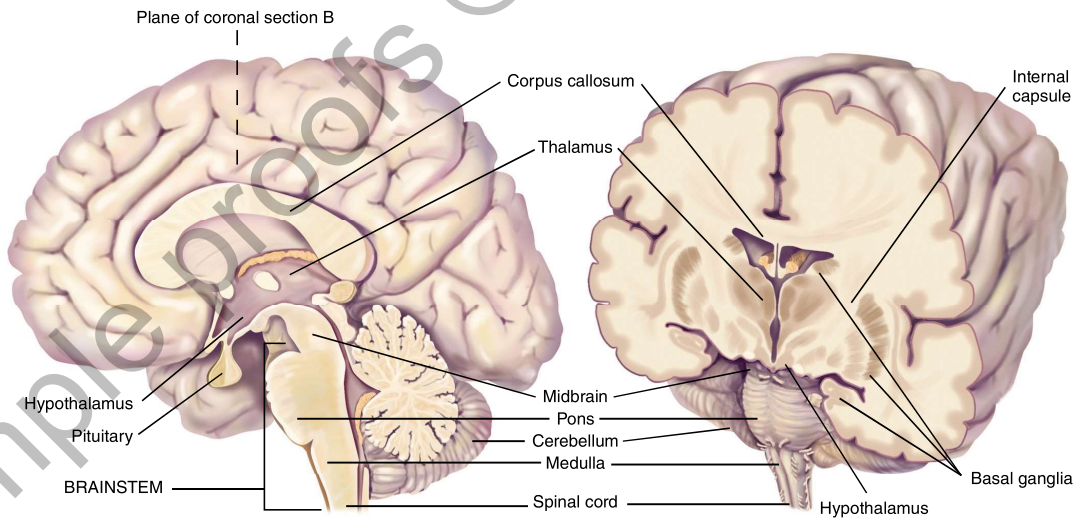


FIGURE 12.5 Components of the central nervous system

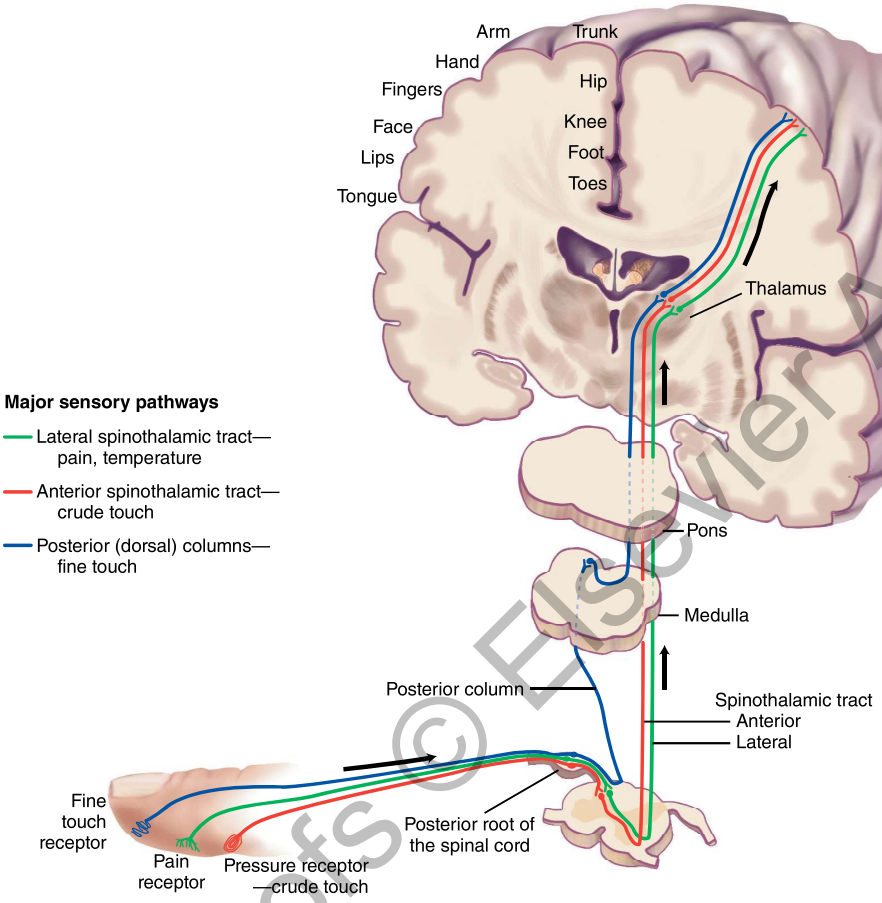


FIGURE 12.6 Major sensory pathways

likewise interacts with the *left* side of the body. Knowledge of where the fibres cross the midline will help you interpret clinical findings.

Sensory pathways

Millions of sensory receptors are embroidered into the skin, mucous membranes, muscles, tendons and viscera. They monitor conscious sensation, internal organ functions, body position and reflexes. Sensation travels in the afferent fibres in the peripheral nerve, then through the posterior (dorsal) root, then into the spinal cord. There, it may take one of two routes—the spinothalamic tract or the posterior (dorsal) columns (Figure 12.6).

Spinothalamic tract

The spinothalamic tract contains sensory fibres that transmit the sensations of pain, temperature and crude or light touch (i.e. not precisely localised). The fibres enter the dorsal root of the spinal cord and synapse with a second sensory neuron. The second-order neuron fibres cross to the opposite side and ascend up the spinothalamic tract to the

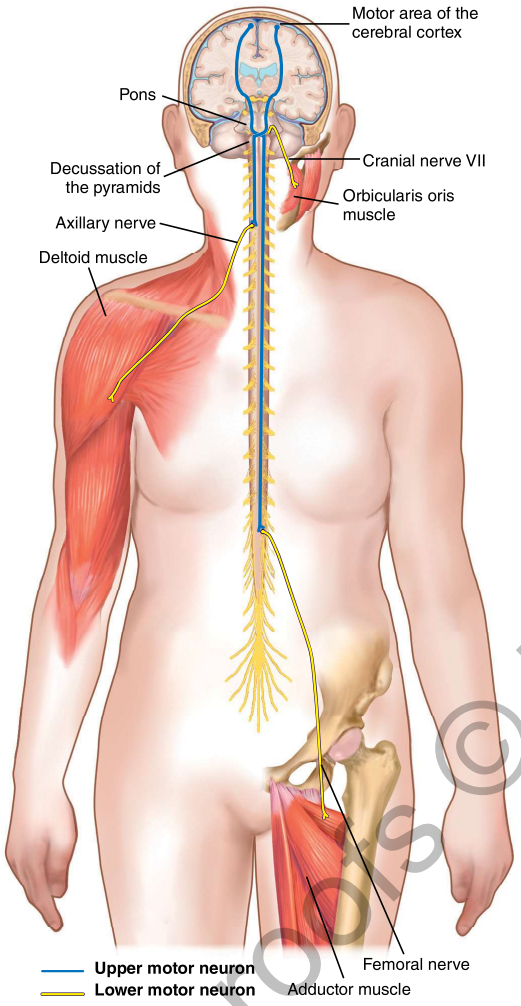


FIGURE 12.8 Upper and lower motor neurons

Lower motor neurons are located mostly in the PNS. The cell body of the lower motor neuron is in the anterior grey column of the spinal cord, but the nerve fibres extend from here to the muscle. The lower motor neuron is the 'final common pathway' because it funnels many neural signals here and it provides the final direct contact with the muscles. Any movement must be translated into action by lower motor neuron fibres. Examples of lower motor neurons are cranial nerves and spinal nerves of the PNS. Examples of lower motor neuron diseases are Bell's palsy in cranial nerve lesions and in spinal cord lesions, poliomyelitis and motor neuron disease.

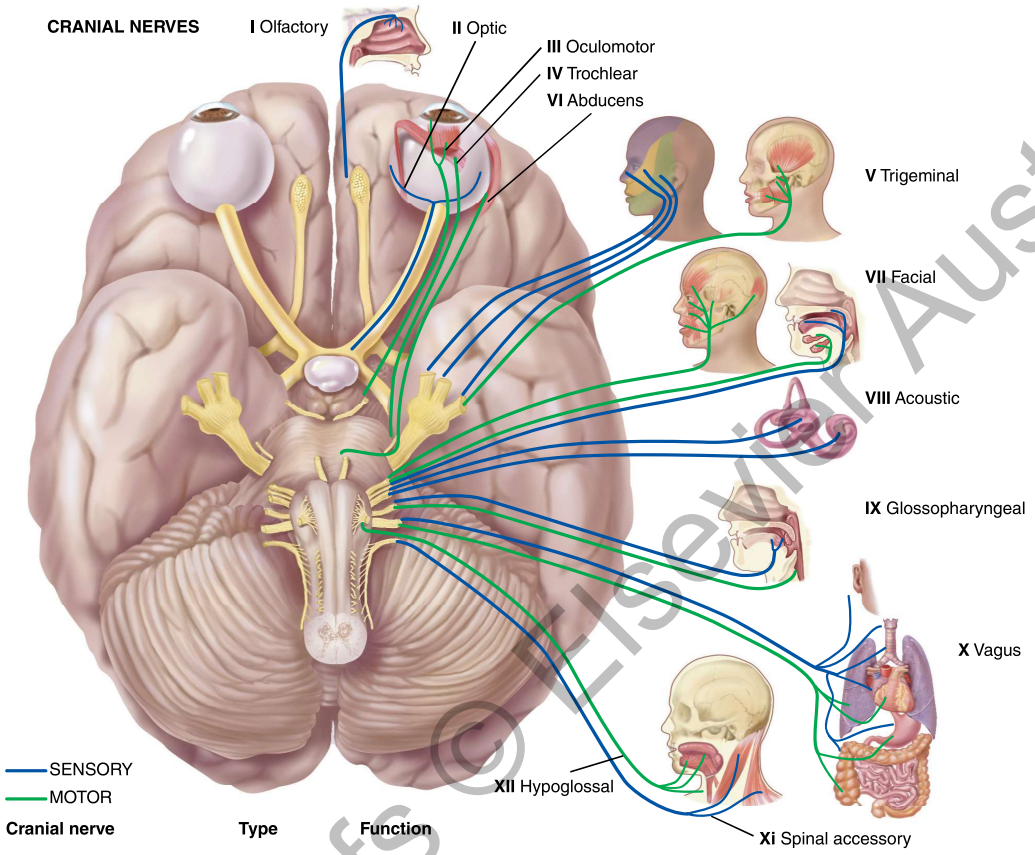
The peripheral nervous system

A **nerve** is a bundle of neurons *outside* the CNS. The peripheral nerves carry input to the CNS via their sensory afferent fibres and deliver output from the CNS via the efferent fibres.

REFLEX ARC

Reflexes are basic defence mechanisms of the nervous system. They are involuntary, operating below the level of conscious control and permitting a quick reaction to potentially painful or damaging situations. Reflexes also help the body maintain balance and appropriate muscle tone. There are four types of reflexes: (1) deep tendon reflexes (myotatic), for example, patellar or knee jerk; (2) superficial, for example, corneal reflex, abdominal reflex; (3) visceral (organic), for example, pupillary response to light and accommodation; and (4) pathological (abnormal), for example, Babinski's or extensor plantar reflex.

The fibres that mediate the reflex are carried by a specific spinal nerve. In the simplest reflex, tapping the tendon stretches the muscle spindles in the muscle, which activates the sensory afferent nerve. The sensory afferent fibres carry the message from the receptor and travel through the dorsal root into the spinal cord (Figure 12.9). They synapse directly in the cord with the motor neuron in the anterior horn. Motor efferent fibres leave via the ventral root and travel to the muscle, stimulating a sudden contraction.



Cranial nerve	Type	Function
I: Olfactory	Sensory	Smell
II: Optic	Sensory	Vision
III: Oculomotor	Mixed*	Motor—most EOM movement, opening of eyelids Parasympathetic—pupil constriction, lens shape
IV: Trochlear	Motor	Down and inward movement of eye
V: Trigeminal	Mixed	Motor—muscles of mastication Sensory—sensation of face and scalp, cornea, mucous membranes of mouth and nose
VI: Abducens	Motor	Lateral movement of eye
VII: Facial	Mixed	Motor—facial muscles, close eye, labial speech, close mouth Sensory—taste (sweet, salty, sour, bitter) on anterior two-thirds of tongue Parasympathetic—saliva and tear secretion
VIII: Acoustic	Sensory	Hearing and equilibrium
IX: Glossopharyngeal	Mixed	Motor—pharynx (phonation and swallowing) Sensory—taste on posterior one-third of tongue, pharynx (gag reflex) Parasympathetic—parotid gland, carotid reflex
X: Vagus	Mixed	Motor—pharynx and larynx (talking and swallowing) Sensory—general sensation from carotid body, carotid sinus, pharynx, viscera Parasympathetic—carotid reflex
XI: Spinal accessory	Motor	Movement of trapezius and sternocleidomastoid muscles
XII: Hypoglossal	Motor	Movement of tongue

**Mixed* refers to a nerve carrying a combination of fibres: motor + sensory; motor + parasympathetic; or motor + sensory + parasympathetic.

FIGURE 12.10 Cranial nerves

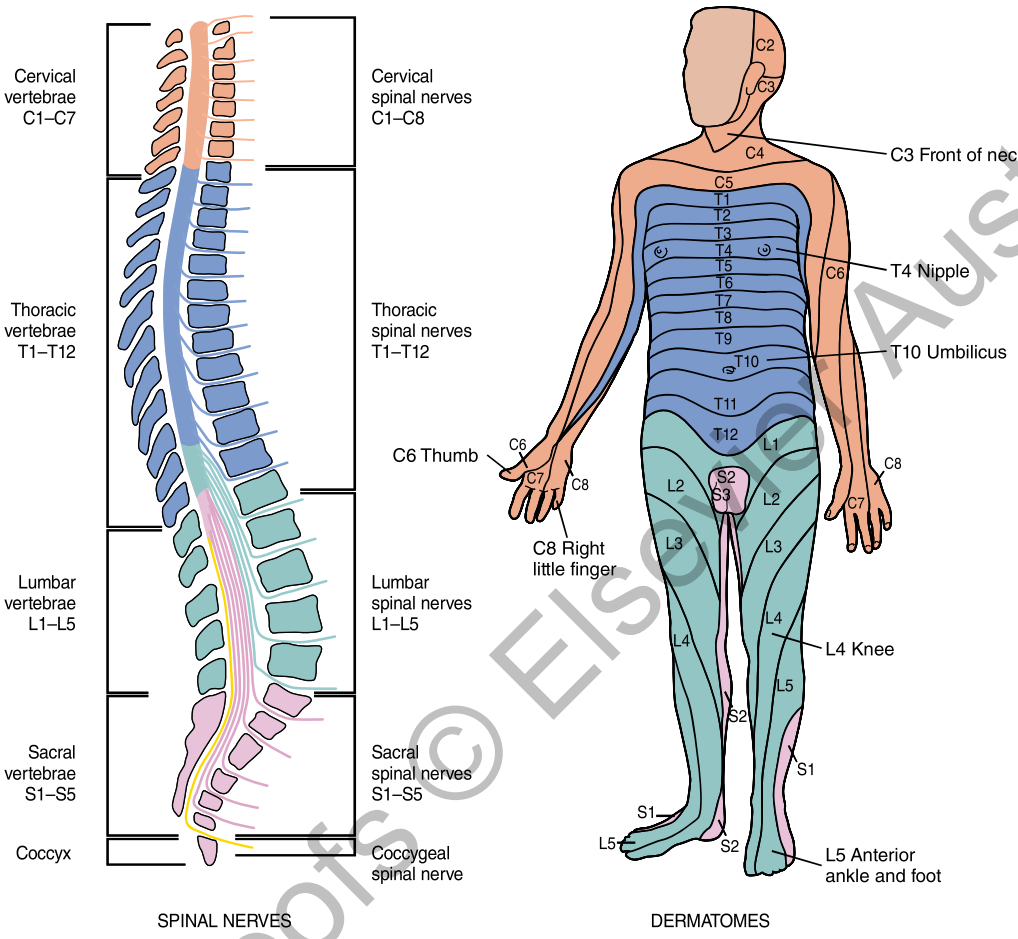


FIGURE 12.11 Spinal nerves dermatomes

unconscious activity. Although a description of the autonomic system is beyond the scope of this book, its overall function is to maintain homeostasis of the body.

Developmental considerations

Infants and children

The bones of the neonatal skull are separated by sutures and by **fontanels**, the spaces where the sutures intersect (Figure 12.12). These membrane-covered 'soft spots' allow for growth of the brain during the first year. They gradually ossify; the triangle-shaped posterior fontanel is closed by 1 to 2 months and the diamond-shaped anterior fontanel closes between 9 months and 2 years.

impairment.[3] The current Diagnostic Statistical Manual of Mental Disorders (DSM-5) requires all the following criteria to be present for delirium to be diagnosed:[5]

- disturbance in attention and awareness
- disturbance develops acutely and tends to fluctuate in severity
- at least one additional disturbance in cognition
- disturbances are not better explained by a pre-existing dementia
- disturbances do not occur in the context of a severely reduced level of arousal or coma
- evidence of an underlying organic cause or causes.

See Chapter 11 and Chapter 30 for more information.

Cultural and social considerations

Many neurological health issues have profound impact on the person and their family. Some will be progressive and chronic (e.g. Parkinson's disease and multiple sclerosis); others have acute onset such as head or spinal cord injury or stroke. Many people will have ongoing cognitive and functional difficulties that will affect their ability to live a full and active life.

Stroke is a serious health problem in the Australian and Aotearoa New Zealand community. Stroke occurs when an artery supplying blood to the brain either suddenly becomes blocked or begins to bleed.

Stroke has a high prevalence and incidence and is a leading cause of death and disability worldwide. The prevalence of stroke is higher in Australian males (1.6%) than females (1.1%). Australians living in regional areas are up to 17% more likely to suffer a stroke than those living in metropolitan areas.[6] The incidence of stroke among Australia's Aboriginal and Torres Strait Islander population is reported to be between 1.7 and 3.0 times as high as the non-Indigenous population.[6] The incidence of new stroke in Australia equates to one stroke every 19 minutes[6] and one every 55 minutes in Aotearoa New Zealand, where stroke is the second biggest cause of mortality.[7]

Stroke is more common in older age groups; 71% of people who had a stroke were aged 65 years or older.[8] However, stroke is not just a disease of older people; young people are also at risk. While the median age for stroke in Australia is around 75 years, one in every four strokes occurs in a person aged 54 or younger.[6] Compared with older people, young people with stroke tend to take longer to seek medical attention, are less likely to receive rehabilitation and have more unmet needs in relation to psychosocial functioning and return to work. Though there is a lack of solid local trend evidence, rates of stroke in young people are increasing worldwide due to an increase in modifiable risk factors such as obesity, hypertension and diabetes.

Stroke is largely a preventable health problem with modifiable risk factors such as high blood pressure, atrial fibrillation, hyperlipidaemia and smoking.[9] It is the high prevalence of these risk factors in Aboriginal and Torres Strait Islander people and Māori and Pacific Islander people that accounts for the high incidence of stroke in these groups.[7] For further discussion of stroke risk factors, symptoms and prevention see the 'Health education' section (and Table 12.3).

HEALTH EDUCATION

Stroke prevention

Stroke is a leading cause of long-term disability and death. A stroke occurs when the blood flow is interrupted to a part of the brain. The most common type is an ischaemic stroke, occurring when a blood clot blocks a blood vessel in the brain. Less common is a haemorrhagic stroke, which occurs when a blood vessel in the brain ruptures and causes bleeding.

Symptoms

The symptoms and after-effects of a stroke depend on which area of the brain is affected and to what extent. This can make a stroke difficult to diagnose. However, early recognition of symptoms and prompt treatment are essential.

The **most common** symptoms of stroke include sudden:

- weakness or numbness in the face, arms or legs, especially when it is on one side of the body
- confusion, trouble speaking or understanding speech
- changes in vision, such as blurry vision or partial or complete loss of vision in one or both eyes
- trouble walking, dizziness and/or loss of balance or coordination
- severe headache with no reason or explanation.

Less common symptoms of stroke include:

- sudden nausea and/or vomiting
- brief loss of consciousness, including fainting.

Stroke symptoms usually do not cause pain, which is why many people ignore them or delay seeking medical attention. Sometimes, people can have a 'mini-stroke' or transient ischaemic attack (TIA). In these cases, the stroke symptoms last only temporarily and then disappear, often within an hour. Because the symptoms 'go away', people too often do not report them or seek medical attention. However, a TIA is a warning sign that should not be ignored. When people experience chest pain, they seek medical attention, to rule out a heart attack. Having a TIA should also prompt people to seek medical attention to rule out the possibility of a future stroke.

The Stroke Foundation Australia[10] has devised an easy-to-remember acronym to assist the public in recognising the signs and symptoms of stroke quickly and calling for an ambulance. The acronym is FAST:

- **F**ace—Check the person's face—has their mouth drooped?
- **A**rm—Can they lift both arms?
- **S**peech—Is their speech slurred? Do they understand you?
- **T**ime is critical—if you see any of these signs call the emergency number (Triple Zero [000] in Australia; 111 in Aotearoa New Zealand).

Stroke can strike anyone without warning. People need to be aware of their stroke risk and take steps to change the risk factors they can control.

Modifiable risk factors for stroke include:

- history of cardiovascular disease including hypertension, atrial fibrillation, dyslipidaemia and asymptomatic carotid stenosis
- cigarette smoking
- type 1 and type 2 diabetes
- sickle cell disease
- postmenopausal hormone therapy
- diet and nutrition
- physical inactivity
- obesity.

Non-modifiable risk factors for stroke include:[11]

- age
- gender—strokes are generally more prevalent in men than in women; however, exceptions are in 35- to 44-year-olds and those 85 years of age or older—groups in which women have slightly greater age-specific stroke incidence than do men
- low birthweight
- ethnicity—Aboriginal and Torres Strait Islander people have higher stroke incidence and mortality rates than other Australians
- genetic factor disorders (e.g. Marfan's syndrome, Fabry's disease, cerebral autosomal dominant arteriopathy with sub-cortical infarcts and leucoencephalopathy (CADASIL)).

Non-modifiable risk factors for stroke may help to identify those who, in conjunction with well-documented modifiable risks, are at highest risk of stroke and who may benefit from more rigorous treatment of modifiable risk factors.

HEALTH EDUCATION cont'd

Nurse's role

- Assess the person's health literacy and readiness to learn about stroke prevention.
- Teach the signs of stroke using the FAST acronym.
- Encourage adoption of a healthy lifestyle such as not smoking, eating a healthy diet, drinking alcohol in moderation, exercising daily and losing weight where necessary.
- Provide information in ways that is understandable and timely and with the appropriate amount of content.
- Encourage those at risk to take preventive medications (e.g. lipid-lowering, anticoagulant and antihypertensive drugs).[12]

Subjective data

Practice note

Before you start the assessment, introduce yourself to the person, confirm the person's identity, discuss the purpose and scope of the assessment, clarify any questions the person may have and get verbal consent from the person to perform the assessment.

ASSESSMENT GUIDELINES	CLINICAL SIGNIFICANCE AND CLINICAL ALERTS
Presenting concern	
• *Do you have any problems concerning your ability to think, your memory, hearing, vision, sensation or with movement and coordination?* It is important to ascertain the person's perception of their presenting health concern. If they do perceive a problem, ask: *How does this affect your quality of life?*	
Headache	
• *Have you experienced any unusually frequent or severe headaches?* • *When did this start? How often does this occur? Gradual, over hours or a day? Or, suddenly, over minutes or less than 1 hour?* • *Have you ever had this kind of headache before?* • *Where in your head do you feel the headaches? In the front, side, over the temple area, behind your eyes, like a band around the head, in the sinus area or in the back of the head?* • *Do the headaches seem to be associated with anything?*	***Clinical alert:*** If a person reports any sudden onset of headache of increasing severity, they should be referred to a medical practitioner for urgent further assessment. For location, character, duration, timing triggers of headaches, see Table 12.4.

ASSESSMENT GUIDELINES	CLINICAL SIGNIFICANCE AND CLINICAL ALERTS
Lack of coordination	
• *Do you experience any problems with coordination?* • *Any problems with balance when walking?* • *Do you lean to one side?* • *Any falling?* • *Which way?* • *Do your legs seem to give way?* • *Any clumsy movement?*	**Dysmetria** is the inability to control the range of motion of muscles.
Numbness or tingling	
• *Do you have any numbness or tingling in any part of the body?* • *Does it feel like pins and needles?* • *When did this start?* • *Where do you feel it?* • *Does it occur with activity?*	**Paraesthesia** is an abnormal sensation such as burning or tingling. ***Clinical alert:*** If the person is experiencing dizziness, tremor, paralysis, lack of coordination or paraesthesia, report to a medical or nurse practitioner. Note there will be an impact of these symptoms on the person's ability to manage activities of daily living.
Visual disturbances and deafness	
• *Have you experienced any periods of visual disturbances—double vision **(diplopia)**, blurred vision **(amblyopia)**, light intolerance **(photophobia)**—or visual loss?* • *When did this occur? In one eye or both eyes?* • *Sudden or gradual onset?* • *How long did it last?* • *What did you do about it?* See Chapter 14 for further assessment of vision. • *Have you experienced any periods of deafness or changes in your hearing (such as ringing sound)?* • *When did this occur?* • *Was it on one side or both?* • *Sudden or gradual onset?* • *How long did it last?* • *Have you been exposed to loud noise in your workplace or recreationally?* • *What did you do about it?* See Chapter 15 for further assessment of hearing.	***Clinical alert:*** Visual disturbances can be signs of a problem within the eye or symptoms of other neurological health issues. A person with a sudden change in vision should be referred for urgent medical assessment. **Unilateral deafness** is likely to be the result of a nerve lesion (e.g. acoustic neuroma or trauma). The person should be referred for an assessment by a medical practitioner.[9]
Difficulty swallowing (dysphagia)	
• *Have you experienced a problem with swallowing?* • *Does this occur with solids or liquids?* • *Have you experienced excessive saliva, drooling?*	***Dysphagia*** is difficulty with swallowing. See Chapter 21 for further discussion of swallow assessment. ***Clinical alert:*** Difficulty with swallowing can pose serious risk to a person's airway and requires further detailed assessment. Report to a medical or nurse practitioner.

Objective data

You will recall from the beginning of this chapter that there are three main types of objective neurological assessments—ongoing neurological observations, a screening assessment and a complete assessment. The sequence for ongoing neurological observations and a screening assessment are described in the section below. In the event of a disorientated or uncooperative person, some parts of the assessment may need to be modified or omitted. You will also note that the initial stage of an objective neurological assessment shares many features with a mental health assessment.

Preparation

Outline the process for neurological assessment for the client and ask their consent for you to continue. On some occasions, it may be necessary to have a support person (usually another nurse) present during the examination. Ensure privacy by closing the door or pulling the screens. Adequate lighting is essential, as is the ability to reduce lighting when assessing the pupils.

People who have recent head trauma, neurological surgery, stroke or a neurological deficit due to a systemic disease process must be monitored closely for any improvement or deterioration in neurological status and for any indication of increasing intracranial pressure. Signs of increasing intracranial pressure signal impending cerebral disaster and potential death and require early and prompt intervention.

Equipment needed

Neurological observations chart
Penlight torch
Hand hygiene solution

PROCEDURES AND NORMAL FINDINGS	ABNORMAL FINDINGS AND CLINICAL ALERTS
Ongoing neurological observations and routine neurological screening assessment	
A skills video (neurological assessment) is available to assist you in your skill development. Click on the QR code to access the video (instructions on the inside front cover of the book to access multimedia resources).	
General inspection	
When collecting subjective data, you will have noticed the condition of the person's skin, lips, hair and mucous membranes, as well as any breath odour, ease of breathing, body movements, height-to-weight ratio, body shape, posture, level of hygiene and grooming and general demeanour. All these factors provide clues to the person's neurological health. Neurological assessment begins as soon as you see the person. This enables the clinician to quickly determine the extent of the neurological assessment that is required.	

PROCEDURES AND NORMAL FINDINGS	ABNORMAL FINDINGS AND CLINICAL ALERTS

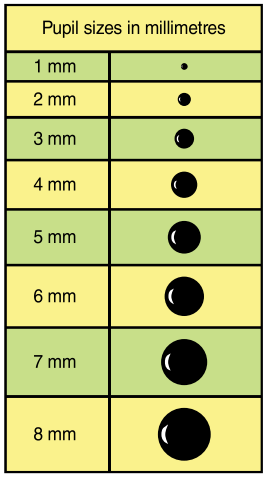


FIGURE 12.13 Pupil sizes

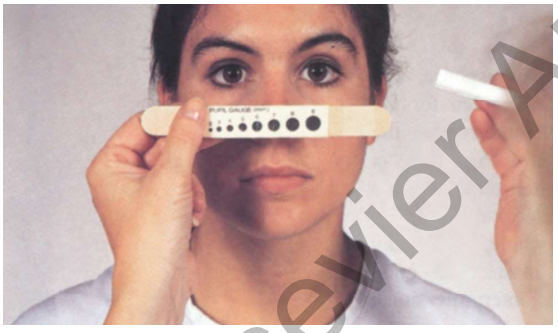


FIGURE 12.14 Measuring pupil sizes

Vital signs

Measure the temperature, pulse, respiration and blood pressure as often as the person's condition warrants. Vital signs should always be performed after a neurological assessment because the act of performing these activities may elicit a painful response to eye opening rather than to name.

Although they are vital to the overall assessment of a critically ill person, pulse and blood pressure are notoriously unreliable parameters of CNS deficit. Any changes are late consequences of rising intracranial pressure.

Clinical alert: **The Cushing reflex** shows signs of increasing intracranial pressure: blood pressure—sudden elevation with widening pulse pressure; pulse—decreased rate, slow and bounding. **This is a medical emergency.**

Limb movement and strength

Upper extremities

- Check upper arm strength by checking hand grasps.
- Ask the person to squeeze your fingers. Offer your two fingers, one on top of the other, so that a strong hand grasp does not hurt your knuckles (Figure 12.15A, B and C).
- Begin by holding your fingers in a position that requires the person to raise their arms up and out to grasp your fingers.
- If they cannot reach their arms up and out, then move your fingers closer.
- Do not place fingers in the palm of the person's hand as some people with diffuse brain damage, especially frontal lobe injury, have a grasp that is a reflex only.

Unequal grasp.

Clinical alert: Changes to limb movement, strength and/or balance can put the person at risk of falling and or being unable to perform activities of daily living. In such a situation a detailed assessment is required to be performed by a nurse or medical practitioner.

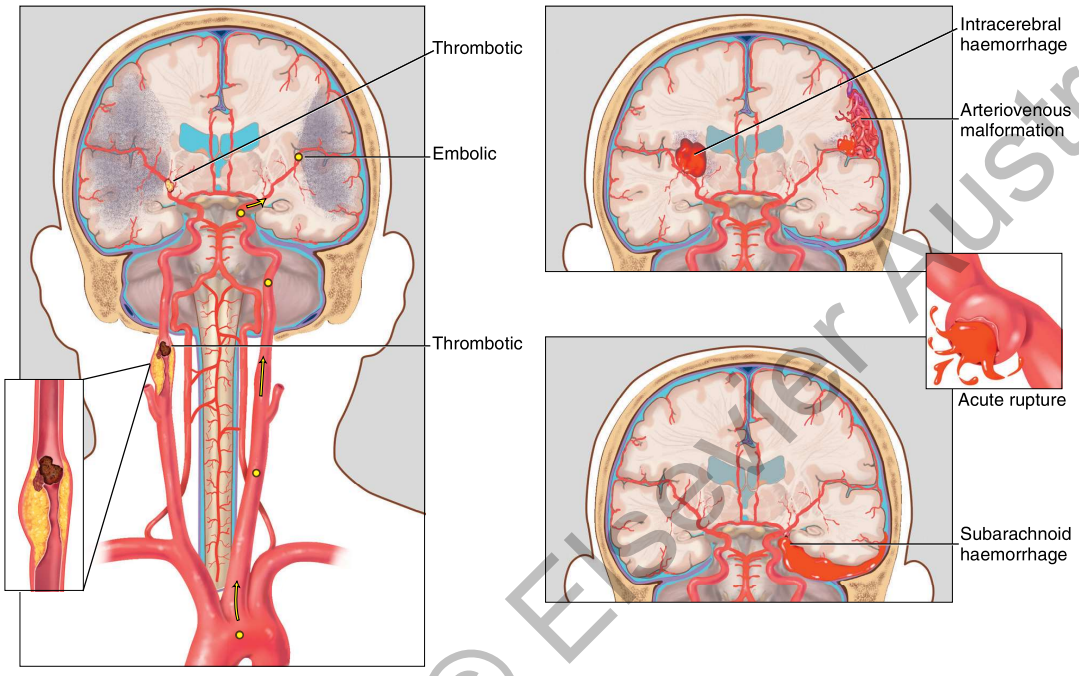
Abnormal findings

TABLE 12.2 Warning signs of dementia

Sign	Explanation
Recent memory loss that affects job skills	• It is normal to forget meetings, colleagues' names or a business associate's telephone number occasionally but then remember them later. • A person with dementia may forget things more often and not remember them later.
Difficulty performing familiar tasks	• Busy people can be so distracted from time to time that they may leave the carrots on the stove and only remember to serve them when the meal has finished. • A person with dementia might prepare a meal and not only forget to serve it but also forget they made it.
Problems with language	• Everyone has trouble finding the right word sometimes. • A person with dementia may forget simple words or substitute inappropriate words.
Disorientation of time and place	• It is normal to forget the day of the week or your destination for a moment. • People with dementia can become lost on their own street, not know where they are, how they got there or how to get back home.
Poor or decreased judgement	• Dementia affects a person's memory and concentration and this in turn affects their judgement. Many activities, such as driving, require good judgement and when this ability is affected, the person will be a risk, not only to themselves but to others on the road.
Problems with abstract thinking	• Managing finances can be difficult for anyone. • Someone with dementia could forget completely what the numbers are and what needs to be done with them.
Misplacing things	• Anyone can temporarily misplace a wallet or keys. • A person with dementia may repeatedly put things in inappropriate places.
Changes in mood or behaviour	• Everyone becomes sad or moody from time to time. • Someone with dementia can have rapid mood swings from calm to tears to anger for no apparent reason.
Changes in personality	• People's personalities can change a little with age. • A person with dementia can become suspicious or fearful or just apathetic and uncommunicative. They may also become disinhibited, over-familiar or more outgoing than previously.
Loss of initiative	• It is normal to tire of housework, business activities or social obligations. • A person with dementia may become very passive and require cues prompting them to become involved.

Source: Dementia Australia 2023[2]

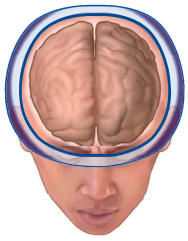
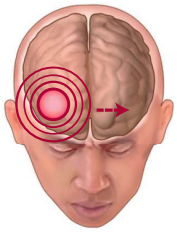
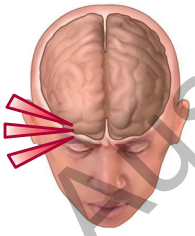
TABLE 12.3 Ischaemic and haemorrhagic stroke



Ischaemic stroke is a sudden interruption of blood flow to the brain and accounts for 87% of all strokes. These are of two types. **Thrombotic** strokes result from atherosclerotic plaque formation. A vulnerable plaque ruptures and a local thrombus forms that deprives the brain tissue in the region of crucial oxygen and glucose. **Embolic** strokes result from a travelling clot caused by atrial fibrillation or flutter, recent heart attack, growth around prosthetic heart valves and endocarditis. Acute ischaemic stroke symptoms include unilateral facial droop, arm drift, weakness or paralysis on one half of the body, difficulty speaking or understanding speech, confusion, sudden onset of dizziness, loss of balance, clouding of vision.

Haemorrhagic stroke results from acute rupture and bleeding from a weakened artery in the brain and accounts for only 13% of all strokes. Most are intracerebral haemorrhages caused by ruptured aneurysm, arteriovenous malformation, disturbed coagulation cascade, tumour or cocaine abuse. Arteriovenous malformations are congenital networks of arteries and veins that do not have capillaries in between and are at risk for rupture. Think of a snarl of tendrils. A subarachnoid haemorrhage is less common and is due to an aneurysm between the base of the cerebral cortex and the arachnoid layer of the meninges. Symptoms include sudden severe headache, nausea and vomiting, sudden loss of consciousness and focal seizures.

TABLE 12.4 Primary headaches

	Tension	Migraine	Cluster
	 Tension	 Migraine*	 Cluster
Definition	Headache (HA) of musculoskeletal origin; may be a mild-to-moderate, less disabling form of migraine	HA of genetically transmitted vascular and trigeminal nerve origin; HA plus prodrome, aura, other symptoms; 2–3 times as common in women as in men	Rare HA that is intermittent, excruciating, unilateral, with autonomic signs
Location	Usually both sides, across frontal, temporal and/or occipital region of head: forehead, sides and back of head	Commonly one-sided but may occur on both sides Pain is often behind the eyes, the temples or forehead	Always one-sided Often behind or around the eye, temple, forehead, cheek
Character	Bandlike tightness, vicelike Nonthrobbing, nonpulsatile	Throbbing, pulsating	Continuous, burning, piercing, excruciating
Duration	Gradual onset, lasts 30 minutes to days	Rapid onset, peaks 1–2 hours, lasts 4–72 hours, sometimes longer	Abrupt onset, peaks in minutes, lasts 45–90 minutes
Quantity and severity	Diffuse, dull aching pain Mild-to-moderate pain	Moderate-to-severe pain	Can occur multiple times a day, in 'clusters', lasting weeks Severe, stabbing pain
Timing	Situational, in response to overwork, posture	≈2 per month, last 1–3 days ≈1 in 10 patients have weekly headaches	1–2 per day, each lasting ½ to 2 hours for 1 to 2 months; then remission for months or years
Aggravating symptoms or triggers	Stress, anxiety, depression, poor posture Not worsened by physical activity	Hormonal fluctuations (premenstrual) Foods (e.g. alcohol, caffeine, MSG, nitrates, chocolate, cheese) Hunger Letdown after stress Sleep deprivation Sensory stimuli (e.g. flashing lights or perfumes) Changes in weather Physical activity	Exacerbated by alcohol, stress, daytime napping, wind or heat exposure

Continued

Clinical reasoning and documentation cont'd

Case study 2—Sudden onset of neurological symptoms

Context

You are a registered nurse working in the emergency department of a large tertiary hospital.

Consider the patient's situation

Sarah Mitchell (a Wurundjeri woman) has presented to the emergency department with sudden onset right-sided headache. She is 42 years old and is a primary school teacher who lives with her husband and three children, aged 10, 7 and 4.

Collect cues/information

Subjective data

Sarah has no significant past medical history. Her only hospital admissions have been for the births of her children. Sarah's mother and sister both experience migraines, though Sarah has never had one before. Her only regular medication is the oral contraceptive pill. Sarah became unwell at work today. She describes a sudden onset, severe, throbbing headache localised to the right side. She is experiencing nausea and vomited twice before a colleague became concerned about her and drove her to the hospital. A brain CT shows no signs of bleeding. Sarah describes increased sensitivity to light (photophobia), increased sensitivity to sound (phonophobia), blurred vision, difficulty concentrating and fatigue.

Objective data

Mental status: Dressed in hospital gown, lying in bed with eyes closed. Speech is slow, requires great effort and voice tone is very soft. Orientated to place and time.
Eye opening: In response to speech.
Motor: Obeying commands. Left- and right-hand grip slightly weak, no drift. Leg strength normal. Facial motor control symmetrical.
Pupillary response: Pupils equal. Size 5 mm and responding briskly to light.
Vital signs: HR – 87 RR – 17 BP – 135/68
Glasgow Coma Scale score: 14/15 (E3V5M6).

Process information and identify problems/issues

Collaborative problem

Headache, nausea and vomiting related to migraine

Problem statements/nursing diagnoses

Knowledge deficit related to first presentation of migraine
Pain related to migraine
Nausea related to migraine
Self-care deficit related to altered sensation and perception and fatigue
Altered sensation/perception related to photo- and phonophobia
Risk for falls related to altered sensation and perception
Risk for fluid and electrolyte imbalance related to nausea and vomiting

ADDITIONAL RESOURCES

You can further develop your knowledge and skills relevant to neurological assessment, related pathophysiology, common health issues and nursing interventions by:

- reading chapters of a fundamentals of nursing or medical-surgical nursing textbook
- answering chapter multiple choice questions online. Log onto ClinicalKey Student and search for the text 'Health Assessment, 4th edition'. Choose the section titled 'Teaching material'. In this section you will find question and answer documents for each chapter.
- visiting websites

  Dementia Australia: https://www.dementia.org.au/information/diagnosing-dementia

  Glasgow Coma Scale: https://www.glasgowcomascale.org

  Brain Injury Australia: https://www.braininjuryaustralia.org.au/

  Stroke Foundation Australia: https://strokefoundation.org.au

  Stroke Foundation of New Zealand: http://www.stroke.org.nz

REFERENCES

1. Castelli V, Benedetti E, Antonosante A, Catanesil M, Pitari G, Ippoliti R, et al. Neuronal cells rearrangement during aging and neurodegenerative disease: metabolism, oxidative stress and organelles dynamic. Frontiers in Molecular Neuroscience. 2019 May 28;12:132. doi: 10.3389/fnmol.2019.00132.
2. Dementia Australia. Warning signs of dementia. 2023. Available at: https://www.dementia.org.au/information/about-dementia/how-can-i-find-out-more/warning-signs-of-dementia
3. Australian Commission on Safety and Quality in Health Care (ACSQHC). Delirium Clinical Care Standard. Sydney: ACSQHC; 2021. Available at: https://www.safetyandquality.gov.au/sites/default/files/2021-09/delirium_clinical_care_standard_2021.pdf
4. Marcantonio ER. Delirium in hospitalized older adults. New England Journal of Medicine. 2017;377:1456–1466.
5. American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 5th ed. Arlington, VA: American Psychiatric Association; 2013.
6. Stroke Foundation Australia. Top 10 facts about stroke. 2023a. Available at: https://strokefoundation.org.au/about-stroke/learn/facts-and-figures.
7. Stroke Foundation of New Zealand. Facts and FAQs. 2023. Available at: https://www.stroke.org.nz/facts-and-faqs
8. Australian Institute of Health and Welfare (AIHW). Heart, stroke and vascular disease: Australian facts. Canberra: AIHW; 2023. Available at: https://www.aihw.gov.au/reports/heart-stroke-vascular-diseases/hsvd-facts/contents/all-heart-stroke-and-vascular-disease/stroke
9. Talley NJ, O'Connor S. Clinical examination: a systematic guide to physical diagnosis. 8th ed. Chatswood: Elsevier; 2018.
10. Stroke Foundation Australia. Signs of Stroke. 2023b. Available at: https://strokefoundation.org.au/about-stroke/learn/signs-of-stroke
11. Stroke Foundation Australia. Understanding stroke. 2021. Available at: https://strokefoundation.org.au/news-and-events/latest-news/2021/07/understanding-stroke#:,:text=The%20truth%20is%2C%20