SECTION 3: COMMUNICATION AND COORDINATION

Introduction

Body systems do not work in isolation - their functions are interrelated and integrated. The coordination of all these functions is left to the nervous and the endocrine systems.
The endocrine system works through the use of special messengers, known as hormones.

Objectives

By the end of this section you will be able to:

- Describe the structure and function of the nervous system
- Describe the disorders of the nervous system and their management
- Describe the structures and functions of the eyes and ears
- Describe the disorders of the ears and eyes and their management
- Describe the structure and functions of endocrine organs
- Utilise the nursing process in the management of disorders of the endocrine system

Neurons

The Nervous System - The Structure

The nervous system is divided into two parts: the central nervous system and the peripheral nervous system.
The central nervous system consists of the brain and spinal cord while the peripheral nervous system consists of the cranial nerves, spinal nerves and autonomic nervous system.

The neurons are the functional cells of the nervous system.
A neuron consists of a nerve cell/body, an axon and a dendrite. When they are grouped together outside the central nervous system, they are called a ganglion. Neurons are specialised cells, which enable the transmission of information in the form of nerve impulses.

Neurons can be divided into two groups. The first group takes messages from receptor end organs into the Central Nervous System (CNS). These are sensory or afferent nerves. The second group takes messages away from the CNS to the effector organs. These are

known as motor or efferent nerves.
More than one neuron may be involved in the process of relaying information. In such cases, the multiple neurons connect with each other,

ata point of connection called a synapse. At the synapse there are chemical transmitters, or neurotransmitters, which are involved in the transmission of messages. Two examples of

neuro-transmitters which you may have heard of, are Acetylcholine and Noradrenaline.

The Brain, Spinal Cord and Nerves

You will have heard of the central nervous system. This term refers to the brain and the spinal cord. Membranes called meninges cover the brain and spinal cord. Within the cranium, the meninges are found between the skull and brain. In the vertebral column they are found between the vetebrae and the spinal cord. The dura mater and the arachnoid mater are

The Flow of the Cerebrospinal Fluid

separated by a potential space - the subdural space.
The three membranes, starting from the outermost are:
·Dura Mater
·Arachnoid Mater
·Pia Mater

There are two spaces between the three membranes. The space between the arachnoid and pia mater is the sub-arachnoid space and it contains cerebrospinal fluid. In your practice, you have seen patients having cerebrospinal fluid (CSF) removed for laboratory study.

The Brain

The brain consists of the following parts:
The **cerebellum** undertakes coordination of voluntary muscle movement. Posture and balance are also controlled by the same part of the brain. Finally, the reticular formation found in the core of the brainstem performs the functions of coordination of skeletal muscle and maintaining balance. It also coordinates activity of the autonomic nervous system and performs the function of selective awareness. When you want to continue reading, while the radio is playing, the process that enables this dual activity is referred to as selective awareness.

The **medulla oblongata** comprises certain vital centres. These are the respiratory, cardiac, vasomotor and reflex centres of vomiting, coughing, sneezing and swallowing. As these vital centres suggest by their names, they control the functions mentioned. Temperature regulation is done by the hypothalamus.

The **pons** forms a bridge between the two cerebral hemispheres and other parts of the brain

The other part of the brain is the **midbrain**. It is involved in relaying ascending and descending nerve fibres

The **cerebrum** is the largest area and its cortex has many furrows. One of the big furrows divides the cerebrum into right and left hemispheres. These are further divided into lobes, which are named according to the bones of the cranium under which they lie.

Can you remember the bones of the cranium?

The lobes of the brain named after the cranial bones are the frontal, parietal, temporal and occipital lobes. The cerebrum is associated with mental activity, for example, memory and intelligence, sensory, initiation and control of voluntary movement. This part of the brain (cerebrum) can further be subdivided into sections according to their specific function.

The Spinal Cord

The spinal cord is part of the central nervous system, which we have already discussed. It is the link between the brain and the rest of the body. The spinal cord is divided into two parts: the anterior median fissure and the posterior median septum.

The spinal cord is composed of grey matter at the centre and white matter on the outside. The grey matter has cells of the sensory nerves, the connector nerves and of the lower motor neurons.

White matter is arranged in tracts that may be sensory or motor. In the spinal cord, neurons transmit impulses to and from the peripheral. In the grey matter of the spinal cord, between the cells of the anterior and posterior horns, are small connector neurons which transmit an impulse straight from the skin to muscles. For example, when you touch a hot bowl of soup, a message is relayed to the spinal cord for you to withdraw your hand quickly. This is referred to as the reflex action.

Simple Reflex Arc

The CNS comprises several nerves that are involved in the relaying of messages, which you will now examine.

Peripheral Nerves

There are 31 pairs of spinal nerves and 12 pairs of cranial nerves. The 31 pairs are distributed as eight cervical, twelve thoracic, five lumbar, five sacral and one coccygeal. Each of these nerves supplies a particular area of the body. The illustration opposite outlines the distribution and origins of nerves.

The 12 cranial nerves are numbered from one to twelve.

1.Olfactory
2.Optic
3.Occulomotor
4.Trochlea
5.Trigeminal
6.Abducent
7.Facial
8.Vestibulocochlea
9.Glossopharyngeal
10.Vagus
11.Accessory
12.Hypoglossal

Autonomic Nervous System

The autonomic nervous system supplies the involuntary muscle tissue of the body. It controls the movements of the internal organs and the secretion of glands. The autonomic nerve cells are situated in the brain stem and spinal cord.

The parasympathetic and sympathetic nervous system have opposing effects on the body. They both send weak impulses to the organs and glands maintaining normal activity. In stressful situations the sympathetic impulses become stronger and the organs and glands react to the situation. The parasympathetic nervous system will take over when the stressful situation has passed and the functions of the organs return to normal. Some of the activities controlled by this system include:

·The rate and force of the heart beat
·Vasodilatation
·Vasoconstriction
·Secretions of the glands, for example, in the alimentary tract and sweat glands

Some of the organs and the systems controlled by the autonomic nervous system are:

- Cardiovascular system
- Eye
- Skin
- Digestive system
- Respiratory system
- Urinary system
- Genitalia

Read more about the nervous system. As a primary reference book, Ross and Wilson, 9th edition, pp. 141-175 is recommended.

What are the functions of the cerebrospinal fluid?

You should have included some of the following functions:

- It is involved in the exchange of substances, for example, nutrients between the CSF and the nerve cells.
- It keeps the brain and spinal cord moist.
- It is a shock absorber for the brain, spinal cord and nerves.
- It supports the brain and spinal cord and protects them.
- It maintains pressure around the delicate structures in a uniform manner.

Disorders of the Brain and Spinal Cord

Increased Intracranial Pressure

One of the most common consequences of traumatic and non-traumatic lesions in the brain is increased intracranial pressure.

The brain is protected within a rigid bony structure, the cranium. The cranium encloses:

- The brain
- Cerebral blood vessels and blood
- Cerebral spinal fluid (CSF)

An increase in any of these three lead to an increase to the intracranial pressure. Increased ICP is a life threatening situation. When pressure increases, arterial supply is affected and the resultant hypoxia causes cerebral oedema which aggravates the problem.

Causes of increased intracranial pressure include:

- Cerebral oedema
- Hydrocephalus or obstruction of the flow of the CSF
- Space occupying lesions e.g. haematoma, tumours, abscesses

Increased intracranial pressure manifests with severe headaches, projectile vomiting and pupil oedema. The brainstem may be compressed, leading to loss of consciousness, respiratory arrest and even death. Raised intracranial pressure, by reflex, slows the heart rate because it also affects the cardiac centre. The heart rate and blood pressure should, therefore, be closely monitored.

Care of the Patient with Increased Intracranial Pressure

The goal of management of a patient with increased intracranial pressure is to identify and treat the underlying cause and support brain function. Caring for the patient with increased intracranial pressure involves patient assessment through the use of the Glasgow Coma Scale as well as general treatment.

Child/Adult	Infant	Score
Eyes		
Opens eyes spontaneously	Opens eyes spontaneously	4
Opens eyes to speech	Opens eyes to speech	3
Opens eyes to pain	Opens eyes to pain	2
No response	No response	1
Verbal		
Oriented	Coos and babbles	5
Confused	Irritable cry	4
Inappropriate	Cries to pain	3
Non specific sounds	Moans to pain	2

No response	No response	1

Motor

Obeys commands	Spontaneous movements	5
Localizes pain	Withdraws to touch/pain	4
Flexion	Flexion (decorticate)	3
Extension	Extension (decerebrate)	2
No response	No response	1
Total Score:		**3-14**

Assess for verbal response, pupilary response, reflexes, motor and sensory input. General management involves maintaining a neurological observation chart and administering osmotic diuretics such as IV mannitol.
You may use an indwelling catheter and maintain a strict input and output chart. Control of temperature and observation of vital signs are very important as well as preparation for surgery if the patient's condition deteriorates. Changes in vital signs are caused by increasing pressure on the thalamus, hypothalamus, pons and medulla. Other clinical manifestations include decrease in motor function and changes in the dilatation and reaction of the pupil of the eye.

Traumatic Lesions of the Central Nervous System
Injuries can affect the functioning of the central nervous system. Minor injuries can cause a little haemorrhage and inflammatory oedema. Major injuries can cause tears in the meninges and even death. Occasionally, bleeding can occur and form a subdural haematoma. This may manifest with the same signs and symptoms as raised intracranial pressure.
An extradural haemorrhage may occur if one of the main arteries in the brain is ruptured. This process may be accompanied by a fracture of the skull bones. The patient loses consciousness and as time passes, there is increased intracranial pressure, which may eventually result in a coma.

Head Injuries

Definition: *A head injury is any trauma to the scalp, skull or brain.*

Types of Head Injuries
These include scalp lacerations, skull fractures and brain injuries. Brain injuries are categorised as being minor or major. Concussion is considered a minor brain injury. The patient may not lose total consciousness

Clinical features will depend on the type of injury present. Diagnostic procedures include x-rays, CT scan, MRI.

The patient who has a head injury requires immediate management at the casualty department and ongoing review and care afterwards. Immediately after receiving the patient, you must maintain an open airway, and ensure they have adequate breathing and circulation. This is because, as you have already learnt, cerebral hypoxia can lead to brain oedema and further damage the brain.
You must determine the baseline condition of the patient by assessing responsiveness, presence of headache, vomiting or double vision. You should also evaluate pupil size, blood pressure, pulse and respiration.
It is important to assess motion and strength of extremities and consider injuries to other organs. An accurate personal history and physical assessment are always paramount.
You may start to administer anti-seizure medication and fluids depending on the assessment.
Later on, support of the airway, close observation, fluid and electrolyte balance correction and control of temperature are instituted. Medication to decrease cerebral oedema such as osmotic diuretics, for example, IV mannitol, anti-seizure medication, for instance, epanuitin should be administered.
Patient support and restraint will also contribute to improvement of the patient.
Always remember that preventing complications is part of the care of your patients.

Complications of Head Injury
- Unconsciousness
- Loss of corneal reflex
- Hypothermia
- Problems related to motor and sensory deficits
- Seizures
- Behavioural disorders

with this injury. Major brain injuries include contusions and lacerations.

The Unconscious Patient

Definition*: Uconsciousness is an abnormal state in which the patient is unaware of self or environment. Unconsciousness is a manifestation of a large number of pathophysiologic processes including trauma, metabolic disturbances, mass lesions and infections.*

The unconscious patient should be nursed in the semi-prone position. The airway should be opened by the use of an oral airway device or the insertion of an endo-tracheal tube. Oxygen should be administered and secretions minimised through suction. Assess the patient's level of consciousness and make a record of the same. Evaluate vital signs half hourly and maintain fluid and electrolyte balances strictly. You should manage restlessness and keep the patient clean, dry and free of pressure sores.

The extremities should be put through a range of motion exercises. This promotes blood supply to various parts. Catheterisation and regular turning are also part of care for the unconscious patient. You should catheterise the patient to avoid wetting, which predisposes them to pressure ulcers. It will also enable you to closely monitor the intake and output. Protection from seizures, complications (for example infection), aspiration, obstruction of the airway, and corneal irritation should all be part of the care plan.

Non-Traumatic Cerebro-Vascular Disorders Stroke (Cerebrovascular Accident) ***Definition: This is a condition in which neurologic deficits occur as a result of decreased blood flow to a focal (localised) area of brain tissue.***

Causes

Cerebrovascular accidents result when there is inadequate supply of blood to the brain (cerebral ischeamia) or cerebral hemorrhage within the brain.

Types of stroke (CVA)

There are three types:
·Thrombotic
·Embolic
·Haemorrhagic

Non-Traumatic Cerebro-Vascular Disorders The most common types of ischemic stroke are thrombotic and embolic. Haemorrhagic strokes are generally the result of spontaneous bleeding into the brain tissue itself or the subarachnoid space or ventricles.

The most common cause of haemorrhagic stroke is a ruptured cerebral aneurysm. This is a saccular outpouching of a cerebral artery that occurs at the site of weakness in the vessel wall. The weakness may be the result of atherosclerosis, a congenital defect, trauma to the head, aging or hypertension.

When cerebral haemorrhage occurs, patients loose consciousness, progressing to coma and even death. This condition is common in people aged over 50 years of age.

Clinical Manifestations

The warning signs of stroke include temporary blindness in one eye, hemiplegia and defects in speech and confusion. In haemorrhage, thrombosis and embolism within the brain, the manifestations depend on the area of the brain affected. Normally, in the case of a severe stroke, consciousness is lost but is eventually regained. Speech may also be affected but later recovers. Loss of voluntary movement on the side of the body opposite to the side of the brain affected results in a condition referred to as hemiplegia.

Patients affected by this condition need intensive care, which shall be covered in the third section. The care of the patient with a non-traumatic lesion may take several forms.

Management of Non-Traumatic Lesion and Cerebro-Vascular Accident

Disorders affecting blood supply to the brain may lead to quick loss of brain function. You will now look at the care of patients who have cerebro-vascular accidents, including strokes, transient ischemic attacks and emboli.

In the acute phase of stroke, you must carry out an assessment, ensure adequate cerebral perfusionpressure and reorient the patient when they regain consciousness. The principles of nursing care for an unconscious patient will apply.

You have already learnt about these. In the rehabilitative phase, the goals are to prevent deformities, retrain the affected limbs and help the patient gain independence in personal hygiene, and other activities of daily living. To do this, good positioning and physical therapy are necessary. Patient and family education are required to achieve the results quickly.

The patient with cerebral haemorrhage requires bed rest, treatment of headache, antihypertensive drugs and reduction of cerebral oedema. They should also be prepared for surgery and rehabilitation afterwards just like the patient with head injuries.

Management of a Patient Undergoing Intracranial Surgery

Indications of intracranial surgery include:

·Brain tumour

·Vascular abnormalities such as aneurysms

·Cranio cerebral trauma

Depending on the location of the pathologic condition a craniotomy may be done at the frontal, temporal, parietal, occipital or a combination of any of these.

Pre-operatively you should assist the patient while they are undergoing diagnostic tests. You can do this by answering questions from the patient and relatives.

Evaluate the patient's condition and prepare them for surgery by shaving the head, giving enema, administering pre-medication as ordered and informing the patient on what to expect after surgery. The patient may need to know about the various operations, drainage, what they can and cannot do and so on. Pre- operative teaching is important in allaying the fears of the patient and the family and also in preparing them for post operative period.

What are some of the intracranial surgical operations that can be performed in Kenya?

One of the most common intracranial operations performed in Kenya is craniotomy to remove tumours, relieve pressure and evacuate blood clots.

Post-operatively, you must establish proper respiratory exchange, assess the patient's level of consciousness, evaluate for signs and symptoms of increasing intracranial pressure and control cerebral oedema. Steroids and osmotic diuretics will decrease cerebral oedema. Analgesics, changing the patient's position, an in-dwelling catheter and close observation are some of the measures that are put in place.

Always make sure you observe for drainage, which could be leaking cerebrospinal fluid, and for complications of intracranial haemorrhage such as post-operative meningitis, wound infections, pulmonary complications and post-traumatic epilepsy.

Brain Tumours

Tumours of the brain may be primary, arising from tissues within the brain or secondary, resulting from a metastasis from a malignant tumour elsewhere in the body.

The clinical features result from the local destructive effects of the tumour, the resulting accumulation of metabolites, displacement of the structures, the obstruction of CSF flow,
effects of oedema and increased ICP on cerebral functions.

The management of the patient with a brain tumour involves total or partial removal of the tumour and decompression, radiation and chemotherapy. For surgery, the principles of care of a patient undergoing intracranial surgery will apply.

A patient on radiation requires steroids, close observation and education. Generally, principles applied in the care of patients with cancer will also apply. If a patient is on steroid therapy, they may be predisposed to infections. Always be observant for potential infection.

Infections Affecting the Neurological System

Two infections that affect the neurological system are meningitis and encephalitis.

Meningitis is an acute inflammation of the membranes covering the brain and spinal cord. The infection may spread and cause suppuration in the brain. Infections can localise in the menengis resulting in Meningitis. They may also

spread and cause suppuration in the brain. This could lead to a cerebral abscess. The mode of spread of infections is normally two-fold. The infecting micro-organisms may be blood borne, or they may get to the brain via local spread, that is, if there is communication with brain substance after trauma, therapeutic devices, for example, shunts or surgery. The local spread is a result of infection in the ear or fractures of the skull bones.

The micro-organisms commonly involved

Encephalitis is the inflammation of the brain substance. It can be caused by trauma and infection. The infection is usually due to bacterial, viral and fungal micro-organisms.
Patients with these infections will present with fever, severe headache, unconsciousness and convulsions. Stiffness of the neck, paralysis of cranial nerves and hemiplegia may also occur. Patients can go into coma and the risk of death is substantial. Have you nursed any patients with these infections? What clinical picture do they present with?

The management of infections of the neurological system involves:

· Investigations including lumbar puncture to examine the cerebrospinal fluid.

·Use of intravenous anti bacterial drugs for meningococcal meningitis (or the most effective drug or those specific to the infective organisms).

·Anti viral medications for aseptic meningitis, for instance, Zovirax.
·Anti fungal medication for cryptococcal meningitis.
·Anti pyretic and analgesic medications are necessary.
·Anti convulsant drugs may be prescribed to prevent or control seizure activity.

Nursing management includes:

·Assessment of the vital signs and neurological evaluations two to four hourly.
·The patient should be assisted to a position of comfort.

·Fluid and electrolyte status is maintained through intravenous fluid placement until the patient is able to resume oral intake.
·Supportive care is necessary to prevent complications related to prolonged bed rest. Activity should be gradually increased as tolerated, but adequate bed rest and sleep should be encouraged.
·In most cases, meningitis does not require isolation with the EXCEPTION of meningococcal meningitis.

Complications include:

·Dementia
·Seizures
·Deafness
·Hemiplegia
·Hydrocephalus

Demyelinating Disorder, Metabolic Disorders and Vitamin Deficiencies

From our study of the normal structure of the nervous system, can you remember the myelin sheath? This is the covering of the nerve axon. When it is damaged, the conduction of nerve impulses is impaired. Certain disorders can result in impaired formation of the myelin sheath or damage to it (demyelination). One such disorder is multiple sclerosis. Its cause is not well understood. Another cause of demyelination is encephalitis.

Multiple sclerosis is a chronic neurological disease characterised by multiple patchy demyelination of white matter in the central nervous system. Multiple sclerosis is chronic and manifests with impaired vision, paralysis, bladder dysfunction and emotional instability.
These manifestations can occur as acute episodes interspersed with recovery periods. This type of disorder requires patients to receive support and understanding from you, the nurse, and their families as part of the management. Considering the impaired vision and mobility, the environment should be structured in such a way that accidents are avoided.

Medical management will include drugs to control spasticity such as diazepam in combination with physiotherapy. For fatigue, patients may be treated with drugs such as Amantadine. Steroids may be administered for optic neuritis. Anti depressants and counselling is important where patient presents with psychological disturbances.

Vitamin deficiencies sometimes result in serious consequences to the nervous system. The most common deficiencies affecting the nervous system are vitamin B1 and B12 deficiencies. Vitamin B1 deficiency causes unsteadiness, double vision, and mental impairment. Vitamin B12 deficiency causes degeneration of the spinal cord. The deficiencies can occur because of alcoholism, deficiencies in the diet or malabsorption.

Metabolic disorders in the brain could result from hepatic encephalopathy, alcoholism and hypoglycemia. Poisoning of the brain substance can occur as result of direct toxins in substances consumed, drugs or as a result of toxins liberated through the metabolic process in the body, e.g. bilirubin.

Care of the Adult with Multiple Sclerosis,
Vitamin Deficiencies and Metabolic Disorders

All patients initially require a thorough assessment. This provides the data for planning and eventually for evaluation. The main goal of care is to ensure the patient with multiple sclerosis should be treated for muscle spasticity through exercises, avoidance of muscle fatigue, prevention of muscle contractures, walking and the use of braces and crutches.

You should also avoid skin pressure and immobility. This decreases the possibility of pressure ulcers. Position change, avoidance of trauma, and giving careful attention to pressure areas are very important.

Assist the patient to overcome inability to coordinate by regularly practising walking techniques and support. If they have bladder dysfunction, catheterise and maintain adequate fluid intake. Bowel training for bowel incontinence is a good practice. For optic and

speech problems, adequate attention should be given to training and use of assistive devices. Most importantly, attention to activities of daily living and patient education can help patients lead better quality lives.

Vitamin deficiencies and degenerative disorders of the nerves that result in nerve damage will also require the same care as is given to the patient with multiple sclerosis.

Degenerative Disorders

All patients with degenerative diseases require a structured and predictable environment. This means that you should give education to their caretakers to organise their environment in such a way that home accidents are prevented. They should always have somebody present to help them and should be oriented to their surroundings regularly.

Two degenerative disorders are Alzheimer's disease and Huntington's Chorea

Degeneration of the neurons occurs in certain individuals due to certain disorders. In **Alzheimer's disease** there is dementia, that is, degeneration of intellectual ability, loss of short-term memory and loss of physical ability. The cause of Alzheimer's disease is not known.

Senile dementia affects elderly individuals and also results in the degeneration of intellectual ability. In **Huntington's chorea**, patients manifest with unusual grimacing and uncontrolled jerking movements, which we call chorea. This particular condition is inherited as a dominant trait.

Herniation of the Intervertebral Disc and Laminectomy

Herniation refers to squeezing of the disc between two vertebral bodies. It is normally a very painful process and patients should be managed appropriately. The treatment of the herniated disc involves immobilisation to allow for healing of soft tissues and reduction of inflammation. Immobilisation involves the use of traction, bed rest, collars and braces.

Muscle relaxants, anti-inflammatory drugs and analgesics are also generally used. Additionally, a moist heat compress will help the patient. The patient with lumbar disc herniation requires bed rest, anti-inflammatory or analgesic drugs, heat treatment and sometimes surgery. Patient education should be included to ensure the patient co-operates with treatment procedures.

Laminectomy

Laminectomy is the removal of the lamina to expose the spinal cord. It is recommended for the prevention of irreversible neurological damage, for progressive disease with muscular weakness and for recurring episodes of pain. Pre operative

management includes teaching the patient to practice log rolling to ensure the spinal column remains in alignment when turning until healing has occurred. Explain the importance of taking analgesics regularly, deep breathing and leg exercises.
Post-operatively, the patient requires bed rest, use of a pillow under the head and knee flexion to relax back muscles. Assess movement and sensation of extremities for signs of nerve compression. Change of position through logrolling, use of pillows between legs when turning and avoidance of extreme flexion must be part of the care. Assess for haematoma and leakage of cerebrospinal fluid, and for urinary retention. The patient should void within eight hours after surgery.

You should give drugs to reduce inflammation, relieve pain and anxiety and decrease the possibility of infection. The patient should also be given education on self care and should be closely observed for complications.

A more common neurological disease that you may have encountered is epilepsy.

Epilepsy
The term refers to two or more unprovoked seizures in one year. The seizures are sudden and uncoordinated. Epilepsy is normally a manifestation of underlying disorders. If they are linked to a particular part of the brain, then they are called focal or partial epilepsy. However, if they cause unconsciousness and general brain dysfunction, they are called generalised epilepsy.

The manifestations of focal epilepsy are hallucinations of taste, smell or hearing. Jacksonian epilepsy affects motor functions, leading to twitching of particular areas. Generalised epilepsy can either be petit mal
seizures or grand mal seizures.

Grand Mal Seizures
In **grand mal epilepsy**, the patient may be aware that the seizure is imminent. This is followed by an aura phase after which there is a generalised tonic contraction. The third phase is the clonic phase where muscles have jerky movements. The tonic and clonic phases are collectively referred to as the ictal phase. Finally the patient enters the phase of relaxation and moves from coma to sleep. This is the post-ictal phase

Petit Mal Seizures
Petit mal seizures are characterised by a phase of transient loss of consciousness. Perhaps you have seen patients who stare expressionlessly for some time before they continue with their function without being aware. This is a characteristic of petit mal seizures

Primary epilepsy has no known cause. Some of the causes of secondary epilepsy are cerebral scarring due to head injury, cerebral vascular accidents, infections, degenerative CNS diseases and childhood febrile illnesses. It is important to bear this in mind so that you control febrile illness well and avoid head injury in neonates during obstetric care.
Seizures that occur spontaneously in succession are called status epilepticus. These normally occur without recovery. This condition is considered a major medical emergency. Vigorous muscular contractions impose a heavy metabolic demand and can interfere with respirations. At the height of each seizure, some respiratory arrest occurs which produces venous congestion and hypoxia of the brain. Repeated episodes may lead to irreversible and fatal brain damage.

Factors that precipitate status epilepticus include:
·Withdrawal of anti epileptic drugs
·Fever and infection
·Cerebral oedema

Management of status epilepticus includes positioning the patient to lie on the lateral position to prevent inhalation of secretions from the mouth. Give IV (not IM) diazepam 10- 30mg STAT slowly over three minutes, repeat if there is no response. If no response put 80mg in 500mls of normal saline, adjust rate to control seizures.

Other useful drugs include phenobarbitone sodium - IM 125mg to 250mg, phenytoin sodium (Epanutin) 100mg tds. Treat hyperpyrexia by temperature reducing measures.

Give care as for the unconscious patient. Oral anti convulsants are given as soon as the patient gains consciousness. The general management of status epilepticus will follow the general care pattern we will now outline. You will learn more about this disorder in children in the unit on paediatric nursing.

Care of the Adult Patient with Epilepsy
You have studied epilepsy and its various forms. After a careful assessment of the patient with epilepsy, you should concentrate on meeting the following objectives as part of the management of the disorder:

·Determine and treat (if possible) the primary underlying cause

·Prevent recurrence

·Manage the seizure and prevent injury During a seizure period, closely observe the patient and support the patient by giving privacy and ensuring an adequate airway. Do not attempt to place anything in the mouth and always protect the head from injury, for example by placing a folded blanket under the head. After the convulsions have passed, re-orient the patient to the environment.

Generally, medications such as phenytoin, carbamazepine and phenobarbitone are useful anti-seizure drugs. Other drugs may be given for tranquilisation. Patient education on a safe environment and coping with stress is also required. If there are underlying causes, these should be treated, for example, in the case of a tumour, surgical excision is recommended.

Other common conditions include:

Parkinson's Disease

Definition: *This is a progressive neuro- muscular disease involving degenerative changes and dysfunction of the basal ganglia. It is a disorder of movement and posture.*

Patients have deficient amounts of naturally occurring dopamine which is required for normal functioning of the basal ganglia in the brain.

The cause is unknown but it is associated with viral infections such as viral encephalitis or meningitis, cerebral vascular disease, toxicity or poisoning.

The clinical features are initially non specific aches and pains but the key features are tremors, rigidity and slowness of movement (Bradykinesia). Other features include slow eye movements, depression, postural hypotension.

Patients with parkinsonism are susceptible to respiratory complications because of muscle rigidity which prevents excursion and ability to cough. There is disturbance of autonomic nervous system. Patient's appearance deteriorates as they cannot attend to activities of

daily living.

Patients with Parkinson's disease require medication such as Levadopa 0.25-0.5mg daily. This relieves symptoms of tremor and rigidity.

The aim of nursing care is to maintain muscular and joint function so that the patient can be as independent as possible. Blood pressure monitoring to detect postural hypotension and teach the patient to avoid rapid postural changes. Moderate exercises to

improve muscle tone which reduces stooping and shuffling movements. Patient should be instructed to walk slowly and carefully. Provide adequate rest to prevent fatigue.

General nursing care includes assisting the patient to feed slowly, prevent constipation and provide psychological support to counteract

depression, discouragement and hopelessness. Speech therapy should be done to correct dysarthia. Involve patient in own care.

Patients have deficient amounts of naturally occurring dopamine which is required for normal functioning of the basal ganglia in the brain.

What complications may ensue after severe head injury?

Your examples should include:

·Coma

·Paralysis

·Respiratory failure

·Hypothermia

What are the functions of the cerebrospinal fluid?

Did you think of the following

·It is involved in the exchange of substances, for example, nutrients between the CSF and the nerve cells.

·It keeps the brain and spinal cord moist.
·It is a shock absorber for the brain, spinal cord and nerves.
·It supports the brain and spinal cord and protects them.
·It maintains pressure around the delicate structures in a uniform manner.

You should study further the various nerve cells of the central nervous system and the movement of cerebrospinal fluid. This information can be found in any anatomy book.

The Eyes and Ears

Under the special senses, you should consider the vision, hearing, smelling and taste. However, you shall only learn about the diseases of the eye and ear and how to manage them.

The Eye

This is the organ of sight, which lies protected in the orbit of the skull. The other protective structures of the eye are eyelids, brows and
eyelashes. The eye blinks by a reflex that serves as further protection. Eyes function as a pair. Anteriorly, a transparent mucus membrane called the conjunctiva covers the eye. The eye surface is kept moist by tears produced by lacrimal glands.

The eye has three layers. These are the sclera and cornea on the outside, the choroids, cilliary body and iris in the middle, and the retina is the inner most part of the eye. Anteriorly the cornea allows light rays to pass through. Since the lens is convex, it refracts or bends light rays to focus on the innermost part of the eye, the retina. Light rays are absorbed by the choroid to stimulate nerve endings.

The cranial nerve that supplies the eye is the optic.
The cilliary body is the point of attachment for muscles and ligaments whose contraction changes the thickness of the lens.
The iris lies behind the cornea and is circular and forms an opening at its centre called the pupil. This varies in size depending on light intensity. You may have seen patients who have organophosphate poisoning and whose pupil were pinpoint in size.

The lens lies behind the pupil.
The innermost part, the retina, has cells involved in changing light rays into nerve
impulses.Behindand in front of the cornea and lens is a clear fluid called aqueous fluid (humor) and vitrous humor respectively. The vitrous humor is colloidal. The aqueous and vitrous humor maintain intra- ocular pressure.

The nerve that supplies the eyes is the optic nerve. Light is focused onto the retina in both eyes and is bent by the lens. The pupils change size to allow the appropriate amount of light to enter the eye. The eyeballs

also move to change the visual field. Once light is changed into nerve impulses, the brain can interpret and form a visual image.

Basic Assessment of the Eye and Vision This consists of a careful patient interview and physical assessment of the eye structures. The patient will normally have complaints e.g blurred vision, itchy eyes, discharge that must
beexamined. A basic assessment of the eye includes observing:

·Eyelids and conjunctiva e.g for oedema

·Corner e.g for clarity
·Sclera e.g for colour
·Iris and pupil e.g colour shape size
·Lens - transparent or opaque

Visual acquity means acuteness or sharpness of vision and includes measurement of
distance and near vision.

A Snellen's chart is used to measure acuteness of vision. It consists of printed letters or words in various sizes.

The inspection of the internal structures is done by use of an ophthalmoscope.

This allows the examiner to view the back of the eye through the pupil to see the optic nerve, retina, blood vessels and macula.

The Human Eye
The Structure of the Eye

Disorders of the Eye

Blepharitis
Blepharitis is one of the most common disorders of the eye. It is an inflammation of the eyelids, characterised by irritation, burning, redness and itching of the eyelid margins. The assessment of a patient with blepharitis must gather all the information related to any recent trauma, possible exposure to allergic substances and infection.

In our country, blepharitis is commonly associated with trachoma. During management you should consider the various causes. The drugs commonly used include tetracycline eye ointment, gentamycin and kanamycin eye drops. Any allergens should be eliminated from the patient's environment

Eye Infections and Inflammations

(a)Hordeolum/Stye: An infection of small glands of lid margins.

·Causative organism: Staplylococcus aureours.
·Clinical features: Tender swollen pustive on eyelid, it eventually ruptures.

· Management: Apply warm compresses three to four times a day to facilitate ripening and drainage. This can be done by hot spoon bathing. Tetracycline eye ointment can be applied three times a day in severe cases after cleaning the lid margin. Incision and drainage should be done if it does not resolve.

b)Chalazion: A Sterile cyst located in the connective tissue in the eyelid.
·Clinical Features: Small lump, hard and non-tender but may put pressure on the eye and affect vision.
·Management: May resolve on its own otherwise incision and drainage is done if it does not resolve. Cleaning of eyes facilitates healing without further complications.

Uveitis

Uveitis: Acute inflammation of the uvea (i.e choroid)
·Causes: Infection, allergy, toxic agents or systemic disorders e.g. diabetes
·Clinical Features: General eye pain
around the eyeball. Swelling photophobia, visual impairment.

Management

Treat the underlying cause. DO NOT ADMINISTER ANTIBIOTIC WITH STEROIDS this may mask the inflammation and cause further damage to the eye structures. Refer to an ophthalmologist for assessment and further care.

Corneal Ulceration and Corneal Detachment

Ulceration of the cornea may be caused by trauma or cataract surgery. If a patient receives blunt trauma to the eye, the retina may separate from the choroid and vitreous humor seeps behind the eye. This will cause retinal detachment.

Clinically, the patient presents with flashes of light, they may see floating images (floaters) and there is a sensation of veiled sight. On examination, the patient may have loss of vision. Keratitis is the inflammation of the cornea that may be caused by infection, hypersensitivity, and trauma. The management will follow the same pattern as ulceration. Most importantly, the cause of the problem must be removed.

Corneal Ulcer

A patient who has a corneal ulcer requires examination, systemic antibiotics, warm compresses for comfort and padding of the eye. For the patient with retinal detachment, bed rest is always recommended to promote healing and tranquilisers may be administered to reduce anxiety. Surgery may be undertaken in specialised centres.

Ptosis

Weakness of the muscle that elevates the eyelid causes ptosis. This is characterised by the drooping of the upper lid. This drooping makes it difficult to see. The commonest causes of ptosis is drugs, trauma and muscle weakness. The etiologic factor should be removed to promote vision.

Conjunctivitis

This is the inflammation of the conjunctiva. Infections, allergens, chemical agents or physical irritants commonly cause it. The signs and symptoms of conjunctivitis include redness, a burning sensation in the eye and tearing.

Patients have a gritty sensation in the eye, and there may be itching and discharge. Bacteria, viruses and other agents may also cause conjunctivitis. The treatment includes antibiotics, anti-inflammatory drugs and analgesic drugs. One of the common drugs that you are likely to use is tetracycline eye ointment.

Trachoma

Trachoma is one of the most widespread eye problems in the drier regions of our country. It is caused by the agent chlamydia trachomatis. Flies normally transfer the micro-organisms from person to person. It is a common cause of blindness in Kenya. The micro-organisms will affect the conjunctiva leading to conjunctivitis. As the inflammation proceeds, the eyelids get turned inwards causing scratching and scarring.

Finally, this may end up in blindness. This is a preventable cause of blindness. The main factors to concentrate on in prevention are good personal hygiene, avoiding the sharing of handkerchiefs, and getting rid of flies. The treatment of trachoma involves use of antibiotics and the commonest one is tetracycline.

Cataract

Cataract: is the opacity of the lens.

·Causes: Cataracts may be associated with aging, trauma, congenital or secondary to other medical conditions.

Pathophysiology

Cataracts associated with aging may result from a decrease in protein, accumulation of water and an increase in sodium content that disrupts the normal fibres of the lens. This leads to opacification of the lens.

Clinical Features

The primary symptom of cataracts is a progressive loss of vision. The degree of loss depends on the location and extent of opacity, it can manifest with:

·Gradual painless blurring and loss of vision
·Glare at night and in bright light
·Haloes around lights
·Cloudy white opacity on the pupil

Diagnosis

This is done by direct inspection of lens with an ophthalmoscope after pupil dilation.

Management

Surgery is the treatment of choice under local anaesthesia, the lens is extracted. An intraocular lens implant may be inserted.

Pre-operative Management

·Informed consent is signed by the patient
·Health messages on the expected post-operative restrictions are given e.g. avoid bending over or rubbing eyes to avoid dislodging of implant
·Treat patient for any coughing or sneezing to avoid complications

Post-operative Care

·Immediately after surgery
·Position patient to lie on back or on the side of the unoperated eye to prevent strawling by patient
·Keep eye padded for rest
·Clean aseptically before instilling eye ointment

Complications

These include infection, bleeding and elevated IOP. The patient is instructed to promptly report when they notice signs of complications.

Glaucoma

Glaucoma: is an eye disease characterised by progressive nerve atrophy and loss of vision.

Pathophysiology

The normal range of aqueous humor pressures in the eye ranges from 10 to 21 mmhg. In a normal eye there is a balance between the production and drainage of acqueous humor that allows the intraocular pressure to remain relatively constant. An increased intraocular pressure results from a blockage in the
outflow. When this blockage persists, the optic nerve is damaged with loss of vision. In primary open-angle glaucoma, the changes occur slowly. The process can also occur more rapidly in response to injury infection or as a complication of surgery.

Clinical Features

1)Open Angle Glaucoma
·Intraocular pressure of > 24mmHg

·Slow loss of vision, peripheral vision lost before central vision
·Persistent dull pain in eyes
·Difficulty adjusting to darkness
·Failure to detect color changes
2)Angle Closure Glaucoma
·In its acute form, it presents with severe ocular pain, decreased vision, pupil enlarged and fixed eye red, steamy cornea
·It may cause nausea and vomiting
·Intraocular pressure may exceed 50mmHg
·Permanent blindness can occur if there is marked increase in pressure for 24-48 hours
3)Congenital Glaucoma
·Enlargement of eye, lacrimation, photophobia, blepharospasm

Diagnosis

Tests include: Tonometry: measurement of intraocular pressure, Ophthalmoscopy to evaluation of colour and shape of optic cup.

Management

This is first medical (conservative). Surgical intervention is indicated where conservative management fails.

Conservative Management

Drugs are used to lower the intraocular pressure and prevent loss of vision. Drug therapy does this by:
·Increasing outflow of aqueous humor
·Decreasing product of aqueous humor Drugs of choice include:
·Miotics constrict pupil e.g pilocarpine
·Cholinesterase inhibitors to constrict ciliary muscle e.g eserine
·Carbonic anhydrase inhibitors to decrease aqueous humor production e.g. diamox

Surgical Management

Trabeculectomy is the common procedure performed. This creates an opening in the trabecular meshwork to allow for draining. The specific management includes:
·Observations post anaesthesia
·Protection of operative eye with patal or shield
·Maintaining comfort in the eye by drug instillation
·Regular assessment of intraocular pressure
·Administration of medications in combination to protect the eye from infections and inflammation i.e. antibiotics and steroid
·Patients to avoid lifting heavy objects and any straining e.g. at defecation to avoid prolapse of eye contents

Colour Blindness

At this point it is important also to make a note about the condition known as colour blindness. In this disorder individuals confuse, mismatch or have reduced acuity for colour discrimination. Mostly, this is a genetic problem.

General Care of Eye Injury

Eye injuries are a common occurrence in our environment. The types of injuries include lacerations to eyelids, corneal injuries, foreign bodies on cornea or in penetrating injuries, splashes to the eye. Preventive measures are more important in this case, but for the patient who already has an injury to the eye, you must undertake the following:
·If there is any penetrating object, leave it in situ, cover the eye lightly with a sterile dressing and refer immediately.
·In the case of splashes to the eye, irrigate the eye with saline solution for 15 minutes.
·Prepare for examination of the eye and assist in determination of the extent of the injury.
·Advise the patient on care and follow- up. Patients with severe injuries may have their eyes padded and should be advised to take good care of the eye to minimise infection and to seek medical
care as soon as possible.
You need to learn skills used in treatment of eye conditions e.g. Hot spoon bathing, eye irrigation, version of eyelid to manage eye injuries.
For the patient having eye surgery you must assist in the immediate pre-operative management by:

·Preparing for general anaesthesia, for example, evacuation of bowel.
·Removal of dentures.
·Trimming eyelashes.
·Instructing the patient regarding post- operative restrictions such as no showers or shampoos, no lifting and no sleeping on operated side until healing has taken place. They should also avoid sneezing and breathing through their noses as this increases
intra-occular pressure.
In the post-operative period, the patients require good positioning, preferably, the dorsal recumbent position, with the use of lateral pillows. The patient also requires education on what to report, for example, severe pain, bleeding and how to communicate if they cannot see. Analgesics and other drugs may also be prescribed.

The Ear

The ear is the organ of hearing, and comprises the external ear, a middle ear and an inner ear. The external part of the ear has the auricle, which is externally visible. The auricle concentrates sound into the ear canal. The external auditory meatus ends at the eardrum, also called the tympanic membrane.

After this membrane is the middle ear, which has structures made up of three tiny bones: the tapes, the incus and malleus. By vibration, the three bones transmit sound waves to the inner ear. The three bones are called ossicles.

A coclear, which is the real organ of hearing, and semicircular canals that are involved in balance, is found in the inner ear.

Once the auricle has concentrated sound waves, they vibrate the tympanic membrane, which causes movement of the three tiny bones. The moving sound waves cause movement of fluid in the cochlear and specialised cells pick these waves to produce nerve impulses. These specialised cells are in
theorgan of Corti.

The brain interprets the impulses from the semi-circular canals. The three semi-circular canals are at right angles to each other. They, therefore, represent the three planes of position.

The nerve that supplies the ears is the vestibulo-cochlear nerve, which has a vestibular branch for balance and cochlear branch for hearing. The external auditory meatus produces wax or cerumen that protects the ear.

Disorders of the Ears

The diseases that affect the ears can be classified into those affecting the external ear,
the middle ear and the inner ear.

External Ear

Tumours, foreign bodies or simple inflammation are the conditions that commonly afflict the external ear. Inflammation of the external auditory meatus is called external otitis. It is caused by irritation by various substances, for example objects placed in the ear. Ear wax produced from the ear canal may cause obstruction.

The external ear may also suffer from tumours, which can be benign or malignant. General ear care can help prevent obstruction and inflammation. Tumours are normally excised if
theycause hearing loss.

External Otitis can be bacterial or fungal or due to an allergic reaction e.g. from soaps, hairsprays.
The patient experiences pain on touching or moving the auricle. Some people are prone to infection from swimming in contaminated water and this is referred to as 'Swimmers ear'. Furuncles also occur and these are mainly caused by Staphylococcus aureus. Incision and drainage of the furuncle is rarely done and this is best managed by administration of antibiotics and application of hot packs. This usually results in resolution of the furuncle.

Cerumen in the ear canal may occasionally be impacted causing ear ache and hearing difficulties. These wax deposits may be softened using warm glycerine drops. When cerumen becomes difficult to dislodge, it can be removed with a cerumen spoon under magnification.

In some instances, **foreign bodies** are inserted accidentally into the ear canal. Insects can easily be removed by instillation of oil drops as the oil allows the insects to float and be flushed out. For foreign bodies of vegetable origin, irrigation with any fluid is contraindicated as they have a tendency to swell making removal difficult. Removal of foreign

bodies should be by a skilled person as the object may be pushed even deeper, lacerating the skin of the canal and perforating the ear drum.

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The Middle Ear

The middle ear is a cavity, which has the eardrum and the auditory ossicles. In the middle ear, we can have otitis media, caused by micro-organisms such as staphylococcus aureus, and inflammation caused by the insertion of foreign objects. This condition may