

SURGICAL NURSING ONE

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INTRODUCTION TO SURGERY

SURGERY

The word surgery comes from a Greek-Latin word “cheirourgia” that means handwork. It’s an ancient medical specialty that uses operative manual and instrumental techniques on a patients to investigate and or treat a pathological condition such as disease or injury or help to improve bodily function or appearance.

Therefore surgery; is the branch of medicine that deals with the physical manipulation of a bodily structure to diagnose, prevent or cure an ailment.

Ambrose Pare, a 16th century French surgeon, stated that to perform surgery is to “eliminate that which is superfluous, restore that which has been dislocated, separate that which has been united, join that which has been divided and repair the defects of nature.

Definition of surgery :

It is a branch of medicine which deals with management of conditions by surgical interventions or operations.

Is the art And Science of treating diseases, injuries and deformities by operation and instrumentation?

It is a branch of medicine which seeks to alleviate (lessen) suffering, promote health and prolong life fully or partly by manual and operating procedures.

HISTORICAL BACKGROUND:

Surgery is as old as human kind in the world an ancient method where operations were performed crudely like cutting off of the affected part with men holding the patient in and surgery was not taught in universities on college of higher learning. There was no anesthesia and aseptic technique was not very much observed. Patients were at risk of infection and some died due to pain, infection and septicemia. There were no trained health workers but strong men used to be the surgeons of the time.

The organization of the United Company of Barber surgeons of London in 1540 marked the beginning of some control of the qualifications of those who performed operations

In the 18th century with the increasing knowledge of anatomy operative procedure like amputation excision of tumors helped to establish surgery in the medical curriculum. Patients were sedated with opium or made drunk with alcohol tied down and procedure could be done in 3 to 5 minutes. The pain involved in such procedures continued to limit until the introduction of ether anesthesia in 1946.

In the mid-19th century the French microbiologist Louis Pasteur developed an understanding between the bacteria and infectious disease and the application of this theory to wound sepsis by British surgeon Joseph Lister from 1867 resulted in the technique of antisepsis which brought remarkable results in reduction in the mortality rate from wound infections after operations. The introduction of anesthesia and modern surgery marked the beginning of modern surgery

Modern surgery and training of surgeons solved the above problems by the use of anesthesia and aseptic technique observation.

Surgery may be performed for the following reasons;

- Diagnosis; determination of the presence and stroke or extent of pathology e.g. lymphonade biopsy
- Cure; elimination of repair of pathology e.g. appendicectomy
- Palliation; alleviation of symptoms without cure e.g. rhizotomy to remove symptoms of pain

- Exploration; surgical examination to determine the nature or extent of disease e.g. laparotomy
- Cosmetic improvement; change in breast shape or repairing of a burn scar

TERMS

TERMS USED IN SURGERY

1. **Abscess;** A localized collection of pus.
2. **Adenoma;** A benign epithelial tumour of the glandular origin.
3. **Aneurysm;** Dilation of an artery/ vein.
4. **Colitis;** Inflammation of the colon.
5. **Dysplasia;** Abnormal development or growth of tissue organs or cells.
6. **Empyema;** A collection of pus in a body cavity.
7. **Cutaneous;** Relating to or existing on or affecting the skin.
8. **Gangrenous;** Localized death and decomposition of body tissue, resulting from either obstructed circulation or bacterial infection.
9. **Haematoma;** A solid swelling of clotted blood within the tissues.
10. **Haemorrhage;** A heavy bleeding from a ruptured blood vessel.
11. **Necrosis;** Death of most or all of the cells in an organ or tissue due to disease, injury or failure of the blood supply and hence tissue death (ischemia).
12. **Sepsis;** The presence of pus-forming bacteria or their toxins in the blood or tissues.
13. **Slough;** A piece of dead soft tissue. Or a necrotic tissue separated from the living structure.
14. **Stoma;** Surgical opening/ artificial opening made in an organ, especially an opening in the colon (colostomy) or ileum (ileostomy) made via the abdomen.
15. **Suture;** The fine thread or other material used surgically to close a wound or join tissues, an immovable joint (especially between the bones of the skull).
16. **Thrombus;** A blood clot that forms in a blood vessel and remains at the site of formation.

17. **Infection;** Is the invasion of the body tissue by pathogenic microorganisms.
18. **Disinfectant;** Is a chemical substance that is used for rendering only animate objects free from disease causing microorganisms with the exception of their spores. They include, phenol, chlorine.
19. **Anti-septic solution;** Is a substance that is used on a person's skin to inhibit the growth and activity of micro-organisms, but not necessarily destroying them.
20. **Contamination;** Is the process by which something is rendered unclear or unsterile.
21. **Carriers;** Are people or animals that show no symptoms of illness but have pathogens on or in their bodies that can be transferred to others.
22. **Disinfection;** Is the elimination of virtually all pathogenic microorganism on inanimate objects with the exception of their spores ie reducing the level of microbial contamination to an acceptably safe level.

COMMON SURFIXES USED IN SURGERY

Angio; relating to blood vessels e.g. angiograms, contrast imaging of an artery

Antegrade; going in the direction of flow e.g. antegrade pyelogram; injection of contrast medium under imaging control into the renal pelvis percutaneously

Chole; related to the ability tree or bill e.g. cholelithiasis; gall stones

Cele; a cavity containing gas or fluid e.g. hydrocele, lymphocele, galactocele

Ectasia; related to dilation of the ducts e.g. sialectasia; dilation of salivary gland ducts

Ectomy; cutting something out e.g. gastrectomy

Gram; an imaging technique using radio-opaque contrast medium e.g. cholangiogram; to visualize the bile ducts

Lith; stone e.g. pyelolithotomy; removal of a stone from the renal pelvis by opening the renal pelvis

Oscopy; the inspection of a cavity, tube or organ with an instrument e.g. cystoscopy inspection of the bladder

Ostomy; opening something into another cavity or to the outside e.g colostomy; an opening of the colon on to the skin

Oma- denotes tumour/ neoplasm

Pyelo; relating to the pelvis of the kidney e.g. pyelogram; contrast imaging showing the renal pelvis

Otomy; making an opening in something e.g. laparotomy; exploring the abdomen

Per; going through a structure e.g. percutaneous; going through the skin

Plasty; refashioning something to alter functioning e.g. angio-plasty; to widen an obstruction in an artery

Retrograde; going in a reverse direction against the flow e.g. endoscopic retrograde, cholangio-pancreatogram (ERC)

itis- denotes inflammation

rrhage- excessive flow

pnea- relates to breathing

rrhoea- means discharge

plegia- means paralysis

scopy- means examining

galy- relates to enlargement of an organ/structure

logy- study of

ase- related to enzyme

trans; going across a structure e.g percutaneous transluminal angioplasty

GENERAL CAUSES OF DISEASES.

The study of causes of diseases is referred to as etiology.

THE GENERAL CAUSES INCLUDE;

1. Congenital;

It's when an individual is born with a disease in any of the organs due to damage in early weeks of development while in the uterus.

2. Hereditary;

This where by an individual inherits (is passed on) the disease from the ancestors via genes e.g. sickles cell disease.

3. Traumatic;

These include gunshots, surgical operations, excessive heat, or cold, corrosive chemicals, poisonous gases and electricity.

4. Mechanical;

Those are any agencies that cause obstruction to the normal passages e.g GIT, RT and blood vessels.

5. Deficiency;

These are due to the absence of diet substances necessary for normal health, growth and replacement e.g. Kwashiorkor, Marasmus, Rickets, etc.

6. Metabolic disorders;

Is the inability to deal with certain results of food. It may result in accumulation of unwanted chemical in the blood which may lead to trouble e.g excess sugar in the blood which leads to diabetes mellitus.

7. Tumours;

These are over growth of cells which have undergone changes that makes them multiply themselves. This can be benign or malignant.

8. Hypersensitivity;

Some people are hypersensitive to small amounts of certain proteins and if exposed to them, they react. Hypersensitivity can be;

- a) An allergy
- b) Anaphylaxis.

9. Degenerative diseases;

The ageing process usually results in various conditions e.g. osteo-arthritis, stroke etc.

10. Psychological factors;

This can be an important cause of disease e.g. stress, anxiety, disappointments etc.

INFECTION

- It is the successful invasion, growth & multiplication of microorganisms in the body.

SOURCES OF INFECTION ON A SURGICAL WARD

1. MEDICAL PERSONNEL

- a. This is due to the ward staff e.g. nurses, doctors, support staff & students.
- b. All these harbor infection & spread it through the respiratory system, hands, hair, skin, dresses, & shoes.

2. THE PATIENT

- a. The patient themselves spread infection by being too friendly & anxious thereby sitting on other patients' beds, sharing things like basins, cups, flasks, & linen.
- b. Patients with wounds handle them unnecessarily by showing them to their visitors.
- c. They also transmit infections/disease through droplet infection

3. WARD POSITIONING/ARRANGEMENT

- a. The surgical ward should be 5meter away from the medical ward & the surrounding of the ward should be catered for in cleanliness.
- b. Scattered refuse & busy environment is a source of infection to a surgical ward.

4. WARD BED SPACING

- a. Bed should be in a considerable distance from each other according to the ward setting.
- b. This minimizes transfer of microbes from one patient to the other.
- c. The lockers, tables, cupboard should be carefully cleaned.

5. INADEQUATE STERILIZATION

- a. Use of inadequately satirized equipment containing microorganisms will cause wound sepsis e.g. use of unsterile instruments for dressing wounds is a major threat to patients' healing.

6. WARD EQUIPMENT

- a. Dirty ward equipment e.g. mattresses with discharges & all equipment with cracks are good breeding places of microorganisms.
- b. Blocked sinks &toilets all act as breeding places of microorganisms.

MICROBES WHICH ARE LIKELY TO CAUSE INFECTIONS ON A SURGICAL WARD

1. Staphylococci e.g. *S. aureus*
2. Streptococci e.g. *S. pyogenes*, *S. Faecalis* e.t.c.
3. Clostridium e.g. *C. Welchi*, *C. Tetanii*, e.t.c.
4. *E. coli*
5. *Klebsiella*
6. *Proteus*
7. *Salmonella*
8. *Pseudomonas*

MODE OF ENTRY

- ⊕ Direct contact
- ⊕ Inhalation
- ⊕ Inoculation
- ⊕ Transplacental

CONTROL OF INFECTION ON A SURGICAL WARD

1. MEDICAL PERSONNEL

Personal hygiene should be improved & all rules pertaining personal health should be followed;

- a. Hair should be kept clean & neat.
- b. Nails & hands should be cared for relatively.
- c. Hands should be washed before & after a given procedure.
- d. Uniforms should be kept clean & aprons should be worn them.
- e. Do not hang them on other clothes at home on return from duty.
- f. Medical personnel with URTI & Skin infections should report & be treated effectively before they contaminate & infect others.

2. PATIENTS

- a. Patients should be encouraged to carryout personal hygiene & if unable, are helped by nurses.

3. WARD

- a. There should be adequate ventilation to allow free air circulation in the ward & allow in enough light which also helps kill microorganisms.
- b. Daily cleaning of the ward; high & dump dusting.
- c. Fumigate all isolation units on discharge of infectious patients e.g. detol, jik/jezz for toilets.
- d. Adequate bed spacing; 2-3M apart.
- e. Avoid overcrowding.
- f. Dark corners & surfaces should be avoided.
- g. Surfaces should be polished & smooth.
- h. Cover mattresses with mackintosh, wash & dry them after patient discharge.

4. PROPER STERILIZATION TECHNIQUES

- a. Instruments should be thoroughly sterilized.
- b. Never dress a patient with unsterilized equipment
- c. All rules of wound dressing should be followed i.e. use one pack on one patient, dress clean wound first then dirty wound later, & administer treatment under aseptic techniques.

5. COMPOUND

- a. Keep it clean
- b. Dispose of wet & dry refuse correctly

Refuse bins should not be kept in clean utility rooms

SURGICAL DIAGNOSIS AND THE NURSE

Surgical diagnosis is an important aspect in surgery and it helps to distinguish one condition from the other as they are presented by the patients

Diagnosis can be reached after carrying out the following;

- History taking of the patient
- Examination of the patient
- Investigations (see special investigations)

HISTORY TAKING

Always allow yourself plenty of time to take full history

Develop a method of taking it and try not to write and talk to the patient at the same time

When writing the patient's history in the notes initially, the following should be recorded;

- Full names
- Address
- Sex
- Age
- Tribe/ethnic group
- Marital status
- Occupation
- Next of kin

Make sure that you record the date of the examination; you will need these so that you can record subsequent progress

The remainder of the history should be taken in the following order;

- **Presenting complaint**

Ask about what symptoms the patient is complaining of.

If there is more than one complaint, list them in the order in which they are the most troublesome to the patient

- **The history of the presenting complaints**

- Record the full details of the main complaints
- Allow the patient to give a full record of complaints relating to a particular system and then ask any remaining questions that you may have about the abnormal system e.g. if the patient complains of indigestion, nausea and vomiting, make sure that as a part of the history of the presenting complaints which clearly relates to the alimentary tract, that you ask all other questions in this section of the alimentary tract e.g. bowel habit, abdominal distention and jaundice.

- **Systemic inquiry**

- Once you are satisfied, you have obtained the full history of the presenting complaints then ask all pertinent questions about other systems.
- These are laid out as below;
 - **Gastro-intestinal system;** appetite, change in diet, change in weight, nausea, difficulty in swallowing, regurgitation, heart burn, flatulence, faeculent, abdominal pain, distention change in bowel habit, characteristics of stool
 - **Respiratory system;** cough, sputum, character of sputum e.g. purulent, dyspnoea, wheezing, hoarseness, chest pain
 - **Cardio-vascular system;** chest pain, dyspnoea, paroxysmal nocturnal dyspnoea, orthopnoea, palpitations, ankle swelling, cough, dizziness, intermittent claudication, oedema.
 - **Nervous system;** fits, loss of consciousness, fainting attacks, tremors, weakness of the limbs, paresthesia, disturbances of smell, vision or hearing, headaches, change of behavior
 - **Muscular skeletal system;** pain in joints, swelling in joints, limitations of movements, muscle pain, muscle weakness, disturbances of gait.
 - **Genital urinary system;** frequency of micturation, hesitancy, poor stream, dysuria, colour of urine, haematuria, thirst, polyuria, low abdominal pain, date of menarche / menopause, menstruation complications, breast symptoms, impotence, dyspareunia

- **Past history Surgical**

Find out about the following;

- Previous operations and whether they were followed by any complications e.g. (DVT, infections, sepsis)

Position

- Previous anesthetics whether there are any problems such as drug reaction, excessive vomiting, silicone sensitivity or malignant hyperthermia
- Previous history of rheumatic fever which may have damaged the heart valves; with such a history, the heart must be examined carefully
- Previous history of jaundice

Past Medical

Find out the following;

- Previous illness

Other diseases which may influence the management e.g. diabetes, T.B, asthma, hypertension

- **Family history**

In case of death of close relatives, find out the cause e.g. parents, brothers and sisters

- Inquire particularly cardio-vascular disease and malignancy
- Check for familial illness, e.g. malignant hyperthermia, pseudo cholinesterase deficiency

- Social history

Important points are as follows;

- The patient's job: check fully the details of the occupation and make sure you understand exactly what the patient does
- Support: what sort of support is available from the family or friends post operatively
- Habits: check how much the patient drinks and smokes. A heavy drinker may be resistant to the normal dose of anesthesia. A heavy smoker will be very liable to develop a chest

infection post operatively and preoperative physiotherapy may be indicated to minimize the risk

- Leisure activities
- Marital status
- Eating habits
- Drug history
- Check the patient's present medications. Many drugs interfere with anesthetic agents make particular inquiries about steroids anticoagulants and contraceptive pills
- Drug abuse
- Ask about allergies especially antibiotics, anesthetics and applications e.g. iodine

EXAMINATION OF THE PATIENT

This includes general examination and physical examination

General examination

- Following the history, (a general examination) statement is made
- It is a statement of the provider's general impression of a patient
- Although the provider may include other data that is seen pertinent, the major areas usually included in the general survey statements are;
 - body features
 - state of consciousness of and arousal
 - speech
 - body movements
 - obvious physical signs
 - nutritional

Physical examination

- It is performed together with comprehensive pertinent assessment data
- It provides a complete picture of the patient's physiological functioning
- When combined with history taken, it forms a database to direct decision making
- It is done in a sequential head to toe fashion to ensure thorough assessment of each system

- Specific assessment techniques are used when performing the head to toe assessment and those include; inspection, palpation, percussion and auscultation
- The physical assessment techniques are usually performed in the above sequence with the only exception to this being the abdominal examination. Inspection, auscultation, percussion of the abdomen before auscultation can alter bowel sounds and produce false findings

Not all assessment techniques are approachable for all body parts and systems

- The physical examination should be performed systemically and efficiently
- Explanations should be given to the patients as the examination proceeds
- Only abnormal findings should be recorded during the actual examination. This prevents needless interruptions in the examination to write lengthy normal findings

INSPECTION

Consists of a thorough visual observation of the client or patient

The visual assessment gives the nurse a description of the body's outward response to its internal functioning.

Inspection is more than just looking

- The nurse needs to compare what is seen with the known, generally visible characteristics of the body part being inspected e.g.;
 - In patients, face may be seen
 - Anxiety or distress, depression
 - Flush, sweat
 - Pallor, cirrhosis
 - Jaundice
 - Oedema, a swelling

Any of the above observations may be informative e.g. pallor and sweat may be a result of haemorrhage

- Else-where, similar careful observations should be made

- In all sites, previous scars, dilated veins or the presence of a swelling are important
- Any abnormal sound should be reported by the nurse, however trivial it may appear.

PALPATION

It is the examination of the body through the use of a touch

- The use of light and deep palpation can yield information related to masses pulsations, organ enlargement, tenderness, swelling, muscular spasms or rigidity elasticity, vibration of voice sounds, crepitus, moisture and differences in textures
- The nurse's figure pads are placed flat against the patient's skin, exerting a slight press is for light palpation and extra pressure for deep palpation
- Different parts of the hand are more sensitive for specific assessments e.g. the finger tips- lymph nodes, the dorsa of the hands and fingers-temperature and palmer surface-feeling vibration
- Palpation requires a calm, gentle approach and is used systemically with light palpation proceeding
- Deep palpation and palpation of tender areas performed first.

PERCUSSION

It is an assessment technique involving the production of sound to obtain information about the underlying organs

It is used for assessing the density of structures or determining the location size of organs in the body.

The percussion sound may be produced directly or indirectly

- Direct percussion is performed by directly tapping the body with one to two fingers in the elicit sound
- Indirect or mediated percussion is the more common percussion technique
- The middle figure of the dominant hand (plexor) strikes the distal phalanx or the distal inter-phalangeal joint of pleximeter finger

The sounds and vibrations produced are evaluated relative to the underlying structures.

Deviation from an expected (normal) sound may indicate a problem (see table below)

Description of percussion tones

| Tones | Intensity | Pitch | Duration | Quality | Normal |
|-----------------|-----------|----------|----------|------------------|--------------|
| Dullness | Medium | High | Medium | | Liver |
| Flatness | Soft | High | Short | Extreme dullness | Muscle |
| Hyper resonance | Very loud | Very low | Long | Booming | Child's lung |
| Resonance | Loud | Low | Long | Hollow | Normal lung |
| Tympani | Loud | High | Medium | Drum like | stomach |

ASCULTATION

Involves listening to sounds in the body that are created by movement of air or fluid

It is usually indirect, using a stethoscope to clarify sounds by blocking extraneous sounds.

It is particularly useful in evaluating sounds from the heart, lungs, abdomen and vascular systems
e.g. respiratory auscultation reveals the presence of normal or abnormal breath sounds

There are three distinct types of normal breath sounds;

1. **Bronchial sounds** – loud and high pitched sounds with a hollow quality heard from air moving through the trachea
2. **Bronchial vascular sounds** – medium pitched and blowing sounds heard from air moving through the large airways
3. **Vascular sounds** – soft breezy and low pitched sounds heard from air moving through the smaller airways over the lungs periphery
4. Abnormal sounds include; wheezes, crackles, stridor and pleural friction rub.
5. Abnormal auscultation reveals a “bubbly gurgly” sound caused by peristalsis and movement of the intestinal contents heard approximately 1 minute in each quadrant

1. When 5 to 20 bowel sounds are heard per minute, the bowel sounds are considered active
2. The absence of bowel sounds during 1 minute of auscultation in each quadrant is documented as absent bowel sounds, less than 5 bowel sounds 1 minute are described as hypo active
3. More than 20 bowel sounds / min are defined as hyper active
4. High pitched sounds are termed as borborygm . This is caused by the passage of gas through the liquid contents of the intestine.

TYPES OF SURGICAL OPERATIONS

There are three types of operations specifically addressed in surgery.

- Emergency operations
- Planned/elective operations
- Multi-staged operations

EMERGENCY

This is performed only when there is an immediate threat to life of hemorrhage, respiratory and intestinal obstruction which conditions are not likely to be controlled by conservative methods alone

PLANNED / ELECTIVE

It is the most desired operation which is undertaken when the patient's general condition and local factors are controlled to maximum degree before surgery e.g. uterine fibroids where hysterectomy and myomectomy is done.

MULTI-STAGED OPERATION

It is between emergency and planned but done stage by stage

- It is necessary because;

- The patient's condition is not good enough to do all that is necessary at once. The 1st operation may be designed to rest or drain an organ or cavity so that subsequent curative measures can be safely undertaken
- There is need for re-operation due to a complication

NB

The component of planning is vital too in this operation e.g. VVF repair and colostomy repair where examination under anesthesia is done first and then the damage is repaired in different operations

In summary, the aim of surgery is to assist and not to disturb the pace of natural healing in multi-staged operation

PERI – OPERATIVE CARE

Refers to the nursing care delivered to a patient before (pre), during (intra), and after (post) surgery.

The aims of care are;

- To reassure and prepare the patient for the operation
- To provide safe anesthetic and to ensure that patient recovers consciousness without any disturbances
- To prevent / treat shock
- To achieve wound healing as rapidly as possible
- To RX / prevent complications which may arise
- To restore rapidly the function in all the organs of the body as well as in the mind.

CLASSIFICATION OR TYPES OF SURGICAL PROCEDURES

Surgical procedures can be classified according to purpose, risk factor and urgency;

| | CLASSIFICATION | FUNCTION | EXAMPLES |
|---------|---------------------|--|---|
| PURPOSE | Diagnostic | Determines or confirms diagnosis | Breast biopsy and bronchoscopy |
| | Ablative (curative) | Remove diseased organ / extremity | Appendectomy, amputation |
| | Constructive | Build tissue/organs that are absent (congenital abnormalities) | Repair of the cleft palate |
| | Reconstructive | Re-build tissue/organs that have been damaged | Skin graft, total joint replacement |
| | Palliative | Alleviate symptoms of disease (not curative) | Bowel resection with client terminal cancer |
| | Transplant | Replace organs/tissue to restore function | Heart, lungs transplant |

| | | | |
|-------------|-----------|--|--|
| | Minor | Minimal physical assault with minimal risk | Removal of skin lesions, D&C, cataract |
| RISK FACTOR | Major | Extensive physical assault and or serious risk | Transplant, colostomy, nephrectomy |
| URGENCY | Elective | Suggested though no fore seen ill effects it can postponed | Cosmetic surgery, cataract surgery |
| | Emergency | Performed immediately | Obstetric emergency, bowel obstruction |

PRE – OPERATIVE CARE

It is the assessment and preparation of a patient physically and psychologically before surgery.

Aims of physical preparation

- To minimize post-operative complications e.g. by teaching the patient deep breathing exercises and relevancy after surgery to the well being
- To assess the physical condition of the patient so that potential problems can be anticipated and prevented
- To ensure that the patient is in an optimum physical condition before surgery

Aims of psychological preparation

- To ensure that the patient understands the nature of the surgery
- To teach the patient what to expect post operatively e.g. about any drains, catheters that may be necessary after wards

To assess areas of anxiety that the patient may have and discuss them e.g. loss of a body part

PRE-PARATIONS

1. Initials

- May commence many weeks prior to operation
- If surgery is elective, the patient may probably have arranged medical consultations and outpatient investigations prior to admission

2. Admission

- Patients for elective surgery are usually admitted a day or two before the operation. On admission, temperature, pulse, blood pressure and respirations are taken and recorded on vital observation chart. If there is any abnormality, it's reported to the ward in-charge or surgeon.
- If a patient has a cough or cold or un-explained pyrexia, the operation may be postponed. A note should be made of any known allergies (e.g. skin preparations, dressing and drugs e.t.c.)
- Patients may be anxious when they enter the hospital for surgery and so it is essential that the first impression is positive
- Patients who can move around can be shown facilities like toilets, bathrooms etc.
- Patients are also introduced to their neighbors and to the nurses who will care for them during their stay.
- The patients may also appreciate some information on the ward and its routine

3. Patients assessment

- Nursing assessment is done, it is always better to take history first so that the patient can get used to the new environment before measuring the vital observations.
- The general history taken includes;
 - Biographic information
 - Reasons for admission
 - Current illness and health status including any medication, complaints and disability
 - Previous medical history, hospitalization and chronic diseases if any
 - Family medical history
 - Nutritional history including eating habits or preferences, food allergies, religious and other dietary preferences, any eating problems

4. Assess factors/conditions that may influence surgical risks according to the systems

- Cardiovascular and hematological problems focus on the problems of; angina, hypertension, congestive heart failure and recent history of myocardial infarction, identify any drug or herbal products that may affect coagulation e.g. aspirin, ginger, ginkgo
- Respiratory problems, note presence of infection or chronic obstructive pulmonary disease (COPD) smoking and thoracic of upper abdominal surgery

- Neurologic status; determine orientation to time, place and person; identify presence of confusion, disorderly thinking or inability to follow commands. Identify past history of stroke, transient ischemia attacks, or diseases of the central nervous system e.g. Parkinson's disease or multiple sclerosis
- Urinary diseases; history of kidney, bladder and prostate gland disease
- GIT diseases; PUDs, nausea and vomiting, constipation, obesity and flatulence, any suspected liver disease. Review past history of substance abuse especially alcohol abuse
- Endocrine diseases; diabetes mellitus, thyroid disease, hypersensitivity or food and drugs
- Muscle- skeletal status; assess the presence of any pressure ulcer limitations, in joint, range of motion, mobility, gait, balance and muscle weakness
- Determine skin status; note dying, bruising, rashes, infections especially around a planned surgical site
- General and systemic factors; age (> 70 or very young), malnutrition (extreme over weight or underweight), number of current illnesses, electrolyte imbalance and emergency versus elective procedure

5. Psychosocial assessment

- Determine the support system, including family, significant others, religious and spiritual orientation
- Determine current degree of personal control, decision making and independence
- Identify the presence of hope and anticipation of positive results
- Identify specific areas and depths of anxiety and fears (unfamiliar surroundings and people)
- Identify passive or potential changes if role or relationships and their impact and body image
- Review previous surgical experiences, hospitalization and treatment and let the patient to relate those with the current perception of surgical procedure
- Assess understanding of the surgical procedure, including preparation, care, interventions, preoperative activities, restriction and expected outcome

PSYCHOLOGICAL PREPARATION

- Admit the patient 1 -2 days prior to the operation
- If possible, arrange the bed position with patients of own age group and similar conditions

- Establish a satisfactory nurse-patient relationship through a positive attitude to the patient and relatives, be kind, friendly and the patient un hurried (introduce self and other patients)
- Explain all hospital routines and procedures
- In case of socio-economic factors, encourage patients to talk about these factors and if necessary arrange visits with medical social workers and spiritual advisors.
- In case of anxiety about the operation, anesthesia, disfigurement and death, re-enforce doctor's explanations avoiding over dramatization. Arrange visits with successful case.

PHYSICAL PREPARATION

Investigation

1. General

- Chest x-ray should be obtained in all patients with cancer, cardiac, renal and respiratory diseases
- Hemoglobin estimation
- Full or white blood cell count
- Grouping and cross matching
- Urinalysis

2. Specific, ordered according to patient's condition

- ECG
- Blood glucose
- Electrolytes
- Pulmonary function studies
- Liver function test
- Pregnancy test

Correct any abnormalities that may affect the surgery

1. Nutrition

- High calories food if the patient is under weight or low caloric foods if over weight
- Easy digested, low residual diet is encouraged

2. Fluid

- Dehydrated patients will need fluid and electrolyte replacement

3. Treat any other existing abnormalities

- Like dental carries, skin lesions, constipation, respiratory or cardiac conditions. Etc

Physical therapy

- The patient is encouraged preoperatively to practice deep breathing exercise, cough exercise and leg exercise
- Deep breathing exercise, hyper-ventilation of the alveoli helping to keep them open and mobilize secretions trapped in smaller airways
- Coughing exercises help in expelling the mobilized secretions
- Leg exercises include flexion and extension, and rotation of the ankles
- Leg exercises in conjunction with breath-in exercises help prevent pulmonary embolism and deep venous thrombus
- If the patient can move, early ambulation (mobilization) after surgery (short frequent respiratory and vascular complications)

IMMEDIATE PRE-OPERATIVE CARE

- Includes all the care given within 12 hours before surgery
- It applies to both elective and emergency surgery

Consent form

- The informed consent process protects a patient's right to self-determination and autonomy regarding surgical intervention
- When a person freely makes a thoughtful decision based on accurate useful information, this is an informed choice
- Before surgery, the physician asks the patient to sign a statement consenting to the operative procedures
- The consent implies that the patient has been given the information necessary to understand the possible consequences
- The physician is responsible for providing the patient with sufficient information to weigh the risks and benefits of the proposed surgery (disclosure duty)

- The information usually includes; the disease process and diagnosis, the nature of the surgery with benefits, risks, prognosis, if the treatment is with-held and alternative treatment modalities
- The nurse's role is to assess, the patients decision making capacity, confirms the patient has been given the necessary information to give informed consent, clarifies any misconceptions and witness signing of the consent form
- The necessary components of the consent document include;
 - The patient's full legal names
 - Surgeon's name
 - Specific procedures to be performed
 - Signature of the patient, next of kin or legal guardian
 - Signature of the witness
 - Date
- If an adult is incapable of giving informed consent, the doctor must obtain consent form from next of kin
- A parent or legal guardian usually provides consent for the minor child
- In an emergency, the surgeon may operate without written permission of the patient or family though every effort made to contact a family member or guardian if time permits
- Consent in the form of a telephone call is permissible in an emergency situation. Two people must witness the call
- If no family member or legal guardian can be contacted, two doctors who are not associated with the surgical procedure may consent but a relative must sign an operative consent form as soon as possible
- In case of illiterate patients, make sure they understand the verbal explanation of the consent process and may sign the form with an x or thumb print. This process must be witnessed by two persons
- In case of language barrier, you should provide a translator

NB; a patient has a right to refuse a surgical intervention or withdraw informed consent at any time before the procedure, if that decision is reached voluntarily and rationally.

GIT PREPARATION

- Patients having elective surgery are usually instructed to have nothing mouth (N.P.O) starting at midnight on the night before surgery (6 hours fasting prior to operation)
- This protocol may vary if the patient is having local anesthesia or the surgery is scheduled late in the day
- Patients having emergency surgery may have their stomach contents aspirated if necessary
- Restriction of fluids and food is designed to minimize the potential risk of aspiration and to decrease the post-operative nausea and vomiting

4. Providing the patients with the rationale for the adherence to NPO orders can significantly increase the patient's perception of their importance

- The patient who has not followed this instruction may have a surgery delayed or cancelled
- Empty the rectum; this eliminates incontinence during anesthesia
- Any aperients may be ordered two nights before surgery or suppositories/small enema or the morning the preparation may be given (special preparation is needed in bowel surgery)

PRE-MEDICATION

- Before administering any medication, the nurse must ascertain that the consent form has been completed, signed and placed in the patient's chart
- These drugs are given "on call to the operating theatre" but may also be given just before anesthesia induction in the operating theatre
- Oral medication should be given 60 – 90 minutes before the patient goes to the operating theatre
- IM or SC injections should be given 30 – 60 minutes before the arrival at the operating theatre
- Iv medications are usually administered in the operating theatre or holding area
- The drugs must be charted immediately
- Once pre-medications have been administered, the patient should be kept in the bed with the side rails up to ensure safety

Other medications include;

- Antibiotics are usually ordered in cases where wound contamination is either a potential risk or where wound infection could have serious post-operative consequences
- Eye drops are usually administered as ordered and on time to adequately prepare the eye for surgery
- Routine prescription medications i.e. anti-hypertensive are always given on the day of surgery. In case of insulin, it is important to clarify the time and amount of the last dose before surgery

THE TABLE BELOW SHOWS FREQUENTLY USED DRUGS AND THEIR PURPOSE

| Class | Drugs | Purpose and effects |
|--------------------------------------|------------------------------------|--|
| Benzodiazepines | Diazepam, midazolam | <ul style="list-style-type: none"> - Reduce anxiety - Induce sedation - Induce amnesia |
| H ₂ O receptor antagonist | Cimetidine, famotidine, ranitidine | <ul style="list-style-type: none"> - Increase gastric PH - Decrease gastric volume |
| Anti-acids | Sodium citrate | <ul style="list-style-type: none"> - Increase gastric PH |
| Anti-emetics | Metoclopramide, droperidol | <ul style="list-style-type: none"> - Increase gastric emptying - Decrease nausea and vomiting - Provide mild relaxation |
| Anti-cholinergis vagolytic agents | Atropine, scopolamine | <ul style="list-style-type: none"> - Decrease oral and respiratory secretions - Prevent bradycardia |

DAY OF SURGERY PREPARATION

The nursing responsibilities include;

- Final preoperative teaching
- Assessment and communication of patient findings
- Ensuring that all preoperative preparations orders have been completed

- Ensuring that records and reports are present and complete to accompany the patient to the operating theatre
- Notify relatives and emergency, it may also be necessary to notify the minister of religion

Observations

- Vital observations as baseline for future comparison
- Urine testing to detect abnormalities which may have risen
- Weight measurement as baseline for future comparison
- Final preparation for surgery – the nurse ensures that the patient is ready to be safely transferred to the operating theatre
- All the patient's belongings are identified and secured. They may be returned to a family member or locked up according to hospital protocol
- If the patient puts on a hospital gown and removes all personal clothing
- If the patient is wearing nail polish or artificial nails, one or more finger or toe nails are exposed to allow for accurate assessment of capillary refill and pulse oximetry
- Jewelry are usually removed, however wedding rings may be taped. Body piercings can be potential foreign bodies, sources of infections and electrical conductors
- All prosthesis, including dentures, contact lenses and glasses, prosthetic limbs, eyes are removed, hearing aids are usually left in place
- The patient must void shortly before surgery. This prevents involuntary elimination under anesthesia, and to reduce the possibility of urinary retention during early post-operative recovery. This is done before any pre-medication is given as they can interfere with balance and could result in a fall when the patient is in the bathroom
- An identification band is put on the patient and if applicable, an allergy band
- An agreed preoperative checklist must be used to ensure that the right patient is presented for the correct surgical procedure; that all the details and information are available and that pre-operative preparation is complete

TRANSPORTATION TO THE OPERATING THEATRE

- All movements during transportation should be gentle, steady and unhurried

- The nurse takes the clinical notes, charts, x-rays (if any) and accompanies the patient to the theatre; gives a detailed report to the theatre team
- In some hospitals, a family member may accompany the patient to the holding room

NB: continue to support the patient emotionally and answer any questions she/he may have.

- During surgery, the nurse can prepare the patient's room in consideration of the patient's needs after surgery
- The bed is made and additional necessary equipment including IV stands, O₂ concentrators, suction machines and additional pillows for positioning should be placed in the room

INTRA – OPERATIVE CARE

This phase begins with the transfer of the patient on to the operating theatre table and continues until the patient is admitted to the post anesthesia care unit (PACU) or recovery unit

The intra operative nursing care plan is designed to address individual patient needs and safely facilitate the surgical procedure

THE AIMS OF CARE

- To ensure that the patient understands what is happening at all times in order to minimize anxiety
- To ensure that the patient has the surgery for which the consent form was signed
- To ensure patient safety at all times and minimize post-operative complications

The Surgical Team

It is divided into two categories based on the members' responsibilities

1. Scrubbed sterile surgical team

- Members scrub their hands and arms wear sterile gowns and gloves, maintain sterility and work in a sterile field
- Members include primary or operating surgeon, surgical assistants and the scrub nurse

2. None scrubbed, non-sterile surgical team

- Members function outside the sterile field
- Members include the circulating nurse anesthesiologist and anesthetics

Members of the Surgical Team and their Responsibilities

| TYPE OF TEAM MEMBER | NAME OF TEAM MEMBER | RESPONSIBILITIES |
|---------------------|---|---|
| | Surgeon | <ul style="list-style-type: none"> - Determines and plans appropriate treatment - Discuss surgical risks, benefits, possible complications and treatment alternatives with the client - Obtains informed consent - Performs surgery and follows the client after surgery |
| | The assistant surgeon. This can be a registered nurse or surgeon. He/ she works closely with the surgeon | <ul style="list-style-type: none"> - . He performs the following duties; - Exposing the operative site. - Retracting the operative site. - Sponging or suctioning the wound. - Ligaturing the bleeding vessels. - Suturing or assisting in suturing. - |
| | Assistant | <ul style="list-style-type: none"> - Helps the surgeon - Retracts tissue and aids in the removal of blood and fluids at the operative site - Assists with haemostasis and wound closure |
| | Scrub nurse | <ul style="list-style-type: none"> - Assists with preparations of the room - Scrubs gowns and gloves, self and other members of the surgical team - Prepares the instrument table and organizes sterile equipment for functional use - Assists with draping procedures - Possess instruments, sutures according to the surgeon's |

| | | |
|--|--------------------------------|--|
| | | <p>needs, and assists by anticipating their needs</p> <ul style="list-style-type: none"> - Counts sponges, needles, swabs and instruments - Monitors practices of aseptic techniques in self and others - Keeps track of irrigation solution used for circulation of blood loss - Reports amounts of local anesthesia and epinephrine solution used by the anesthetist - Aids in cleaning room after procedures |
| | Anesthesiologist / anesthetist | <ul style="list-style-type: none"> - Assesses client during a pre-operative period visit - Chooses, induces and maintains anesthesia - Monitors oxygenation and gas exchange - Manages effects of anesthesia - Monitors and maintains fluids and electrolyte balance - The anesthetist administers anesthesia and monitors the client during and after surgery - Anesthetist assesses the client before surgery, writes pre-operative medication orders, informs the client of the operations for anesthesia and explains the risk involved - Classifies clients according to their general physical status and assign a risk of potential |
| | Circulating nurse | <ul style="list-style-type: none"> - Responsible and accountable for all the activities during a surgical procedure - Assists with preparing the room - Monitors the activities of others - Ensures that needed items are available and sterile (if required) - Checks mechanical and electrical equipments and environmental factors - Arranges the furniture in working order |

| | | |
|--|-----------------------|---|
| | | <ul style="list-style-type: none"> - Identifies and assesses patients then plans and coordinates the intra-operative nursing care - Checks the charts and relates pertinent data - Admits the patients to operating room suite - Assists with transferring the patient to the operating room bed - Participates in insertion and application of monitoring devices - Opens sterile supplies - Ties gowns of sterile team members - Assists the anesthetist in the induction of anesthesia - Positions the patient for surgery - Performs designated surgical skin preparation - Monitors the draping procedures and all activities requiring asepsis - Records, labels and sends to proper locations tissue, specimen and cultures - Measures blood and fluid loss - Counts sponges, instruments and sharps with scrub nurse and reports results to the surgeon - Communicates with surgical team members and others such as patients' family, pathologist - Applies dressings - Assists in transferring the patient to cot / trolley and possibly in transporting the patient to the recovery room - Aids in cleaning the room after procedure |
| | Instrument nurse. | <ul style="list-style-type: none"> - She takes soiled swabs from the surgeon and disposes them off into a bucket or container for the circulating nurse to hang them in a swab rack. |
| | The theatre assistant | <ul style="list-style-type: none"> - He/ she sluices the used instruments under running |

| | | |
|--|--|--|
| | | water in a sluice room to remove blood clots. Keeps the theatre clean and aseptic at all times, ready for use. |
|--|--|--|

Operating Room Environment

The operating room or surgical suite environment is physically isolated from other areas of the hospital or surgical clinic

This restricts access to the area to only authorized or personnel or surgical clients

The suite is divided into three distant areas;

- **Unrestricted zone** – includes a central point to monitor the arrival of patients, personnel and supplies. Street clothes are allowed in this area
- **Semi-restricted zone** – includes the peripherals support areas of the surgical suite, with storage area for sterile and clean supplies, work areas for processing and storage of instruments and corridors leading to the restricted area of the OR personnel are required to wear surgical attire, including two-piece pant suits, cover jackets and caps

Restricted zone – includes the OR and procedures room, the clean core and scrub sink areas.

Personnel are required to wear full surgical attire and cover all head and facial hair, and in these areas, masks are required to surgical supplement attire

Theatre dress;

The nurse should clean herself/ himself, hands kept free from cracks and abrasions, and the finger nails kept short, rounded and **unvarnished**. She should wear a special uniform provided which should be either a dress with short sleeves or trousers or a top.

The material must have a smooth surface, boilable so that all germs are destroyed. Hair should be covered with a cap. Foot wear for the theatre should not be worn outside the theatre. The nose and mouth must always be covered with a mask during an operation and when the theatre is being prepared.

NB: Nurses from the ward must change into the theatre clothing like the theatre staff if they are to enter the operating theatre.

Nb Theatre scrubs for students

SURGICAL ASEPSIS

- It is defined as the absence of micro-organisms that can cause disease
- Surgical asepsis promotes tissue healing by determining pathogens from coming into contact with the surgical wound
- Practices that suppress reduce and inhibit infection processes are known as **aseptic technique**
- Surgical asepsis prevents contamination of surgical wounds
- All members of the operating theatre (OR) team are responsible for strict adherence to aseptic techniques
- It is essential that OR nurses acquire a surgical conscience – vigilant adherence to aseptic technique throughout the entire peri-operative period

The purpose of maintaining asepsis, operating theatre. They should have the following;

- Air conditioned ventilation.
- Chamber enclosure for orthopedic work.
- Easily cleanable fabric.
- A one way traffic circulation from clean area to dirty area.
- Adequate shower facilities for medical staff after finishing a day's operation.

Basic Rules OF Surgical Asepsis in the OR

1. Scrubbed persons function within sterile field

Scrubbed personnel wear gloves and gowns at the surgical field. The gown of scrubbed team member is considered sterile in front, from the chest to the level of the sterile field and the sleeves are sterile front two inches above the elbow to the stockinette cuff

The non-sterile areas of the gowns include; stockinette cuff, neckline, shoulder, axillary region and back.

Dressing in OR attire proceeds from head to toe

2. Sterile drapes are used to create a sterile field

Sterile drapes are placed on the patient equipment and furniture used within the sterile field
Draped tables are sterile only at the table level; items extending over the table edge are contaminated

Handling of the drapes should be minimized

3. All items used in the sterile field are sterile

If the sterility of an item is questioned, it must be considered unsterile. Packaging materials must guarantee that items will remain sterile until removed

4. Supplies introduced into the sterile field

Are delivered in a manner that ensures the sterility of the item and maintains the integrity of the sterile field

The nurse opens a sterile package from the far side first and near side last and holds the wrapper tails when the item is presented to the sterile field

The nurse pours solutions carefully to avoid splashing liquids on to the field

After opening a bottle of a sterile solution, the nurse must present the entire contents to the sterile field or discard it

5. Maintenance and monitoring of sterile field

The possibility for contamination increases with time, therefore the sterile field should be established as close to the time of use as possible.

Un-attended sterile field is considered contaminated

6. The integrity of the sterile field must be maintained by individuals moving within or around the sterile field

Only scrubbed personnel touch and reach over sterile areas. Sterile persons remain close to the sterile field and never turn their backs to it.

Sterile individuals change positions by passing back to back or face to face.

Un-scrubbed personnel only touch and reach over non-sterile areas, do not walk between sterile fields and approach sterile fields by facing them

Client Preparation

Although much preparation have taken place prior to clients transfer to the surgical department additional activities such as shaving and positioning may be performed

Skin preparation

The goal of skin preparation is to reduce the risk of post-operative wound infection by;

- Removing transient microbes from the skin
- Reducing the resident microbes count to sub-pathogenic amounts
- Inhibiting rapid rebound growth of microbes

The skin is prepared by mechanically scrubbing or cleaning around the surgical site with anti-microbial agents

If the patient is very hairy or if the hair will interfere with the surgical procedure, the nurse removes it; usually either wet shaving, clippers or use of depilatory agent

The area is then scrubbed in a circular motion.

The principal of scrubbing from the clean area (site of incision) to the dirty area (periphery) is observed at all times

A liberal area is cleansed to allow added protection and unexpected occurrences during the procedure

After preparation of the skin, the sterile members of the surgical team drape the area.

Only the site to be incised is left exposed

Positioning the patient

- It is a critical part of every procedure and usually follows administration of the anesthesia
- Anesthetist will indicate when to begin the positioning
- The circulating nurse ensures optimal positioning and continually assess the client
- The position of the patient should allow accessibility to the operative site, administration and monitoring of anesthetic agents and maintenance of the patient's airway
- Improper positioning would potentially result into muscle strain, joint damage and other unwanted effects
- It is a nurse's responsibility to secure the extremities provide adequate padding and support and obtain sufficient physical or mechanical help to avoid unnecessary straining of self or patient frequently

Positions used frequently include;

NB: see positions in medical surgical nursing (patient centered collaborative care 8th edition)

The surprise position: it is used for many abdominal surgeries, thoracic surgeries and some surgeries on the extremities

The semi-sitting up position: it is used for surgeries on the thyroid and neck areas

The prone position: it is used for spinal fusions and removal of hemorrhoids

The lateral chest position: it is used for gynecological, perineal or rectal surgeries

The jackknife: it is used for proctologic and some spinal surgeries

The Trendelenburg position: it is used for examinations and for performing abdominal surgeries

Lateral position: it is used for surgeries of the anal area

Anesthesia

The term anesthesia is derived from the word anasthesis meaning “no sensation” therefore anesthesia is limited or total loss of feeling (normal sensation) with or without loss of consciousness.

There are two broad classifications of anesthesia; general and local anesthesia

General Anesthesia

Involves unconsciousness, complete insensitivity to pain, amnesia, motionless and muscle relaxation

It involves four overlapping stages i.e. induction (going to sleep), maintenance, emergence (waking up) and recovery

Induction time period starting with pre-operative medication, initiation of appropriate IV access, application of monitors, initiation of sequence of medication that render the patient unconscious, securing airway, drugs used include; benzodiazepines, narcotics, hypnotics and volatile gases

Maintenance-time period during which the surgical procedure is performed, patient remains in an unconscious state with appropriate measures to ensure safety of the airway. Drugs are the same as above

Emergence-time – it is a period during which the surgical procedure is completed. Patient is prepared for return to consciousness and removal of airway assist devices. Drugs used; reversal agents – anticholinergic, sympathomimetics, narcotic, antagonists, benzodiazepines antagonist.

Recovery-time / period during which the patient regains his/her clear thinking ability. This often takes longer with some residual thinking difficulty persisting for several days or even weeks. Many anesthetic drugs are metabolized slowly. The speed of metabolism depends on amount of drug given, the length of surgery and how deeply the patient is breathing

Local Anesthesia

Allows operative procedures to be performed on a particular part of the body without loss of consciousness or sedation

The duration of action of the local anesthetic frequently carries into the post-operative period providing continued analgesia

The disadvantages

- Inadvertent IV administration producing hypotension and potential seizures
- Inability to precisely match the duration of action of the agents administered to the duration of surgical procedure
- Technique difficulty and discomfort that may be associated with infections

Methods of administration

- Topical application – application of the agent directly to the skin, mucous membranes or open surface
- Local infiltration – injection of the agent into the tissues through which the surgical incision will pass
- Regional nerve block – injection of the agent into or around a specific nerve or group of nerves. Examples of spinal anesthesia (injection of the agent into CSF found in the subarachnoid space, usually below L₂) and epidural block (injection of agent epidural space via either a thoracic or lumbar approach)

Conscious sedation – a minimally depressed level of consciousness with maintenance of patient's protective airway, reflexes

Its primary goal is to reduce the patient's anxiety and discomfort and to facilitate cooperation. Often a combination of sedative

The anesthetist determines the choice and method of administering the anesthesia according to;

- Patient's preferences, age, physical status and emotional status
- Type and length of the surgical procedure

- Patient's positioning during surgery
- Co-existing disease

NB: operating theatre nurses do not administer anesthetic agents but they must understand the various anesthetics used in surgery and the potential side effects and complications (check pharmacology)

This knowledge enables the nurse to plan intra-operative nursing care to assist the anesthesia team

Monitoring the Patient during Anesthesia

- Continuous monitoring and assessment to the patient is necessary to detect changes in the patient's physiologic status and to initiate necessary treatment in a timely manner
- During monitoring, the nurse uses both invasive and non-invasive methods
- Automatic devices can also assist in the monitoring process but still the nurse anesthesiologist should remain in close contact with the patient to immediately observe any significant physiological changes
- The anesthetist has the primary responsibility of monitoring by estimating and reporting blood loss, measuring urine output and assessing the patient's overall status.

Nurse's Role during Induction and Emergency

The induction and emergence from general anesthesia are critical points in the intra-operative care of the patient

During induction, the circulating nurse should remain at the bedside to provide the patient with physical and psychological support and to assist the anesthesia provider

The circulating nurse may be asked to carry out Sellick's maneuver in the patient at risk of pulmonary aspiration

During emergence from anesthesia, maintenance of a patient's airway and ventilation is a responsibility of the anesthetic team but the nurse may be called to assist as necessary

Safety and comfort are primary nursing concerns, the patient may exhibit retching, vomiting, shivering or restlessness during emergence.

SUTURING

Is the procedure of closing a surgical incision or wound by use of sutures to promote healing?

QUALITIES OF A GOOD SUTURE.

- It should be sterile
- It suitable for the purpose
- It should be none allergic
- It should be none carcinogenic
- Good tensile strength. Sutures should last in a tissue sufficiently long until tissues unite.
- They should have minimal tissue reaction.
- Should be easily handled and have good knot security.
- Sutures should not invite sepsis.

Classification of sutures

They are classified according to;

According to structure i.e.

- Absorbable sutures; Sutures do not require removal this is because the enzymes found in the body tissues digest them naturally
Catgut suture is a natural monofilament absorbable suture with tensile strength
- Non- absorbable sutures; these require removal at a later date or in some cases left permanently e.g. silk, nylon polyester and propylene. They are removed after a few weeks

According structure material

- Monofilament; it comprises of a single thread that allows the suture to pass through the tissues easily e.g. catgut
- Braided suture; consist of many threads which are braided together however increase the potential of wound infection eg vicryl it is synthetic braided suture

According to structure used for making the suture

- Synthetic; e.g. nylon, Polydioxanone (PDS); these are replacing cut gut because they are stronger, more durable and less irritating. It can be used in many soft tissue wound closure such as abdominal and pediatric cardiac procedures
- Natural eg nylon natural monofilament, silk natural braided suture

Common skin closure methods.

- *Plain interrupted suture. is a technique that uses many strands of the suture material in order to close a wound*

- *Plain continuous suture. Is a surgical technique which involves several stitches where the doctor makes single strands of the suture thread?*

Other skin closure methods

- *Deep sutures; the suture is place under the tissue layer which are deep below the skin.*
- *Buried sutures the suture knot is found inside and they are not removed.*
- *Staples are used to close surgical wounds that are too big to close with traditional stitches*
- *Tapes*
- *Retention bridge are heavy gauge percutaneous sutures usually with some form of skin protection used in high tension wound closure to support healing with the help of suture Gard.*
- *Stay(retention) sutures*

Note see methods in medical surgical nursing (patient centered collaborative care) by ignatavicius and workman

POST OPERATIVE CARE

- ♣ *.Begins with the transfer of the patient from the operating theatre to the appropriate post-operative unit and ends with the discharge of the patient from the surgical facility or hospital.*
- ♣ *The focus of the post-operative care is to assist the patient in returning to the optimal functioning quickly as possible.*

IMMEDIATE POST OPERATIVE CARE

- ♣ *It begins when the client has been transferred from the operative theatre to the recovery room (post anesthesia care unit (PACU))*

- ♣ It involves the short term critical care required by patients during their immediate post-operative period until they are stable conscious and oriented.
- ♣ The goal of PACU (are to identify active and potential problems that may occur as a result of surgery and anesthesia and to intervene appropriately.
- ♣ **Potential problems in the recovery room are**
- ♣ airway obstruction
- ♣ **hypoxemia and hypocarbia**
- ♣ emergency delirium and delayed awakening
- ♣ hypothermia
- ♣ pain
- ♣ nausea and vomiting
- ♣ **On admission of the patient to the recovery room (PACU)**
- ♣ Post anesthesia care nurse, care provider, surgeon, includes the following
- ♣ General information i.e. patient name and age, anesthesia provider, surgeon, and surgical medical history, medications and allergies.
- ♣ Intra operative course; unexpected anesthesia reactions, vital signs and monitoring trends.
- ♣ The PACU nurse immediately notes the time of arrival and begins to assess the ABC status of the patient.
- ♣ The nurse asses the airway patency rate and quality of respirations.
- ♣ The patient is attached to the pulse oximetry and breath sounds auscultated
- ♣ The color and condition of the skin are noted as part of the respiratory assessment
- ♣ The therapy will be used if the patient has had general anesthesia (G.A) or the anesthetist orders it
- ♣ If the patient requires ventilation, a ventilator will be provided.
- ♣ ECG monitoring is initiated to determine cardiac rate rhythm
- ♣ Blood pressure is measured and compared with the baseline
- ♣ Body temperature is taken and monitored and recorded on the vital observation chart.
- ♣ Any evidence of inadequate circulatory status requires prompt interventions
- ♣ Assess mental status and level of consciousness is another ongoing nursing care.
- ♣ Nurses responsibility may include, orientation to time, place, person among others
- ♣ Assessing and evaluation of hydration status by intake and output is crucial in detecting cardiovascular or renal complications
- ♣ The PACU nurse should the presence of all IV lines , irrigation solutions and infusions and all output devices including catheters and wound drains , IV infusions are regulated according to the post-operative orders
- ♣ The PACU nurse assesses the patient's pain level and administers analgesics carefully.

- ♣ Once the initial assessment is completed, the PACU nurse continues to apply the skills of ongoing assessment, diagnosis, intervention and also noting patient's response to interventions.

CARE OF THE ANASTHETISED PATIENT (unconscious pt.)

NOTE: Must never be left alone during this stage because of the dangers of asphyxia, shock and haemorrhage.

Maintenance of the airway

- ♣ Airway can be obstructed by tongue, mucus, vomitus, blood, teeth, packs and swabs.
- ♣ **Position;** varies with the operation
- ♣ Head turned turn side, prevent tongue from falling over the pharynx and blocking the airway.
- ♣ Head lower than shoulders, prevent flow of fluid/ secretions to pool in the cheeks thus making removing easier
- ♣ Usual position modified Sims position-upper knee and hip flexed, upper shoulder blade resting against the pillow.
- ♣ **Note:** no pillows under the head

Control of tongue

- ♣ Position as above
- ♣ Use of airway tubes, follow the curves of the tongue to the pharynx and thus forward.
- ♣ Support of the jaw, tongue and muscles of the floor of the mouth are attached to the mandible forward by means of the thumbs behind the angle of the jaw or by finger under the chin prevent the tongue from falling back and occluding the airway.
- ♣ Tongue forceps or clips used only when the tongue cannot be retrieved by other methods mentioned. They are placed 2.5 cm from the tip of the upper surface of the tongue thus avoiding blood vessels on the under surface.

Suction

- ♣ Visible mucus, vomitus and blood can be swabbed from the mouth; excessive secretions are removed by gentle suction intermittently applied to the pharynx.

Observation

- ♣ General condition of the patient is observed.
- ♣ If restless, it might be due to shock, asphyxia, cardiac arrest and deep anesthesia
- ♣ If pallor: it might be due to shock, hemorrhage and cardiac arrest

- ♣ If cyanotic, it might be due to respiratory obstruction, shock and cardiac arrest
- ♣ If flushed, it might be due to blood transfusion circulatory overload and over clothing.
- ♣ Vital observation
- ♣ Pulse and blood pressure are taken and recorded $\frac{1}{4}$, $\frac{1}{2}$, hourly to assess the degree of shock and early signs of deepening shock and hemorrhage and cardiac arrest.
- ♣ Report any deviations from normal.
- ♣ Respirations should be inaudible and regular in depth and rhythm.
- ♣ Noisy snoring respiration indicates partial obstruction; sighing respiration indicates hemorrhage and movements are observed for exaggeration or absence.
- ♣ Temperature is taken 2-4 hourly as a guide to the degree of shock.

Dressing

- ♣ If excessive oozing, reinforce dressing
- ♣ If fresh blood appears, report immediately

Drainage tubes.

- ♣ Connect to an appropriate receptacle and establish drainage

Intravenous infusions.

- ♣ Observe rate of flow, type of fluid whether the apparatus is air tight.
- ♣ Observe site of insertion for proper positioning or dislodgement, whether leaking or infected.

CARE OF THE POST OPERATIVE PATIENT ON THE WARDS

- ♣ The patient is transferred from the recovery room to his/her room on the ward only.
- ♣ If:
- ♣ Is fully awake / conscious
- ♣ Is able to breathe without support.
- ♣ Is having good skin color and warmth.
- ♣ Is observed to have stable pulse and blood pressure.
- ♣ Is observed to have no signs of hemorrhage

Moving the patient

- ♣ All movements should be minimal, gentle and unhurried, any sudden alteration may lower the blood pressure.

- ♣ Before discharging the patient from PACU, the nurse gives a verbal report about patient to the receiving nurse and a written copy of which is included in the patients file on transfer from the recovery room to the ward.
- ♣ The report summaries the operative and post anesthetic period.
- ♣ The receiving nurse accompanies the patient back to the ward in conjunction with PACU transport personnel.
- ♣ The patient should be transferred from one trolley with facilities for tilt and left side.

The patient must be warmly clothed.

- ♣ Care must be taken to protect intravenous lines, wounds, wound drains, dressings and traction devices.
- ♣ On return to bed, the patient should continue to be with the nurses on their side without pillow.
- ♣ Vital signs are obtained and patient status compared with the report provided by the PACU nurse.

- ♣ Documentation on the transfer is then completed followed by a more in-depth assessment
- ♣ Post-operative head to toe assessment include;
- ♣ General appearance.
- ♣ Assessing level of consciousness of the extremities.
- ♣ Assessing air way and breath sounds.
- ♣ Wound dressing, dressing, and drainage tubes.
- ♣ Type and amount of drainage.
- ♣ Urinary output catheter or ability to urinate.

NOTE: The time of voiding and total output.

- ♣ Bladder distention or urge to void pain and discomfort. Note the last void and type of the drug. Note current pain intensity.
- ♣ Nausea and vomiting, ensure that emesis basin and tissue are available
- ♣ Determine emotional condition and support check post-operative orders and initiate appropriate nursing care.

CONTINUING NURSING CARE

Fluids

- ♣ Keep an accurate intake and output records using a fluid balance chart?
- ♣ Ensure that fluids are running at the prescribed rate.
- ♣ Assess infusion site for discomfort during effects of Anticholinergics drug or fluid deficit, adequate and regular mouth care is help full while the patient cannot ingest food or drink by mouth.
- ♣ If the patient is unable to tolerate oral fluids replace loses by intravenous fluids.
- ♣ Discontinue when oral fluids are tolerated

Diet

- ♣ This usually commences when oral fluids have been well tolerated.
- ♣ It usually starts with a light diet which can be digested easily.

DRUGS

- ♣ Analgesics e.g. pethedine, tramadol or morphine are given in the first 24hrs then milder analgesics are prescribed.
- ♣ Anti-biotic are given to combat infections.
- ♣ Any other drugs can be given symptomatic

DRAINAG E TUBES

- ♣ These are usually placed in the cavities within the organ or in the wounds to;
 - Provide an escape route of blood or serum following surgery to prevent infection.
 - Allow escape of body fluids by an alternative route eg bile via a T- TUBE.
- Tubes should be shortened, turned daily and kept insitu with safety pin.
- Tubes should be removed within 24-48hrs if there is no more discharge coming out

DRESSING

- ♣ These are frequently checked for excessive drainage and fresh blood otherwise they should not be disturbed until sutures are on the face.
- ♣ When there is excessive drainage, extra dressing should be added and the wound left alone.

HYGIENE

- ♣ Patient is given water to rinse the mouth and face washed on awakening up and mouth care done frequently.
- ♣ Pressure areas treated every after 4 hours and position changed 2hourly, other aids e.g. soft pillow, air cushions are used to prevent pressure sores
- ♣ Eyes may be washed or irrigated especially in debilitated patients, nose – necessarily if NGO2 tubes are in use. they should be cleaned with water and the NG changed weekly from on nose to another to prevent ulceration
- ♣ Bladder – regular emptying of the bladder should be encouraged. it should pass urine in the first 12 hours operatively otherwise nursing measures should be carried out .
- ♣ Bowel – once the diet is started, bowel actions is expected , if it is not opened after 3-4 days, an aperients is given, if this also fails an enema may be given. Encourage a high fiber diet (roughage) fluids and vegetables.

Physiotherapy

- ♣ Deep breathing, coughing and limb exercises should be encouraged as soon as possible
- ♣ Early ambulation should be emphasized
- ♣ Contraindication to early ambulation in surgery include shock, exhaustion if thrombosis is suspected to have formed in the heart, conditions like hypertension

Records

- ♣ Record of vital signs are taken and the time is gradually increased from ¼, ½,-1-2-4-12 hourly according to patient progress.
- ♣ Fluids taken, time and the amount of the output are recorded and any abnormality should be reported.
- ♣ Any treatment given should be recorded as given and its effects
- ♣ All these charts are kept in the record office after discharge

Convalescence

- ♣ This is a period of gradual improvement in the ambulation and independence
- ♣ During this period psychotherapy and occupational therapy may be carried out or encouraged according to patient's ability.

Time of discharge

- ♣ The patient should be discharged at the suitable time when she or he is at his or her maximum level of health or independence
- ♣ Clear instruction concerning the drugs given his or her diet, follow up clinics and when to return to work are provided.

- ♣ If there are some other things the patient is required to get eg artificial limbs, dentures and eye glasses. S/he should be instructed when to get them and to get them from where.

COMMON POST OPERATIVE COMPLICATIONS:

- ♣ Nausea and vomiting
- ♣ Pain
- ♣ Asphyxia
- ♣ Acute urine retention
- ♣ Shock
- ♣ Hemorrhage
- ♣ Cardiac arrest.
- ♣ Respiratory obstruction: due tongue, or vomitus.
- ♣ Respiratory failure: Due to depressing effects of anesthesia and narcotics.
- ♣ Hiccough
- ♣ b) Late complications:
- ♣ Secondary hemorrhage
- ♣ Wound infection/ sepsis
- ♣ Cardiovascular complications
- ♣ Pulmonary edema
- ♣ Pulmonary embolism
- ♣ Deep venous thrombosis
- ♣ Burst abdomen
- ♣ Constipation
- ♣ Paralytic ileus
- ♣ Adhesions
- ♣ Peritonitis
- ♣ Incision hernia
- ♣ Acute dilation of the stomach

MANAGEMENT OF THE COMMON POST OPERATIVE COMPLICATIONS:

Nausea and vomiting:

- ♣ It's also at times, talked about as post anesthetic vomiting and it normally occurs during the first 24 hours.

Causes:

- ♣ Inadequate pre-operative abstaining from food and drinks i.e. not starving enough the patient prior to surgery.
- ♣ Not emptying the stomach before operation.
- ♣ Fear and apprehension (pylorospasm) i.e. spasms of the pyloric sphincter.
- ♣ Anesthesia given as some patients can be allergic or even the smell of the drug used.
- ♣ **NB:** Vomiting after 24- 48 hours maybe due to more serious cause's i.e. paralytic ileus, acute dilation of the stomach.

Prevention:

- ♣ Ensure complete starvation of the patient i.e. 6 hours, nothing should be taken orally.
- ♣ Careful choice of anesthesia and analgesics.
- ♣ Encourage deep breathing exercises.
- ♣ Do not hurry to introduce oral feeds.

Nursing care:

- ♣ At the time of vomiting, hold the hand of the patient and support the wound which is on the operation side.
- ♣ Insert the NGT if not passed for intermittent gastric aspiration or continuous gastric drainage.
- ♣ Withhold plenty of fluids orally but encourage frequent sips.
- ♣ There may be need for anti-emetic drugs e.g. metoclopramide, sedatives etc.

Pain

- ♣ Is what the patient say it is or "It hurts"

Causes:

- ♣ Incisions made during the operation.
- ♣ Infections
- ♣ Referred pain e.g. at the right shoulder in case of inflammation of the gall bladder.
- ♣ Side effects of anaesthesia e.g. headache
- ♣ Due to pressure i.e. by the bleeding/ tight dressings.

Signs and symptoms

- ♣ Restlessness
- ♣ Anxiety

Nursing management:

Manage according to the cause:-

- ♣ Re-assure the patient.
- ♣ If pain is due to tight bandages, loosen and re-adjust the dressing to reduce the pressure.
- ♣ Change position to a comfortable posture.
- ♣ In case pain is associated with increase in temperature; investigations should be done to rule out any infections.
- ♣ Massaging the patient at the back.
- ♣ Delay propping up, in patients with spinal anaesthesia 12 hourly.
- ♣ Administer prescribed drugs like pethidine, morphine or codeine and frequency depends on the surgeons instructions

Hiccough

- ♣ Is the irritation of the diaphragm causing contraction associated with spasms of the larynx on inspiration?
- ♣ This is an involuntary inspiratory spasm of the respiratory organs ending in a sudden closure of the glottis accompanied by the production of a characteristic sound.
- ♣ It is painful especially if it persistent

- ♣ It is considered to be a sign of kidney failure

Causes:

- ♣ Indigestion of food in the stomach.
- ♣ Presence of a gas in the stomach.
- ♣ Acute dilation of the stomach, paralytic ileus, peritonitis.
- ♣ Subphrenic abscess i.e. collection of pus in the space below the diaphragm usually on the right side between the liver and diaphragm.
- ♣ When the amount of urea is high.
- ♣ Eating of extremely cold food
- ♣ Drinking of hot/ warm fluids in bigger amounts after operation other than sips and irritation of the diaphragm

Prevention

- ♣ Avoid early feeding of the patient until bowel sounds return.
- ♣ Avoid over eating which may lead to indigestion.

Treatment/ Nursing Care.

- ♣ Re-assure the patient and relative.
- ♣ Relieve the abdominal tension by encouraging relaxation of the diaphragm; encourage breathing exercises.
- ♣ In severe cases, administer O₂ using nasal mask of 10-15% OR
- ♣ Sedate the patient in order to relax the gut e.g. with Valium 10-20mg
- ♣ Give the patient lukewarm water to drink

Thirst

- ♣ Is the desire for a patient to take in fluids?

Causes:

- ♣ Inadequate pre-operative intravenous hydration.

- ♣ Little or no oral uptake pre operatively.
- ♣ Giving Atropine to the patient who is inadequately hydrated.
- ♣ Sweating
- ♣ Polyuria.

Nursing care:

- ♣ Re-assure the patient.
- ♣ Encourage frequent mouth washes (4hrly).
- ♣ The patient should be given ice cube to suck; or sips of water.
- ♣ Carry out fluid replacement by intravenous infusion.

Prevention:

- ♣ Ensure adequate hydration, pre and post operatively.
- ♣ The theatre and recovery room should not be over heated.

Urine retention

- ♣ this is the failure to pass urine and it is particularly associated with abdominal and rectal operation
- ♣ The patient fears pain during micturation.
- ♣ It is treated by relieving of pain (carbochol-antispesmodic drug for urine retention) and carrying out nursing measures fail then catheterization is done under aseptic technique.

Difficulty in defecation

- ♣ This is majorly due to pain when passing feaces
- ♣ The main factor in this condition is intestinal distension with gas causing pain and in all causes it should be relieved by passing flatus tube.

Haemorrhage

- ♣ This is not common complication but the risk is higher in some operation eg tonsillectomy
- ♣ Haemorrhage should be arrested by either giving haemostatic eg adrenaline vitamin k, ligaturing the bleeding vessels and applying pressure to the bleeding part
- ♣ Fluid and blood transfusion may follow later

Sepsis

- ♣ This is when the operated site is invaded by microorganisms. It is prevented by strict emphasis to the rules and principles of asepsis in the theater and wards. Chemotherapy may be necessary in its prevention and treatment.

Flatulence

- ♣ This is the accumulation of gas or flatus in the lower stomach or intestine.
- ♣ This condition occurs after abdominal operation especially when there has been much handling of the gut
- ♣ It is relieved by passage of flatus tube, intake of sips of warm water which aim to and return of peristalsis and continuous encouragement of the patient to pass flatus.

Rapture of the wound

- ♣ Dehiscence is a common in abdominal operations especially where there is persistent cough, vomiting, abdominal distension, bad posture and strain exerted on the wound
- ♣ Family leakage of pinkish serum is sometime a warning sign of dehiscence, in case it happens the nurse must immediately inform the surgeon meanwhile covering with a sterile towel which has been in normal saline and cover it with firm bandage.
- ♣ Then prepare for the surgeon to repair the wound in theater.

Femoral thrombosis

- ♣ This may be reliable to occur due to external pressure or sluggish venous return from the lower limbs
- ♣ It may be due to disease of the lower limbs ie disease of blood vessel eg polycythaemia and commonly in DM.
- ♣ Drugs that dissolve the clot can be given e.g. streptolyzine and streptokinase. In addition drugs which prevent extension of the clot can be given e.g. heparin.
- ♣ Exercising the calf muscle is particularly important to promote quick venous return from the lower limbs (passive exercises) if the limb is very swollen, it is raised on the pillow.
- ♣ Severe chest pain and death can occur instantly if the clot is carried away into the venous circulation passing through one side of the heart and then lodged in the branch of a pulmonary vessel, this is called pulmonary embolism
- ♣ Deep femoral thrombosis is common in people who have had gynecological operation.

Post-operative psychosis

- ♣ When this happens the patient needs psychiatric help both counseling and psychotherapy

Respiratory obstruction

- ♣ **This may be due to the tongue falling back, vomiting, blood and discharge from the mouth or throat being stacked to the pharynx on inspiration and may obstruct the airway**
- ♣ **This is prevented by keeping the head low and slightly turned to the side during anesthesia**
- ♣ **When the patient is unconscious, the airway is maintained by keeping the jaw towards and using an airway**
- ♣ **This is prevented by keeping the head low and slightly turned to one side during anesthesia.**

Respiratory failure

- ♣ The respiratory centre in the medulla oblongata are severely suppressed
- ♣ Aims may be due to depressing effects of the anesthesia during operation or due to narcotic positioning
- ♣ This is treated by giving a respiratory stimulant e.g. nikethamide and artificial ventilation

Chest complications

- ♣ After operation a patient experiences cough, pneumonia and atelectasis
- ♣ This may be due to operative care, anesthesia, poor ambulation and physiotherapy especially in elderly patient, heavy smokers and debilitated patient (bed ridden)
- ♣ Treatment – oxygenation, upright position to aid breathing
- ♣ Physiotherapy to re expand the lungs and make maximum use of lung diseases
- ♣ If necessary antibiotics, bronchodilators and steroids can be given to reduce the risk
- ♣ The patient should stop smoking if he is a smoker

Shock and circulatory collapse

- ♣ This is a complete collapse of the circulatory system and depression of the vital centers accompanied by a fall of blood pressure
- ♣ This is treated by avoidance of excessive movement, gentle handling of the patient and proper positioning – the patient is put in supine position with the foot of the bed elevated and this helps in supply of oxygenated blood to the brain to be increased
- ♣ Pain can also cause shock – so it is relieved by administration of strong analgesics initially – blood transfusion is added if necessary especially in case of excessive haemorrhage, haemoconcentration and severe burns. In severe dehydration, glucose saline drops is commenced

Heart failure

- ♣ This is a condition when the heart fails to carry out its function

- ♣ It occurs due to the strain of the operation and the effects of anesthesia especially to the elderly, patient / people and the young
- ♣ This may be prevented by preoperative care medication and good management of the heart conditions prior to operation
- ♣ Cardiac massage is done in a cardiac arrest to stimulate the cardiac muscles to being functioning
- ♣ Cardiac stimulant can be given e.g. adrenaline

Special Investigations

X-ray & Contrast Studies

The X-ray has been called one of the most significant advances in medical history.

It is used in many different ways in medical diagnosis.

Routine X-rays involve exposing a body part to a small dose of radiation to produce an image of an internal organ.

An X-ray image is produced when a small amount of radiation passes through the body and strikes a sheet of sensitive film placed on the other side of the body.

This film is then either placed in a developing machine, to produce images much like negatives from a 35-mm camera, or is digitally stored on a computer.

The most common use of X-rays is to identify and treat bone fractures.

It is particularly beneficial in emergency situations. X-ray images of the skull, spine, joints and extremities can show even very fine hairline fractures or chips.

After treatment, a bone X-ray can be done to ensure that the fracture has been properly aligned and stabilized for healing.

X-rays can also be used to diagnose and monitor the progression of degenerative diseases such as arthritis.

They play an important role in the detection and diagnosis of cancer, as well, although CT, MRI and PET are usually better at defining the extent and nature of suspected cancer.

X-ray is a fast and easy procedure. Patients will experience no discomfort or side effects from their examination and are allowed to leave immediately following their X-ray test.

General Preparation of Patients for X-rays

- Explain to the patient what is going to happen. This is especially necessary for x-rays which are done in a darkened room e.g. barium meal.
- Remove jewellery e.g. necklaces for a chest X-rays.
- Take the patient to the X-ray room, in a chair, or on a stretcher, or walking as ordered by the doctor, and bring with you the patient's chart and previous x-rays, if any.

- On arrival, remove the patient's clothing and put on an X-rays gown.

Contrast Studies

Esophagram

An examination of the pharynx and oesophagus using still and fluoroscopic X-ray images.

The X-ray pictures are taken after the patient drinks a solution that coats and outlines the walls of the oesophagus (also called a barium swallow).

Upper GI Series

A series of X-rays of the oesophagus, stomach, and small intestine (upper gastrointestinal or GI tract) that are taken after the patient drinks a barium solution. (Barium is a white, chalky substance that outlines the organs on the X-ray.)

Small Bowel or Small Intestine Series

A series of X-rays of the part of the digestive tract that extends from the stomach to the large intestine.

Barium Enema / Lower GI Series

A series of X-rays of the lower intestine (colon) and rectum that are taken after the patient is given an enema with a white, chalky solution that contains barium.

The barium outlines the intestines on the X-rays.

These X-rays permit the detection of colon and rectal abnormalities including diverticulosis, diverticulitis, abnormal colon movement, dilation (widening) of the colon, polyps and cancers of the colon and rectum.

Air can be instilled into the colon along with the barium contrast medium to further define structures of the large bowel and rectum. Polyps and small cancers are more readily found using this method which is called an *air contrast barium enema* or a *double-contrast barium enema*. This is the only kind of barium enema that is appropriate for detecting colorectal polyps and potentially curable colorectal cancers.

Intravenous Pyelogram (IVP)

An X-ray examination of the kidneys, their drainage to the bladder, and the bladder.

Hysterosalpingogram

X-ray of the uterus and Fallopian tubes; usually done in diagnosing infertility to see if there any blockages.

Arthrogram

X-ray of a joint after the injection of a contrast medium to more clearly visualize the joint.

MRI

Magnetic Resonance Imaging (MRI) is a method of obtaining detailed pictures of internal body structures without the use of radiation or radioactive substances of any kind.

This is accomplished by placing the patient in a magnetic field while radio waves are turned on and off.

This causes the body to emit its own weak radio signals which vary according to tissue characteristics.

These signals are then picked up by a sensitive antenna and fed to a computer which produces detailed images of the body for interpretation by trained radiologists.

During the examination the patient will not feel anything unusual. He/she will, however, hear a repeated drum-like knocking sound as the scans are recorded. The patient is free to bring a favourite CD or cassette tape to listen to during the scan to make her/himself comfortable. Hearing protection are provided to those patients who do not wish to listen to music.

To produce high quality images, the patient has to lie still during the examination while breathing normally. The average scan takes 5 to 15 minutes—the complete examination about 30 to 45 minutes—during which time several dozen images will be produced.

How to Prepare For the MRI Exam

- Patient wears loose, comfortable clothing without metal snaps or zippers.
- Patient goes with a referral form from the doctor.
- If the patient is having an MRI of the abdomen performed, advise the patient not to eat or drink anything after midnight the night before your procedure.

CT

Computed Tomography (CT) scanning is a rapid, painless diagnostic examination that combines X-rays and computers.

A CT scan allows the radiologist to see the location, nature, and extent of many different diseases or abnormalities inside your body.

HOW to Prepare For the CT Exam

The meal prior to your CT examination should consist of CLEAR liquids ONLY. (You may have coffee/tea WITHOUT milk; broth; soda; and grape, cranberry or apple juice.)

If you are having an out patient, provide the barium drink to the patient to take home. The patient SHOULD NOT REFRIGERATE the barium drink.

TWO (2) HOURS BEFORE THE SCHEDULED APPOINTMENT

- The patient removes cap and drinks the liquid within 30 minutes to the first designated line on the container.

ONE (1) HOUR BEFORE THE SCHEDULED APPOINTMENT

- Drink the liquid within 30 minutes to the 2nd designated line on the container.

REMAINDER OF LIQUID

- THE patient brings the remainder of the liquid to the hospital.

- The patient will finish drinking the liquid when the study begins.
 - Prescription medications may be taken as usual.
- EXCEPTION: Do not take Glucophage.

Nuclear Imaging

Nuclear Medicine provides doctors with information about both structure and function by using safe and painless techniques to image the body and treat disease. It is a superior way to gather medical information that would otherwise be unavailable or require surgery.

Nuclear Imaging now offers two of the most advanced nuclear imaging modalities for the early detection of disease: PET/CT and SPECT/CT.

PET/CT

PET/CT is a state-of-the-art technique that combines Positron Emission Tomography (PET) with Computed Tomography (CT) to image tissue and organ function. This scan is designed to accurately identify even small areas of abnormal metabolic activity, which are associated with several disease processes. PET/CT's major clinical impact to date is in cancer diagnosis and staging; however, PET/CT is also a useful modality for imaging the heart and brain. PET/CT can show more than just where tumours are located. PET/CT can reveal whether lesions are benign or malignant and can assess the effectiveness of treatment, whether surgery, chemotherapy, or radiation therapy.

When the patient arrives at the Nuclear Imaging Suite, a technologist will discuss the PET/CT procedure with him/her and ask if s/he has any questions. When the patient is ready for the PET/CT scan, s/he will have the blood sugar tested. Next, most patients will receive an oral contrast (barium drink). An IV will then be started, and s/he will receive an injection of a small amount of safe, radioactive sugar (radiotracer). The patient will then be asked to wait very quietly in a seated area. Any activity, even talking or gum chewing, may affect the results of the test. Prior to the scan, the patient will be asked to empty his/her bladder.

The patient will lie on a bed that passes slowly through the scanner. For scanning purposes, it is important that the patient lies quietly and remain still on the bed during the scan. The length of time between scans can vary depending on the body areas being studied, typically between 30 to 60 minutes. The patient should plan to spend approximately three hours total time at the Nuclear Imaging Suite for the entire PET/CT procedure.

How to Prepare For the PET/CT Exam

- Refrain from eating for at least six hours prior to the exam since the results of the test are affected by the blood sugar level.
- It is important to be well hydrated for the test, so please make sure that the patient drinks plenty of water beginning the day before the exam up to the appointment time.
- Do not perform any heavy lifting or exercising the day before or the day of the PET/CT scan.

- If the patient is diabetic, please notify the technologist so that s/he may administer special instructions to you as necessary prior to the PET/CT scan.
- It is also recommended that the patient wears comfortable clothing.

SPECT/CT

SPECT/CT is an advanced medical imaging technology that combines Single-Photon Emission Computed Tomography (SPECT) with Computed Tomography (CT) to enable physicians to detect heart disease, cancer and other diseases earlier and target treatments with greater precision.

SPECT, like Positron Emission Tomography (PET), is a nuclear medicine exam that allows direct visualization of tissues, tumours and organs, such as the heart. SPECT/CT system allows physicians to obtain more detailed information and increased image clarity in a single, non-invasive procedure than is possible through separate procedures. The system detects changes in patients' molecular activity – before structural changes become visible – and combines this information with precise anatomical detail obtained through CT technology to pinpoint the location of abnormal tissue.

When the patient arrives at the Nuclear Imaging Suite, a technologist will discuss the SPECT/CT procedure with him/her and ask if s/he has any questions. Then a small amount of radiopharmaceuticals will be introduced into the body by injection, swallowing or inhalation. The radiopharmaceuticals are attracted to specific organs, bones or tissues. The amount of radiopharmaceuticals used for the patient's exam will be carefully determined to provide the least amount of radiation exposure and to ensure an accurate test.

The scanner then creates images of the area being examined and identifies “hot spots” that indicate the location and extent of disease, such as the increased metabolic activity characteristic of cancer. The combination of high-resolution CT through the SPECT/CT allows physicians to accurately localize these hot spots and make a definitive diagnosis.

How to Prepare For the Nuclear Medicine Exam

Bone Scan

- The patient may eat and drink prior to his/her scan.
- Please do not schedule an X-ray barium study on the same day as the patient's Bone Scan.
- You may schedule a CT exam on the day of the patient's Bone Scan.
- If the patient had a Barium Enema (BE) a day or two before the scheduled appointment time, an X-ray may be taken to make sure that the barium is all out of the system.

Cardiac Scan

- Please do not eat or drink after midnight, the day before the Cardiac Scan.

- At the time of scheduling your exam, the patient will be told whether or not s/he will receive Persantine during the exam. If the patient will be receiving Persantine, let him/her not ingest caffeine for 24 hours prior to the exam.
- The doctor will advise the patient of which medications s/he may and may not take the morning of exam.

Hepatobiliary

- Please do not eat or drink after midnight, the day before the scan.

Gastric Emptying

- Please do not eat or drink after midnight, the day before your scan

Brain

- There is no preparation for this exam.
- The doctor will advise the patient of which medications s/he may and may not take the morning of exam.

Parathyroid

- There is no preparation for this exam.

Renal Scan

- There is no preparation for this exam

Ultrasound

Ultrasound uses sound waves to obtain a medical image or picture of various organs and tissues in the body. It is a painless and safe procedure.

Ultrasound produces very precise images of the soft tissues (heart, blood vessels, uterus, bladder, etc.) and reveals internal motion such as heart beat and blood flow. It can detect diseased or damaged tissues, locate abnormal growths and identify a wide variety of changing conditions, which enable the doctor to make a quick and accurate diagnosis.

What will the exam be like?

A technologist will assist the patient onto the examination table. At this time, a water-based transmission gel will be applied to the area of the body that will be examined. A transducer will be moved slowly over the body part being imaged. The transducer sends a signal to an on-board computer which processes the data and produces the ultrasound image. It is from this image that the diagnosis is made.

The patient won't feel a thing except for the slight pressure and movement of the transducer over the part of the body being imaged. It is important that the patient remains still and relaxed during the procedure. The ultrasound images will appear on a monitor similar to a TV screen and will be recorded either on paper or film for a detailed study.

How to prepare for The Ultrasound exam of the pelvis

Eat meals - DO NOT FAST! Drink 32 ounces of clear liquids (no soda) one hour and 15 minutes prior to the time of the appointment. (All of the liquid is to be in your system one hour before the appointment so that the bladder will be full.)

DO NOT EMPTY the bladder until the study has been completed or the patient has spoken with a technologist.

The patient should have a referral form from the doctor. The average time for the study to be completed is approximately 30 minutes to one hour depending on the kind of examination. The technologist will perform the study, and a radiologist will occasionally scan as well. All examination results will be given to the patient by your referring doctor (Results cannot be given to you by the technologist).

How to prepare for The Ultrasound exam for pregnancy, kidneys, and bladder

- Eat meals - DO NOT FAST! Drink 20 ounces of water one hour and 15 minutes prior to the time of the appointment.
- Continue as above

How to Prepare For the Ultrasound Exam of the Abdomen

- Do not eat or drink anything after midnight the night before the procedure.

Bone Density (DEXA)

Bone Densitometry is a fast, safe and painless test that uses advanced technology called DEXA (Dual Energy X-Ray Absorptiometry) to measure symptoms of osteoporosis -- such as low density and mineral content of bone -- that may have developed unnoticed over many years. Because osteoporosis can result in bone fractures that can cause chronic pain, disability and loss of independence, it is important to begin treating osteoporosis at an early stage. Bone densitometry can detect the early signs of osteoporosis so that patients can begin treating it before a debilitating fracture occurs.

During a comprehensive DEXA bone evaluation, a patient lies comfortably on a padded table while the DEXA unit scans one or more areas of his/her body, usually the spine or hip because they are particularly prone to fracturing.

When the exam is complete, the patient's images are sent to a computer and analyzed. They are then given to a radiologist, a physician who specializes in the diagnostic interpretation of medical images. After the study has been reviewed, the doctor will receive a report of the findings. This report will include patient's bone mineral density (BMD), along with the FRAX (Fracture Risk Assessment Tool) results. The radiologist will use the FRAX assessment tool, developed by the World Health Organization, to obtain two results, expressed as percentages. These numbers are a ten-year probability of hip fracture and ten-year probability of a major osteoporotic fracture (clinical spine, forearm, hip or shoulder fracture).

Digital Mammography

A mammogram is a safe low-dose X-ray procedure that takes pictures of the internal tissues of the breasts. This simple exam is performed as a screening or diagnostic study, to determine the possibility of irregularities within the breast. It can reveal areas too small or deep to feel, which may or may not require further investigation. Digital Mammography is the most advanced diagnostic technology available for the early detection of breast cancer.

What are the benefits of Digital Mammography?

There are numerous benefits to digital mammography. For the patient, digital mammograms are faster. The test is "filmless," so nothing has to be developed. Images are read on a monitor and stored electronically in the PACS (Picture Archiving and Communications System). For the radiologist, digital mammograms provide more comprehensive visibility.

Calcifications can be enhanced or magnified on the screen to aid the radiologist in interpreting whether or not the calcifications are suspicious.

That is good news for younger women and those who have dense breasts. Digital mammography units are also able to accommodate women with larger breasts. This means fewer images and less radiation for these patients.

Does every woman need a mammogram?

Yes. Presently the cause of breast cancer is not known, but early detection is a woman's best protection. A mammogram may help discover a change as small as the head of a pin, years before it can be felt. Additionally, having mammograms done on a regular basis allows for comparisons of a baseline study with future mammograms. This provides a more accurate assessment of any breast changes. The sooner detected, the easier and more successful the treatment.

When should I have my mammogram?

Based upon numerous scientific studies, most women have their first mammogram by age 40 and continue yearly for as long as they are in good health. Health care provider can help women to determine when they should begin and how often they should have a mammogram based upon specific medical facts in their family history.

What will the exam be like?

The patient is asked to undress from the waist up. The technologist positions the breast and gently compresses it upon the image plate. It is necessary to spread the breast tissue to reduce the thickness of the breast. This allows for lower doses of radiation and the clearest possible X-ray image. The patient will probably have at least two pictures taken in slightly different positions. The procedure will then be repeated for the other breast. The entire exam usually takes about 15 minutes.

I. Radionuclide (Isotope) Scan

A radionuclide scan is a way of imaging bones, organs and other parts of the body by using a small dose of a radioactive chemical.

A radionuclide (sometimes called a radioisotope or isotope) is a chemical which emits a type of radioactivity called gamma rays. A tiny amount of radionuclide is put into the body, usually by

an injection into a vein. (Sometimes it is breathed in, or swallowed, depending on the test.)

There are different types of radionuclides. Different ones tend to concentrate in different organs or tissues. So, the radionuclide used depends on which part of the body is to be scanned. For example, if radioactive iodine is injected into a vein it is quickly taken up into the tissues of the thyroid gland. So, it is used to scan the thyroid gland.

Cells which are most 'active' in the target tissue or organ will take up more of the radionuclide. So, active parts of the tissue will emit more gamma rays than less active or inactive parts.

Gamma rays are similar to X-rays and are detected by a device called a gamma camera. The gamma rays which are emitted from inside the body are detected by the gamma camera, are converted into an electrical signal, and sent to a computer. The computer builds a picture by converting the differing intensities of radioactivity emitted into different colours or shades of grey.

For example, areas of the target organ or tissue which emit lots of gamma rays may be shown as red spots ('hot spots') on the picture on the computer monitor. Areas which emit low levels of gamma rays may be shown as blue ('cold spots'). Various other colours may be used for 'in between' levels of gamma rays emitted.

A radionuclide scan may be done for all sorts of reasons:

A bone scan is a common type. A radionuclide is used which collects in areas where there is a lot of bone activity (where bone cells are breaking down or repairing parts of the bone). So a bone scan is used to detect areas of bone where there is cancer, infection, or damage. These areas of activity are seen as 'hot spots' on the scan picture.

A kidney scan can assess how well a kidney is working (as the radionuclide chosen is taken up by kidney cells and passes into the urine). So, the scan can detect scars on the kidney, and how well urine drains from the kidney to the bladder.

Lung perfusion scan can detect blood clots in the lungs (pulmonary embolus).

A heart scan can assess blood flow to the heart muscle. Areas of poor blood flow to the heart muscle do not 'take up' the radionuclide very well and this will be shown in the picture. Thyroid scan may be done to assess cases of overactive thyroid (hyperthyroidism). For example, some nodules (small 'lumps') are sometimes a focus of overactivity, and will show as 'hot spots' on the picture.

II. What preparation do I need?

Usually very little. As these tests involve a small amount of radiation, pregnant women and breastfeeding mothers should not have them.

For some types of scan, you may be asked to have lots to drink to help to flush the radionuclide from your body. For some types of scan you may also be asked to empty your bladder of urine before the scanning begins.

III. Are there any risks with radioisotope scans?

The term 'radioactivity' may sound alarming. But, the radioactive chemicals used in radionuclide scans are considered to be safe, and they leave the body quickly in the urine. The dose of radiation that your body receives is very small. In many cases, the level of radiation involved is not much different to a series of a few normal X-rays. However:

- As with any other types of radiation (such as X-ray), there is a small risk that the gamma rays may affect an unborn child. So, tell your doctor if you are pregnant or if you may be pregnant.
- Rarely, some people have an allergic reaction to the injected chemical. Tell your doctor if you are allergic to iodine.

Endoscopy

Endoscopy means *looking inside* and typically refers to looking inside the body for medical reasons using an **endoscope**, an instrument used to examine the interior of a hollow organ or cavity of the body.

Unlike most other medical imaging devices, endoscopes are inserted directly into the organ.

IV. Components

An endoscope can consist of

- a rigid or flexible tube
- a light delivery system to illuminate the organ or object under inspection. The light source is normally outside the body and the light is typically directed via an optical fiber system
- a lens system transmitting the image to the viewer from the objective lens to the viewer, typically a relay lens system in the case of rigid endoscopes or a bundle of fiberoptics in the case of a fiberscope
- an eyepiece
- an additional channel to allow entry of medical instruments or manipulators

V. Uses

Endoscopy can involve

- The gastrointestinal tract (GI tract):
 - esophagus, stomach and duodenum (esophagogastroduodenoscopy)
 - small intestine (enteroscopy)
 - large intestine/colon (colonoscopy, sigmoidoscopy)
 - Magnification endoscopy
 - bile duct

- endoscopic retrograde cholangiopancreatography (ERCP), duodenoscope-assisted cholangiopancreatotomy, intraoperative cholangioscopy
 - rectum (rectoscopy) and anus (anoscopy), both also referred to as (proctoscopy)
- The respiratory tract
 - The nose (rhinoscopy)
 - The lower respiratory tract (bronchoscopy)
- The ear (otoscope)
- The urinary tract (cystoscopy)
- The female reproductive system (gynoscopy)
 - The cervix (colposcopy)
 - The uterus (hysteroscopy)
 - The fallopian tubes (fallopscopy)
- Normally closed body cavities (through a small incision):
 - The abdominal or pelvic cavity (laparoscopy)
 - The interior of a joint (arthroscopy)
 - Organs of the chest (thoracoscopy and mediastinoscopy)
- During pregnancy
 - The amnion (amnioscopy)
 - The fetus (fetoscopy)
- Plastic Surgery
- Panendoscopy (or triple endoscopy)
 - Combines laryngoscopy, esophagoscopy, and bronchoscopy
- Orthopedic surgery
 - Hand Surgery, such as endoscopic carpal tunnel release
 - Epidural space (Epiduroscopy)

VI. How to Prepare for Endoscopy?

To accomplish a safe and complete examination, the stomach should be empty. The patient will most likely be asked to have nothing to eat or drink for six hours or more prior to the procedure.

Prior to scheduling the procedure, the patient should inform his or her physician of any medications they are currently taking, any allergies, and all of their health problems.

Knowledge whether the patient has any major health problems, such as heart or lung diseases, will alert the examiner of possible need for special attention during the procedure.

VII. Risks

- Infection
- Punctured organs
- Over-sedation

The main risks are perforation, or a tear, of the stomach or oesophagus lining and bleeding. Although perforation generally requires surgery, certain cases may be treated with antibiotics

and intravenous fluids. Bleeding may occur at the site of a biopsy or polyp removal. Typically minor in degree, such bleeding may simply stop on its own or be controlled by cauterisation. Seldom does surgery become necessary.

Other minor risks include drug reactions and complications related to other diseases the patient may have. Consequently, patients should inform their doctor of all allergic tendencies and medical problems.

Occasionally, the site of the sedative injection may become inflamed and tender for a short time. This is usually not serious and warm compresses for a few days are usually helpful.

While any of these complications may possibly occur, it is well to remember that each of them occurs quite infrequently.

VIII. After the Endoscopy

After the procedure the patient will be observed and monitored by a qualified nurse in the endoscopy room or a recovery area until a significant portion of the medication has worn off. Occasionally the patient is left with a mild sore throat, which may respond to saline gargles, or chamomile tea. It may last for weeks or not happen at all.

The patient may have a feeling of distention from the insufflate air that was used during the procedure. Both problems are mild and fleeting. When fully recovered, the patient will be instructed when to resume their usual diet (probably within a few hours) and will be allowed to be taken to the ward or home.

NATURAL BODY DEFENSE MECHANISMS

INFLAMMATION

Inflammation is part of the body's immune response to irritation, injury, or infection.

Inflammation is a defensive mechanism in the body.

Inflammation is a defensive reaction intended to neutralize, control or eliminate the offending agent and to prepare the site for repair.

It can be beneficial when, for example, your knee sustains a blow and tissues need care and protection. However, sometimes, inflammation can persist longer than necessary, causing more harm than benefit.

Cells or tissues of the body may be injured or killed by any of the agent (physical, chemical, infections) when this happens, an inflammatory response (inflammation) naturally occurs in healthy tissues adjacent to the site of injury.

Note inflammation is not the same as infection, an infectious agent is only one of several agents that may trigger an inflammatory response. An infection exist when the infectious agent is living, growing and multiplying in the tissues and is able to overcome the body's normal defense.

Inflammation differs from antibody mediated immunity and cell mediated immunity (AMI and CMI) in two important ways

- Inflammatory protection is immediate but short term. It does not provide true immunity on repeated exposure to the same organisms
- Inflammation is a non-specific body defense to invasion or injury and can be started quickly by almost any event, regardless of where it occurs or what causes it.

Functions of inflammation

- ⌚ When something harmful or irritating affects a part of our body, there is a biological response to try to remove it. The signs and symptoms of inflammation can be uncomfortable but are a show that the body is trying to heal itself.
- ⌚ Cells of inflammation or tissues of the body may be injured or killed by any of the agents (physically chemical, infectious) when this happens an inflammatory response (inflammation) naturally occurs in the healthy tissues adjacent to the site of injury.
- ⌚ It provides immediate protection against the effects of tissue injury and invading foreign proteins.
- ⌚ Inflammation also helps start both antibodies mediated and cell mediated actions to activate full immunity.
- ⌚ It can be a barrier to prevent organisms from entering the body or can be an attacking force that eliminates organisms that have already entered the body.
- ⌚ This type of immunity cannot be transferred from one person to another and is not an adaptive response to exposure or invasion by foreign proteins
- ⌚ The inflammatory response are part of innate immunity and other parts of innate immunity include;- This is the body's ability to resist invading organisms and It is achieved through natural barriers, biologically functionally and chemically using
 - The skin_as a barrier,
 - Mucus_to trap organisms,
 - mucus membranes as a barrier
 - Biological agents_like normal flora
 - Functional like taking a lot of fluids to flush
 - Chemical secretions like tears to clear away
 - Cell mediated_like lymphocytes or antibodies

CELL TYPES INVOLVED IN INFLAMMATION

The leukocytes (white blood cells) involved in inflammation are neutrophils, macrophages, eosinophil's and basophils.

An additional cell type important in inflammation is the tissue mast cell

Neutrophils and macrophages destroy and eliminate foreign invaders

Basophils, Eosinophils and mast cells release chemicals that act on blood vessels to cause tissue level responses that help neutrophil and microphage actions

NEUTROPHILS

- ✘ Mature neutrophils make up between 55% and 70% of the normal total white blood cell count
- ✘ Neutrophils come from the stem cells and complete the maturation process in the bone marrow
- ✘ They are also called granulocytes because of the large number of granules present inside each cell; other names of neutrophils are based on their appearance and maturity
- ✘ Mature neutrophils are also called segmented neutrophils because of their nuclear shape
- ✘ Usually, growth of a stem cell into a mature neutrophil requires 12 to 14 days
- ✘ In a healthy person with full immunity, more than 100 billion fresh, mature neutrophils are released from the bone marrow into the circulation daily
- ✘ This huge production is needed because the life span of each neutrophil is short about 12 to 18 days
- ✓ Neutrophil function provides protection after invaders especially bacteria enter the body. This powerful army of small cells destroys invaders by phagocytosis and enzymatic digestion, although each cell is small and can take part in only one episode of phagocytosis

MACROPHAGE

- ✘ Macrophages come from the committed myeloid stem cells in the marrow: and form the mono nuclear phagocyte system
- ✘ The stem cells first form monocytes which are released into the blood stream at this stage until they mature. Monocytes have limited activity
- ✘ Most monocytes move from the blood into the body tissues where they mature into macrophages
- ✘ Some macrophages become fixed in position within the tissues whereas others can move within and between tissues

- ✗ The liver, spleen and intestinal tract within large numbers of these cells

FUNCTIONS

- ✓ Macrophage protects the body in several ways;-
- ✓ These cells are important in immediate inflammatory responses and also stimulate the longer-lasting immune responses of antibody mediated immunity and cell mediated immunity
- ✓ Macrophage functions include phagocytosis, repair antigen presenting and secretion of cytokines for the immune system control

BASOPHILS

- ✗ Basophils come from myeloid stem cells and make up only about 1% of the total circulating white blood cell count
- ✗ These cells cause the manifestation of inflammation

Functions

- ✓ Cells of inflammation or tissues of the body may be injured or killed by any of the agents (physically chemical, infectious) when this happens an inflammatory response (inflammation) naturally occurs in the healthy tissues adjacent to the site of injury.
- ✓ It provides immediate protection against the effects of tissue injury and invading Cells of inflammation or tissues of the body may be injured or killed by any of the agents (physically chemical, infectious) when this happens an inflammatory response (inflammation) naturally occurs in the healthy tissues adjacent to the site of injury.
- ✓ It provides immediate protection against the effects of tissue injury and invading foreign proteins
- ✓ It can be a barrier to prevent organisms from entering the body or can be an attacking force that eliminates organisms that have already entered the body.
- ✓ This type of immunity cannot be transferred from one person to another and is not an adaptive response to exposure or invasion by foreign proteins
- ✓ The inflammatory response are part of innate immunity and other parts of innate immunity include;-

- ✓ Basophils act on blood vessels and release chemicals which include;- heparin, histamine, serotonin, kinins and leukotriene's
- ✓ Basophils have sites that bind the portion of immune-globulin E (IqE) molecules which binds to and is activated by allergens.
- ✓ When allergens bind to the IqE on the basophils, the basophils membrane opens and releases the vaso-active amines into the blood, where most of them act on smooth muscle and blood vessel walls
- ✓ Heparin inhibits blood and proteins clotting
- ✓ Histamine constricts small veins inhibiting blood flow and decreasing venous return
- ✓ This effect causes blood to collect in capillaries and arterioles
- ✓ Kinins dilate arterioles and increase capillary permeability
- ✓ These actions cause blood plasma to leak into the interstitial space

EOSINOPHILS

- ✗ These come from the myeloid line and contain many vaso-active chemical

Functions

- ✓ Eosinophil's are very active against infestations on **rurastic** larvae and also limits inflammatory reaction
- ✓ The eosinophil granules contain many different substances; some are enzymes that degrade the vaso-active chemicals released by other leukocytes

TISSUE MAST CELLS

- ✓ These cells have functions very similar to basophils and eosinophils. Although mast cells do originate in the bone marrow, they come from different parent cells than leukocytes and do not circulate as mature cells
- ✓ Instead they differentiate and mature in tissues especially those near blood vessels, nerves, lung tissues skin and mucous membranes

- ✓ Some mast cells also respond to the inflammatory products made and released by T. lymphocytes

The tissue mast cells have important roles in maintaining and prolonging inflammatory and hypersensitivity reactions

STAGES/ PHASES OF INFLAMMATION

Injury

- ✓ Any type of injury of exogenous (outside the body) or endogenous (inside the body) injury can initiate the inflammatory response; heat cold, radiations, chemicals, trauma infections, immunological injuries, neoplasms etc.
- ✓ Whatever the stimulus the response itself is the same but the degree of response varies with the type and severity of the injury.

Vascular response

- ✓ The vascular response consists of transitory vasoconstriction followed by immediate vasodilation. This reaction is due to chemical mediators such as histamine, serotonin or kinins being released at the site of infection or injury
- ✓ The mediators cause increase in blood flow to the area causing redness and heat.
- ✓ They also cause increased permeability of the capillaries which increase blood flow to the interstitial space. The extra fluid dilutes toxins and microorganisms in the area and serves as a vehicle by which phagocytes and nutrients needed for healing to reach the injured site.

Fluid exudation

- ✓ Fluid exudation from the capillaries into the interstitial spaces begins immediately and is most active during the first 24 hours after
- ✓ The exudate is serous fluid but the capillary walls become more permeable and proteins (proteins) are lost into the interstitial spaces causing increased pressure in this space which encourages tissue swelling and oedema.

Cellular exudation

- ✓ It occurs when WBCS are summoned to the vessels in the affected area as a result of the release of chemostatic substance from injured cells and activation of complement
- ✓ WBCS adhere to the capillary walls and migrate through the walls. Neutrophils are the first to respond usually within first few hours.
- ✓ Neutrophils ingest dead tissue cells and then die, releasing proteolytic enzyme that liquefy the dead neutrophils, dead bacteria and other dead cells forming pus.

Healing

- ✓ The inflammatory response contains the spread of bacteria and prepares tissue for healing by two overlapping process: reconstruction and maturation.
- ✓ For repair to proceed, acute inflammation must subside and pus and dead tissue must be removed repair of wound involves three processes;
 - Filling in the wound
 - Sealing the wound
 - Shrinking the wound

Reconstruction

- ✓ Once the inflamed area is clean or debride, reconstruction begins and new cells are produced to fill in the space left by the injury.
- ✓ Fibroblast is attracted to the area which secret fibrin – a thread like structure that encircles the space.

Maturation

- ✓ Maturation follows reconstruction phase, during maturation which can last for months to years, scar is remodeled. Capillaries contract leaving a vascular scar and structure and function of damaged tissue are restored

Reason for inflammation (facts about inflammation)

- Inflammation is the body's attempt at self-protection to remove harmful stimuli and begin the healing process.
- Inflammation is part of the body's immune response.

- Infections, wounds, and any damage to tissue would not be able to heal without an inflammatory response
- Chronic inflammation can eventually cause several diseases and conditions, including some cancers and rheumatoid arthritis.

Investigation

In the vast majority of infections, the nature of the infection can be determined and the site localized but in severe conditions where the nature of the disease is difficult to understand, investigations will be necessary;

White blood cell count

Bacteriological examination of specimen got from the site of infection.

Serum tests for the presence of antibodies

Types of inflammation

There are three main types of inflammation and its categorized by its duration and the type of exudate produced.

- Acute inflammation
- Chronic inflammation
- Sub-acute inflammation

ACUTE INFLAMMATION

An acute inflammation is one that starts rapidly and becomes severe in a short space of time.

Signs and symptoms are normally only present for a few days but may persist for a few weeks in some cases.

Neutrophils are the prominent cell type at the site of inflammation. The inflammatory response is immediate and serves a protective function.

Symptoms

Symptoms of inflammation vary depending on whether the reaction is acute or chronic.

The effects **of acute inflammation** can be summed up by the acronym PRISH. They include:

- **Pain:** The inflamed area is likely to be painful, especially during and after touching. Chemicals that stimulate nerve endings are released, making the area more sensitive.
- **Redness:** This occurs because the capillaries in the area are filled with more blood than usual.
- **Immobility:** There may be some loss of function in the region of the inflammation.
- **Swelling:** This is caused by a buildup of fluid.
- **Heat:** More blood flows to the affected area, and this makes it feel warm to the touch.

These five acute inflammation signs only apply to inflammations of the skin. If inflammation occurs deep inside the body, such as in an internal organ, only some of the signs may be noticeable.

For example, some internal organs may not have sensory nerve endings nearby, so there will be no pain, such as in certain types of lung inflammation.

Examples of diseases, conditions, and situations that can result in acute inflammation include:

- acute bronchitis
- infected ingrown toenail
- a sore throat from a cold or flu
- a scratch or cut on the skin
- high-intensity exercise
- acute appendicitis
- dermatitis
- tonsillitis
- infective meningitis
- sinusitis
- a physical trauma

Causes

- Inflammation is caused by a number of physical reactions triggered by the immune system in response to;
- Burns
- Chemical irritants
- Frostbite
- Toxins
- Infection by pathogens
- Physical injury, blunt or penetrating
- Immune reactions due to hypersensitivity
- Radiation
- Foreign bodies, including splinters, dirt and debris
- Trauma

Inflammation does not necessarily mean that there is an infection, but an infection can cause inflammation.

Three main processes occur before and during acute inflammation:

- The small branches of arteries enlarge when supplying blood to the damaged region, resulting in increased blood flow.
- Capillaries become easier for fluids and proteins to infiltrate, meaning that they can move between blood and cells.
- The body releases neutrophils. A neutrophil is a type of white blood cell filled with tiny sacs that contain enzymes and digest microorganisms.

A person will notice inflammation symptoms after these steps take place.

The following table shows the key differences between acute and chronic inflammation:

| | Acute | Chronic |
|------------------|-----------------------------------|--|
| Caused by | Harmful bacteria or tissue injury | Pathogens that the body cannot break down, including some types of virus, foreign bodies that remain in the system, or overactive immune responses |

| | | |
|-----------------|--|---|
| Onset | Rapid | Slow |
| Duration | A few days | From months to years |
| Outcomes | Inflammation improves, turns into an abscess, or becomes chronic | Tissue death and the thickening and scarring of connective tissue |

CHRONIC INFLAMMATION

This refers to long-term inflammation and can last for several months and even years.

Chronic inflammation develops if the infectious agent persists and the acute response is perpetuated (prolonged), chronic inflammation may also begin insidiously and never have acute phase. This response does not serve a beneficial and protective function. On contrary, it's debilitating and can produce long lasting effects.

A cycle of cellular infiltration, necrosis and fibrosis begin with repair and breakdown occurring simultaneously considerable scarring may occur resulting in permanent tissue damage. It can result from:

- failure to eliminate whatever was causing an acute inflammation
- an autoimmune disorder that attacks normal healthy tissue, mistaking it for a pathogen that causes disease
- exposure to a low level of a particular irritant, such as an industrial chemical, over a long period

Examples of diseases and conditions that include chronic inflammation

- Rheumatoid arthritis involves chronic inflammation.
- asthma
- chronic peptic ulcer
- tuberculosis

- periodontitis
- ulcerative colitis and Crohn's disease
- sinusitis
- active hepatitis

Although damaged tissue cannot heal without inflammation, chronic inflammation can eventually cause several diseases and conditions including some cancers, rheumatoid arthritis, atherosclerosis, periodontitis, and hay fever.

Inflammation needs to be well managed.

Is inflammation painful?

When people have inflammation, it often hurts.

People will feel pain, stiffness, discomfort, distress, and even agony, depending on the severity of the inflammation. The type of pain varies. It can be described as constant and steady, throbbing and pulsating, stabbing, or pinching.

Inflammation primarily causes pain because the swelling pushes against the sensitive nerve endings. This sends pain signals to the brain.

Other biochemical processes also occur during inflammation. They affect how nerves behave, and this can enhance pain.

Common treatments

- As mentioned earlier in this article, inflammation is part of the healing process. Sometimes, reducing inflammation is helpful, though not always necessary.
- Simple measures like fluid intake and rest can be considered to aid resolution
- Antibiotics may be given to combat infection
- Rest of the affected part
- Surgical interventions may be necessary if all fails, excision and removal of necrotic tissue can be done

- Incision and drainage may be done to drain pus
- Rehabilitation is done to restore the functions

Anti-inflammatory medications

- Non-steroidal anti-inflammatory drugs (NSAIDs) can be taken to alleviate the pain caused by inflammation.
- They counteract an enzyme that contributes to inflammation. This either prevents or reduces pain.
- Examples of NSAIDs include naproxen, ibuprofen, and aspirin, which are available
- Acetaminophen, such as paracetamol or Tylenol, can reduce pain without affecting the inflammation. They may be ideal for those wishing to treat just the pain while allowing the healing factor of the inflammation to run its course.

Corticosteroids

- Corticosteroids, such as cortisol, are a class of steroid hormones that prevent a number of mechanisms involved in inflammation
- Creams and ointments may be prescribed for inflammation of the skin, eyes, lungs, bowels, and nose can be used.

Herbs for treatment of inflammation

- **Ginger:** This has been used for hundreds of years to treat dyspepsia, constipation, colic, and other gastrointestinal problems, as well as rheumatoid arthritis pain.
- **Turmeric:** Current research is looking into the possible beneficial effects of turmeric in treating arthritis, Alzheimer's disease, and some other inflammatory conditions. Curcumin, a substance found in turmeric, is being investigated for the treatment of several illnesses and disorders, including inflammation. Supplements with turmeric and curcumin are available. Cannabichromene.

Inflammation diet

There are several foods that can have been shown to help reduce the risk of inflammation, including:

- olive oil
- tomatoes
- nuts, such as walnuts and almonds
- leafy greens, including spinach and kale
- fatty fish, such as salmon and mackerel
- fruit, including blueberries and oranges

Avoid eating foods that aggravate inflammation, including:

- fried foods, including French fries
- white bread, pastry, and other foods that contain refined carbohydrates
- soda and sugary drinks
- red meat
- Margarine.

Immunity

Immunity is a biological term that describes a state of having sufficient biological defences to avoid **infection**, **disease**, or other unwanted biological invasion.

The term 'immunity' in relation to infectious disease derives from the original meaning of the term 'exemption from military service or paying taxes'.

Immunity involves both specific and non-specific components.

The non-specific components act either as barriers to a wide range of pathogens irrespective of antigenic specificity.

The other components of the immune system adapt themselves to each new disease encountered and are able to generate pathogen-specific immunity.

Innate immunity (non-specific defence mechanisms)

Is the natural resistance with which a person is born?

It is present from birth and protects an individual from pathogens regardless of experiences.

It provides resistance through several physical, chemical, and cellular approaches.

There are 5 main innate defence mechanisms;

1. Surface barriers

- a. Intact skin forms a barrier against many pathogenic bacteria & its secretions (sweat & sebum) have antibacterial & antifungal properties.
- b. In certain situations where the number of bacteria is high the surfaces are moistened with a mucous secretion to entrap the organism until they can be removed; the nose, mouth & vagina are examples.
- c. Vaginal secretions serve as a chemical barrier following menarche, when they become slightly acidic, while semen contains defences and zinc to kill pathogens.
- d. The hair in the nose filter the air & the cilia in the respiratory tract sweep the mucous & inhaled foreign bodies towards the throat for coughing it up or swallowing.
- e. Within the genitourinary and gastrointestinal tracts, commensal flora serve as biological barriers by competing with pathogenic bacteria for food and space and, in some cases, by changing the conditions in their environment, such as PH or available iron.
- f. This reduces the probability that pathogens will be able to reach sufficient numbers to cause illness.
- g. Risk of microbe invading the bladder is minimised by one way flow of urine from the bladder.

2. Phagocytosis

- a. Is an important feature of cellular innate immunity performed by cells called 'phagocytes' that engulf pathogens or particles.
- b. Phagocytes generally patrol the body searching for pathogens, but can be called to specific locations by cytokines.
- c. Once a pathogen has been engulfed by a phagocyte, it becomes trapped in an intracellular vesicle called a phagosome, which subsequently fuses with another vesicle called a lysosome to form a phagolysosome.
- d. The pathogen is killed by the activity of digestive enzymes
- e. Neutrophils and macrophages are phagocytes that travel throughout the body in pursuit of invading pathogens.

- f. During the acute phase of inflammation, particularly as a result of bacterial infection, neutrophils migrate toward the site of inflammation in a process called chemo-taxis, and are usually the first cells to arrive at the scene of infection.
 - g. Macrophages are versatile cells that reside within tissues and produce a wide array of chemicals including enzymes, complement proteins, and regulatory factors such as interleukin 1.
 - h. Macrophages also act as scavengers, ridding the body of worn-out cells and other debris, and as **antigen-presenting cells** that activate the adaptive immune system.
 - i. Dendritic cells (DC) are phagocytes in tissues that are in contact with the external environment; therefore, they are located mainly in the skin, nose, lungs, stomach, and intestines.
 - j. Dendritic cells serve as a link between the bodily tissues and the innate and adaptive immune systems, as they present antigen to T cells, one of the key cell types of the adaptive immune system.
3. Natural antimicrobial substances
- a. **HCL** in the gastric juice kills the majority of ingested microbes.
 - b. **Lysosome**, small protein with antibacterial properties, is present in granulocytes, tears, & other body secretions but not in sweat, urine or CSF.
 - c. **Antibodies**, present in nasal secretions & saliva, inactivate microbes.
 - d. **Saliva**, secreted into the mouth helps in washing away food debris that may otherwise encourage bacterial growth.
 - e. **Interferon's**, produced by T-lymphocytes & virus infected cells, help prevent viral replication within infected & healthy cells.
 - f. **Complement**, system of about 20 proteins found in blood & tissues. It is activated by the presence of immune complexes & by foreign sugars on bacterial cell walls. The complement binds to bacterial cell walls thus destroying the microbe & also stimulating phagocytosis.
4. Inflammatory response
- a. Mast cells reside in connective tissues and mucous membranes, and regulate the inflammatory response.
 - b. They are most often associated with allergy and anaphylaxis.

- c. Basophils and eosinophils are related to neutrophils. They secrete chemical mediators that are involved in defending against parasites and play a role in allergic reactions, such as asthma.
5. Immunological surveillance
- a. Natural killer (NK cells) cells are leukocytes that attack and destroy tumor cells, or cells that have been infected by viruses.
 - b. Although they are lymphocytes, they are much less selective about their targets than the other T-cells & B-cells.

Through these approaches, innate immunity can prevent the colonization, entry, and spread of microbes.

Adaptive immunity (specific defence mechanisms)

Arises only after an infection or immunization and hence is "acquired" during life.

It allows for a stronger immune response as well as immunological memory, where each pathogen is "remembered" by a signature antigen.

The adaptive immune response is antigen-specific and requires the recognition of specific "non-self" antigens during a process called antigen presentation.

Antigen specificity allows for the generation of responses that are tailored to specific pathogens or pathogen-infected cells.

The ability to mount these tailored responses is maintained in the body by "memory cells".

Should a pathogen infect the body more than once, these specific memory cells are used to quickly eliminate it.

Lymphocytes

The cells of the adaptive immune system are special types of leukocytes, called lymphocytes.

B cells and **T cells** are the major types of lymphocytes and are derived from **hematopoietic stem cells** in the **bone marrow**.

T cells;

- Are involved in **cell-mediated immune response**.
- Are processed by the thymus gland & when mature they move out of the gland

- Are programmed to recognise only one type of antigen & during its subsequent travels through the body, it will react to no other antigen, however dangerous it might be.
- They recognize a “non-self” target, such as a pathogen, only after antigens (small fragments of the pathogen) have been processed and presented to it on the surface of an antigen presenting cell like macrophages, & dendrites
- To do this, after engulfing & digesting the antigen, they transport the most antigenic fragment to their own membrane & display it on the surface.
- When they come into contact with the T lymphocyte that has been processed to target that particular antigen, it will stimulate them to divide & proliferate. This process is called clonal expansion.
- There are four main types of specialised T-lymphocytes;
 1. **Cytotoxic T-cells;** directly inactivates any abnormal body cells (cancer cells & infected cells) carrying antigens by releasing powerful toxins.
 2. **Helper T-cells;** essential for correct functioning of whole immune system- produces cytokines which support & promote cytotoxic cells & macrophages. Cooperates with B-cell to produce antibodies.
 3. **Suppressor T-cells;** turns off activated lymphocytes. This limits the powerful & potentially damaging effects of the immune response.
 4. **Memory T-cells.**

B cells;

- Are involved in the **humoral immune response**.
- Produced & processed in the bone marrow.
- Function- production of antibodies (immunoglobins) on the B-cell surface which are proteins designed to bind & destroy antigen.
- They target specific antigen
- They are fixed in lymphoid tissues like spleen & lymph nodes.
- Recognizes whole pathogens without any need for antigen processing.
- Once its antigen has been detected & bound with the help of T-helper cells, the B-cell enlarges & begins to divide (clonal expansion).
- 2 functionally distinct types of cell are formed;

1. Memory B-cells
2. Plasma cells;
 - Secrete antibodies (Ig) into the blood & are carried throughout the tissues.
 - Produce one type of Ig which targets the specific antigen that originally bound to the B-cell.
 - Ig bind to antigens making them targets for other defence cells
 - Ig also bind to bacterial toxins & neutralise them
 - Ig activate complement
 - There are 5 main types of antibody as shown in the table below;

| | |
|-----|---|
| IgA | Found in mucosal areas, such as the gut, respiratory tract and urogenital tract, and prevents colonization by pathogens. Also found in saliva, tears, and breast milk. |
| IgD | Functions mainly as an antigen receptor on B cells that have not been exposed to antigens. It has been shown to activate basophils and mast cells to produce antimicrobial factors. |
| IgE | Binds to allergens and triggers histamine release from mast cells and basophils, and is involved in allergy. Also protects against parasitic worms. |
| IgG | Provides the majority of antibody-based immunity against invading pathogens. The only antibody capable of crossing the placenta to give passive immunity to fetus |
| IgM | They are the first to respond to an invading pathogen. They offer important protection during the early days of infection & are potent activator of the complement. These antibodies tend to stay in the bloodstream where they aid in killing bacteria. |

Immunological memory

When B cells and T cells are activated and begin to replicate, some of their offspring will become long-lived memory cells. Throughout the lifetime of an animal, these memory cells will remember each specific pathogen encountered and can mount a strong response if the pathogen

is detected again. This is "adaptive" because it occurs during the lifetime of an individual as an adaptation to infection with that pathogen and prepares the immune system for future challenges. Immunological memory can be in the form of either passive short-term memory or active long-term memory.

Acquired immunity

When antigens are encountered for the first time, a low level of Ig is produced though sufficient enough to clear the antigens. This is primary response.

When the antigens are encountered for the second time by the memory B-cells, a rapid response characterised by a marked increase in Ig production is achieved. This is secondary response.

This principle is used in active immunisation against diseases.

Immunity can be acquired **naturally** or **artificially** & both forms may be **active** or **passive**.

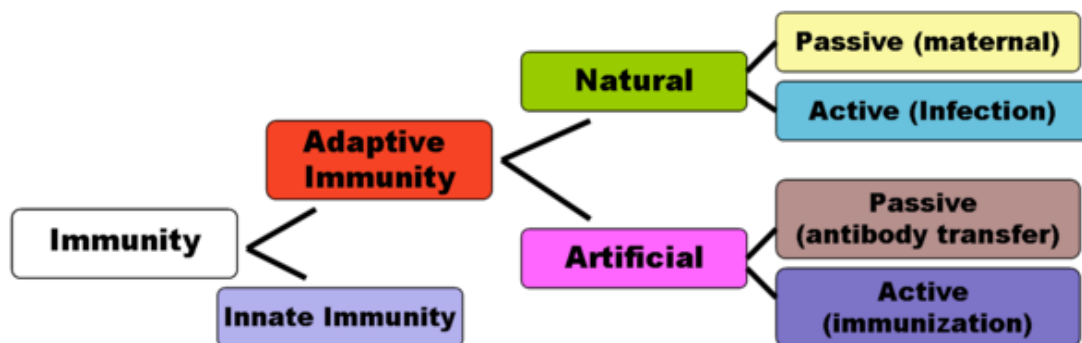
Naturally acquired immunity occurs through contact with a disease causing agent, when the contact was not deliberate.

Artificially acquired immunity develops only through deliberate actions such as vaccination.

Passive immunity is acquired through transfer of antibodies and is short lived -- usually lasting only a few months

Active immunity is induced in the host itself by antigen, and lasts much longer, sometimes life-long.

Summary of the divisions of immunity



Passive immunity

Passive immunity is the transfer of active immunity, in the form of readymade antibodies, from one individual to another.

Passive immunity can occur *naturally*, when maternal antibodies are transferred to the fetus through the placenta. It can also be induced *artificially*, when high levels of human (or horse) antibodies specific for a pathogen or toxin are transferred to non-immune individuals.

Passive immunization is used when there is a high risk of infection and insufficient time for the body to develop its own immune response, or to reduce the symptoms of ongoing or immunosuppressive diseases.

Passive immunity provides immediate protection, but the body does not develop memory, therefore the patient is at risk of being infected by the same pathogen later.

Note antibody also called immunoglobulins is a protective protein produced by the immune system in response to the presence of a foreign substance called antigen

Naturally acquired passive immunity

Maternal passive immunity is a type of naturally acquired passive immunity, and refers to antibody-mediated immunity conveyed to a fetus by its mother during pregnancy.

Maternal antibodies (MatAb) are passed through the placenta to the fetus by around the third month of gestation.

IgG is the only antibody type that can pass through the placenta.

Passive immunity is also provided through the transfer of IgA antibodies found in breast milk that are transferred to the gut of the infant, protecting against bacterial infections, until the newborn can synthesize its own antibodies.

Artificially acquired passive immunity

Artificially acquired passive immunity is a short-term immunization induced by the transfer of antibodies, which can be administered in several forms; as human or animal blood plasma, as pooled human immunoglobulin for intravenous (IVIG) or intramuscular (IG) use, and in the other forms.

It is also used in the treatment of several types of acute infection, autoimmune diseases, and to treat poisoning.

Immunity derived from passive immunization lasts for only a short period of time, and there is also a potential risk for **hypersensitivity** reactions especially from globulin of non-human origin.

The artificial induction of passive immunity has been used for over a century to treat infectious disease, and prior to the advent of antibiotics, was often the only specific treatment for certain infections.

Active immunity

When **B cells** and **T cells** are activated by a pathogen, memory B-cells and T- cells develop. Throughout the lifetime of an animal these memory cells will “remember” each specific pathogen encountered, and are able to mount a strong response if the pathogen is detected again. This type of immunity is both *active* and *adaptive* because the body's immune system prepares itself for future challenges.

Active immunity often involves both the cell-mediated and humoral aspects of immunity as well as input from the innate immune system.

Naturally acquired active immunity

Naturally acquired active immunity occurs when a person is exposed to a live pathogen, and develops a primary immune response, which leads to immunological memory.

This type of immunity is “natural” because it is not induced by deliberate exposure. Many disorders of immune system function can affect the formation of active immunity such as immunodeficiency (both acquired and congenital forms) and immunosuppression.

Artificially acquired active immunity

Artificially acquired active immunity can be induced by a vaccine, a substance that contains antigen.

A vaccine stimulates a primary response against the antigen without causing symptoms of the disease.

There are four types of traditional vaccines:

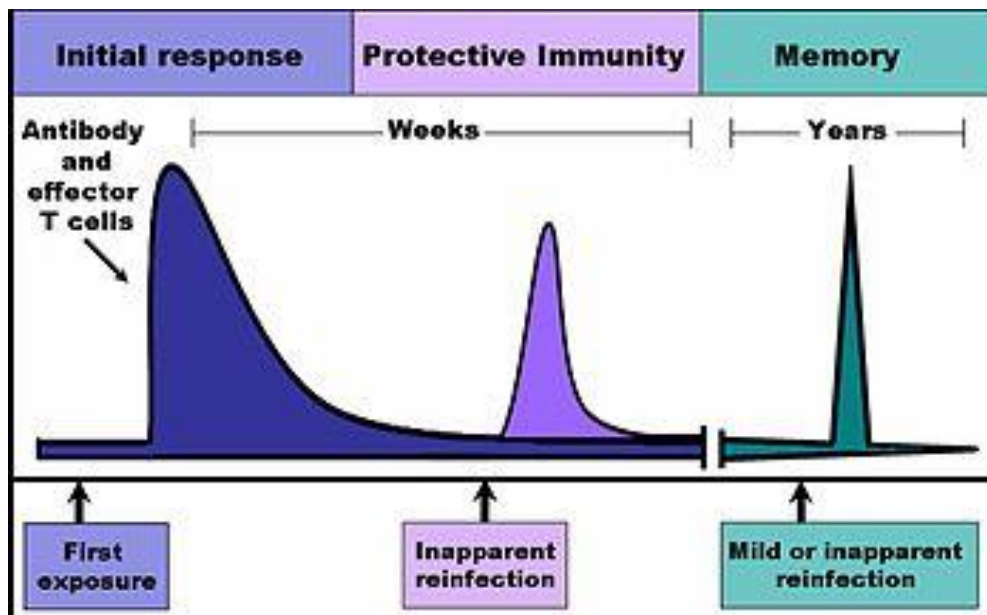
- Inactivated vaccines are composed of micro-organisms that have been killed with chemicals and/or heat and are no longer infectious. Examples are vaccines against flu, cholera, plague, and hepatitis A. Most vaccines of this type are likely to require booster shots.
- Live, attenuated vaccines are composed of micro-organisms that have been cultivated under conditions which disable their ability to induce disease. These responses are more

durable and do not generally require booster shots. Examples include yellow fever, measles, rubella, and mumps.

- Toxoids are inactivated toxic compounds from micro-organisms in cases where these (rather than the micro-organism itself) cause illness, used prior to an encounter with the toxin of the micro-organism. Examples of toxoid-based vaccines include tetanus and diphtheria.
- Subunit -vaccines are composed of small fragments of disease causing organisms. A characteristic example is the subunit vaccine against Hepatitis B virus.

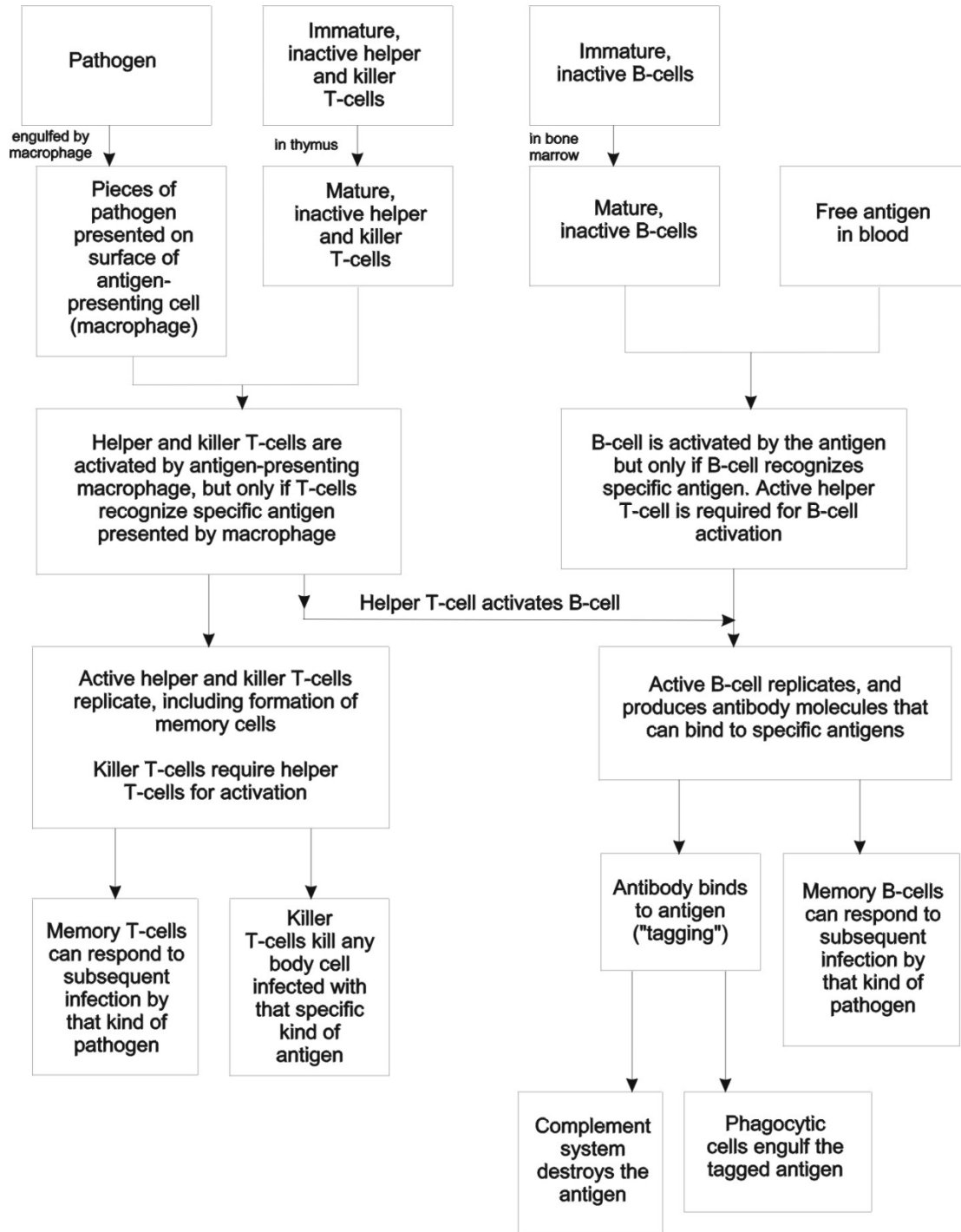
Most vaccines are given by hypodermic injection as they are not absorbed reliably through the gut. Live attenuated Polio and some Typhoid and Cholera vaccines are given orally in order to produce immunity based in the bowel.

The Time Course of an Immune Response



The process by which T cells and B cells interact with antigens is

Summarized in the diagram below



Special Surgical Infections

Tetanus

- ✗ Is a medical condition characterized by a prolonged contraction of skeletal muscle fibres?
- ✗ Tetanus has been recognized for centuries; the term is derived from the ancient Greek words *tetanos* and *teinein*, meaning taut (tight or stiff) and stretched.

Cause

- ✗ *Clostridium tetani*.

Mode of Entry

- ✗ Through deep punctured wound and lacerated wounds (common in accidents)
- ✗ Through genital tract following delivery & menstrual periods associated with sepsis
- ✗ May follow vaccination or inoculation injections using unsterile equipment.
- ✗ Through umbilical stump during & after delivery.
- ✗ Through fresh surgical wounds if infected and latent tetanus

Pathology

1. Tetanus begins when spores of *Clostridium tetani* enter damaged tissue.
2. The spores transform into rod-shaped bacteria (bacilli) and produce the neurotoxin *tetanospasmin* (also known as tetanus toxin).
3. Tetanospasmin binds to motor nerves that control muscles, enters the axons and travels in the axon until it reaches the cell body of the motor nerve in the spinal cord or brainstem.
4. Then the toxin migrates into the synapse where it binds to presynaptic nerve terminals and inhibits or stops the release of certain inhibitory neurotransmitters.
5. Because the motor nerve has no inhibitory signals from other nerves, the signal to the motor nerve of the muscle intensifies, causing the muscle to tighten up in a huge continuous contraction or spasm.
6. If tetanospasmin reaches the bloodstream or lymphatic vessels from the wound site, it can be deposited in many different presynaptic terminals resulting in the same effect on other muscles.

Clinical Picture

1. The incubation period of tetanus may be up to several months but is usually about 7-10 days.

2. In general, the further the injury site is from the central nervous system, the longer the incubation period. The shorter the incubation period, the more severe the symptoms.
3. It usually presents with a descending pattern.
4. The first symptom is slight stiffness (spasms) of the muscles particularly those of the jaw (lock-jaw or *trismus*).
5. Patient is anxious but mentally alert.
6. Hyperreflexia
7. Abdominal wall rigidity often with hematoma formation.
8. Severe convulsions may lead to fractures and dislocations and tendon ruptures.
9. A typical tetanus manifestation occurs later when the patient lies in bed arching the back in a curly posture with the head & the heels thrown back (*opisthotonos*).
10. Drawing up of the angle of the mouth gives rise to a false or characteristic smile (*risus sardonicus*)
11. Orthotonus position: straight posture, both front and back muscles are acting equally.
12. Emprosthotonus position ; forward bending as front muscles are acting more.
13. Pleurosthotonus; lateral bending as the lateral muscles act more.
14. Spasms are triggered by light, touch, & noise but sometimes occur spontaneously.
15. In severe cases, spasms may affect every muscle of the body with resultant rupture of the muscles.
16. Spasms of the sphincter muscles of the body render swallowing, defecation, micturition very difficult.
17. Spasms of the respiratory muscles cause long periods of anoxia until death follows.
18. Other symptoms include elevated temperature, sweating, elevated blood pressure, and episodic rapid heart rate.
19. Spasms continue for up to 4 weeks, and complete recovery may take months.

Management

× Aims;

- + Killing of the bacilli & thus preventing more toxin production
- + Neutralise already circulating toxins
- + Control the spasms
- + Supply nourishment

Nursing care at OPD

- ✗ Secure and maintain the airway if unconscious
- ✗ Position the patient in a recovery position
- ✗ In acute phase of spasms, the clothes should be loosened & everything constricting in nature removed
- ✗ Terminate the spasms by giving diazepam
- ✗ Then the patient is admitted to the ward

Medical Management

Prophylactic/therapeutic treatment

- + The wound must be cleaned.
- + Dead and infected tissue should be removed by surgical debridement.
- ✗ Administration of the antibiotic metronidazole decreases the number of bacteria but has no effect on the bacterial toxin. (Penicillin was once used to treat tetanus, but is no longer the treatment of choice, owing to a theoretical risk of increased spasms).
- ✗ However, its use is recommended if metronidazole is not available.
- ✗ Administration of beta blockers in case of cardiac arrhythmia.
- ✗ Glycerine suppositories are put in the rectum regularly to enable the patient to pass stool due to spasms of the sphincter muscles.
- ✗ Passive immunization with human anti-tetanospasmin immunoglobulin or tetanus immunoglobulin is crucial.
- ✗ If specific anti-tetanospasmin immunoglobulin is not available, then human antiserum may be given instead.
- ✗ All tetanus victims should be vaccinated against the disease or offered a booster shot.

Doses

- ✗ Neutralize toxin: give **tetanus immunoglobulin human (TIG) 150 IU/kg IM into multiple sites** or *(only if TIG is not available)* **tetanus antitoxin (anti-tetanus serum)** give **20,000 IU** as IV single dose (after test dose of 1,500 IU SC) *child: 10,000 IU given IM or IV* Prevent future tetanus (see **Tetanus prevention**):

Specific measures are;

- ✗ Iv diazepam 20mg 6th hourly
- ✗ Iv phenobarbitone 30mg 6th hourly

- ✗ Iv chlorpromazine 25mg 6th hourly
- ✗ Ventilator support and endotracheal intubation
- ✗ Tracheostomy if there is severe respiratory secretions
- ✗ Steroids eg dexamethasone criticize
- ✗ Bronchodilators eg aminophylline, salbutamol
- ✗ Wound care –debridement, drainage, and local injection of ATG.

Nursing Care

- ✗ Admission - Intensive Care Unit or female/male surgical ward.
- ✗ The room is kept quiet, draught-free & dark (or subdue the light) with a suitable lock
- ✗ The nurse should warm her/his hands before touching the patient
- ✗ All the nursing procedures should be done at the same time so that the patient is allowed to rest.
- ✗ Avoid IM injections as much as possible - use
- ✗ alternative routes (for example, NGT, rectal) where possible
- ✗ Change from parenteral to oral medication as soon as possible and keep patient handling to a minimum to avoid provoking spasms
- ✗ Isolation
- ✗ Urinary cauterization
- ✗ Administration of iv fluids PRN
- ✗ Regular suction of the throat
- ✗ Nasal oxygen administration whenever necessary
- ✗ Prevention of DVT by low molecular weight heparin.
- ✗ Give prescribed antibiotic like penicillin 6 hourly.
- ✗ Neonate- thoroughly clean umbilical area
- ✗ Diet :-
 - + Continue with Iv fluid – N/S or dextrose
 - + An NG tube is passed for feeding, hydration and drug administration
 - + Give plenty of nutritious fluids to maintain body fluid balance;
 - ✗ Not less than 2l in 24Hrs.
 - ✗ In neonates – EBM
 - ✗ In adults – half strength milk, glucose drinks, soup, porridge, & fruit juice

- + If NG tube feeding is permitted, feeds are given in small amounts due to reduced gut motility
- + The NG tube is aspirated before each feed.
- + When feeding, watch for regurgitation
- ✗ Hygiene;
 - + Bed bath
 - + Mouth care – glycerin borax is applied on the lips
 - + Eye care
- ✗ Turning the patient – to avoid bed sore and orthostatic pneumonia
- ✗ Catheterisation is done & the catheter connected to the drainage bag
- ✗ Ryle’s tube is passed, initially to decompress , to prevent aspiration but later for feeding purposes
- ✗ Airway is maintained positioning & tracheotomy/intubation may be performed.
- ✗ Oxygen is given PRN
- ✗ Suction in case of secretions may be done at regular interval.
- ✗ The surgical toilet wound is not sutured but irrigated with hydrogen peroxide and dressed light with gauze.
- ✗ Vital observations are taken to R/O cardiac arrhythmia.
- ✗ Muscle relaxants/tranquilizers are administered as prescribed, recorded on a tetanus chart together with the frequency, length & severity of the spasms.
- ✗ Control spasms: chlorpromazine 100mg (child: 12.5mg-25mg) alternating with diazepam 2-3mg (child: 0.5-1mg/kg) by NGT every 4-6 hours (see chart below).
- ✗ Continue for as long as spasms/rigidity lasts
- ✗ The drugs are given 6hrly as shown below;

| Time | 6am | 9am | 12 noon | 3 pm | 6pm | 9pm | 12 midnight |
|----------------|-----|-----|---------|------|-----|-----|-------------|
| Chlorpromazine | | ★ | | ★ | | ★ | |
| Diazepam | ★ | | ★ | | ★ | | ★ |

- ✗ Records are well kept;

- + Maintain a strict FBC
- + Keep a strict observation chart.
- + Pyrexia, tachycardia, & hypotension are due to the effect of the toxin on the ANS
 - poor prognosis
- + Keep a strict tetanus chart – spasm and drugs chart
- ✗ Reassurance – the spasms are very frightening & distressing to the patient and relatives so try to answer their Qns

Rehabilitations

- ✗ When spasms become less the doses of the drugs are gradually reduced, pillows are offered & the patient is put in a sitting up position.
- ✗ The NG tube is removed & the patient takes orally.
- ✗ Encourage the patient to have interest in himself/herself.
- ✗ The patient is helped out of bed into the chair & walked round the bed, to the toilet and then to the bathroom.
- ✗ Drugs are further reduced until is left on the maintenance dose of diazepam 5mg only.
- ✗ Wean the stoma if tracheostomy was done
- ✗ If the wound has healed, the patient is allowed to go home with treatment & advised to come back for review.

Advice on discharge/prevention

- ✗ Encourage pregnant women to deliver in hospitals
- ✗ Vaccination – DPT & TT
- ✗ Care of wounds however small they are, let the patient report to the hospital as soon as possible
- ✗ Adequate umbilical cord care
- ✗ Encourage women to attend ANC when pregnant to get TT & complete doses
 - Use of sterile equipment on delivery & wound dressing.

Complications of tetanus

- ✗ Hypostatic/aspiration pneumonia
- ✗ Ruptured muscles/ haemorrhage because of strong uncoordinated movements.
- ✗ Bone infections

- ✗ Respiratory failure
- ✗ Cardiac failure
- ✗ Excessive exhaustion
- ✗ Septicemia or secondary bacterial infections
- ✗ Starvation and dehydration
- ✗ Severe exhaustion from spasms
- ✗ Overdose of drugs/depression of the respiratory centres.
- ✗ NB: we need to avoid some of the above complication since these are the ones that tend to kill the tetanus patients.

Prevention

- ✗ Prophylaxis in patients at risk of tetanus as a result of contaminated wounds, bites and burns
- ✗ General measures
- ✗ Ensure adequate surgical toilet and proper care of wounds
- Passive immunization
- ✗ Give IM tetanus immunoglobulin human (TIG):
 - + child <5 yrs: 75 IU
 - + child 5-10 yrs: 125 IU
 - + child >10 yrs/adult: 250 IU
- ✗ Note: double the dose if heavy contamination suspected or if >24 hours since injury was sustained
- Alternative - only if TIG not available:
- ✗ Tetanus antitoxin (antitetanus serum) 1,500 IU deep SC or IM
- Active Immunization
- ✗ Unimmunized or never fully immunized patients:
 - + Give a full course of vaccination: three doses of TT 0.5mL deep SC or IM at intervals of 4 weeks
- ✗ Fully immunized patients but last booster >10years ago:

+ Give one booster dose of TT 0.5mL deep SC or IM

Note

- ✘ Fully immunized patients who have had a booster dose within the last 10 years do not need treatment with tetanus antitoxin (anti-tetanus serum) or antitetanus immunoglobulin, human or tetanus toxoid vaccination
- ✘ Giving TIG or TT to a fully immunized person may cause an unpleasant reaction, e.g. redness, itching, swelling, fever, but with a severe injury this is justified

GANGRENE

- Gangrene is necrosis and subsequent decay of body tissues caused by infection or thrombosis or lack of blood flow.
- **Gangrene** refers to the localized death and decomposition of body tissue resulting from obstructed circulation or bacterial infection.
- Gangrene is a condition that involves death and decay of tissue usually in the extremities due to loss of blood supply
- The best of all possible treatments is revascularization of the affected organ, which can reverse some of the effects of necrosis and allow healing.
- Gangrene is a complication of necrosis “cell death” characterized by the decay of body tissues, which become black and appearing “rotten”.

Causes

- ♣ It is caused by infection or ischemia, such as a thrombosis or emboli.
- ♣ Physical and chemical violence in burns
- ♣ Infection such as gas gangrene
- ♣ It is usually the result of critically insufficient blood supply.
- ♣ Often associated with diabetes and long-term smoking.
- ♣ It is usually the result of critically insufficient blood supply sometimes caused by injury and subsequent contamination with bacteria

Types of Gangrene

- Dry Gangrene
- Wet Gangrene
- Gas Gangrene

Dry Gangrene

- Dry gangrene begins at the distal part of the limb due to ischemia and often occurs in the toes and feet of elderly patients due to arteriosclerosis (abnormal thickening and hardening of the arterial walls).
- Dry gangrene spreads slowly until it reaches the point where the blood supply is inadequate to keep tissue viable.
- The affected part is dry, shrunken and dark black, resembling mummified flesh.
- If the blood flow is interrupted for a reason other than severe bacterial infection, the result is a case of dry gangrene.
- People with impaired peripheral blood flow, such as diabetics, are at greater risk of contracting dry gangrene.
- The early signs are a dull ache and sensation of coldness in the affected area.
- If caught early, the process can sometimes be reversed by vascular surgery.
- If necrosis sets in, the affected tissue must be removed and treated like a case of wet gangrene.

The general causes of gangrene

- Atherosclerosis vascular problems
- Diabetes – imbalanced sugar levels can damage
 - Smoking – it damages the blood vessels
- Peripheral arterial disease
 - Serious injury or trauma
- Obesity
- Weak immune system
- Raynaud's phenomenon
- Severe burns and scalds

- Alcoholism
- Intravenous drug use
- Infections such as *Clostridium perfringens*.

Wet Gangrene

- Wet gangrene occurs in naturally moist tissue and organs such as the mouth, bowel, lungs, cervix, and vulva.
- Bedsores occurring on body parts such as the sacrum, buttocks and heels (not in “moist” areas) are also categorized as wet gangrene infections.
- In wet gangrene, the tissue is infected by microorganisms, which cause tissue to swell and emit a foul odour.
- Wet gangrene usually develops rapidly due to blockage of venous and/or arterial blood flow.
- The affected part is saturated with stagnant blood which promotes the rapid growth of bacteria.
- The toxic products formed by bacteria are absorbed causing systemic manifestation of bacteria and finally death.
- The affected part is soft, putrid, rotten and dark.
- The darkness in wet gangrene occurs due to the same mechanism as in dry gangrene.

Gas Gangrene

- Gas gangrene is a bacterial infection that produces gas within tissues.
- It is a deadly form of gangrene usually caused by bacteria.
- Infection spreads rapidly as the gases produced by bacteria expand and effect healthy tissue.
- Gas gangrene is caused by environmental bacteria;
 - *Clostridium perfringens*.
 - It can also be from; Group A Streptococcus, *Staphylococcus aureus* & *Vibrio vulnificus*.
- These Bacteria are mostly found in soil.

- These environmental bacteria enter the muscle through a wound and cause necrotic tissue and powerful toxins.
- These toxins destroy nearby tissue, generating gas at the same time.
- Gas gangrene can cause necrosis, gas production, and sepsis.
- Progression to toxemia and shock is often very rapid.
- Because of its ability to quickly spread to surrounding tissues, gas gangrene should be treated as a medical emergency.

INTERNAL GANGRENE

Gangrene that affects one or more of the organs such as intestines, gall bladder or appendix.

This kind of gangrene occurs when blood flow to the organ is blocked e.g. strangulated hernia

FOURNIERS GANGRENE

This kind of gangrene involves the genital organs. Men are more affected but women can as develop this type of gangrene, an infection to the genital area or urinary tract causes this type of gangrene.

MELENY'S GANGRENE

This is rare type of gangrene it usually as a complication of surgery

People with meleneys gangrene develop painful skin lesions one to two weeks after their operation.

Risk Factors

- Trauma or recent surgical wound
- Arthrosclerosis
- Diabetes
- Colon Cancer
- The onset of gas gangrene is sudden and dramatic.
- Inflammation begins at the site of infection as a pale-to-brownish-red and extremely painful tissue swelling.

- Gas may be felt in the tissue as a crackly sensation when the swollen area is pressed with the fingers.
- The edges of the infected area expand so rapidly that changes are visible over a few minutes.
- The involved tissue is completely destroyed.
- Clostridium bacteria produce many different toxins, four of which can cause potentially fatal syndromes.
- In addition, they cause necrosis, hemolysis, vasoconstriction, and increased vascular permeability.

Signs and Symptoms

Symptoms usually begin suddenly and rapidly worsen.

- Moderate to severe pain around a skin injury
- Progressive swelling around a skin injury
- Moderate to high fever
- Initial pallor, later dark progressing to dark red or purple Vesicle formation
- Blisters filled with brown-red fluid
- Drainage from the tissues, foul-smelling serosanguineous discharge
- Tachycardia
- Diaphoresis
- Subcutaneous emphysema

Diagnostics

- Gram stain of fluid from the infected area
- Culture
- Blood cultures
- Anaerobic tissue and/or fluid culture
- MRI

Management

- As early as 1028 fly maggots were commonly used prevent or arrest necrotic spread.
- Some species of maggots consume only dead flesh, leaving nearby living tissue unaffected.
- This practice largely died out after the introduction of antibiotics.

- Maggot therapy has regained some credibility and is sometimes employed with great efficacy in cases of chronic tissue necrosis.

On admission

- The patient is admitted in the surgical ward and barrier nursing are to be considered

Position the patient is to be put in a position that is comfortable.

Observation Specific observations are taken and records such as temperature, pulse rate, respiration and blood pressure.

- Observe for general signs JACCOLD - Intra venous maintenance according to doctor's prescription

Investigations.

Aspirate (fluids). Culture and sensitivity, blood culture, X-ray to determine the bubbles on an affected part, hemoglobin, and grouping and cross match

Treatment

- Give antibiotics such as penicillin 2.4mls and cephalosporins ;cipro, metronidazole 6 hr.
- Give antitoxins 100mls intravenous
- Give analgesics such as diclofenac 75mg IM, tramadol IV or IM.
- Blood transfusion to correct anemia

Eliminations

- The nurse should ensure that the patient empties his bladder. • The nurse should always offer a bed pan.

Nursing Intervention

Wound care

- Establish a larger wound opening to admit air and promote drainage
- Wound debridement
- Amputation
- Usually surgical with amputation necessary in many cases.
- Antibiotics alone are not effective because they do not penetrate ischemic muscles sufficiently.
- The best treatment for gangrene is revascularization also known also the restoration of blood flow to the affected area.
- Can reverse some of the effects of necrosis and allow healing. The method of treatment is generally determined depending on location of affected tissue and extent of tissue loss
- Wound care with strict medical asepsis
- The wound is observed for bleeding, oozing.
- Irrigate the wound with hydrogen peroxide.
- Replacement of soiled dressing with new dressings.

- Advice the patient not contaminate the wound.
- Autoclaving of equipment and linens
- Drainage and secretion isolation
- Hyperbaric oxygen pressured oxygen

Hygiene

- Care of the skin i.e. daily bed bath
- Treat the pressure areas four hourly
- oral care
- Clean the mouth four hourly

Rest and sleep

- Having a patient in a comfortable bed
- Switching off bright light to dim lights.
- Avoid noise on the ward by having few visitors.
- Play soft music to those who are seriously ill.

Advice on discharge

- Advice on drug compliance Follow up dates

Complications

- Disfiguring or disabling, permanent tissue damage
- Jaundice with liver damage
- Kidney failure
- Sepsis
- Shock
- Stupor
- Delirium
- Coma

ANTHRAX

Anthrax is an acute infectious disease caused by the bacterium *Bacillus anthracis*.

Anthrax most commonly occurs in wild and domestic animals such as cattle, sheep, goats, camels, antelopes, and other herbivores), but it can also occur in humans when they are exposed to infected animals or tissue from infected animals. The incubation period is usually 1-3 days.

Transmission

Anthrax infection can occur in three forms:

- cutaneous (skin),
- inhalation, and
- gastrointestinal,

B. anthracis spores can live in the soil for many years, and humans can become infected with anthrax by handling products from infected animals or by inhaling anthrax spores from contaminated animal products.

Anthrax can also be spread by eating undercooked meat from infected animals.

Diagnosis

Anthrax is diagnosed by isolating *Bacillus anthracis* from the blood, skin lesions, or respiratory secretions or by measuring specific antibodies in the blood of persons with suspected

Signs and symptoms of anthrax

Symptoms of disease vary depending on how the disease was contracted, but symptoms usually occur within 7 days.

Cutaneous; Most (about 95%) anthrax infections occur when the bacteria enter a cut or abrasion on the skin, when the handling contaminated animal products (e.g. wool, hides, leather or hair products) from an infected animal.

Skin infection begins as a raised itchy bump that resembles an insect bite but within 1-2 days develops into a vesicle and then a painless ulcer, usually 1-3 cm in diameter, with a characteristic black necrotic (dying) area in the center. Lymph glands in the adjacent area may swell. About 20% of untreated cases of cutaneous anthrax will result in death.

Inhalation: Initial symptoms may resemble a common cold. After several days, the symptoms may progress to severe breathing problems and shock.

Inhalation anthrax is usually fatal

Intestinal: The intestinal disease form of anthrax may follow the consumption of contaminated meat and is characterized by an acute inflammation of the intestinal tract. Initial signs of nausea, loss of appetite, vomiting, fever are followed by abdominal pain, vomiting of blood, and severe diarrhea.

Intestinal anthrax results in death in 25% to 60% of cases.

Preventive Vaccination

Vaccination using Human anthrax vaccine for the following groups is recommended:

- Persons who work directly with the organism in the laboratory

- Persons who handle potentially infected animal products in high-incidence areas,

Note; Pregnant women should be vaccinated only if absolutely necessary

Protocol for anthrax vaccination

The immunization consists of three subcutaneous injections given 2 weeks apart followed by three additional subcutaneous injections given at 6, 12, and 18 months. Annual booster injections of the vaccine are recommended thereafter.

Treatment

Health workers / doctors can prescribe effective antibiotics such as Ciprofloxacin which is the medicine of choice; alternatives are tetracycline and penicillin. To be effective, treatment should be initiated early. If left untreated, the disease can be fatal.

Public Health Measures to be instituted to prevent and control Anthrax infection

The following Public measures are key for quick prevention and control of anthrax infection

- Health education and Information
- Proper disposal by burying of carcasses; burning is the alternative but not recommended as this could spread spores when carcasses burst,
- No skinning of dead animals as this allows spore formation, which can stay in Soil for years and decades.
- No eating of dead carcasses.
- Restrict movement of animals and animal products from infected to non-infected areas.
- Hides and skins from infected animals should be destroyed (bury, burn)
- Mass vaccination of animals is recommended in endemic areas using Animal Anthrax vaccine.

COMMON SURGICAL CONDITIONS

SHOCK

- Shock is a state of poor perfusion with impaired cellular metabolism manifesting with severe pathophysiological abnormalities. It is due to circulatory collapse and tissue hypoxia. Shock is meant by 'inadequate perfusion' to maintain normal organ function
- The condition associated with circulatory collapse when the arterial blood pressure is too low to maintain an adequate supply of blood to the tissues
- The failure of the circulatory system to adequately supply oxygen to the tissues

ETIOLOGY AND PATHOPHYSIOLOGY

Shock has a multitude of causes

The most common cause of shock is severe blood loss i.e. if it exceeds 1.2 liters

- The circulation may fail because of the following:
 - Sudden malfunction of the heart. This may occur as a result of:
 - Coronary arterial occlusion with acute myocardial ischaemia.
 - Trauma with structural damage to the heart
 - Toxaemia – bacterial or viral
 - Effects of drugs

Complete cardiac arrest is the most urgent of all conditions and death is an inevitable sequel unless the heart can be restored within 3 minutes

External cardiac massage may be the only hope.

- Deficient oxygenation of the blood in the lungs as a result of:
 - Postoperative atelectasis and pneumonia
 - Thoracic injuries, particularly tension pneumothorax, bruising and laceration of the lungs
 - Obstruction of the pulmonary artery by an embolus.
 - Disturbances of lung function following surgery and anaesthesia.
- Reduction in the blood volume (oligaemia or hypovolaemia). This may occur from the loss of:
 - Whole blood – haemorrhage
 - Plasma –significant in burns
 - Water and electrolyte which occurs in:
 - Peritonitis
 - Intestinal obstruction and paralytic ileus
 - Severe diarrhoea and vomiting
- Miscellaneous: there are a number of other conditions that may lead to shocked state with low blood pressure :
 - Adrenal deficiency
 - The common faint. The arterioles in the muscle relax
 - Over dosage of drugs eg analgesic like pethidine
 - Following therapy with beta blocking agents for angina, hypertension etc
 - Noxious stimuli, such as pain, if severe with cause vasodilation, this is a condition of short duration because either the patient dies immediately or recovery, spontaneously if the casual stimulus is removed or severe pain is relieved
 - Systolic dysfunction : it is the inability of the heart to pump forward like in myocardial infarction and cardiac myopathy
 - Diastolic dysfunction: it is the inability of the heart to fill e.g. cardiac tamponade, ventricular hypertrophy and cardiac myopathy
 - Dysrhythmias eg in bradyrhythmias and tachyrhythmias
 - Structural factors like valvular stenosis or regurgitation, ventricular septal rupture

- Internal bleeding like fracture of long bones, ruptured spleen
heamopneumothorax and severe pancreatitis
 - Fluid shift like in burns and cysts
 - Spinal anesthesia
 - Vasomotor center depression
- HYPOVOLEMIC SHOCK results from loss of blood or loss of plasma from the circulating blood e.g. burns, dehydration and peritonitis
 - CARDIOGENIC SHOCK is associated with cardiac infarction of the left ventricle , arrhythmias
 - VASOGENIC SHOCK (it may be also called distributive shock) it is due to relocation of blood with systems because of vasodilation
 - NEUROGENIC SHOCK may develop from pain fear drugs, or loss of sympathetic nervous system stimuli with spinal cord injury , hypoglycemia, severe acidosis
 - ANAPHYLACTIC SHOCK results from rapid general vasodilation due to the release of large amounts of histamines in severe allergic reaction.
 - SEPTIC SHOCK this is a complex process involving both depression of the heart and loss of fluid from the circulation into body tissues. The fluid loss is due to capillary leakage and may give rise to oedema. May develop in persons with severe infections particularly infections with gram – negative e.g. e-coli etc
 - miscellaneous : there are a number of other conditions that may lead to shocked state with a low blood pressure

Recognition features of shock

Early

- Rapid pulse
- Pale, cold clammy skin
- Sweating
- Restlessness
- thirst

Later

- Grey- blue skin especially inside lips
- Nausea or thirst
- Rapid shallow breathing
- Weak pulse

Eventually

- Restlessness
- Gasping for air
- Unconsciousness

SIGNS AND SYMPTOMS OF SHOCK

- The first sign of shock are thirst and agitation or restlessness
- Characteristic signs of compensation are cool, moist pale skin tachycardia and Oliguria.
- In case of septic shock the patient may experience ‘warm shock ‘with fever warm dry flushed skin, rapid strong pulse and hyperventilation, evidence of infection.
- The direct effect of decrease in blood pressure is lethargy, weakness, dizziness and weakness, thread pulse. Initially hypoxemia and respiratory increase. faintness
- Mild shock with mild significant lactic acidosis decreased urine, tachycardia, tachypnoea, drowsiness and mild hypotension
- Severe shock with severe lactic acidosis anuria, tachypnoea with gasping, severe tachycardia, profound hypotension and unconsciousness.

TYPES OF SHOCK

✓ **Vasovagal shock**

- It is a sudden dilation of peripheral and splanchnic vessels causing reduced cardiac output and shock. Often it may be life threatening due to hypoxia

✓ **Neurogenic shock**

- It is caused by disease or dysfunction of the nervous system. It is usually due to spinal cord injury which causes dilation of splanchnic vessels, it can also be caused by

stimulation of the vagus nerve which acts on the Sino ventricular node and slows down the heart rate hence causing a drop in normal blood pressure, usually this leads to faintness in conditions like bud nerves, sever pain and electric shock

✓ **Hypovolemic shock (most common type)**

- Decrease in the volume of circulating blood. It may due to haemorrhage, vomiting, diarrhea due to any cause , burns, compound fractures etc

✓ **Cardiogenic shock**

- Peripheral circulatory failure resulting from an extreme from of the heart failure. Most commonly caused by myocardial infarction, trauma to the heart and over dose of drugs like digoxin

✓ **Cardiac compression shock**

- It is probably due to pericardial tamponade of any cause or kinking of great vessels, massive pulmonary embolism.

✓ **Septic shock**

- A life threatening condition that occurs when the number of bacteria in the blood multiplies uncontrollably and results in hypotension caused by septicaemia. It can also be called endotoxic shock

✓ **Anaphylactic shock**

- It results from an abnormal and immediate allergic response to a substance to which the body has become intensely sensitized. This may arise following the introduction of antigen into the body. these antigen- antibody reaction will release histamine and other substances into the blood stream causing intense contraction of the bronchioles and increased permeability of capillaries

MANAGEMENT OF SHOCK

AIMS

- To treat the cause
- To improve cardiac function
- To improve tissue perfusion

Treatment of shock

- first stabilize the patient with initial resuscitation
- next evaluate the patient for the cause and severity
- lastly treat the specific cause to achieve care

Emergency treatment for shock

- Help patient to lie down and place patient in supine position
- Cover patient and keep him or her warm
- Raise and support her legs as high as possible
- Administer oxygen if possible
- Determine underlying cause and treat if possible g applying pressure for bleeding.
- Lessen any tight clothing, undo anything that constrict the neck, chest and wrist
- Monitor breathing, pulse and response
- Monitor and record vital observation like pulse breathing, monitor level of response, if the casualty become unconscious, open the airway and check breathing.

General management

- Treat the cause e.g. arrest haemorrhage, drain pus etc
- Fluid replacement e.g. plasma normal saline dextrose ringers lactate, plasma expanders maximum 1 liter can be given in 24hours
- Blood transfusion is done whenever necessary, hypotonic solutions like dextrose are poor volume expanders and so should not be used in shock
- Inotropic agents e.g. dopamine, dobutamine, adrenaline infusions
- Correction of acid base balance. Acidosis is corrected by **suing 8.4 sodium** bicarbonate intravenously
- Steroid is often life saving. 500- 1000mg of hydrocortisone can be given. It improves perfusion, reduces the capillary leakage and systemic inflammatory effects.
- Antibiotics in patients with patients with sepsis ; proper control of blood sugar and ketosis in diabetic patients

- Catheterization to measure urine output (30 – 50mls/hour or > 0.5 ml/kg/ hour should be maintained)`
- Nasal oxygen to improve oxygenation or ventilator support with intensive care unit monitoring has to be done
- Haemodialysis (a process of removing a waste part e.g. kidney) may be necessary kidneys are not functioning
- Control pain using morphine (4mg iv)
- Injection ranitidine iv or omeprazole iv or pantoprazole iv
- Activated c protein, it is beneficial as it prevents the release of inflammatory response
- Diuretics, mannitol is an osmotic that neither absorbed in the renal tubules nor metabolized. It may be given when acidosis and Oliguria have been corrected but if oliguria persist frusemide may also be given
- Anticoagulants may occasionally be indicated if micro- circulatory thrombosis is suspected
- Internal heamorrhage from ruptured organ may re-occur so rapidly that the risk of operating on a patient has to be accepted.
- Otherwise, there is a risk of irreversible damage to the kidney the liver and the brain especially in the elderly.
- treatment must be instituted without delay and continued until the condition has been reversed
- observation on the pulse, temperature, the color and the state of the skin and urinary output are important
- examination of the blood should be instituted gradually and observantly to see that shock does not re occur

Prevention of shock

Pre operative measures

- take thorough history which include biographic data, medical history, obstetric history gynaecological
- assess the level of consciousness

- take the baseline vital observation which include temperature, pulse, respiration and blood
- general body assessment from head to head to toe to rule out abnormalities like oedema hemorrhage, cyanosis and pallor
- if there is external heamorrhage arrest the bleeding by positioning the patient
- empty the bladder by passing a catheter
- antibiotic prophylaxis is given to prevent sepsis
- take investigation such as hemoglobin estimation, cross matching, blood grouping and cross matching, clotting factor, malaria slide etc
- give anxiolytics to allay anxiety and give pain killer to reduce pain
- resuscitate patient with iv fluids
- reassure the patient
- the patient should be educated about physical exercises which are done post operatively
- Circulatory collapse should be avoided by strenuous measures if all possible
- Preoperatively patient should be fit as possible and from the point of view of the circulatory system :
- His blood should be a adequate in quality and volume.
- His tissues should be hydrated adequately
- He should be mobile so that there is no stagnation in the circulatory system
-

Intra operatively

- Every operation is an injury but operatively tumors differ from all other injuries in that the surgeon and nursing staff know its nature in advance. Further we know the early signs of circulatory collapse.
- Patient is kept worm on his journey from the ward to the theater and back
- Fear is allied and tranquiller are commonly used pre- operatively.
- The blood pressure is monitored continuously and recorded more so for the serious cases
- Blood and fluid replacement is commenced in good time and the patient is monitored using fluid balance chart.
- Major operations are commenced only after satisfactory infusions have been established

- The head of the bed is lowered if the blood pressure falls (trendelsburg position)
- The anesthetist induces and maintains an adequate level of anesthesia ensuring good oxygenation and tissue perfusion
- Continue resuscitating the patient
- Analgics are given to relieve pain
- Maintain airway patent
- Give diuretics incase of oedema

Post operatively measures

- Fluid and electrolyte replacement (saline, 5% dextrose, Hartman solution, plasma and blood as indicated.
- Position the patient in a recovery position
- Maintain air way patent
- Give antibiotics to prevent infections
- Give inflammatory drugs
- Check the conscious level of the patient
- Initiate exercise like coughing, deep breathing and ambulation to aid normal circulation
- Rest and relieve of pain are continued to prevent shock
- There are conditions which a patient can improve or deteriorate so rapidly as in circulatory failure, its treatment calls for the best organization of the resources of the hospital and the most pain staking care from the nursing staff.

BURNS

Burns are injuries to the skin due to extremes of temperature i.e cold or hot, chemicals or radiations.

Burns occur when there is injury to the tissues of the body caused by heat, chemicals, electric current or radiations.

Anatomical review of the skin.

- ❖ Skin is the largest organ of the body that protects against injury, loss of fluid and from infection.

- ❖ It also maintains a constant body temperature with sebum, hair follicles. The skin has got two layers;
- ❖ -Epidermis (outer layer)
- ❖ -Dermis (inner layer)
- ❖ Under the skin is sebaceous tissue mainly fat.
- ❖ The top part of the skin (epidermis) is made up of fat cells which are constantly shed and are replaced by new cells which come from underneath the layer.
- ❖ The epidermis has got an oily layer called sebum produced by sebaceous gland. It prevents heat loss (it thickens when it's cold).
- ❖ Sebum makes the skin water proof, makes skin supplies plethoric.
- ❖ The dermis contains blood vessels, nerve, muscles, sweat glands, hair follicles, sebaceous glands; the ends of the sensory nerves in the dermis register sensation from the body surface.

SCALDS

Are injuries caused by moist heat, and hot liquids?

TYPES OF BURNS

Thermal burns

These can be caused by flame, flash, scald, or contact with hot object.

Chemical burns

These are the result of tissue injury and destruction from necrotizing substance.

Chemical burns are most commonly caused by acids; however alkalis can also cause a burn e.g. cleaning agents, drain cleaners and lye's.

Electrical burns

These result from coagulation necrosis that is caused by intense heat generated from an electrical current.

It can also result from direct damage to nerves and vessels causing tissue anoxia and death.

The severity of the electrical injury depends on the amount of voltage, tissue resistance, current pathways, and surface area in contact with the current and on the length of time the current flow was sustained.

Smoke and inhalation injury

It results from inhalation of hot air or noxious chemicals that can cause damage to the tissues of the respiratory tract.

Smoke inhalation injuries are an important determinant of mortality in the fire victims.

- Carbon monoxide poisoning.
- Inhalation injury above the glottis, it is thermally produced and above is chemically produced.
- Inhalation injury below the glottis is related to the length of exposure to smoke or toxic fumes.

Cold thermal injury

These are due to extreme cold temperatures e.g. frost bite, freezing metals.

Irradiations I.e. sun burn, radiation therapy, medical therapy e.g. treatment of cancer of the cervix.

CLASSIFICATION OF BURN INJURY

Burns are classified according to;

- ❖ Depth of the burn.
- ❖ Extent of the burn.
- ❖ Location of the burn.

DEPTH OF THE BURN

- ❖ In the past, burns were defined by degrees; first degree, second degree and third degree burns.
- ❖ They now advocate more explicit definition categorizing the burn according to the depth of skin destruction.

SUPERFICIAL BURNS

- ❖ Involves only the outer most skin layer. They have redness, swelling, and tenderness. It usually heals well, if first aid is given promptly and if blisters don't form.
- ❖ Burns from sun, charcoal stove. Are also known as first degree burns.

PARTIAL THICKNESS BURNS

- ❖ The damage to epidermis is severe, we almost always have blister formation and very painful. Completely destroys the epidermis.
- ❖ Blisters form because of fluid released from the damaged tissue, usually heal well but may be fatal if more than 30% of skin is involved. Also known as second degree burns,

FULL THICKNESS/DEEP BURNS

- ❖ The dermis is involved including other structures like muscles, bones. All layers involved blood vessels, fat and nerves.
- ❖ There is either no pain or minimal. This may mislead that the burns are not severe. You need immediate help; the skin is pale and charred (like toasted meat).

LOCATION OF BURN

- The location of the burn wound is related to the severity of the burn injury. Burns to the face and neck and circumferential burns of the chest may inhibit respiratory function by virtue of mechanical obstruction secondary to edema or scar formation.

- These injuries may also indicate the possibility of inhalation injury and respiratory mucosal damage.
- Burns of the hands, feet, joints, and eyes are of concern because they make self-care very difficult and may jeopardize future function. Hands and feet are difficult to manage medically because of superficial vascular and nerve supply systems.
- The ears and nose, composed mainly of cartilage, are susceptible to infection because of poor blood supply to the cartilage.
- Burns of buttocks and genitalia are highly susceptible to infection.
- Circumferential burns of the extremities can cause circulatory compromise distal to the burn with subsequent neurologic impairment of the affected extremity.
- Patient may develop compartment syndrome from direct heat damage] to the muscles, multiple intravenous access attempts or pre burn vascular problems.

EXTENT OF A BURNT AREA.

- ❖ Two commonly used guides for determining the total body surface area (TBSA) affected or the extent of a burn wound are the Lund-Browder chart and rule of nines.
- ❖ Only partial thickness burns and full thickness burns are included when calculating the burnt area because it is more accurate. The patient's age, in proportions to relative body area size, is taken into account.
- ❖ The rule of nines, which is easy to remember, is considered adequate for initial assessment of an adult burn patient.
- ❖ For irregular or odd-shaped burns, the palmar surface of the patient's hand is considered to be approximately 1% of the TBSA. The extent of a burn is often revised after edema has subsided and demarcation of zones of injury has occurred.

USES OF WALLACE'S RULE OF 9

- ❖ Where the body is partitioned into 2 parts which carries 9%.

- ❖ Head and neck is 9%
- ❖ NB. The head alone is 8% and the neck is 1%. Each arm is 9% and both arms carry 18%.
- ❖ Anterior trunk-18% (chest and abdomen).
- ❖ Posterior trunk-18% (from neck to symphysis, coccyx).
- ❖ Lower limbs-18% (both limbs 36%)
- ❖ Perineal/genital area-1%
- ❖ In addition, there is a slight difference when you still use Wallace rule of 9 i.e.
- ❖ Head -18 %
- ❖ Arms -9%
- ❖ Chest and trunk -18%
- ❖ Back of trunk -18%
- ❖ Legs -14%
- ❖ Perineal and genital area -1%

WALLACE'S RULE OF 7 IN CHILDREN

- ❖ Arms 7%
- ❖ Head 28%
- ❖ Back 14%
- ❖ Chest and trunk 14%
- ❖ Perineal region 2%
- ❖ Lower limbs 14%

Use of Lund Browder's chart

| | |
|-----------------|-----|
| Head | 7 |
| Neck | 2 |
| Anterior trunk | 13 |
| Posterior trunk | 13 |
| Rt buttock | 2.5 |
| Lt buttock | 2.5 |
| Genitalia | 1 |

| | |
|--------------|------|
| Rt upper arm | 4 |
| Lt upper arm | 4 |
| Rt lower arm | 3 |
| Lt lower arm | 3 |
| Rt hand | 2.5 |
| Lt hand | 2.5 |
| Rt thigh | 9.5 |
| Lt thigh | 9.5 |
| Rt leg | 7 |
| Lt leg | 7 |
| Rt foot | 3.5 |
| Lt foot | 3.5 |
| Total | 100% |

PREDISPOSING FACTORS

- ❖ Age, children and old (weak)
- ❖ Disease-commonly epilepsy, leprosy
- ❖ alcoholism, and cigarette smoking
- ❖ Occupation-e.g. electricians, industrial workers, alcohol brewers (alcohol brew)
- ❖ Poverty e.g crowded kitchen.
- ❖ Fights (wrangles and conflicts)
- ❖ Race e.g. frost bite common in whites
- ❖ Skin bleaching.

SIGNS AND SYMPTOMS OF BURNS

- ❖ History of involvement with any of the cause of burns.
- ❖ -Blistering due to vasodilation hence collection of serum between the dermis and epidermis.
- ❖ Necrosis due to coagulation of proteins.

- ❖ -Functional impairment of the temperature regulation process of the burnt area.
- ❖ -Shock due to fluid loss and blood loss (hypovolemic shock).
- ❖ -Shock can also occur due to severe pain (neurogenic shock).
- ❖ NB. Rapid loss of fluids is from vascular to extra cellular area in form of;
- ❖ Blisters, exudates from loss surface, oedema in surrounding tissue. Pain is usually marked due to pressure of fluids on nerve endings or due to destruction of the RBC's and plasma loss.
- ❖ Toxaemia depending on the type and cause of burns. Histamines and adenocytes produced are released from the burnt surface and they find their way into the blood stream.

ASSESSMENT OF BURNS

- ❖ Circumstances and cause of burns i.e. where and when did it occur.
This helps to identify the potential problems that occurred with the burns e.g. If it occurred in a room or a car, patient could have inhaled hot gases, carbon dioxide, toxic fumes; the airway could have got burns.
- ❖ Was the airway affected? Assess whether it was in closed spaces (inhaled hot gases) flames are common causes of airway burns. Assess for difficulty in breathing i.e. check respiratory rate increased. The patient needs close monitoring and urgent medical attention.
- ❖ Assess the extent, location and depth. The bigger the burn, the higher the extent (%) the greater the surface area.

NB. For adults we use the Wallace's rule of nine and children we use Wallace's rule of seven.

CRITERIA FOR ADMISSION OF BURNT PATIENT.

- Burns involving the airways
- Full thickness.
- Admit all children for observation
- The bigger the surface area above 5% superficial burns.

- Special areas involved e.g. face, hands, joints, neck, and genitalia.
- Circumferential burns give a tourniquet effect may cause gangrene.
- Electric burns because all electric burns are said to be deep until proved otherwise.
- Chemical burns, can continue burning for several days.
- If you are not sure; below 15% burns, GIT absorption is intact, oral route work in fluid replacement.

FIRST AID FOR BURNS.

- Decrease temperature /stop fire if possible.
- Call for help.
- Evacuate the patient; pour water on the affected area.
- Undress the patient.
- Assume the airway has been affected until proved otherwise continue pouring water on the burnt area for minimally 20min to reduce injury i.e neutralized heat.

AIMS

- Maintain an open airway.
- Minimize the risk of infection
- Treat any other associated injuries
- Make sure you watch for signs of shock.
- Make sure you check for signs of respiratory distress.

ACHIEVING THE FIRST AID MANAGEMENT

- Lie patient down but avoid the burnt area touching the ground.
- Pour water on burns for 20mins
- Continue pouring water until pain stops.
- Put on gloves.
- Remove rings, shoes, watches, necklace, belts, stockings and clothes before tissue damage.
- Cover the injured area with sterile cloth or sterile dressing.

- Record details of injuries.
- Regularly monitor and record the vital signs and the level of consciousness, urine output.
- Treat shock if present.
- Re-assure and give words of hope
- Avoid over cooling the patients especially children and elderly because they may get hypothermia.
- Do not remove anything stuck on the burnt wound to prevent spread of infections and more injuries.
- Do not touch the burnt area with your fingers.
- Do not apply lotions on the burn apart from anti-septic.
- Do not burst any blisters.
- If burns are on the face do not cover them for easy assessment of respiratory distress.

FOR AIRWAY BURNS

Burns of the face, mouth, throat, nose, airway passages, are serious because the airway passage rapidly becomes swollen because of inflammation.

How to assess for airway burns.

- History taking.
- Respiratory rate increased.
- Examine the nostrils i.e there is no soot.
- Examine the nasal hair i.e if they are burnt, short with a Taft.
- There would be damaged to the skin around the nose and mouth.
- Has difficulty in breathing.
- Has hoarse voice due to inflammation of vocal cords.

AIMS OF MANAGEMENT

- ❖ To recognize the airway burns.
- ❖ To maintain the airway and after take the patient to hospital

management

- Open the mouth (airway) and check whether he is breathing
- Sweep the tongue.
- If not breathing, give rescue breaths, mouth to mouth. Put patient in a recovery position and call for help.
- Take the steps to improve the airway e.g remove clothes or unbutton, clear the place.
- Re assure the patient.
- Monitor and record vital observations until help arrives.

Interventions in the hospital

Put patient on oxygen therapy.

Intubate the patient with endotracheal tube, connected to oxygen cylinder.

Electric burns are always deep or full thickness with charring (fresh looking and smelling like roasted meat) of the entry and exit points especially if the patient develops cardiac insufficiency, will have signs of shock.

NOTE:

The current will cause muscle spasms which may prevent patient from breaking contact with electric source hence continues electric shock.

Switch off the main switch. Do not touch a patient with live hands or metallic materials to break the contact.

Assess the ABC immediately.

Shout for help.

Be safe, do something and waste no time.

FOR CHEMICAL BURNS

The commonest cause of chemical burns in Uganda are domestic fights and it's commonly women to women.

FIRSTAID

Ensure your safety.

Disperse the powerful chemical by wiping away the chemical, pouring water (plenty) for about 30min. This dilutes the chemical.

Arrange to transfer patient to hospital but label the chemical if you have identified it.

Do not attempt to neutralize the chemical with another chemical.

Ensure that you remove contaminated clothing.

If the face has been burnt, expect the burns of the airway. Make sure that the airway is open and functioning.

How do you recognize chemical burns

- There may be chemicals in the vicinity.
- The pain is intense and stinging (itching).
- Later discoloration, blistering and peeling of the skin forming wound.
- Supportive treatment with anti-inflammatory drugs, anxiolytics, painkillers.
- Re-assure the patient.

FOR ELECTRIC BURNS

These occur when electricity passes through the body, person a conductor through which electricity passes.

Most of the visible damage occurs at points of entry and exit of the current.

You may have an internal tract where wounds are mainly concentrated.

The position and direction of entry and exit of wound will give you a clue to the likely site and size and extent of the hidden injury and the degree of shock that is likely to result.

The current follows mainly muscle, nerves and blood vessels. If it follows the nerves, it can cause cardiac arrest which is the commonest cause of death in

electric burns. If the patient is unconscious, first check the heart, if not pumping, do a cardiac massage until pumping resumes.

Assess for pumping on the carotid and femoral pulses.

Do cardio-pulmonary resuscitation urgently 15 thrust: 1 breath. Give adrenaline if possible.

FIRST AID {AIMS}

- Ensure your safety first.
- Ensure that electric source is disconnected or blocked i.e you may use your shoes or clothes to disconnect the source from patient.
- Flood the exit and entry points with water to cool the burn and prevent further burning process.
- Protect the burn from infection.
- Re-assure
- Give treatment for shock.

ASSESSMENT FOR BURNS TO THE EYE.

Patient is usually unconscious or semi-conscious. If eyes are burnt with chemicals, it will cause scarring and blindness so gets water and wash the eyes to dilute and disperse the acid.

Let them not rub the eyes (don't touch the eyes), continue pouring water in the eyes.

SIGNS AND SYMPTOMS OF EYE BURNS.

- Continue watering the eyes
- Swollen
- redness

Treatment

- Have gloves on.
- Lie the patient with the affected eye low and most so that water does not affect the rest of the face.

- Open that eye and run cold water for more than 30 minutes.
- Make sure that the water is penetrating into all parts of the eye. Open eye with your hands if they cannot open.
- Get a clean bandage and close the eye until the ophthalmist comes.
- Try to identify the chemical and record or label.

GENERAL MANAGEMENT OF BURNS

Aims of management

- ✓ To arrest bleeding.
- ✓ To prevent the condition from worsening.
- ✓ To preserve life.
- ✓ To correct electrolyte imbalances. Etc

N.B Burns with a TBSA greater than 15% the following is done.

- it is a surgical emergency so quick assessment and immediate care is needed plus quick admission. (Immediate nursing care).

Airway maintenance

Through opening and clearing the airway, In case of a suspected cervical spine, keep movements of the neck to a minimum and never hyperflexion or hyperextend to head or neck.

If smoke inhalation is suspected intubate before oedema makes it difficult.

The head of the bed is elevated and nasal pharynx suction is done in case of excessive secretions.

Breathing and ventilation.

Expose the chest and make sure that chest expansion is adequate.

Always provide oxygen in severe burns or when inhalation injury is suspected give 4-8 hr/min.

Assess breathing sounds and respiratory rate.

Monitor for hypoxia

Encourage aggressive pulmonary care e.g. turning, coughing and deep breathing.

Circulation and hemorrhage control

Stop bleeding with direct pressure.

Check capillary if greater than 2secs it means hypovolaemia.

Monitor pulse and check pollar which occurs with 30%.

Insert 2 large bow peripheral IV lines in superficial burns.

Assessment of the neurological status.

This is done through using a glasgowcoma scale.

This helps to check the levels of consciousness that is checking;

- ✓ Alertness (A)
- ✓ Response to vocal stimuli (V)
- ✓ Response to painful stimuli (U)
- ✓ Unresponsive.

Examine the pupils for light reaction.

Hypoxia can cause reduced levels of response.

Keep the patient flat and covered with a sterile sheet to relieve the pain induced by circulatory air currents.

Keep the patient warm and check for any adherent clothing, cut around it, when removing the cloth i.e cut around the edges of the clothes disturbing the wound as little as possible

FLUID REPLACEMENT

Always replace the lost fluids, can be IV or orally since fluid absorption in the GIT is now very poor. IV fluids are recommended.

If an adult loses 15% of the body fluid or as little as 10% in a small child, this will lead to shock.

Replacement needs to be continued from the moment of the burns for a period of at least 48 hours.

In deep burns, plasma is given as this is what the patient is losing in 48 hours. Towards the end of 48 hours, as the actual loss gradually diminishes, whole blood is given to replace RBCs destroyed, later N/S to replace electrolytes. Glucose to replace energy loss.

The diminishing rate of fluids versus fluid replacement can be expressed by dividing the 48 hours into a series of time periods during which the fluid replacement will be roughly equal.

The fluid loss in the first 8 hours = the next 16 hours = 24 hours. After 48 hours, the fluid loss decreases (unlikely to cause shock)

X = rate of fluid loss.

| | | |
|----------|-----------|-----------|
| X=8hours | X=16hours | X=24hours |
|----------|-----------|-----------|

X=x=x

Replace from T0 to T48

The volume of fluid replacement (Y), $Y = \frac{\text{weight in kg} \times \text{surface area of burns}}{100} \text{ mls.}$

Give these volumes of fluids (y) mls.

$Y=Y=Y$ in $X=X=X$

e.g

$Y=70\text{kg} \times 20\%$

2

$Y=700\text{ml}$ in 4 hours so multiply it by 2

$Y=1400\text{ml}$ in first 8hours

$Y=1400\text{ml}$ in the next 16hours

$Y=1400\text{ml}$ in the next 24hours

But adults require 3 liters in 24hours with or without burns (normal physiological fluid requirement)

How much is needed

$Z = (3000 \times 1) / 24 = 125\text{ml}$ per hour

$X=Y \times 2$

The rate of fluid loss in children below 6yrs is twice that of adults hence double the fluids to be replaced.

Fluid replacement classification time

- 1. Crystalloids** i.e. Darrow's, normal saline, ringers lactate, Hartman's solution given in the first 24 hours.
- 2. Corrodes;** these are plasma expanders e.g. dextran and dextrose 5% given in the next 24hours.
- 3. Blood.** For Hb, grouping and cross matching, blood urea.

Vital observations temperature, pulse, respiration, and blood pressure are taken half hourly, danger of circulatory collapse is over 24hourly or 48hourly, jugular venous pulse is taken.

NB. Watch out for cyanosis and wheezing oedema, will restrict the airway. Ensure patient's patent airway, pass an endo-tracheal tube, give oxygen and humidified air.

Maintenance of urinary system. An indwelling catheter is passed into the bladder and amount of urine excreted is estimated hourly.

The purpose of indwelling catheter is to help in estimation as well as assisting the patient to pass urine in case of urinary shutdown.

Diet.

Patient should have a well-balanced diet as this promotes healing.

N.G tube may be substituted for patients who can feed themselves unless contraindicated.

Plenty of fluids e.g vitamin C and protein are beneficial.

Care of the skin: keep the skin clean using soap and clean water.

Care of the bowel: avoid constipation by taking roughages, plenty of water and exercises.

Physiotherapy: the physiotherapist should promote exercises to avoid contractures.

Drugs

Strong analgesics e.g morphine to relieve severe pain, then mild analgesics for moderate pain.

Antibiotics given because we expect infections, pus swab taken for culture and sensitivity.

Local management.

Bacteriological control, swabs should be taken off for culture and sensitivity.

Prophylaxis for tetanus, give an anti-toxoid.

Maintenance of an aseptic environment. All attendants must wear capes, gowns, masks and cover shoes. Hands should be washed thoroughly. Cleaning should consist of sloughing skin and use of aseptic solution like hibitane or savlon, the surface is then dried with warm air or sterile dressing (gauze). Afterwards the burnt area is treated by either the exposure method or closed of dressing.

Management of wounds.

- Nurse the patient in a special room to prevent infections (burns are normally sterile). Make sure that you maintain asepsis as much as possible.
- Avoid touching the wound with bare hands i.e. use sterile gloves and use a disinfectant after attending to the patient.
- You must have a mask while examining the patient.
- Use the mosquito net to protect the patient from flies.
- Limit visitors as these increase the risk of infection we give definitive treatment (dress) after resuscitation for burns involving the eyes attend to airway then the burnt eyes and resuscitation later.

EXPOSED METHOD

Nothing touches the burn except air and anti-bacterial agent e.g. hibitane, ghee and honey.

This indicates for- burns of the face especially scalds.

- Large partial thickness burns, the air helps to cool the burn and encourages a scar to form. This method is best for partial thickness burns and is best in tropics.
- It is economical for both sundries and nursing. It is also time saving. It is easy to examine.
- It is good for areas that are difficult to dress e.g. perineum, buttocks, face, Axilla. Less dependent on ability and skills.
- The bigger problem is the flies and keeping it sterile these method

- Put impregnated gauze with anti-bacterial agent. Just place the gauze piece onto the wound. This accelerates healing by 50%. This method should be barrier nursed (aseptically).

Requirements

- Sterile gloves
- Hibitane or N/S
- Sedatives
- Galipot
- Sterile mackintosh and clean bed sheets.
- Sterile drapers

Put patient on sterile drapes and put a bed cradle, cover patient with another sterile drape.

Monitor the temperature should be between 36-38°c. Then cover the patient with bed sheets and blanket.

Make sure there are no air currents as may cause hypothermia which delays healing. Close the adjacent windows.

Leave the wounds alone, clean and dry an area that is damp and moist using N/S.

You can use the modified exposure method for the moist areas.

Limitations

NB. It is not good for children i.e. may scratch the wounds, may soil the bed with urine or stool.

Not fit for un co-operative patients. Wounds are prone to getting infections secondarily.

OCCLUSIVE / CLOSED METHOD.

This method keeps the wound sterile, also aims at applying anti-bacterial agents. E.g. ghee, honey, neomycin cream, tetracycline, hibitane etc

Problems of this method

- ✓ It's expensive because, it demands abundant sundries.
- ✓ It requires skills
- ✓ It takes a lot of time.
- ✓ It also depends on anti-bacterial agents
- ✓ Do not close a wound without them.
- ✓ It can cause hyperpyrexia.
- ✓ It is a surgical procedure and asepsis must be observed.
- ✓ The dressing absorbs the exudates from the burns and prevents organisms from reaching the burn.
- ✓ Therefore, the dressings must be enough to absorb all the exudates. The moment the dressing soaks are going to come from the top into the wound following the exudates hence infecting the wound.
- ✓ Make sure the dressing is thick enough to prolong the soaking. The dressing must extend beyond the wound 4cm.
- ✓ A mere application of a few dressing that does not obey of low is not close dressing.

PROCEDURE

It is a number touch technique.

You must have sterile instruments.

No human hand shall touch the burn or dressing except sterile.

You may need some sedation with either ketamine or pethidine.

You clean the burn and the skin around it with chloroxydine.

Leave the blisters alone, "don't puncture them".

Using a sterile spatula apply the impregnated gauze on the burn.

Put at least 2 pieces.

Cover the impregnated gauze with at least 2cm of dry gauze with about 3cm of cotton wool then add the crape bandage.

Extend the dressing beyond wound margin by about 10cm.

If the wound is on the flexor surface of the joint , apply the dressing in extension position to avoid formation of contractures.

You may also apply a plaster for children to maintain the extension position.

When to change a dressing

For superficial burns change after 10 days.

For full thickness burns change after 4 days because the anti-bacteria effects has been used by the fourth day.

Always remove the dressing earlier if the exudates soak the dressing

If it starts smelling (indicates sepsis)

If there is too much pain (indicates sepsis)

If there is a swelling of the wound

If fever develops that's to say 2° c to infection i.e with hyper pyrexia

Incase of regional lymphadenitis

Incase of hyperpyrexia, resorts to open(exposure method)

If there is distal circulation impairment whenever you change the dressing, test for culture and sensitivity,

SALINE METHOD

AIMS

To keep the burnt wound constantly wet.

We use half strength, N/S until it heals

Either pour (irrigates) or (immerse/dip) the infected in N/s

Advantages

This method reduces the patient's time to stay in the hospital

It uses minimum equipment and material and time saving

It is painless and patient will be able to move the joint early

The healing is relatively fast especially for partial thickness and scar separates early.

This method is therefore best for partial thickness burns.

It is popular for mothers and nurses.

Disadvantages.

It is clumsy

The healing is not as fast as in the closed method.

Some people have less belief in this method.

Some organisms thrive in saline e.g pseudomonas aeruginosa. The saline should be warmer than room temperature.

Equipments

Mackintosh

Basin

Jug

Bucket

Half strength saline

Mix the saline with an equal amount of boiled water or 1 teaspoon salt and pour it in a litre of water (boiled).

Warm of prepared saline and pour it in a jug and then pour saline gauze placed on a wound 1 hourly.

The gauze is replaced 4hrly

For immersion, keep the wound in saline for 5 minutes then remove for 2 minutes.

Change saline after 4hours.

Debridement and disloughing

This is done to remove necrotic tissue around the burnt area.

Skin grafting (this is done in theatre)

This may be done according to the degree of burns and this may help in ; - reducing evaporation:-protect underlying tissues. -to encourage early healing.

Specific pre-operative care for grafting

Donor site is carefully selected i.e inner aspect of the thigh, abdomen, inner aspect of the arm.

Donor site is prepared by shaving and scrubbing by a bacteriocidal solution and rinsed with sterile dressing.

The recipient wound is prepared for graft by removal of all dead tissues and debris control of infection and blood oozing.

Saline dressings applied to the burnt wound to aid the final debridement and help to reduce the granulation tissue.

Specific post-operative care for grafting.

This aims at:-

Prevention of infection

Promotion of healing

Relieving pain and keeping the graft in place.

The bulb is incised and the fluid and exudates under the graft is rolled out using cotton swab moistened with N/S compressing towards the edge of the graft.

Application of a bandage assists in immobilizing the grafted part.

Patient's co-operation to prevent excessive motion should be gained.

The graft site is observed for dislodgement and infection which can result in the loss of the graft.

Dressings are not changed before fourth or fifth post-operative day.

Patient requires positioning and range of exercises to maintain mobility status by preventing contractures of joints and atrophy of vascular muscles i.e axillary contractures are prevented by abduction of the shoulder at 50-60° c.

Arm contractures prevented flexion of elbow of 30-40 and forearm in pronation and wrist supported in slightly extension using splint.

Maintenance of legs in full extension may prevent knee contractures.

Active and passive exercises 2-4° c help in prevention of muscular atrophy but avoid mobility of the grafted site.

Foot boards, splints, traction and pillows used to ensure anatomic alignment.

The head is kept in alignment with sand bags.

NB General nursing care inclusive. And also the first aid management.

Prevention of Burns.

Treat the epileptics, teach them, and mobilize the community about epileptics with burns.

Raised fire places.

Keep flues out of the houses e.g. petrol.

Keep chemical in raised places and out of reach of children.

Avoid bleaching

Keep children out of hot or fire places

COMPLICATIONS OF BURNS.

- Shock.
- Excessive oedema, quite dangerous if burns are of the face, neck as it causes obstruction of the airway and oesophagus.

Tracheotomy may be considered.

- Renal failure; due to failure to give adequately fluids, it is as a result of haemo-concentration following plasma loss from circulation and due to a fall in blood pressure.
- Toxaemia and infections; infection of the burnt area causing sepsis resulting in septicaemia, release of toxin hence toxaemia, gas gangrene and tetanus.
- A patient dies of infection more than burns.
- Depression of the bone marrow.
- Contractures.
- Keloid formation
- Electrolyte imbalance
- Anaemia due to haemolysis.
- Thrombosis due to plasma loss, RBC have nowhere to float. Do haematocrit count?
- GIT bleeding, ulcers develop due to increased production of gastric acid and decreased production of mucus.
- Paralytic ileus.
- Sepsis.
- Neuromas
- Cosmetic disfigurement
- Mal-function of the body part

HAEMORRHAGE

Introduction

- This is the loss of blood from blood vessel
- Clotting is the circulatory system's defence mechanism to prevent leakage.
- Clot formation may be deficient from disease, absence of essential clotting factors or use of anticoagulant drugs.

Types of Haemorrhage

- They are classified according to the following;
 1. Blood vessel
 2. Situation of haemorrhage
 3. Time of occurrence of haemorrhage

Blood Vessels

- The blood vessels where haemorrhage can occur include; arteries, veins & capillaries

1. Arterial Haemorrhage

- The bleeding from the artery is characterized by bright red blood in colour
- Blood spurts with the heart beat
- Blood loss is rapid than from a vein of the corresponding size.
- Blood loss is from both ends of the vessel

2. Venous Haemorrhage

- The bleeding is characterized by dark purplish reddish blood in colour.
- Blood flows in an even gentle rate
- Blood loss is less than that of arterial haemorrhage.

3. Capillary Haemorrhage

- Blood oozes over the surface
- It is darkish red in colour
- Over oozing over several hours can result in considerable blood loss.

Time or Duration of Haemorrhage

- Haemorrhage can be classified into the following 3 types;

1. Primary Haemorrhage
2. Reactionary or Intermediate Haemorrhage
3. Secondary Haemorrhage

1. Primary Haemorrhage

- This is the haemorrhage that occurs immediately after injury & continues until it stops by natural or artificial means e.g. a cut finger, an operative incision.

2. Reactionary Haemorrhage

- Bleeding which occurs in the first 24 Hrs after injury or operation.
- It is due to the fact that shock, haemorrhage or drugs given at the time of injury or operation had reduced so much the small blood vessels that were cut but could not bleed at that time but bleeding begins when blood pressure rises up as the shock passes off.
- It is common in operations of the kidney, the thyroid, the breast, & the uterus (total hysterectomy).
- Additional contributing factors include;
 - Coughing
 - Vomiting
 - Increasing the pressure in the veins
 - Excitement and stimulants

NB:- restrict visitors to a minimum.

3. Secondary Haemorrhage

- Bleeding occurs between 36 Hrs to 48 Hrs or 10 -14 days from the time of injury or operation.
- There is sloughing of the blood vessel walls.
- It is caused by
 - sepsis
 - The action of an enzyme e.g. pepsin on a peptic ulcer
 - Pressure of a drainage tube
 - Bone fragment
 - Presence of carcinoma

Situation of Haemorrhage

- Haemorrhage can be classified according to visibility of the blood into the following types:
 1. External or revealed haemorrhage
 2. Internal or concealed haemorrhage

External Haemorrhage

- This is bleeding from a wound or an orifice where blood is visible

Internal Haemorrhage

- This is bleeding which cannot be seen into internal cavity such as the peritoneum, pleural cavity, lumen of hollow organs such as intestines or tissues of the limb.
- It may be revealed later by being vomited or passed per rectum, by formation of bruising & swelling on the surface of the body.
- Symptoms & signs are used to diagnose since bleeding is concealed

Clinical Picture

- Symptoms & signs can be divided into;
 - Early Symptoms and signs
 - Symptoms and signs after severe haemorrhage

Early Symptoms and signs

- Restlessness and anxiety
- Coldness – subnormal temperature – 36.9°C
- Pulse rate is slightly increased
- Blood pressure lowered
- Pallor increases
- The patient is thirsty

Symptoms and signs after severe haemorrhage

- Extreme pallor - face is ashen white
- Coldness is profound – temp. - 36°C
- Air hunger – patient gasps for breath, respirations are rapid & sighing
- The pulse – very rapid in rate, thready in volume & irregular in rhythm
- The blood pressure is extremely low
- Thirst is extreme
- The volume in urine is diminished – may result in acute renal failure
- The venous pressure is low
- Blindness, tinnitus (buzzing in the ears) & coma prior to death

Treatment of Haemorrhage

- This may be summarized under 3 categories;
 1. The arrest of haemorrhage i.e. its control
 2. Restoration of the blood volume
 3. The fate of the extravasated blood

Arrest of Haemorrhage: *Revealed Haemorrhage*

- Most forms of external haemorrhage can be controlled by application of pressure to the bleeding site.
- According to severity of haemorrhage, one of the following methods can be used;
 - 1. Pad & Bandage**
- Simple method of applying direct pressure to a bleeding wound.
- Effective & causes no damage
 - 2. Digital Pressure**
- Fingers are used to apply pressure over the pressure point of the artery supplying the wounded area.
- It temporary control of haemorrhage
- It is called indirect pressure
- Commonly used on the neck where other methods are inapplicable.
 - 3. Elevation of the Limb**
- It can control venous bleeding.
- It is a classical methods of controlling bleeding ruptured varicose veins of the leg.
 - 4. Application of Tourniquet**
- It is ONLY in the control of heavy bleeding from a limb.
- Tourniquets include; Samway anchor, Esmarch's Elastic bandage & Inflatable cuff
- Dangers – gangrene & nerve damage if left on for more than 30 minutes.
 - 5. Surgical Ligation**
- It is necessary if the bleeding continues.
 - 6. Coagulation**
- This achieved by electrocautery or diathermy of the bleeding point
 - 7. Therapeutic Embolisation**
- This is the deliberate occlusion of blood vessels by means of emboli introduced through an angiographic catheter
- Examples emboli used include lyophilized human dura mater
- Common in oesophageal varices & gastric ulcers
 - 8. A Pack**
- This is a temporary control of very severe bleeding.
- Commonly used in theatre to control a sudden haemorrhage.
 - 9. Styptics**
- These are substances which are capable of causing bleeding to stop.
- They include; snake venom, adrenaline.
- They are used locally in certain in cases.
- Thrombin can be used in low pressure bleeding from capillaries & venules

Arrest of Haemorrhage: *Concealed Haemorrhage*

- Pressure can only be used internally in case of surgical ligation or packing
- Haemorrhages are mostly caused by infection
- Control of infection controls bleeding & encourage vessel contraction.
- The following methods are employed in the control of internal blood loss;
 - 1. Empty Organ of Blood Clot if possible**
- Severe bleeding from the bladder can be controlled by passing a catheter & emptying it.
- This will help the organ to contract & hence seal the bleeding vessels.
 - 2. Encouraging Vessels to Contract**

- Saline or sodium bicarbonate to which a few drops of adrenaline have added is of great value in washing out the organ. It is done 2Hrly.

- Ergometrine stimulates vessels to contract after birth of the placenta

- Pitressin can be used effectively in the control of bleeding from oesophageal varices

3. Increasing Blood Coagulability

- It is very valuable in case the mechanism of clotting is deficient.

- IM Vitamin K is important in jaundiced patient who is bleeding.

- Factor VIII concentrate is indicated in haemophilia.

4. Packing

- Gauze soaked in adrenaline is effective in certain sites.

- Oxycel – absorbable gauze impregnated with fibrin - is used extensively.

- A piece of the patient's own muscle which is crushed can be used in the same way.

5. Surgical Ligature

- This can be used in case of ruptured spleen

6. Antibiotics

- In addition to measures to control bleeding & restore the blood volume, secondary blood loss requires systemic antibiotic administration.

7. Internal Pressure

- This may be applied by the balloon of a triluminal tube in bleeding oesophageal varices or by the balloon of a Foley catheter in a prostatectomy cavity

8. Antifibrinolytic Therapy

- This is achieved by the use of tranexamic acid.

Fate of blood lost in haemorrhage

- Patient's problems may not be resolved when the bleeding stops or when blood volume is restored.

- Blood lost may be highly destructive in specialized tissue e.g. eyes, brain or spinal cord.

- In the brain, extravasated blood may compress the brain if it is between the skull & the meninges or between the meninges & the brain

- In the thoracic cavity, the function of the heart & lungs may be hindered by large blood effusion or clots.

- In the pharynx, larynx or trachea, blood can obstruct respiration & give rise to a lung infection.

- Inhaled blood may flood the whole lung leading to death.

- Terms used to describe extravasated collections of blood include;

- **Petechiae or Purpura** – tiny pinpoint haemorrhage from capillary damage.

- **Ecchymosis** – a small area of skin bruising

- **Haematoma** - a sealed collection of blood & clot. It may be sealed beneath:

- A wound

- A tissue – subperiosteal or subcapsular

- A tear of soft organ - spleen or liver

Special types of haemorrhage

Epistaxis

- Bleeding from the nose

- **Causes;**

- Injury to the nose

- Fracture base of the skull

- Ulceration of the mucus membrane of the nose

- Bleeding diseases e.g. leukemia

- Infections like rhinitis

- Venous congestion associated with heart diseases.
- ✿ Treatment
 - The patient sits head flexed slightly backwards & pressure applied on the nostrils.
 - Sponge the face with cold water
 - If this fails, inform the Dr.
 - The nose may be packed with sterile gauze with adrenaline.
 - The plug is left in situ for 12-24Hrs because of the danger of sepsis.
 - Recurrent bleeding may be treated by cauterization.

Haemoptysis

- ✿ This is the coughing up of blood
- ✿ The blood is bright red in colour, frothy, mixed with sputum.
- ✿ It is alkaline
- ✿ Causes;
 - ☐ Pulmonary disease – TB
 - ☐ Lung cancer
 - ☐ Benign tumour
 - ☐ Injury to the lungs
 - ☐ Primary embolism
 - ☐ Bronchiectasis
 - ☐ Lung abscess
 - ☐ Venous congestion into the lungs
 - ☐ blood diseases – leukemia
 - ☐ Rupture of aortic aneurysm into a bronchus
- ✿ Treatment;
 - ☐ Severe cases need urgent treatment
 - ☐ Care of the mind
 - ☐ Sitting up position
 - ☐ Blood for HB, grouping & X-matching
 - ☐ Frequent mouth washes
 - ☐ Fluids of non-stimulating type
 - ☐ Keep the patient warm, quiet & total rest
 - ☐ Blood transfusion if severe
 - ☐ morphine

Haematemesis

- ✿ This is vomiting blood
- ✿ Blood may be bright red in colour but is more often brown.
- ✿ It is acidic
- ✿ Causes;
 - ☐ Gastric ulcers
 - ☐ Acute gastritis (corrosive drugs [aspirin] & alcohol taken on an empty stomach)
 - ☐ Gastric cancer
 - ☐ Swallowed blood e.g. after Epistaxis, haemoptysis
 - ☐ Fracture base of the skull
 - ☐ After operation on the nose & throat
 - ☐ Portal hypertension
 - ☐ Oesophageal varices
 - ☐ Blood disorder (leukemia)
- ✿ Treatment

- ☐ Blood for Hb, grouping & X-match
- ☐ Stool for occult blood
- ☐ Absolute rest & quietness
- ☐ Morphia
- ☐ Specific treatment according to cause
- ☐ General nursing care

Melaena

- ✿ This is the passage of dark blood per rectum from a site high in the GIT
- ✿ Causes;
 - Duodenal ulcers
 - Swallowing of a large amount of blood
 - Drugs like iron sulphate
- ✿ Investigation: stool for occult blood
- ✿ Treatment; as of internal haemorrhage

Haematuria

- ✿ Is the passage of blood in urine
- ✿ This is common symptom of bladder, kidney & blood diseases
- ✿ **Causes;**
 - ☐ Trauma e.g. ruptured kidney
 - ☐ Renal calculi due to chronic kidney infection
 - ☐ TB of the kidney
 - ☐ Post operative cause e.g. prostatectomy
 - ☐ Growth in the bladder
 - ☐ Leukemia
 - ☐ Inflammation of the urinary tract –bilharzia
 - ☐ Kidney disease
- ✿ **Treatment’;**
 - ☐ In less severe cases - rest in bed & reassurance
 - ☐ In more severe damage to the bladder or kidneys, surgery is indicated.
 - ☐ Specific treatment may also vary according to cause.

Special terms for haemorrhage from special sites

- ✿ Haemothorax – bleeding into the chest
- ✿ Haemoperitoneum – bleeding into the peritoneum
- ✿ Haemarthrosis – bleeding into the joint
- ✿ Menorrhage – excessive menstruation at normal intervals
- ✿ Metrostaxis – metrorrhagia – excessive , irregular or continuous bleeding per vaginam between the periods.
- ✿ Haemopericardium – bleeding into the pericardium
- ✿ Haematomyelia – bleeding into the spinal cord

Next lesson

Blood Transfusion

- Q This is the transfer of human blood from one vascular system of an individual to another.
- Q It is whole blood, plasma or packed cells.

Clinical Use of Blood Products and Blood

- Q Whole blood – replacement of blood in haemorrhage. usual anticoagulant is citrate phosphate dextrose
- Q Packed cell (concentrated RBC) - replace haemoglobin in anaemia without increasing the circulatory volume.
- Q platelets – used in thrombocytopenia
- Q Plasma (Plasma Protein Fraction) – replaces proteins lost in burns & large wounds.
- Q Fresh frozen plasma (contains all the clotting factors) – invaluable in bleeding states with loss of coagulation factors.
- Q Cryoprecipitate (concentrated factor VIII) or freeze -dried factor VIII – used for treating patients with haemophilia.
- Q Fibrinogen – used in hypofibrinogenaemia
- Q Gammaglobulin – used for immunization against hepatitis.

Indications

- Q Severe anaemia e.g. hook worm anaemia, & haemorrhage.
- Q Acute blood loss >15% of total body volume in otherwise healthy individual(liver, kidney, spleens kidney
- Q In septicaemia.
- Q During major surgeries eg abdominoperineal surgery, thoracic surgery , hepatobiliary surgery.
- Q Certain conditions like haemophilia
- Q As prophylactic measure prior to surgery
- Q Severe burns
- Q Diseases of the bone marrow e.g. aplastic anaemia or bone marrow aplasia
- Q Exchange of blood e.g. Rhesus incompatibility & carbon monoxide poisoning

Donor criteria

- Q Donor should be fit without any serious illness like HIV, hepatitis b etc
- Q Weight of the donor should be more than 45kg

Precautions before Blood Transfusion

- Q Donors & recipients of blood must be typed to ensure that it is compatible & cross matched.
- Q The donor must be screened thoroughly from any infections e.g. infective hepatitis, syphilis, malaria, & HIV.

- Q The patient's blood after being withdrawn is labeled with the patient's name, group, ward, expire date, unit number, & bed number.
- Q Blood should be stored.
- Q It should be double checked by 2 people in the lab and on the ward to make sure that it is the right blood for the right person using a compatibility form.
- Q Patients should be offered a bedpan to prevent disturbance.
- Q Patients should be offered a meal before the transfusion.
- Q Patient's baseline observations should be taken and recorded accurately on a blood transfusion chart. Vitals are continued until when the transfusion is stopped. The temperature should be normal to rule out uncertainties of whether the increase is due to blood reaction or due to previous infection. A diuretic e.g. lasix is given to prevent pulmonary oedema especially in patients with heart diseases.
- Q Explain thoroughly the importance of transfusion to the patient.
- Q The site should be well cleaned with an antiseptic before insertion of the cannular.
- Q The blood giving set should have a filter chamber to prevent thrombosis while transfusion is commenced.

Precautions during Blood Transfusion

- Q The patient & transfusion apparatus must be under constant supervision during the entire period of the transfusion.
- Q The Dr. should inform the nurse of the rate at which the transfusion is to be maintained. 40 drops/min is the standard rate of transfusion of blood.
- Q Patients with haemorrhage may need to be given transfusion at a much greater rate.
- Q Patients suffering cardiac, pulmonary disease & severely anaemic patients must be transfused at a slow rate. Packed cells may be used because of their smaller volume.
- Q When transfusion is in progress, ½Hrly pulse & Hrly temperature record are kept or as prescribed by the Dr.
- Q Observation of urinary output to rule out renal failure, the colour is observed, amount measured & charted & strict intake & output chart is maintained.
- Q All patients should be watched for the symptoms of transfusion reactions after the few minutes of blood from each unit of blood. Immediate treatment should be given & the medical officer informed without delay.
- Q Allergy e.g. skin rash & rigor usually occurs when 300mls of blood are given & treated with anti-histamine.

Precautions after Blood Transfusion

- Q The bottle sample should be kept for at least 24Hrs for emergency investigations of blood transfusion reaction.
- Q After the 24Hrs, the used bag should be disposed of by incineration.
- Q Any unused or partly used bags of blood that has been left at room temperature for 1Hr or more should be labeled 'dangerous for the patients & returned to the laboratory.
- Q Information about the transfusion including serial numbers of bags, any untoward reactions & the time taken for transfusion should be entered in the case records.

- Q The HB is re-checked to ensure that there has been progress of the blood transfusion. At least a unit of blood should raise the HB by 7% or 1gm/dl.
- Q Coomb's test is done to rule out haemolysis if any.

Complications of blood transfusion

- Q Infection;
 - ⊠ Introduction of infections due to lack of inadequate screening of blood for microorganisms e.g. HIV, plasmodia, infective hepatitis.
- Q Incompatibility;
 - ⊠ Due to errors in grouping & crossing matching.
 - ⊠ The signs & symptoms include pain in the chest, pyrexia, rigors & renal failure whereby renal tubules are blocked by agglutinates.
- Q Haemolysis;
 - ⊠ It is due to incompatibility. It could also be caused by transfusion of expired blood.
 - ⊠ The transfusion should be stopped & the patient is infused with mannitol 100mls 20%.
- Q Citrate Intoxication
 - ⊠ It is due to much sodium citrate used. Patients present with irregular slow pulse.
 - ⊠ Treat with IV 10ml calcium chloride 20%.
- Q Overloading
 - ⊠ This is due to rapid transfusion in young, old, anaemic & cardiac patients. This may result into cardiac failure or pulmonary oedema, right heart failure.
 - ⊠ Treatment - slow down the rate of transfusion, give diuretics & monitor vital signs
- Q Air Embolism
 - ⊠ Due to air in the blood tubing.
 - ⊠ Treatment – expel air from the tube before transfusion & keep air away from the lower portion of the drip chamber & beyond.
- Q Thrombophlebitis;
 - ⊠ It is due to inflammation of the veins by blood clots.
 - ⊠ It is an occasional complication usually at or near the transfusion site.
 - ⊠ Treatment – give IV fluids e.g. saline
- Q Pyrexia;
 - ⊠ It is caused by pyogens in the blood.
 - ⊠ It is usually due to dirty apparatus and infected blood.
- Q Renal Failure;
 - ⊠ it is caused by mismatched blood
 - ⊠ Stop the blood transfusion.
- Q Allergic Reactions;
 - ⊠ Occurs in patients with history of allergic reactions to blood transfusion, asthma or similar allergic conditions after about 300ml of blood have been given.
 - ⊠ symptoms & signs - itching and urticaria
 - ⊠ Treatment – do not stop transfusion & give IV antihistamine.

- Q Transfusion Haemosiderosis;
 - ⊠ This is iron overload in chronically anemic patients who are regularly transfused.
- Q Haemorrhage;
 - ⊠ If blood is stored for more than a day, it loses its functioning platelets & factor VIII.
 - ⊠ Transfusing the patient with blood amounts equal to the blood volume will dilute the number of circulating platelets & clotting factors.
 - ⊠ This leads to haemorrhage.
 - ⊠ They are corrected if necessary with FFP or concentrated platelets.

Prevention of Blood Transfusion Complication

- Q Thorough cross-matching by 2 people in the lab & ward before transfusion.
- Q People with known allergy should be given antihistamine.
- Q Ensure sterile techniques before, during & after blood transfusion.
- Q Expiry date should be checked before transfusion
- Q No blood should be transfused if plasma is pink in colour. This indicates haemolysis.
- Q Blood should be thoroughly screened for certain microorganisms. the donor must be free from infection
- Q Urine output is measured & colored noted & charted.

FLUID AND ELECTROLYTE IMBALANCE FLUID AND ELECTROLYTE IMBALANCE

Fluid and electrolyte is a dynamic process that is crucial for life and homeostasis.

Electrolytes

Electrolytes in body fluids are active chemicals (cations) that carry positive charges and anions carry negative charges)

The major in the body fluid are sodium, potassium, calcium and hydrogen ions.

The major ions are chloride, bicarbonate, phosphate, sulphate and protein ions.

The chemicals unite in varying combinations. Therefore electrolyte concentration in the body is expressed in terms of milliequivalents (mEq) per litre.

Milliequivalent is defined as being equivalent to electrochemical activity of 1mg of hydrogen.

Approximately 60% of a typical adult's weight consists of fluids (water and electrolytes)

Factors that influence the amount of body fluid are age, gender and body fat. In general, young people have a high percentage of body fluid than old people and men have proportionately more

body than women. People who are obese have less fluid than those who are thin because fat cells contain little water.

FLUID VOLUME DISTURBANCES OR ELECTROLYTE IMBALANCE OR DISORDERS

An electrolyte disorder occurs when the levels of electrolytes in the body are either too high or too low. Electrolytes are naturally occurring elements and compounds in the body.

They control important physiologic functions.

TYPES OF ELECTROLYTE DISORDER

SODIUM IMBALANCES

Sodium is the most abundant electrolyte in the ECF

Its concentration ranges from 135-145 mEq, per litre

Sodium has a major role in controlling water distribution throughout the body because it does not easily cross the cell membrane and because of its abundant and high concentration in the body.

Sodium also functions in establishing the electrochemical state necessary for muscle contraction and transmission of nerve impulses

SODIUM DEFICIT(HYPONATREMIA)

Hyponatremia refers to a serum level that is less than 135 mEq/L (135mmol/L).

Sodium imbalance often occurs with a fluid imbalance because the same hormones regulate both sodium and water imbalance.

CLINICAL MANIFESTATIONS

- poor skin turgor
- Dry mucosa
- Headache
- Decreased saliva production
- Orthostatic fall in blood pressure.
- Nausea and vomiting.
- Abdominal cramping
- Neurological changes which include;
- Altered mental status

- Status epilepticus and coma.
- Anorexia.
- Feeling of exhaustion

SIGINS OF INTRACRANIAL PRESSURE

- Lethargy
- Confusion.
- Muscle twitching.
- Hemiparesis.
- Focal weakness.
- Papilledema.
- Seizures and death may occur.

CAUSE.

- Excessive diaphoresis.
 - Diuretics (high ceiling diuretics)
 - Wound drainage (especially gastrointestinal)
 - Decreased secretion of aldosterone.
 - Hypolipidemia.
 - Kidney diseases (scarred distal convoluted tubule.)
 - Nothing by mouth.
 - Low salt diet.
 - Cerebral salt wasting syndrome.
 - Hyperglycemia.
 - RELATION SODIUM DEFICITS (dilution)
 - Excessive ingestion of hypotonic fluids fresh water submersion
 - Kidney failure (nephrotic syndrome)
 - Irrigation with hypotonic fluids.
-
- Heart failure

MANAGEMENT

-When possible the underlying cause is treated.

- Intravenous infusion of normal saline as a slow and gradual correction.
- Monitor therapy can help restore sodium balance in mild Hyponatremia. This includes increasing oral sodium intake and restricting oral fluid intake.
- The nurse's responsibility for this patient includes skin protection, safety, monitoring, patient and family teaching, administering prescribed drugs.

HYPERNATREMIA

Hypernatremia is excess sodium in the blood in which the serum level is over 145 MEQ/L

CAUSES

ACTUAL SODIUM EXCESSES.

- Hyperaldosteronism
- Kidney failure, Heart failure, Liver failure .
- Corticosteroids
- Cushing's syndrome or disease
- Excessive oral sodium ingestion (salt intake)
- Excessive administration of sodium –containing iv fluids.

RELATIVE SODIUM EXCESSES.

- Nothing by mouth -severe burns
- increased rate of metabolism
- Fever (high)
- Hyperventilation
- Infection
- Excessive diaphoresis
- Watery diarrhea
- Dehydration.

CLINICAL FEATURES

- Pitting edema.
- Puffiness of the face
- Increased urination
- Often dilated jugular veins
- Features of pulmonary oedema
- Body temperatures may increase mildly
- A primary characteristic of Hypernatremia is thirst.
- Dry sticky mucus membranes
- A rough dry tongue and lethargy which can progress to coma.

MANAGEMENT

Treatment depends on the cause.

- Infusion of a hypotonic electrolyte solution e.g 0.3% sodium chloride or an isotonic nonsaline solution e.g. dextrose 5% in water.
- Diuretics also may be prescribed to treat the sodium gain.
- Nutrition therapy to prevent or correct mild Hypernatremia.
- Involves ensuring adequate water intake especially among older adults.
- Dietary sodium excess when kidney problems are present.
- Collaboration with dietician to teach the patient how to determine the sodium content of food, beverages and drugs.
- Nursing actions patients safety are skin protection, monitoring and patient and family teaching about sodium excess.

POTASSIUM IMBALANCES

Potassium is the major cation of the intracellular fluid.

Potassium is particularly important for regulating the heart function.

Helps in maintaining health nerves and muscles.

Almost all foods contain potassium but it's highly in meat and fish but less in eggs, bread and cereals grains.

A deficit of potassium in the blood is called hyperkalemia.

HYPOKALEMIA

Is an electrolyte imbalance in which the serum potassium level is below 3.5 mEq/l

It can be life threatening because everybody system is affected.

Causes

— Actual potassium deficits

- In appropriate or excessive use of drugs eg:
- Diuretics
- Digitalis
- Corticosteroids
- Increased secretion of aldosterone
- Cushing syndrome
- Diarrhea
- Vomiting
- Wound drainage (especially gastrointestinal)
- Prolonged nasogastric suction
- Heat induced excessive diaphoresis
- Kidney failure

RELATIVE POTASSIUM DEFICITS

- Alkalosis
- Hyperalimentation
- Hyperinsulinism
- Total parenteral nutrition
- Water intoxication
- Iv therapy with potassium –poor solution

CLINICAL FEATURES

- Fatigue
- Anorexia
- Nausea and vomiting
- Muscle weakness
- Polyuria
- Decreased bowel motility
- Ventricular systole or fibrillations
- Paralysis

- Leg cramps
- Decreased blood pressure
- Abdominal distention
- Hypoactive reflexes

The serum potassium level is above 5.5mEq/l

Management

Conventional measures such as increased intake in the daily diet or by oral potassium supplements for deficiencies are good for mild to moderate hyperkalemia.

Iv replacement therapy in potassium loss is 40-80 mEq/day. Examples of potassium chloride potassium gluconate and potassium citrate.

IV k⁺ is given in severe loss ad amount depends on degree of loss.

Oral potassium preparation taken as liquid or solids.

Diuretics that increase the kidney excretion of potassium can cause hyperkalemia so should be awarded like frusemide (lasix)

Nutrition therapy involves collaboration with dietitian to teach the patient how to increase dietary potassium intake. Eating food that contains natural potassium helps to prevent further loss but supplementation is needed t restore normal k⁺ levels.

Respiratory monitoring is performed at least hourly for severe hyperkalemia, monitor pulse cough reflex among others.

HYPERKALEMIA

Is an electrolyte imbalance in which the serum potassium level is higher than 5.0 MEQ \L(MMOL\L)

COMMON CAUSES

- Over ingestion of potassium –containing foods or medications i.e.;

- Salt substitutes
- Potassium chloride
- Crush injury
- Burns
- Rapid infusion of potassium –containing iv solution
- Bolus iv potassium injections
- Transfusions of whole blood or packed cells
- Adrenal insufficiency
- Kidney failure
- Addison's disease
- Potassium –sparing diuretics
- Angiotensin –converting enzyme inhibitors (ACEIS)

RELATED POTASSIUM EXCESSES

- Tissue damage
- Acidosis
- Hyperuricemia
- Uncontrolled diabetes mellitus

CLINICAL MANIFESTATIONS

- Muscle weakness
- Twitching
- Palpitations
- Bradycardia
- Hypotension
- Tingling and burning sensations followed by numbness in the hands and feet.
 - Increased motility with diarrhea and hyperactive bowel sounds.
 - Bowel movements are frequent and watery.
 - Flaccid paralysis.
 - Parathesias.
 - Intestinal colic.
 - Cramps
 - Abdominal distension

- Irritability
- Anxiety

Management

- In non acute situations restrictions of dietary potassium and potassium containing medications may correct the imbalance for example eliminating the use of potassium containing salts substitutes in a patient who is taking potassium-conserving diuretic.
- Administration of either orally or retention enemas of cations exchange resins (e.g. sodium polystyrene sulfonate may be necessary.)
- If serum potassium levels are dangerously elevated, it may be necessary to administer IV calcium gluconate on caution.
- Monitor blood pressure to detect hypotension.
- IV administration on regular insulin and a hypertonic dextrose solution causes a temporary shift of potassium into cells.
- Loop diuretics such as frusemide (lasix) increase excretion of water by inhibiting sodium, potassium, and chloride reabsorption in the ascending loop of Henle and distal convoluted tubule.
- Beta- 2 agonist such as Albuterol (Ventolin) is highly effective in decreasing potassium.
- The nurse must caution the patient about the use of salt substitutes sparingly if they are taking other supplementary forms of potassium.
- The nurse also observes the general condition of the patient's vital signs; GI symptoms like nausea and vomiting, intestinal colic are noted.
- Hyperkalemia can be prevented by ;
- Avoiding potassium rich foods like meat, fish
- Labels of cola beverages should be checked carefully for high concentration.
- Encouraging patients to adhere to the prescribed potassium restriction.

CALCIUM IMBALANCES

- ❖ More than 99% of the body's calcium (Ca^{++}) is located in the skeletal system. It is major component of bones and teeth.
- ❖ It is an ion having two positive charges (divalent cation) that exist in the body in abound form and ionized (unbound or free form).

- ❖ Bound calcium is usually attached to serum proteins, especially albumin. Ionized calcium is present in the blood and other extracellular fluid (ECF)
- ❖ The body functions when calcium levels are maintained between 9.0 and 10.5 mg/dl or between 2.25 to 2.62mmols.
- ❖ Calcium enters the body by dietary intake and absorption through the intestinal tract. Dairy products are common foods high in calcium. Absorption of dietary calcium requires the active form of vitamin D; calcium is stored in the bones.
- ❖ Calcium is a vital mineral that the body uses to stabilize blood pressure and control skeletal muscle contraction.
- ❖ It is also used to build strong bones and teeth.

HYPOCALCEMIA

- ❖ It is an electrolyte imbalance in which total serum calcium (Ca^{2+}) level is below 9.0 mg/dl or 2.25mmol/l

Common causes of hypocalcaemia

Actual calcium deficits

- Inadequate oral intake of calcium.
- Lactose intolerance
- Malabsorption e.g. celiac sprue, crohns disease.
- Inadequate intake of vitamin D.
- End stage kidney disease
- Steatorrhea
- Wound drainage(especially gastrointestinal)
- Hypoparathyroidism
- Pancreatitis
- Vitamin D deficiency
- Massive subcutaneous infections
- Massive transfusions of citrated blood
- Chronic diarrhea
- Decreased parathyroid hormone
- Fistulas
- Burns

- Alcoholism

Relative calcium deficits

- Hypoproteinaemia
- Alkalosis
- Immobility
- Removal of parathyroid gland

Clinical manifestations

- The manifestations of hypercalcemia are related to its severity and how quickly the imbalance occurred
- Numbness
- Tingling of fingers.
- Positive trousseaus sign and chvostek's sign.
- Seizures.
- Immobility.
- Bronchospasms.
- Anxiety.
- Impaired clotting time.
- Diarrhea or constipation.
- Anorexia.
- Nausea and vomiting.
- Abdominal distention and pain are common.
- Cyanosis and pallor.

MANAGEMENT.

- Acute symptomatic hypocalcaemia is life threatening and requires prompt treatment with IV administration of calcium salt.
- Parental calcium salts include calcium gluconate and calcium chloride while administering the site is observed carefully.
- Vitamin D therapy may be instituted to increase calcium absorption from the GI tract.
- Calcium containing foods include milk products, greens, leafy vegetables, antacids.

- In addition aluminium hydroxide, calcium acetate or calcium carbonate. Antacids may be prescribed to decrease elevated phosphorus levels before treating hypocalcaemia.
- The nurse must educate the patient with hypocalcaemia about foods that are rich in calcium.
- The nurse must also advise the patient to consider calcium supplements if sufficient calcium is not consumed in the diet.
- Patient is advised to reduce amounts of alcohol and caffeine because they inhibit calcium absorption and smoking increases urinary calcium excretion.

HYPERCALCEMIA (calcium excess)

- ❖ It is an electrolyte imbalance in which the total serum calcium level is above 10.5mg/dl or 2.62mmol/l.
- ❖ Hypercalcemia means either that the amount of serum calcium is so great that the normal calcium controlling actions cannot keep pace or that a control action is not functioning properly.
- ❖ The excitable tissues affected most by hypercalcemia are the heart, skeletal muscles, nerves and intestinal smooth muscles.

CAUSES OF HYPERCALCEMIA

Actual calcium excesses.

- Excessive oral intake of calcium
- Excessive oral intake of vitamin D
- Kidney failure
- Use of Thiazides diuretics
- Malignancies e.g. leukemia
- Hyperparathyroidism and thyroid disorders
- Paget's disease
- Prolonged immobilization most structures of the spinal cord.

RELATIVE CALCIUM EXCESS

- Use of glucocorticoids
- Dehydration
- Digoxin toxicity

CLINIICAL MANIFESTATION

- Increased heart rate and blood pressure
- Cyanosis and pallor
- Muscular weakness
- Constipation
- Anorexia
- Nausea and vomiting
- Polyuria and polydipsia
- Dehydration
- Hypoactive deep tendon reflexes
- Lethargy
- Deep bone pain
- .Pathologic fractures
- Flank pain
- Calcium stones
- Hypertension

MANAGEMENT

- ❖ Therapeutic aims include decreasing the serum calcium level and reversing the process causing the hyperkalemia.
- ❖ Treating the underlying cause (e.g. chemotherapy for a malignancy, partial parathyroidectomy for hyperparathyroidism is essential.
- ❖ Drug therapy involves preventing increases in calcium, as drugs to lower calcium levels. IV solutions containing calcium e.g. ringers lactate are stopped, oral drugs containing Calcium or vitamin D (e.g. calcium based antacids) are discontinued .
- ❖ Fluids volume replacement can help restore normal serum calcium levels. IV normal saline (0.9% sodium chloride) is usually given because sodium increases kidney excretion of calcium.
- ❖ Thiazides diuretics are discontinued and are replaced with diuretics that enhance the excretion of calcium such as frusemide (lasix)

- ❖ Drugs to prevent hypercalcemia include agents that inhibit calcium reabsorption from bone such as phosphorus, calcitonin and prostaglandins synthesis inhibitors.(aspirin, NSAIDS)
- ❖ Cardiac monitoring of Patient with hypercalcemia.

PHOSPHORUS

- ❖ Normal serum level of phosphorus range from 3.0 to 4.5mg/dl or 0.97to 1.45mmols.
- ❖ It is essential to the function of muscles and red blood cells.
- ❖ The formation of adenosine triphosphate (ATP) and 2-3 diphosphoglycerate which facilitate release of oxygen form hemoglobin.
- ❖ It maintains acid base balance and as well as the nervous system and intermediary metabolism of carbohydrates, proteins and fats.
- ❖ It provides structural support to bones and teeth.

Phosphorus deficits (hypophosphatemia)

- ❖ It's an electrolyte imbalance in which the serum phosphorus level is below 3.0 mg/dl. Because phosphorus and calcium are interrelated decrease in serum phosphorus level cause increase in serum calcium levels

CAUSES OF HYPOPHOSPHATEMIA

- Malnutrition
- Starvation
- Use of aluminium hydroxide based antacids
- Use of magnesium based antacids
- Hyperparathyroidism
- Hypercalcemia
- Kidney failure
- Malignancy
- Hyperglycemia
- Hyperalimentation
- Respiratory alkalosis
- Uncontrolled diabetes mellitus

- Alcohol abuse or withdraw
- Vitamin D deficiency
- Diarrhea
- Burns and severe wounds

CLINICAL MANIFESTATIONS

- ♣ Paresthesia
- ♣ Muscle weakness
- ♣ Bone pain and tenderness
- ♣ Chest pain
- ♣ Confusion
- ♣ Cardiomyopathy
- ♣ Respiratory failure
- ♣ Seizures
- ♣ Tissue hypoxia
- ♣ Increased susceptibility to infections
- ♣ Nystagmus
- ♣ On laboratory investigations the serum phosphorus level is less 2.5mg/dl.

MANAGEMENT

- Drugs that promote loss of phosphorus are discontinued e.g. antacids, osmotic, diuretics and calcium supplements.
- Oral replacement may correct moderate hypophosphatemic e.g. phosphorus along with vitamin D.
- Iv phosphorus given slowly because the problem caused by hyperphosphatemia is equally serious so it's given on caution when phosphorus is less than 1mg /dl
- Nutrition therapy involves increasing the intake of phosphorus rich food while decreasing the intake of calcium rich food.
- Collaborate with the dietitian to teach the patient and family which food to eat and which to avoid.

PHOSPHORUS EXCESS (HYPERPHOPHATEMIA)

- ❖ It is an electrolyte imbalance in which the serum phosphorus level is above 4.5mg/dl. High levels are tolerated by most body systems.

Causes

- Certain cancer treatment
- Increased phosphorus intake
- Tumor lysis syndrome
- Acute and chronic renal failure
- Excessive intake of phosphorus
- Vitamin D excess
- Respiratory and metabolic acidosis
- Hypoparathyroidism
- Volume depletion
- Leukemia/ lymphoma treatment with cytotoxics drugs
- Increased tissue break down
- Rhabdomyolysis

Clinical manifestations

- ♣ Tetany
- ♣ Tachycardia
- ♣ Anorexia
- ♣ Nausea and vomiting
- ♣ Signs and symptoms of hypocalcaemia
- ♣ Hyperactive reflexes
- ♣ Soft tissue calcifications in lungs kidneys heart and cornea. Etc
- ♣ On laboratory analysis the serum phosphorus level exceeds 4.5mg/dl(1.5 mmol)

MANAGEMENT

- Thus the management of hyperphosphatemia entails the management of hypocalcaemia.
- Give vitamin D orally or parenteral.
- Restriction of dietary phosphorus, forced diuretics with loop diuretics, volume replacement with saline

- Dialysis may also lower phosphorus levels.
- Surgery may be indicated for removal of large calcium and phosphorus deposits
- When appropriate the nurse advises the client to avoid phosphate containing laxatives and enemas. also monitors urine output and records on a fluid balance chart

CHLORIDE IMBALANCES

- ❖ Chloride (cl-) the major anion of the ECF is found than in the interstitial and lymph fluid compartments than in blood but works together with sodium.
- ❖ The normal plasma concentration of chloride ranges from 98 to 106mEq/L or mmol.
- ❖ It enters the body through dietary intake and is important in formation of hydrochloric acid in the stomach.
- ❖ It maintains acid base balance.

CHLORIDE EXCESS (Hyperchloremia)

- ❖ It exists when the serum level of chloride excess 107mEq/L (107 mmol/L).
- ❖ Hypernatremia, bicarbonate loss and metabolic acidosis can occur with high chloride levels.

Clinical manifestations.

- Tachypnea
- Weakness and lethargy
- Deep and rapid respirations
- Diminished cognitive ability
- Hypertension;

A high chloride level is accompanied by a high sodium level and fluid retention.

- Rapid cardiac out
- Pitting oedema
- Dysrhythmias
- Lab indicates serum chloride.

Management

- Correcting the underlying cause of hyperchloremia and restoring electrolyte fluid and acid base balance are essentials.
- Ringers lactate solution may be administered to restore balance.
- I.V sodium bicarbonate may be administered to increase bicarbonate levels and corrects acidosis
- Bicarbonate leads to renal excretion of chloride ions because bicarbonate and chloride compete for sodium.
- Diuretics may be administered to eliminate chloride as;
 - The nurse monitors vital signs, arterial blood, gas value, patient status and effectiveness of treatment
 - The nurse educate the patient about the diet that should be followed and maintain adequate hydration.

HYPOCHLOREMIA

Hypochloremia is a serum chloride level below 97mEq/l

CAUSES

- Addison's disease
- Reduced chloride intake or absorption
- Untreated diabetes ketoacidosis
- Excessive sweating
- Vomiting and nausea
- Gastric suctioning
- Diarrhea
- Draining fistulas and ileostomies

- Rapid removal of ascetic fluid with high sodium content
- Iv fluids that lack chloride (dextrose and water)

Signs and symptoms

- ♣ Agitation
- ♣ Irritability
- ♣ Tremors
- ♣ Muscle cramps
- ♣ Hyperactive deep tendon reflexes
- ♣ Hypertonicity
- ♣ Tetany
- ♣ Slow shallow respirations
- ♣ Seizures
- ♣ Dysrhythmias
- ♣ Coma
- ♣ Laboratory indicates decreased serum chloride , decreased sodium

MANAGEMENT

- IV normal saline (0.9 sodium) or half strength
- If a patient is using a diuretic, it may be discontinued or another prescribed.
- Nursing care is the same as for other saline (0.4 % sodium chloride) electrolytes

MAGNESIUM

- ❖ Magnesium is an abundant intracellular cation. The normal serum mg+ level is 1.3 to 2.5 mg/dl (0. 62 to 0.95mmols)
- ❖ Mg acts on muscles
- ❖ Magnesium is the most abundant intracellular cation after potassium. it plays a role in both carbohydrate and protein s

metabolism and it acts as an activator for many intracellular enzyme systems

- ❖ Magnesium balance is important in neuromuscular function because it acts directly on the myoneural function, variation in the serum levels affecting neuromuscular irritability and contractibility
- ❖ Magnesium also affects the cardiovascular activity acting peripherally to produce vasodilation and decrease peripheral resistance
- ❖ Magnesium is deposited in the bone (60% and soft tissues) it is absorbed in the small intestines and is excreted by the kidneys.
- ❖ Increase in magnesium level is called hypermagnesaemia and decrease in magnesium level is called hypomagnesaemia
- ❖

Magnesium deficits (hypomagnesaemia)

- ❖ Refers to a below normal serum magnesium concentration (1.3mg/dl) or 0.6mmol/l and is frequently associated with Hypokalemia and hypocalcaemia.

Causes

- Chronic alcoholism
- Hyperthyroidism
- Hyperaldosteronism
- Diuretic phase of renal failure
- Malabsorptive disorders
- Diabetic ketoacidosis
- Refeeding after starvation
- Parenteral nutrition
- Chronic laxatives use
- Diarrhea

- Acute myocardial infarction, heart failure
- Certain pharmacological agent e.g. gentamicin

Clinical manifestation

- ♣ Neuromuscular irritability
- ♣ Positive trousseaus sign
- ♣ Positive chvosteks sign
- ♣ Insomnia
- ♣ Mood changes
- ♣ Anorexia

Management

- Mild mg deficits can be corrected by diet alone. Principal dietary source include green leafy vegetables, nuts, seeds, legumes, whole grains, sea food, peanut, butter and cocoa.
- If necessary magnesium salt can be administered orally in an oxide or gluconate form to replace continuous losses but can produce diarrhea.
- Iv parenteral mg can be administered with severe hypomagnesaemia
- Vital signs should be monitored frequently during mg administration
- Monitor urine output during, before and after mg administration
- Calcium gluconate must be readily available to treat hypocalcaemic tetany or hypermagnesemia
- The nursing care is the same as other electrolyte imbalances.

Magnesium excess (hypermagnesemia)

- ❖ This when the serum magnesium level is over 2.3mg/dl. Its rare electrolyte abnormality because the kidneys efficiently excrete magnesium.
- ❖ A serum magnesium level can appear falsely elevated if blood specimens are drawn from an extremity with a tourniquet that was applied too tightly.

Contributing factors

- Renal failure
- Diabetic ketoacidosis
- Adrenocortical insufficiency
- Decreased elimination of magnesium or its increased absorption due to intestinal hypomotility.
- Lithium intoxication
- Extensive soft tissue injury or necessary e.g. trauma , shock , sepsis cardiac arrest etc

Signs and symptoms

- ♣ At mildly increased levels, there is low blood pressure because of peripheral vasodilation
- ♣ Nausea
- ♣ Vomiting
- ♣ Weakness
- ♣ Soft tissue calcification
- ♣ Facial flushing
- ♣ **At higher magnesium concentration**
- ♣ Lethargy
- ♣ Difficulty speaking (dysarthria)
- ♣ Drowsiness
- ♣ Coma, cardiac arrest if magnesium is not treated

- ♣ Platelet clumping and delayed thrombin formation

MANAGEMENT

AIMS

- To alleviate signs and symptoms
- to decrease on serum magnesium
- To prevent complications

Medical management

- Avoid the administration of magnesium to patient with renal failure
- Monitoring of seriously ill patient who are receiving salts
- Parental and oral magnesium salts are discontinued in case the patient has severe hypermagnesemia.
- I'v calcium gluconate entogonises the cardiovascular and neuromuscular effects of magnessium

Nursing management

- The nurses observes changes in the level of consciousness
- The nurses monitors vital signs, noting hypotension's and shallow respirations
- Patient with hypermagnesemia are identified and assessed.
- Medications that contain magnesium are not administered to patients with renal.

FRACTURES

It is the structural break in the normal continuity of a bone, cartilage, diaphysis and epiphyseal plate.

DISLOCATION

It is destruction of bone in a joint, there is contact between articular surfaces.

SUBLUXATION

We have got partial disruption of the joint with some contact between articular surface of the bones but the remaining contact is abnormal hence joint not function.

TYPES

There are two types of fractures

SIMPLE / CLOSED FRACTURE

This is when a bone breaks but there is no wound from the skin leading to broken bone. There may be damage to surrounding tissue.

OPEN/ COMPOUND FRACTURES

The bone breaks and there is a wound leading from the site of fracture to the skin.

- They may be damage to the surrounding tissue. There is always danger of in actions.
- Infections can be pyogenic/ gas forming bacteria
- Compound fractures are also called complicated fractures.

ANATOMICAL PATTERNS/ VARIETIES OF FRACTURES

a. Green stick

A bone may bend especially in children. Without breaking usually in shafts of children. The bone is not yet fully mineralized thus less calcium.

b. Segmental fracture

There are two complete fracture lines in one bone.

c. Comminuted fracture

The bone is broken into more than 2 fragments. It may either be simple/compound.

d. Displacement

This is the deformity which follows a fracture (loss of normal shape).

Fracture line

Transverse

comminuted

Oblique

Spiral

Green stick #

complicated #

Causes of fractures

- Initial force e.g. force on the knee displaces a hip joint.
- Gravity
- Muscles attachment i.e. which muscle pulls which fragment.
- By health workers i.e. turning fractured limb recklessly.

1. Direct force e.g. hit by a car common in causing accidents.

- The fracture occurs at the site of the blow.

2. Indirect force

- The fracture occurs at a distance of a blow e.g. twisting a joint force is transmitted throughout the bone.

3. Muscular forces

The muscles violently contract and break the bone.

4. Pathological causes

Fractures usually occur due to a disease. They break without or with little force.

- When the bone is diseased and one is not aware e.g. TB of bones, rickets plus osteomyelitis.
5. Trauma (RTA)
Causing twisted fracture or bending of the bone seriously or continuous pulling and pushing.

Predisposing factors of fractures.

- Age: Young children and old people are prone to fractures
- Diet: poor diet
- Sex: male are prone to fractures
- Slippery surfaces
- Diseases like sickle cell disease, necrosis of the bone
- Occupation: builders due to falling from height
- Position of certain bone tibia

Signs and symptoms

- Tenderness at the site
- Pain, swelling and bruising at the site
- Abnormal mobility (movement of the affected area)
- Deformity
- Shortening of limb which may be due to overriding of the bones and fragments due to damage.
- Crepitation
- Bone fragments grate over each other.
- Haemorrhage in case of open fracture
- Broken bone may be seen protruding
- The patient may hear the bone sharp or break
- Shock which may be caused by many factors e.g. pain, hemorrhage, anemia, fear.

REPAIR OF FRACTURE/ FRACTURE HEALING

Takes place in form of a process

- There is haematoma formation between the broken bone ends. The serum is squeezed out leaving the fibers.
- The capillaries from neighboring blood vessels bend into the fractured end area.

- There is callus formation by bone building cells (osteoblasts). They collect calcium salts and other necessary substances and build a bone (callus) after which solidification occurs.
- Periosteum forms and development of blood vessels.

Factors necessary for bone healing

- ✓ Good diet full of proteins and vitamins
- ✓ Exercises i.e. physiotherapy

GENERAL RULES OF BONE HEALING

- Lower limb fractures take twice as long as upper limb fractures to unite.
- Fractures in adults take twice as long as in children (<8 years) to heal
- Transverse fractures take long to unite than oblique and spiral
- Compound and comminuted fractures are very slow to unite.
- There is no fracture that unites in less than 3 weeks even in children eg transverse fracture of tibia take 2 weeks and comminuted fracture of tibia takes about 1 year. Expect an oblique in upper limb of a child to heal in 3 weeks.

DELAYED UNION

Signs and symptoms

- Fracture still displays abnormal movement at the fracture line
- There is pain when the fracture is stressed
- There is tenderness over the fracture site
- If delayed union takes long, it becomes **nonunion** with all the above signs and symptoms.
- Because callus has not formed or less callus than expected callus has not been calcified.

DX do an x-ray, shows a thin callus or no callus (The whiter it is the stronger)

Pseudo-arthrosis: False joint formation from nonunion. Is an abnormal joint caused by movement at the fracture site, fails to unite, pain stops and edges smoothens.

FACTORS THAT INFLUENCE/ CAUSE DELAYED UNION

- The initial injury e.g. compound and comminuted
- Infections delay healing as the cellular elements which lay down new bone.
- Inter-position of soft tissue, i.e. soft tissue like muscles, fat skin are forced into the fracture site.

- Poor blood supply could be physiological hence a small haematoma and few Osteogenic cell.
- In adequate mobilization, slight mobilization activates healing.
- Systematic diseases e.g. any tumour anywhere in the body e.g. DM, TB, etc
- Pathological fracture, malignancy or infection there will be delay or destroy the new bone.
- Old age i.e. reduced blood supply
- Destruction of the fracture e.g. a big gap forms in between due to too heavy weight traction.
- Drugs e.g. steroids, cytotoxics

MANAGEMENT PRINCIPLES FOR FRACTURE

- History taking: most fracture originates from physical injury.
- Examine the patient for;
 - ✓ Tenderness i.e. touch gently, abnormal mobility of the limb, deformity, shortening, rotation
 - ✓ Crepitus (move bone fragment over each other and some noise is hard.
 - ✓ Always look and compare with the normal limb (undress the patient).
 - ✓ Feel for the fracture.

RX/MANAGEMENT OF FRACTURE

AIMS

- To reduce displacement of fracture
- To maintain immobility until union occurs
- To maintain and restore function of joints, muscles and tendons so that the limb can function normally until or after recovery
- Treatment of soft injured tissue
- To offer good general nursing care for good union of fracture.

1. First aid RX

- Haemorrhage is arrested
- Fracture is immobilized using any splint
- Pain is relieved with strong/ mild analgesics

2. To reduce displacement

After the fracture there is a degree of displacement at the fractured ends. These ends can be brought together by taking the patient to operating theatre with the broken ends pulled together. It may be done without opening the site of the fracture or by opening it. This is referred as closed or open reduction respectively. It's usually done in O.T.H

3. Maintain immobility (fixation)

After the reduction of displacement, the acquired situ is to be maintained while callus is building. Its achieved by fixing the broken ends together by use of splints, P.O.P, traction externally, plates and pins internally.

4. Maintenance and restoration of function of the limb. Can be achieved by observation of the situation of joints during period of fixation. Early active exercises of the limb and passive exercises at 1st if the pt is not able to do them by himself.

5. General Rx of fracture

Admission

Immobilization

Relief of pain

Investigations

- X-rays
- Blood analysis and urine testing
- Starvation of patient in case general anaesthesia will be used.

preparations

- Preparation of the limb
- Shave and wash the limb
- Theatre team is informed
- Administer pre-medication e.g. atropine 0.6mg (1m)
- The patient is then taken to theatre for either closed/ open reduction.

6. General Nursing care after surgery

Immediate care when the patient is still under general anaesthesia (G.A)

- Observation of vital centers
- Maintenance of clear air way
- General examination/ observation of the condition, pallor of the skin and mucus membrane
- Position of limb according to the type and site of fracture.

- When he gains consciousness the situ is adjusted accordingly.

Diet

- Nourishing diet with adequate calcium, vitamin C and D for quick healing with
- Plenty of fluids orally to assist, among other things digestion because he is always confined to bed.
- Attention should be paid to the general health thus assure fresh air by keeping the windows open.
- Ensure bladder and bowel care
- Daily bed bath and Rx of pressure areas,
- Lift the patient with fractures limbs but do not roll them.
- Chest complications must be avoided by giving additional extra pillows especially in old patients and those with weak chest.
- Anti-biotic can be given if necessary, e.g. when the patient has open fracture.
- Tetanus vaccine is given in case of wounds
- Rehabilitation

Residue shiftiness following immobilisation is inevitable but can be minimized by use of limb in plaster, unless the cast is removed, period of immobilization and reduction is required to restore normal movement and muscle power in the injured part.

Complications of fracture

- Acute circulatory failure leading to shock
- Hypostatic pneumonic especially in elderly pts
- Pulmonary embolism
- Progressive sores
- Fat embolism is due to presence of globules
- Osteomyelitis
- Haemorrhage mainly in compound fracture.
- Delirious tremors especially in alcoholics
- Injury to blood vessels, nerves and joints
- Infection i.e. tetanus and gas gangrene and aerobic septic infection
- Nonunion/ delayed union
- Shortening of the limb
- Compartment syndrome
- Infections due to either open or closed fractures.

TRACTION

Traction refers to the set of mechanisms for straightening broken bones or relieving pressure on the spine and skeletal system.

TRACTION (EXTENSION)

Traction is a force exerted in the long axis of the limb in order to overcome muscles spasms with overriding of bone fragments and consequents and consequent shortening.

Traction may be used to achieve reduction e.g. in fractures of the shaft of the femur; after manipulation, it helps to prevent overlapping as the extended muscles surrounding the bone act as supporting sheath.

Traction is the means by which continuous pull or traction is applied and maintained on the limb or other parts of the body using cords and cuts.

Traction can be:-

1. Fixed traction- secured to the end of Thomas splint.
2. Sliding traction- when a wheel pulley is used and weight is attached to it.

Uses of traction

- To overcome and prevent over-riding of broken ends of bones in case of fractures and to maintain the bones in its correct situ; while healing takes place.
- To correct joint deformities
- To separate joint surfaces and to prevent further spread of disease of the joints eg TB of hip/ knee and osteochondritis.
- To overcome muscle spasms in case of fractures. Efficient traction and immobilization stop muscle pain.

TYPES OF TRACTION

- Skeletal traction
- Skin traction

Skin traction e.g. include;

- a) **Bucks** used for many conditions affecting hip, femur, knee and back. It is generally used for temporarily immobilization and stabilization of

fractured hips or fractures of femoral shaft. It can be unilateral or bilateral.

May also be used to correct knee and hip joint contractures.

- b) **Ressell's** used for fractures of femur or hip
- c) **Bryants (Gallows)** used for fractures of the femur, fractures in small children and stabilization of hip joints in children under 2 years or below 14kgs in weight.
- d) **Pelvic belt (or girdle)** used for sciatica, muscles spasms (low back) and minor fractures of the lower spine.
- e) **Pelvic sling traction** used for pelvic fractures to provide compression for separated pelvic girdle.
- f) **Head halter** used for tissue disorders and degenerative disk disease of the cervical spine. It is not commonly used for unstable fractures of the cervical spine.

SKELETAL TRACTION

It is used in adults. It's obtained by inserting a Steinman's pin through a bone.

Types of skeletal traction

- a) **Overhead arm (90°- 90°)** – Commonly used for immobilization of fractures and dislocations of the upper arm and shoulder.
- b) **Balanced suspension traction**- used for injury or fracture of the femoral shaft of the femur, a acetabulum, hip, tibia or any combination of these.

Common sites for the introduction of Steinman's pin are:-

- a. Lower end of the femur
- b. Head of the tibia
- c. OS- calcus (calcaneum)

The tibia is commonly used. The bone is pierced from outside by a pin or wire with supports on its protruding end. A stir up to which the traction card is attached.

Two methods used are:-

- (1) **KIRSHNER PIN:-** is a narrow steel wire which is not rigid until pulled out by the stirrup. Rotang movements of the stirrup can cause infection; therefore it's less commonly used as Steinman's pin.
- (2) **Steinman's pin:-** it is a rigid stainless steel pin with a sharp point at one point at one side and a square end at the other side. It is driven through the bone and attached to a special stirrup. The stirrup enables the surgeon to alter the tine of the pull without moving the pin. This is important because movement of the pin causes infection.

PREPARATION AND REQUIREMENTS FOR SETTING UP SKELETAL TRACTION (STAINMANS PIN)

The patient is prepared and thorough skin preparation is necessary. On a limb, the whole limb must be prepared, including cutting nails; normal skin preparation is done the day before operation.

Sterile skin preparation is done the morning of operation (wash with anti-septic solution). The patient is then taken to O.T with leg in Thomas formats splints with skin traction applied under G.A.

The operation to insert the Steinman's pin through the bone is performed. A stirrup is then attached to the pin and the patient returned to the ward.

In the ward the following is required to setup the extension traction before the patient regains consciousness.

TROLLEY

Top shelf

Extension cord, 6-8 metal pulleys, brown wool or cotton wool.

Bottom shelf

Knee piece for Thomas splint, foot piece for Thomas splints, strong sling with safety pin, weights as required by the doctor.

Bedside

Balkon bin, over head support, bed blocks, monkey pull.

NURSING CARE OF A PATIENT WITH TRACTION APPLIED.

The traction should be put up during day preferably. The patient is nursed on a fracture board bed and the foot of the bed is raised or elevated at all times.

Do not lift the weights or remove them unless asked to do so by the doctor. They must always be pulling i.e. they may not be resting on the bed or floor and the splints is not resting on the bed. The foot of the bed is raised on bed blocks or bed elevators. Traction must be applied 24 hours of the day.

Sudden cessations of the traction initiate the diseased joint; causes displacement of the fracture and causes severe pain for the patient. The cord must run freely over the pulleys. The pulleys must be kept oiled.

Adequate pillows to the patient in sitting up position. A back rest should not be pulled as it increases tendencies of the patient to strip down causing counter traction.

The body weight is thrown to the sacrum rather than the ischial tuberosity so that there is a definite risk of the bed sores.

Watch the colour of tissues to see that the circulation is satisfactory (gangrene, foot drop and oedema).

In case of skeletal traction, the area where the pin punctures must be kept clean and dry. Tincture of benzoin co is always used to seal the wound.

Do daily check of the screws on either side of the pin to see that there is no free movement.

Keep a cork on the sharp point of the pin.

See that the patient's bed is provided with an over head lifting pole and chain to lift off or get up to help himself.

- When giving a bed pan, ask the patient to lift himself or get another nurse.
- Change the bottom sheet from top to bottom.
- The patient will be able to wash the upper part of the body himself.
- Assist him to wash his back and the legs daily. Keep both the legs warm.
- Special care about bed sores, pressure areas, especially around the ring of the splint.

- The patient should have a full diet (balanced diet), extra milk and vitamins.
- The patient should be taught muscle exercise to be done daily and for more the joints e.g. knee and ankle joints. The foot should be supported to prevent foot drop. (tendon of Achilles' heel and malleolis) to avoid pressure sores. Exercises of toes and ankles is called **paudriceps drill** i.e. contraction and relaxation of the muscles is done by nurse or physiotherapist.

Use of overhead support which helps to develop the arm muscles and facilitates the use of crutches later.

The patient should use the correct normal leg through exercises as it will bear most of the weight when on crutches.

Movement complications – loss of muscle tone

- Stiffening of joint
- Urine stasis
- Decalcification
- Constipation

SKIN TRACTION

It is commonly used in young children and old people.

The pull is exerted on the skin by means of elastoplasts. Steinman's pin cannot be fixed in children because their bones are still growing and in old people, healing is slow so it is not necessary. That is why skin traction is used instead of skeletal traction.

Skin traction may be:-

- a) Fixed skin traction
- b) Sliding skin traction

Requirements for skin traction

Top shelf: shaving tray, receiver containing:- 1 dressing forceps pair and dissecting forceps, bowel containing swabs, extension plaster, scissors, crep bandage, tape measure and skin pencil.

Bottom shelf: Receiver for used swabs

Pulley, spreader, cord, brown wool or sorbo pads, tincture of benzoin co, dressing mackintosh and towel.

A small blanket to cover the limb balkon bin, bed blocks, fracture boards.

Methods of application

- See general rules of nursing
- Inspect the limb for sores, if satisfactory; put a mackintosh under the limb.
- Shave the part where extension is to be applied.
- Apply tincture of benzoin co, on the limb. The advantage of tincture of benzoin co is to lessen the irritating effect that strapping should be long enough to overlap the spreader by 10cm at the end. This will prevent the extension from sticking to the ankle. The central hole in the spreader carries the extension cord.

Cut the extension strap long enough to fit at sides of the limb for the purpose required place the wooden spreads in the middle. One nurse stead the limb in the required traction gently and firmly, and the other nurse applies strapping smoothly since wrinkles can cause sores. The strap may overlap at the back but bony points i.e. malleoli arcerios border of the tibia and patella should be avoided.

Apply crepe bandage over the spreader leaving the malleolus free. Put a soft padding on the ankles to prevent friction from the strapping.

FIXED SKIN TRACTION

A Thomas splint is prepared with flannel bandages and put on the leg. If the traction cord is passed over the splint and tightened, the ring of the splint is passed into the groin and the foot is drawn towards the end of the splint and traction is exerted on the leg.

Pressure on the groin makes the patient uncomfortable. This can be eliminated by tying the end of the splint to the foot of the bed which is raised on blocks.

The tension of the leg remains the same but the patient's weight tends to move away from the ring of the splint, hence pressure is relieved.

Fixed skin traction is used to:-

- To treat fracture of the femur in elderly patients and children.
- To strengthen an arthritic knee

- As a means of immobilizing a leg before a patient is transported to another hospital.

SLIDDING SKIN TRACTION

A splint is not necessary. A pulley is fixed to the front of the bed. The traction cord is passed over the wheel and weight is attached to it.

The end of the bed should be raised on blocks as in most forms of fractures. If the patient sits up in bed, the weight is drawn up the bed because the cord can move over the pulleys and if he lies down, the weight sinks down.

In both sliding and fixed skin traction fractured, the foot is unsupported, so continuous extension should be done to prevent foot drop.

A bed cradle is used to prevent hindrance of movements by bed clothes if weight is used, it must hang freely without touching the bed.

GALLOWS TRACTION

This is commonly used in treatment of fracture femur in small children below 5 years. The requirements and application is the same as for skin traction, except that the extension is applied on both limbs which are raised and tied on an overhead bar. The foot end of the bed is not raised.

When nursing a patient on gallows traction, it's very important to note that buttocks do not rest on the bed.

PULP TRACTION

This is commonly used in fractures of the fingers and toes. It involves passing the structure through the fingers and it's fixed on to a piece of plaster.

ORTHOPAEDIC SPLINTS

Reasons for splinting

- To immobilize the part after injury in order to repair the damaged tissue or to reinforce rest e.g. in TB of the joints and other pyogenic infections.
- To prevent deformities where other is muscle imbalance e.g. poliomyelitis.
- To correct deformities, this is done by holding the part in an over corrected situ e.g. Denis Brown's splint for congenital – equino **various** (Talipes- Equino varus) club feet.

- To protect a joint or limb in a healing stage e.g. weaning a caliper to keep the knee straight when quadriceps muscles are unable to control the joint.
- To overcome muscle spasms i.e. the continual uncontrolled contraction of the muscles due to pain or any other irritation.

In the application of traction, splints are made for individuals. The splints must fulfill the purpose for which it is applied and the fitting must be perfect.

Care must be taken to prevent sores by warning the patient to complain where there is pressure, burning, swelling and pain.

Areas liable to pressure should be oiled, rubbed and left dry at least 4 hours. Never attempt to relieve pressure by putting a pad directly over the point of pressure. When immobilizing the joint, the other joints should be freely exercised to maintain circulation, thereby preventing venous stasis and oedema and also prevent a trophy of muscles.

Splints commonly used

- Plaster of Paris (P.O.P) splint
- Thomas knee bed splint
- Walking caliper splint
- Cock-up caliper splint
- Shoulder abduction splint
- Abduction frame splint.

P.O.P

Uses:

- To immobilize fracture of the bones
- To immobilize inflamed and infected joints
- To correct joint deformity
- To protect wound.

Observation following the application of P.O.P

Important points

- Extremities i.e. fingers and toes, the nails must be clean and no plaster left on it.

The fingers and toes should be warm. Report stat if cold and blue in colour.

The patient should be able to move **the fingers and toes freely and the sensation should be tested.**

To test that the circulation is satisfactory, press the finger or toe nail of which is in the plaster, when the circulation is normal, the colour should return stat as the pressure is released. If the colour does not return, or return slowly it should be reported.

In certain cases doctors may ask for pulse to be taken an injured arm, the volume as well as the rate should then be noted

- Pain in the limb which is in the plaster and splint must always be reported to the doctor.
- Swelling, swelling of the extremities occurs when the plaster is applied following accidents and operations. It may be relieved by raising the limb, raising the foot of the bed in case of a limb or leg.

A nurse must raise the limb and report the swelling to the doctor.

A plaster **staw- shears** and a knife must be made available stat in case the plaster needs bivalring (removing). The foot of the bed must be raised in all injuries of the lower limb and the hand raised on a pillow, a collar or sling in all upper limb injuries.

Requirements for application of P.O.P

Trolley

Top shelf

- A basin of warm water
- A tray of plaster bandages
- Stockinet
- Tape measure
- Skin pencil
- Scissors and cotton wool

Bottom shelf

- 2 long mackintosh

- 1 mackintosh apron
- Plaster
- Shears
- Rolled bandage
- Dressing pencil

At bed side

- Water in a basin
- Flannel
- Towel and soap

To assist drying in the correct position

Plaster sets in a few minutes but takes hours to dry thoroughly.

- Allow nothing hard to press against the plaster e.g. bed cradle
- Leave it exposed to the area supported if necessary
- Keep the rest of the patient warm
- For leg in plaster, a bed cradle should be used to keep the bed clothes off it.
- A leg in plaster should be elevated on one or two pillows besides having the foot of the bed elevated.

Nursing of patient in P.O.P splint

- See that the patient lies comfortable in his plaster at all times on a firm bed with fracture boards except for upper limb fractures.
- Keep the bed free from pieces of plaster.
- When a sling is used, the nurse must ensure that the auxiliary area is well padded to prevent skin maceration associated with direct skin-to-skin contact.
- Movement of the fingers should be encouraged to enhance the pumping action of vascular and soft tissue structures to decrease oedema.
- The nurse should also encourage the patient to actively move non-immobilized joints of the upper extremity to prevent stiffness and contractures.
- The patients with body jacket cast should be assessed for the development of cast syndrome, due to too tight cast.
- The nurse should reposition the patient for every after 2-3 hours to promote drying and the cast and relieve pressure and discomfort.
- A fracture bed pan may be used to provide comfort and ease movement of getting on and off the bed pan.

- Daily bed bath. In some cases the patient may be able to bath himself.
- Special attention must be given to pressure areas and care taken that the edges of the plaster do not cause sores.
- DDT powder may be sprinkled inside the plaster to prevent lice or bed bugs.
- There may be itching inside the plaster. The patient should be prevented from scratching the wound and plaster with sharp objects like knitting needles. A little talcum powder should be sprinkled inside down the inside of the plaster.
- Prevent the plaster from becoming wet or soiled and teach the patient not to soil or damage it.
- Report pain, swelling or poor circulation at once.
- Encourage the circulation in the limb by movement of the fingers and toes.
- The plaster must not be cut except on instruction of the doctor, except in case of emergency when the doctor is not available.
- Give the patient a pamphlet on a plaster of Paris case if one is available. "Instructions for patients in plaster" and explain this to the patient.

VERY IMPORTANT INSTRUCTIONS TO PATIENT

If the arm is in a plaster of Paris.

- Move your shoulder and finger many times during the day.
- Keep the plaster dry and away from water
- Carry the arm in the sling during the 1st week.

If the leg is in a plaster of Paris

- Do not bear weight on it unless the cast has a rubber bottom
- Move the toes many times during the day.
- Raise your foot on the stool when sitting especially during the 1st week.
NB: if your fingers or toes becomes swollen or cannot be felt go to the nearest hospital or health unit.

Instructions after the plaster has been removed

If arm was broken

- Move fingers, wrist, elbow and shoulder many times during the day (everyday)
- Use arm and hand more and more everyday

If leg was broken

- Move toes, ankles, knee and hip many times everyday
- If foot swells, raise it on a stool when sitting
- Walk more and more every day.

Patient and family teaching or advice

Do not

- Get plaster cast wet
- Remove any padding
- Insert any foreign object inside cast
- Bear weight on a new cast for 48 hours (not all casts are made for weight bearing)
- Cover cast with plastic for prolonged periods.

Do the following

- Apply ice directly over fracture site for first 24 hours (avoid getting cast wet by keeping ice in plastic bag protecting cast with cloth).
- Dry cast thoroughly after exposure to water
- Blot dry with towel
- Use hair dryer on the setting until cast is thorough dry
- Elevate extremity above level of the heart for the first 48 hours
- Move joints above and below cast regularly
- Report signs of possible problems to the health care provider eg
- Increasing pain
- Swelling associated with pain and discoloration of toes or fingers
- Pain during movement
- Burning or tingling under cast
- Sores or foul odor under the cast
- Keep appointment to have fracture and cast checked.

THOMA'S BED SPLINTS

The splint is made up of 2 rigid bars joined above to a ring of the same material. These bars meet below at a w-shaped junction to extensions are fixed.

The ring should be well padded when felt and covered with soft leather. The ring is oval in shape and the outside is at a slightly higher level than the inner site. The back is made to fit the back of the thigh.

The advantage of this splint is that the patient can be lifted with the limb supported and can be raised from the bed by means of counter rails and pulleys going to an overhead beam without disturbances.

The ring must be fit. Too larger the ring causes pressure on the inner side of the groin. The knee in Thomas split must be kept slightly flexed and the upper end of the tibia supported by pad of wool to prevent subluxation.

Care must be taken that the distal sling leaves the heel free and does not press on the tendon archillis.

This would cause a sore. The iron bars should not press on the lateral poplited nerve where it winds around the head of the tibia.

To measure the Tomas knee bed splint

The patient lies on a firm bed with the foot in dorsal flexion and the leg is measured as follows:-

- Obliquely around the thigh at the level of adductor tendon. From the tendon to the heel, allow 20-30cm for extension irons.
- When putting a limb in Thomas splint, 2 people are required ie one holds the limb firmly while the other gently slides on the Thomas splints.
- Cords and weights are then fixed as required by the doctor.

PROSTHESIS

It's any artificial device that is attached to the body a substitute for a missing or non functional part.

Prosthesis include artificial limbs, hearing aids and cochlear implants, dentures etc

TYPES OF PROSTHESIS

- Cup prosthesis
- Austeen moores prosthesis
- **Mcknee farr total** hip prosthesis
- Charnely low friction prosthesis
- Breast prosthesis

Cup prosthesis (Cup Anthroplasty)

(diagram)

The **vitallum** cup is put in between the head and acetabulum femoral

Austeen moores prosthesis

(diagram)

Metal head with a long stem passing through the medullary canal

Mcknee Farr total Hip replacement

The femoral head is mounted on a curved metal stem for which a cavity reamed out of the femur. Cement is put into the cavity until it sets in

(diagram)

Charnel low friction anthroplasty

(diagram) The cement is applied on a curved neck of the femoral head which is mounted on the metal stem.

WOUNDS

Is an injury that breaks the integrity skin or body tissues,, often which may be associated with disruption of structure and function .They including cuts, scratches?

Wound is simply a disruption of any tissues – soft tissues or bone or internal organs

TYPES OF WOUNDS

1. OPEN WOUNDS

a. Incised wounds

These wounds have clean cut gapping edges.

These wounds are inflicted by cutting and moving on a plane parallel to the skin surface edge by the use of the knife, razorblades or surgical blades. The edges of such wounds bleed freely and there is loss of tissue eg operated wounds.

b. lacerated wounds

These wounds are produced by the blow with a blunt instrument such as a stick or hammer by a punch or a fall. The injury may also result from striking a blunt object as seen in RTA.

The edges of the wound are rugged, irregular and there is loss of tissue and brushing in the neighboring tissue. Bleeding is not too severe in the depth of the wound.

Extensive laceration causes damage to nerves and blood vessels causing ischemia. These wounds are prone to poor healing and are frequently contaminated and even much foreign body materials eg, small stones and grass may enter the wound predisposing it to infections.

c. punctured/stabbed

These are wounds produced by moving a plane perpendicular to the skin and penetrating. These wounds are also caused by sharp knives, scissors, nails, arrows, needles.

Stabbed wounds have clean cut skin edges are usually broader. There is very little internal bleeding however there is considerable internal bleeding or involvement of deep internal organs and blood vessels. Contamination is carried out into the tissues by aerobic micro-organisms such as clostridium tetani for tetanus and Clostridium welchii causes gas gangrene.

d. poisoned wounds

These may be caused by poisonous objects and animals e.g. snake bites [pitmen] an insect bite e.g. bees and scorpion. The area is always red and swollen and the point has a discomfort.

e. Burns and scalds wounds

These are wounds caused by the excessive heat, boiling water, strong acids and electricity; they can be superficial or deep. Structures like skin, old vessels, nerves, tissues, muscles and bones are damaged usually involvement of deeper extensive structures is dangerous.

f. crush injury

Is the one where a part of the body is being squeezed / compressed between two high forces or pressure system? It causes excessive bruising, laceration compartment syndrome, crush syndrome, fractures, hemorrhage etc with extensive tissue destruction and devitalisation.

Renal failure, hypovolaemic shock and sepsis are the most dreaded problems in crush injuries

g. Degloving injuries

It occurs due to shearing force between tissue planes as traction –avulsion injury. It usually occurs between subcutaneous tissue and deep fascia or between muscles and bones. It can be localized or circumferential

It is commonly observed in machinery accident or major road traffic accident. It needs examination under general anaesthesia, wound excision, microflap surgeries and skin grafting with proper asepsis and blood transfusion as there is significant blood loss in these injuries.

CLOSED WOUNDS

a. Bruise or contusion

It is a superficial injury to the underlying tissues but the skin remains intact by swelling, pain and discomfort of the skin are due to extravasation of blood into the tissue. If there is loss of tissue, subcutaneous tissue bleeding is more severe such that the area turns black.

This is commonly seen around the eyes and scrotum.

In general female and children bruise more easily seen. In these wounds blood vessels are injured or torn blood leaks into the tissue but there is no break in the skin.

b. Hematoma

Is a collection of clotted blood following an injury associated with the swelling and the pain. The haematoma may be absorbed naturally or removed surgically by aspiration or may become infected forming an abscess and these requires incision and drainage.

c. Sprain

It is a characteristic injury to the joints which involves tearing of ligaments or tendons around the joints accompanied by excessive exudation. There is severe pain, swelling loss of function, commonly found in the ankle joint which becomes stiff. It is usually RX by application and analgesics can also be given to relieve the pain.

CLASSIFICATION OF WOUNDS

CLEAN WOUNDS

These are wounds made from theatre where we expect a septic techniques to be followed .There is no inflammation. The wound is not infected however this may happen due to poor techniques eg breast biopsy, mitral valve.

CLEAN CONTAMINATED WOUNDS

There is no sign of infection. There is a minor break in sterile techniques eg radical prostatectomy total abdominal hysterectomy.

CONTAMINATED WOUNDS

There is a major break in a septic technique .There are signs of infections .It is contaminated from GIT .Open fresh traumatic wound e.g. appendicectomy from perforated bowel.

DIRTY INFECTED WOUNDS

It is an old traumatic with tissue necrosis .There is a pre-existing infection .The viscera is perforated and there is a cute inflammation e.g. incision and drainage of abscess.

WOUND HEALING

This is the process of repair that follows injury to the skin and other soft tissues.

HEALING, This interaction of a complex cascade of cellular events that generates resurfacing, reconstitution and restoration of the tensile strength of injury tissue.

METHODS OF WOUND HEALING

Wound healing is divided into two

- a. Healing by the first intention [primary intention]
- b. Healing by secondary intention

BY PRIMARY INTENTIONS

It occurs typically in operated wounds or incised wounds with edges being brought together by sutures or clips

It also occurs in accidental wounds which have defined edges with no infection. As soon as the edges are brought together, granulation takes place in the tissues affected, and then finally covers the top.

BY SECONDARY INTENSION

This is when the cavity in the tissue becomes filled by granulation tissue. It occurs in the following places.

In a wound left unsutured for a period of time

In abscess cavities after drainage of pus

In deep burns and deep ulcers

PHASES\STAGES OF WOUND HEALING

There are majorly three phases of wounds healing mainly;

♣ Inflammatory phase

Here a clot forms and cells of inflammation debride the injury tissue

♣ Proliferative phase

Epithelialization, fibroplasias and angiogenesis occur. Also the wound begins to contract.

♣ The maturation phase

Collagen forms tight cross-links to other collagen and with protein molecules increasing the tensile strength of a scar.

1. Inflammatory phase

a. immediate

The body quickly responds to any disruption of the skin surface

Early events of wound healing are characterized by a vascular and cellular response to injury

b. hemostasis

Vasoconstriction (blood vessel constrict to control bleeding at the site)

Platelet plug formation (platelet aggregation) platelet form a plug to stop bleeding and clotting starts.

Thromboplastin makes a clot (fibrinogen is changed to fibrin (soluble))

c. inflammation

Vasodilation – blood vessels dilate to supply more blood in the area

Neutrophils enter the wound to fight infection and attract macrophages

Phagocytosis – macrophages breakdown necrotic debris and activate fibroblast response's

2. Proliferative phase

The inflammatory phases that are about 24hours and leads to proliferative phase .Epidermal cells undergo mitotic division and cells begin to migrate to the area.

Epithelialization, fibroplasia and angiogenesis occur.

Also granulation forms and wounds begin to contract.

Two days to three weeks

Granulation

Granulation tissue consists of capillary loops supported in this developing collagen matrix.

Granulation lasts 72hours and leads to fibroblastic phase.

a) Fibroblasts [synthesis lay a bed of collagen]

b) Fills defects and produces new capillaries.

Contraction

wound edges pull together to reduce the defect.

Epithelialization ;

Ø Crosses moist surfaces

Ø Cells travel about 3cm from point of origin in all direction.

NOTE: Skin grafting can be done where epithelium growth is low.

REMODELING (MATURATION) PHASE

Ø Three weeks to 2 years.

Ø New collagen forms which increases tensile strength to wounds scar tissue is only 80% as strong as original tissue.

During maturation fibroblast leave the wound and collagen is remodeled into more organized matrix.

Ø The patient's age, racial differences, type of wound on the body location and duration of inflammatory phase affect the amount collagen to be deposited in an area.

SCAR FORMATION

The process of wound healing is essentially similar in all body tissues and is relatively independent of the male of injury; however slight variation in the relative contribution of the different elements to the overall result may occur.

The final product of a healing process is a scar. This is relatively a vascular and a cellular mass of collagen which serves to restore tissue continuity and function.

Delays in the healing process because the prolonged presence of wounds while abnormalities of the healing process to the abnormal scar formation.

FACTORS AFFECTING WOUND HEALING

SYSTEMIC FACTORS THAT AFFECT WOUND HEALING

- **Drugs**

- (a) steroids

- Inhibits macrophage function, decrease inflammatory response.
 - inhibit unstable collagen bonds.
 - Decrease leukocyte bacteria activities.
 - Leads to t and b-cells dysfunction (inhibit b and t-cell mediated immunity).

- (b) Anti cancer drugs

Decreased WBCS, decrease fibroblast proliferation, decreased wound contraction, decreased protein synthesis.

- (c) NSAIDS (non steroidal anti- inflammatory drugs)

Decreased collagen synthesis by 45% even at normal levels

- **Vitamins (supra-normal levels of vitamins are not defined)**

- a. vitamin A

- Increases wound strength.
 - Capable of reversing inhibitory effects of steroids; vitamin E does not increase wound healing in absences of steroids.

- b. Vitamin c

Absences scurvy –causes capillary fragility and wound healing problems.

- c. Vitamin E

Decrease collagen synthesis, inhibits wound healing and decreases tensile strength.

- **Trace minerals.**

Zinc;-it is a co-factor for collagen synthesis.

Copper;-it is required for collagen synthesis.

- **Nutritional status.**

Catabolic state inhibits wound healing.

Protein depletion prolongs inflammatory phase, impairs fibroplasia.

Carbohydrates are energy sources for WBCs.

- **Associated illnesses /immunity**

- Diabetes –decreases collagen synthesis.
- Cancer, infections, peripheral vascular disease
- COPD (chronic obstructive pulmonary disease) hypoxia, obesity, smoking may prolong wound healing.

- **PATIENTS AGE**

Associated to the onset healing.

Associated with decreased tensile strength and wound closer rate.

- **EXERCISE**

Exercises help to improve the blood supply to the area.

LOCAL FACTORS

- **Wound infection(localized infection)**

Infection by different microbes may delay wound healing because presences of pus prolongs inflammatory phase and inhibits epithelializations

- **Foreign body**

Clot, necrotic debris, dirt, suture, glass etc. prolongs inflammatory phase and inhibits epithelialization.

- **Wound hydration**

Moist wound healing environment increases the rate of re-epithelialization.

- **TEMPERATURE**

Environment temperature greater than 30⁰C increases tensile strength.

- **Previous radiation therapy**

Changes in pressure may lead to ischemia of the wound

WOUND ASSESSMENTS /ASSEESING A WOUND

Assessment of the wound is the only one part of holistic assessment and should never be carried out in isolation. A full history is taken to identify any systemic patient related factors which may influence healing e.g. mal-nutrition.

WOUND characteristics

➤ CAUSES OF THE WOUND

The cause may impact in further assessment and care planning. The cause will help determine the risk of complications e.g. if a knife causing a wound is contaminated with soil, then the risk of infection is much higher than it was a clean knife from a dish washer.

➤ LOCATION

Initially ,wound location is considered in relation to its proximity to vial structure as life- saving care takes priority .Location may provide clues to the cause of the wound.

The position of the wound may also impact on the dressing choice.eg wounds of the joints should be managed by putting in mind room for mobility and joint function.

➤ CONDITION OF THE SURROUNDING SKIN

The condition of the surrounding wound may also indicate the patients general health or the presences of problems e.g. eczema. The impacts on the dressing choice e.g. when the surrounding is fragile, it may not be possible to use adhesive dressings.

➤ SIZE

The size of the wound is important as it may indicate the rate of healing. The size should be measured and recorded.

➤ **TYPE OF TISSUE PRESENT IN THE WOUND**

In addition to the size of the wound, it is important to record the type of tissue visible in the wound bed.

Necrotic tissue is black and hard or leathery, however as it softens, it may become grey or brown.

Slough –is usually soft and stringy and may vary in colour from creamy yellow through brownish grey as the wound progresses.

NB; Despite removal of thick slough, a thin layer of creamy colour red slough remains closely adherent to the wound surface almost until the process is complete.

Granulation tissue – it contains many new capillaries and it bright red, moist and uneven in texture. Over granulation occurs when it grows above the surrounding tissue.

➤ **EXUDATE**

All wounds produce protein –rich in exudate throughout the healing process. Exudate bathes the wound, keeping it moist and supplying the substances needed for the healing process.

In acute wounds, the level of exudate decreases as the healing processes however, in chronic wounds exudate may persist or increase.

FACTORS THAT DELAY WOUND HEALING

➤ **Stress**

- Psychological factors affects patient / clients wound healing because stress and anxiety result in the production of glucocorticoids hormones e.g. cortisol
- These are anti inflammatory and may inhibit fibroblast collagen synthesis and granulation. They may also reduce blood supply
- So relieve stress, anxiety including ensuring adequate sleep and rest

➤ **Smoking**

- The adverse effects of smoking tobacco on wound healing include: local hypoxia and altered platelet aggregation which increases the risk of thrombus (clot formation)

➤ Systemic diseases

- Clotting disorders e.g. haemophilia disrupt clotting and delay the arrest of bleeding
- Cardiovascular diseases eg hypertension, heart diseases, lead to poor circulation hence poor perfusion with oxygen and reduced supply of nutrients
- Poor venous return lead to venous congestion and collection of cellular debris within a wound
- Cancer and its treatment with chemotherapy ie chemotherapy reduces the body's ability to heal (reduces immunity)
- Chemotherapy adversely affects the inflammatory response and impedes cells proliferation

➤ Diabetes mellitus

- This is associated with arterial diseases which impairs healing. Diabetes mellitus also damages peripheral nerves (neuropathy) and people may be unaware of tissue damage.
- Impaired mobility and sensation e.g. impaired mobility such as aftershock leads to reduced circulation and associated problems

➤ Medications

- Cancer chemotherapy e.g. vincristine, methotrexate
- Non steroid anti inflammatory drugs e.g. ibuprofen affect inflammatory response
- Corticosteroids e.g. prednisolone reduced the inflammatory and immune response, reduced level of immunity increase the risk of infection
- Anticoagulants e.g. warfarin or long term use of aspirin delay platelet aggregation, vasodilation and attraction of cells. They affects the inflammatory response and healing is delayed

➤ Dehydration

- Dehydrated cells are not able to function efficiently and all replication will be impaired. All cells need moist environment for survival and movement

- Nutritional status

- Many individual nutrient are vital in wound healing and a deficiency in any delay wound healing

➤ Age

- The skin of older people often thins and becomes more vulnerable to damage. When trauma occurs healing may be delayed because of slower cell turn over reduced collagen synthesis and S

Complications of wound healing

a. local

- cosmetic disfigurement : this affects ones outlook and confidence
- contractures: these are common in wounds around the joints and it limits movement and function of the joint ,
- adhesions: these can cause intestinal obstruction, blockages in luminal areas
- Keloid: these are ugly scars that may result. They may result also from infection
- painful scars (nueromas):for example dysperonia, herpes zoster scars
- Deformity: this changes ones outlook and it may result from the time of injury.
- Malignancies usually develop from chronic wounds that stay for a longer period of the time
- Haematoma
- Dehiscence (separation in layers of incision wounds)
- Evisceration (protrusion of the body organs from a wound)

b. Systemic

- Renal failure: this may result from deposition of substances which are inactive
- It may also result from hypotension due to excessive bleeding
- Infection: due to poor aseptic technique and poor nursing care.
- Incisional hernias: protrusion of an organ through a pouch
- Fistulas (an abnormal communication two epithelial surfaces.

ULCERS

AN ulcer is a break in the continuity of the covering epithelium either skin Or mucous membrane due to molecular death.

Classification of ulcers

I. Clinical Classification

- Spreading ulcers: here the is inflamed and oedematous
- Healing ulcers: edge is slopping with healthy pink/ red granulation tissue with serous discharge.
- Callous ulcer: floor contains pale unhealthy tissue with indurated edge / base. It lasts for many months to years. Ulcers do not show any tendency to heal. It is due to callous attitude of the patient

2. Pathological classification

a. Specific ulcers

- Tuberculous ulcers
- Syphilitic ulcer
- Actinomycosis ulcers
- meleneys ulcers

b. Malignant ulcers

- Carcinomatous ulcer
- Rodent ulcers
- Melanotic ulcers

c. Non specific ulcers

- Traumatic ulcers: which may be mechanical, physical or chemical –common

- Venous ulcers: gravitational ulcers , post phlebitic ulcer
- Trophic ulcers/pressure sores
- Pyogenic ulcers :infective ulcers
- Tropical ulcers; it occurs in tropical countries. It is callous type of ulcer
- Ulcers due to chilblains and frostbite (cryopathic ulcers)
- Martorells hypertensive ulcers
- Bazin ulcers
- Diabetic ulcers
- Ulcers due to leukemia, polycythemia, jaundice, collagen diseases lymphoedema
- Cortisol ulcers are due to long time application of cortisol (steroid) creams to certain skin diseases. These ulcers are callous ulcers last for long time and require excision and grafting

Investigation

- Study of discharge; culture and sensitivity
- AFB study, cytology
- Edge biopsy: biopsy is taken from the edge because edge contains multiplying cells. Usually two biopsies are taken. Biopsy taken from the centre may be inadequate because of central necrosis
- X-ray of the part to look periostitis / osteomyelitis
- FNAC of the lymph nodes
- Chest x-ray in suspected cases of TB

TRAUMATIC ULCERS

- Such ulcers occur due to trauma. It may be mechanical- dental ulcer along the margin of the tongue due to tooth injury: physical like by electric burn: chemical like by alkali injury
- Such ulcers is acute superficial painful and tender. Secondary infection or poor blood supply of the area makes it chronic and deep.
- Footballers ulcer is a traumatic ulcer occurring over the shin of the males due to direct knocks on the shin
- Traumatic ulcer can occur anywhere in the body due to trauma.

- Trauma causes infections, necrosis fasciitis, and crush injury, endarteritis of the skin leading into formation of large or deep non healing ulcer.
- Treatment depends on size and extent of ulcer. Regular dressing and later skin grafting is done

TROPHIC ULCER (PRESSURE SORE/ DECUBTUS ULCER)

- Pressure is tissue necrosis and ulceration due to prolonged pressure.
- Blood flow to skin stops once external pressure becomes more than 30mmHg (more than capillary occlusive pressure) and this causes hypoxia, necrosis and ulceration. It is more prominent between bony prominence and external surface.

It is due to:

- Impaired nutrition
- Defective blood supply
- neurological deficit

Sites

- over the ischial tuberosity
- sacrum
- in the heel
- in relation to heads of metatarsals
- buttocks
- over the shoulder
- Occiput.
- Due to the presence of neurological deficit, trophic ulcer is also called as neurogenic ulcer/ neuropathic ulcers.
- Initially it begins as callosity due to repeated trauma and pressure, under which supuration occurs and gives way through a central hole which extends down into the deeper plane up to the underlying bone as perforating ulcer (penetrating ulcer)

NB. Bed sores are trophic ulcers

Factors causing pressure sore

- Normal stimulus to relieve the pressure is absent in an anaesthetized patient
- Nutritional deficiencies worsen the necrosis.
- Inadequate padding over the bony prominences in malnourished patients
- Urinary incontinences in paraplegia patient causes skin soiling-maceration – infection necrosis

Neurological causes

- Diabetic neuropathy
- Peripheral neuritis
- Spinal bifida
- Leprosy
- Spinal injury
- Paraplegia
- Peripheral nerve injury

Investigations

- Study of the discharge
- Biopsy from the edge
- X-ray of the part and x-ray of the spine

Treatment

- Treat the cause
- Nutritional supplementation
- Rest the patient
- Slough excision
- Regular dressing of the ulcer
- Vacuum assisted closure (VAC) it is creation of intermittent negative pressure to promote formation of healthy granulation tissue.
- Negative pressure reduces tissue oedema, clears the interstitial fluid and improves the perfusion, increases the cell proliferation and so promotes the

healing. A perforated drain is kept over the foam dressing covered over the pressure sore.

- It is sealed with a transparent adhesive sheet. Drain is connected to required vacuum apparatus.
- Once the ulcer granulate well, flap cover or skin grafting is done

ULCER DUE TO CHILBLAINS

- It is due exposure to intense cold causing blisters and ulceration of the feet.
- These ulcers are superficial
- It is due to excessive Cutaneous arteriolar constriction
- The condition is also called as **perniosis**.

ULCER DUE TO FROSTBITE

- It is due to exposure of part to wet cold below the freezing point (cold wind)
- There is arteriolar spasms, denaturation of proteins and cell destruction
- It leads to gangrene of the part
- Ulcers here are always deep

MARTORELL'S ULCER

- It is seen in hypertensive patients often with atherosclerosis.
- It is seen in calf. Often it is bilateral and painful.
- Necrosis of calf skin occurs with sloughing away and formation of deep, punched out ulcers extending into the deep fascia.
- There is obliteration of the arterioles of the calf skin
- All peripheral pulses are present
- It takes months to heal

Treatment: once ulcer granulates well, skin grafting is done with appropriate nursing care.

ARTERIAL / ISCHAEMIC ULCER

- It is common in toes, feet or legs: often can occur in upper limb digits. It is due to poor blood supply following blockages of the digital or medium sized arteries.
- Atherosclerosis and TAO (thromboangiitis obliterans) are common causes in lower limb.
- Cervical rib, and vasculitis are common causes in upper limb.
- Ulcer initially occurs after trauma soon becomes nonhealing, spreading with scanty granulation tissue.
- Ulcer is very painful tender and often hyperaesthetic. Digits are always gangrenous. Other features of ischaemia are obvious in the adjacent areas. They are: pallor, dry skin, brittle nail, patchy ulceration and loss of hair.
- Ulcer is usually deep, destructs the deep fascia, exposes tendons, muscles and underlying bone. Dead tendons look pale /greenish with pus over it.
- Treatment is done accordingly – drugs like vasodilator, arterial surgery may be needed. Investigations are also performed eg arterial Doppler, angiogram, lipid profile and blood sugar are done.

BAIRNSDALE ULCER

- It is a chronic, irregular, undermined ulcer due to *mycobacterium ulcerans* infection.
- Deep severe form with extensive dermal necrosis is called as *Buruli ulcer*
- *Treatment*
- Discharge study will show acid fast bacilli.
- Antituberculous drugs resolve the ulcer usually. Skin grafting may be required later.

CARCINOMATOUS ULCER (EPITHELIUM SQUAMOUS CELL CARCINOMA)

- It arises from prickle cell layer of the skin. It may initially begin as nodules or ulcer but later forms an ulcerative lesion with a rolled out edge. Floor contains necrotic content, unhealthy (tumour) granulation tissue and blood
- Ulcer bleeds on touch and is vascular and friable. Induration is felt at the base and the edge. It is usually circular and irregular in shape. Initially the ulcer is mobile but become

nonmobile once it infiltrate into deeper tissues the typical foul smell is due to necrotic material, infection and release of polymids from the tumor cell.

- Hard discrete regional lymph nodes are often palpable, ulcer and lymph nodes but becomes painful and tender once there is deeper infiltration or secondary infection
- Management
- Investigation edge bopsy, FNAC, of regional lymph nodes
- Treatment is with wide local excision with skin grafting and regional lymph node block dissection.

MAJOLINS

- It is slow growing locally malignant lesion- Avery well differentiated squamous cell carcinoma occurring in an unstable scar of long duration
- It is commonly seen in chronic venous ulcer scar. Often it is observed in burns scar and scar of previous snake bite
- Edge is everted or may not be. It is painless as the scar does not contain nerve fibrils. It does not spread into lymphatics as the scar is devoid of lymphatics. Indurations felt at the edge and the base. There is marked fibrosis also. Once the lesion spreads into adjacent normal skin it can spread into regional lymph nodes and behaves like squamous cell carcinoma
- Managed by edge biopsy and wide local excision and grafting.

RODENT ULCER

- It is ulcerative form of basal cell carcinoma which is common in face.
- Ulcer shows central area of dry scab with peripheral raised active and pearly white edge. Often floor is pigmented. It erodes into deeper plane like soft tissues, cartilage and bones hence the name rodent.
- As lymphatic are blocked early in the disease by large tumor cells, it does not spread to regional lymph nodes. Blood spread is absent, it is only locally malignant, it is common in the face, it rarely occurs over tibia, external genitalia, mucocutaneous junction. It does not occur in mucosa.

Management: edge biopsy, CT scan of the par tot see the depth, wide excision.

MELANOTIC ULCER

- It is ulcerative form of melanoma. It can occur in the skin as in a pre-existing mole. Ulcer is pigmented often with a halo around.
- Ulcer is rapidly growing, often with satellite nodule and in-transit' it is very lesion. It is very aggressive skin tumour arising from melanocytes.
- It spreads rapidly to regional lymph nodes which are pigmented. Blood spread to liver, brain, lungs, and bones is common. It can occur in mucosa, genitalia and the eye. It is a systemic malignant disease.

Management:

- Excision biopsy (usually incision biopsy is not done), FNAC lymph nodes, us scan abdomen, treatment is wide local excision, regional node block dissection, chemotherapy.

DIABETIC ULCERS

These are ulcers that occur in diabetic patients due diabetes mellitus

Causes

- Increased glucose in the tissue precipitates infection
- Diabetic microangiopathy which affects microcirculation
- Increased glycosylated tissue protein decreases the oxygen utilization
- Diabetic neuropathy involving all sensory, motor and autonomous components
- Associated atherosclerosis

Sites

- Foot planter aspect is the most common site
- Leg
- Upper limbs, back, scrotum, perineum
- Diabetic ulcer may be associated with ischaemia
- Ulcer is usually spreading and deep

Investigations

- Blood sugar, both random and fasting
- Urine ketone bodies
- Discharge for culture and sensitivity
- X ray of the part to see osteomyelitis
- Arterial Doppler of the limb

Treatment

- Control of diabetes using insulin and oral antidiabetics
- Antibiotics
- Nutritional supplement
- Regular cleaning, debridement and dressing
- Once granulation takes place the ulcer is covered with skin graft or a flap
- Toe or foot or leg amputation is performed
- Microcellular rubber shoes to prevent injuries: Care of the foot

MELLEN'S ULCER (POST OPERATIVE SYNERGISTIC GANGRENE)

- It is commonly seen in post operative wounds in abdomen and chest wall like empyema drainage or after surgery for peritonitis
- It is an acute rapidly spreading ulcer with destruction and deep burrowing of the subcutaneous tissues
- Occasional symbiotic infection may develop in the hand or leg

Etiology

- It is common in old age and immunosuppressed individuals and after surgery for infected cases.
- It is caused by microaerophilic streptococci, staphylococcus aureus and anaerobes

SITES

- It is common in abdomen and thorax. It begins in wound margin and spreads rapidly. It can occur in other areas of the skin
- Infection is severe often with endarteritis of the skin leading to ulcer and destruction.

Clinical features

- Features of toxæmia
- Spreading painful ulcer with discharge
- Abundant granulation tissue with purple and red zones

Management

- Random blood sugar is checked, if diabetic it has to be controlled
- Antibiotics
- Blood transfusion, critical care
- Adequate excision of dead tissue until it bleeds
- Once healthy granulation tissue is formed skin grafting is done
- Lupus vulgaris (lupus wolf)
- It is Cutaneous tuberculosis commonly found in young groups, commonly seen in face or hands

Treatment

- Atituberculosis
- And if complete healing doesn't occur excision and skin grafting
- Tuberculous ulcer
- It is due to mycobacterium tuberculosis
- It is usually due to cold abscess, later forming ulcer in the neck, chest wall, axillae and groin
- It can be single or multiple
- It is usually painful and tender but not deep

Management

- Discharge study for epitheloid cells
- Do FNAC
- Age biopsy
- Anti tuberculous drug
- Basins disease
- It is localized area of fat necrosis with chronic ischemia of the ankle skin affecting exclusively adolescent girls
- It may be due to tuberculosis and is observed in girls with thick or more subcutaneous fat around ankle
- Bluish pink leg which becomes bluish motoring in extreme cold season
- On warming, the skin becomes bright red and painful which is typical to hyperemia
- In these patients perforating arteries perfusing the skin around the ankle are small /not existing causing ischaemia of the skin around the ankle which becomes hyperaesthetic and sensitive for temperature alteration.
- Symmetrical, purple nodules develop in ankle and lower leg which later break down forming later break down forming multiple, small painful, superficial ulcers often with ankle oedema and pigment scars

Treatment is antitubercular drugs and lumbar sympathectomy.

TROPICAL ULCERS

- It is endemic in monsoon hit humid tropics with repeated epidemics but sporadic in sub tropics. Trauma and insect bite leads into infection exclusively in the lower part of the leg and foot.
- It is an acute ulcerative lesion on the skin observed in tropical region like Africa, India and South America. It is associated with lower socioeconomic class, anaemia and malnutrition and vitamin deficiency. It is commonly caused by flusobacteria fusiformis.
- There are abrasions, redness, papule and pustule formation, acute regional lymphadenitis and severe pain.

- Postule burst in 3 days along with necrobiosis and phagedena causing a spreading ulcer with discharge. Spreading stops in few weeks with ulcer persisting for many months and years.
- Eventually becomes chronic, large nonhealing/ callous formation with persistent pain, profuse serosanguineous discharge, extremely unpleasant odour, and long existing firmly adherent slough without any obvious constitutional symptoms.
- Occasionally squamous cell carcinoma can develop in it.

Treatment

- Improvement in nutrition, penicillin, metronidazole, dressing and skin grafting when the ulcer granulates at the later date.

VENOUS ULCER (GRAVITATIONAL ULCER)

- It is common around the ankle due to chronic venous hypertension
- It is due to varicose veins and post phlebitis limb
- Consists of veins that has been partially recanalised following deep venous thrombosis which causes increased venous pressure around the ankle.
- It presents with pain discomfort, pigmentation, dermatitis, ulceration, periostitis, ankle joint, ankylosing.
- Inguinal lymph nodes are often enlarged. Ulcer often attains a very large size which is non-healing, indolent and callous.
- Ulcer heals on rest and treatment but reforms again. scarring is common due to repeated healing and recurrent ulcer formation

Management

- Venous Doppler
- Regular dressing
- Skin grafting, specific treatment for varicose veins

SYPHILITIC ULCER

It is a rare entity; it is caused by treponema pallidum bacterium

Treatment

- Give antibiotics
- Do daily dressing

GENERAL MANAGEMENT OF ALL ULCERS

- Cause should be found and treated
- Correct deficiencies like anaemia, protein and vitamin deficiency
- Transfuse blood if required
- Control the pain
- Investigate properly
- Control the infection and give rest to the part
- Care of the ulcer by debridement, ulcer cleaning and dressing is done
- Ulcer cleaning is done by using dilute povidone iodine (better and ideal)
- It should be done daily or twice daily
- Remove the exuberant granulation tissue
- Topical antibiotics for infected ulcers only. eg silver sulphadiazine, ampicare.

NOTE; antibiotics are not required once healthy granulation tissue are formed

- Once granulates, defect is closed by secondary suturing, skin graft and flap.

IX. 4.9: Tumors

An abnormal mass of a tissue whose growth exceeds and is uncoordinated with that of the normal tissues and persists in the same excessive manner even without or after cessation of the growth stimuli is a **Neoplasm**.

These new abnormal growths or swellings are termed as **Tumors**.

Etiology of Tumors

The exact cause of tumors is idiopathic. However, the following can cause tissue abnormal growth.

- Genetics due genetic predisposition e.g. gene alternation
- Hereditary where the family poses predisposing factors to certain tumor e.g. cancer
- Viral infections such as human papilloma virus (HPV) that predisposes to cervical cancer and other microorganisms that may impair tissue growth

- Chronic irritations by the chemical carcinogens such as smoke and radiation carcinogens e.g. exposure to ultraviolet rays and ionizing radiations and benzene
- Immunosuppression body illnesses such as HIV/AIDS predisposes to Kaposi sarcoma
- Hormonal disturbances especially the growth hormones
- Excessive substance use disorders such as excessive alcohol consumption and cigarette smoking
- Others include diet, stress, local trauma or injury, [inflammation](#), age (more in elderly), and race.
- Race and geographical distribution i.e. common in some areas of world and not others

Classification of Tumors

When considering the tumors affecting any organ, use this simple classification.

- **Benign tumors:** These are simple tumors and are non-cancerous. They do not spread to the surrounding tissues, only exert pressure to such tissues and will remain in its current form.

They do not generally return after removal but they can be dangerous in areas such as the brain.

Histological findings show that cells are similar to cells of original tissue, only that they grow faster. Therefore, cells are of similar shape, size, and nuclear appearance.

Benign tumors can be serious if they press on vital structures such as [blood](#) vessels or nerves. Therefore, sometimes they require treatment and other times they do not.

They can develop into malignant tumors if no interventions in early stages.

The most familiar types of benign tumors are the warts of the skin.

- **Malignant tumors:** These are cancerous tumors, may be primary or secondary in occurrence. They can grow, spread, and get worse.

Some tumors are premalignant i.e. not yet cancerous but appears to be developing the properties of cancer. The common tumors of brain and bone are secondary deposits.

In some case, there is no sharp dividing line between benign and malignant tumors.

There are many different types of tumors and a variety of names for them. Their names usually reflect their shape, the origin of the cell, and type of tissue they appear from.

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Types of Benign Tumors

Benign tumors acquire the name from the tissue of origin, and all benign tumours ending with “oma”

Adenomas: These are benign tumors starting in the epithelial tissue of a gland or gland-like structure.

A common type of adenoma is a polyp in the [colon](#). Adenomas might also grow in the [liver](#) or the adrenal, pituitary, or [thyroid](#) gland.

Adenomas can often be removed with surgery, if not they can turn cancerous.

Fibromas (or fibroids): These are benign tumors of fibrous or connective tissue. They can grow in any organ, commonly in the uterus.

Although not cancerous, [uterine fibroids](#) can lead to heavy [vaginal bleeding](#), [bladder](#) problems, or [pelvic pain](#) or pressure.

Another type of fibrous tissue tumor is a desmoid tumor. These tumors can cause problems by growing into nearby tissues.

Because they can cause symptoms, fibrous tissue tumors may need removal by surgery.

Hemangiomas: These are a buildup of [blood](#) vessel cells in the [skin](#) or internal organs.

They can sometimes appear on the surface of the skin and termed as strawberry marks.

The majority of hemangiomas appears at birth and gradually goes away after some months or years.

Lipomas: These grow from fat cells or adipose tissue. They are the most common benign tumor in adults, often found in the neck, shoulders, back, or arms.

Lipomas are slow growing, usually round and movable, and soft to the touch.

They may run in families and sometimes they result from an injury.

They may need treatment if they are painful or growing quickly. This may include [steroid](#) shots or removal through [liposuction](#) or surgery.

Two other types of benign fat tumors are lipoblastomas, which occur in young children, and hibernomas.

Meningiomas: These tumors develop from the membrane surrounding the [brain](#) and spinal cord.

About nine in 10 are benign. Many grow slowly. Others grow more quickly.

Treatment varies depending on the location of the meningioma and the symptoms it causes.

Symptoms may include [headache](#) and [weakness](#) on one side, [seizures](#), personality changes, and visual problems.

Myomas: These grow from muscles. Leiomyomas grow from smooth muscle, found in internal organs such as the [stomach](#) and uterus.

They can start in the walls of blood vessels. In the wall of the uterus, leiomyomas are often termed fibroids.

A rare benign tumor of skeletal muscle is rhabdomyoma.

Neuromas: They grow from nerves. Two other types of nerve tumors are neurofibromas and schwannomas.

These benign nerve tumors can occur almost anywhere in the nerves that run throughout the body.

Neurofibromas are more common in people with an inherited condition called [neurofibromatosis](#).

Osteomas: Such as osteochondromas, the most common type of benign [bone tumor](#).

They usually appear as a painless bump or bumps near the joint such as the [knee](#) or [shoulder](#).

Often, the doctor will simply see this benign tumor with X-rays and may need surgery if the tumor causes symptoms such as pain or pressure on nerves or blood vessels.

Papillomas: These grow from epithelial tissue and project in finger-like fronds. They can be benign or malignant.

They can grow in the skin, [cervix](#), [breast](#) duct, or mucous membrane covering the inside of the eyelid (conjunctiva).

They can result from direct contact with an infection such as human papillomavirus (HPV).

Some types of papillomas go away on their own. In some cases, may need surgery to rule out [cancer](#).

Nevi (also known as [moles](#)): These are noncancerous growths on the skin and they are very common.

Others include the angioma radiating from the blood vessels, chondromas from the cartilage.

Symptoms of Benign Tumors

Not all tumors, cancerous or benign, have symptoms.

Depending on the tumor's location, numerous symptoms could affect the function of important organs or the senses.

For example, if you have a benign brain tumor, you may experience [headaches](#), [vision trouble](#), and [fuzzy memory](#).

If the tumor is close to the skin or in an area of soft tissue such as the abdomen, you may feel the mass by touch.

Most of the features of benign tumours results from exerted pressure on surrounding structures of nerves, blood vessels, and visceral organ depending on the location.

Possible symptoms of a benign tumor include [chills](#), discomfort, or pain, [fatigue](#), fever, loss of appetite, [night sweats](#), and weight loss.

[Skin discoloration](#) may be evident in the case of benign tumors that appear on the skin, such as nevi.

Treatment of Benign Tumors

Surgical excision is a common type of treatment for simple benign tumors and they will heal completely.

The goal is to remove the tumor without damaging surrounding tissues.

Other types of treatment may include [medication](#) such as corticosteroids or radiation.

If no intervention at the early stages, they may develop into malignant tumors.

Premalignant Tumors

These requires close monitoring and they premalignant growths such as

Actinic keratosis: known as senile keratosis or solar keratosis, consists of patches of skin that turn [crusty, scaly, and thick](#).

Fair-skinned people are more at risk of developing these types of growths, especially those who over expose to sunlight.

Actinic keratosis are seen as potentially premalignant, because around 20 percent of them progress to squamous cell [carcinoma](#)

Cervical dysplasia: This is a change in the normal cells lining the cervix.

The growth can be premalignant and is at risk of [developing into cervical cancer](#).

Cervical dysplasia is diagnosed with a PAP smear.

Metaplasia of the lung: These [occur](#) in the tubes that carry air from the windpipe into the lung, or the bronchi.

The glandular cells line the bronchi, which can change and become squamous cells.

Smoking most commonly cause metaplasia of the lung.

Leukoplakia: [Thick, white patches](#) can form on the gums, the bottom of the mouth, the insides of the cheeks, and, less commonly, on the tongue, cannot be scraped off easily.

Experts believe smoking or chewing tobacco is the main cause.

Although Leukoplakia is rarely dangerous, a small percentage can eventually become cancerous.

Many mouth cancers occur near areas of leukoplakia.

Malignant Tumors

Malignant tumors are cancerous tumors that can potentially result in death

Unlike benign tumors, malignant ones grow quickly, and can spread to new territory in a process known as metastasis.

These have a tendency of new cells to move in blood or lymphatic tissues to distant sites where they grow as new cells.

They commonly infiltrate the surrounding tissues, spreading rapidly to invade nearby structures and blood stream.

They have a high tendency to reoccur after excision i.e. may not completely cure.

Histological findings show that cells have an abnormal shape, size, and nuclear characteristics from normal cells or tissues of origin.

This is **Anaplasia**, cells are abnormal both in structure and rate of growth.

Types of Malignant Tumors

Carcinoma: These tumors form from epithelial cells Ex: adenocarcinoma from epithelial glandular cells.

Other examples include hepatocellular carcinoma, chorion carcinoma, breast carcinoma and ovarian carcinoma.

Carcinomas can occur in the stomach, prostate, pancreas, lung, liver, colon, or breast.

Many of the most common tumors are carcinomas, especially among older adults.

Sarcoma: These start in connective tissue such as cartilage, bones, fat, and nerves Ex: liposarcoma, fibrosarcoma, myosarcoma, chondrosarcoma

They originate in the cells outside the bone marrow. The majority of sarcomas are malignant.

Germ cell tumor: These arise from the cells that give life, the sperms, and egg cells.

They most commonly occur in the ovaries or testicles.

The majority of testicular tumors start from germ cells.

Less commonly, they may also appear in the brain, abdomen, or chest.

Blastomas: These form from embryonic tissue or developing cells. They are more common in children.

Ex: medulloblastoma and glioblastoma, types of brain tumor, retinoblastoma, a tumor in the retina of the eye, osteoblastoma, a type of bone tumor, and neuroblastoma, a tumor of the nervous system found in children.

Note: All lymphomas are malignant not benign.

There are some neoplasms whose naming does not end with either oma, sarcoma or carcinoma but they are still abnormal growths e.g. leukemia.

Mode of spread of malignant tumours

- Local extension to surrounding tissues
- Lymphatic spread to lymph nodes and other distant structures
- Blood spread to other organs causing metastasis
- Transcaelonic route i.e. malignant cells spread across scoelemic membrane to invade another organ e.g. carcinoma of the cervix can move across peritoneum to invade the stomach
- Tumour seedlings e.g. during improper surgical operations in a tumor, cells can be carried to other new sites due to surgical incisions

Clinical Features and Diagnosis of Malignant Tumors

A malignant tumour may manifest itself in any or all of four ways.

- The effects of the primary tumour itself,
- The effects produced by secondary deposits.
- The general effects of malignant disease

- Para-neoplastic syndromes: These are remote effects caused by hormone or other tumour-cell products, which are most common in carcinoma of the lung, particularly small cell tumours.

For example, production of ectopic adrenocorticotrophic hormone (ACTH) may present like Cushing's syndrome, and production of ectopic parathormone (PTH) may present with hypercalcaemia and its symptoms.

The only common exceptions to this scheme are primary tumours of the CNS, which seldom produce secondary deposits.

Diagnosis is always made by history, clinical examination and, where necessary, special investigations.

Investigations

Take a sample biopsy to find out if it is cancerous. There are three different types of biopsy taken

- Excisional biopsy: This involves the surgical removal of the entire lump or suspicious area or surrounding area.
- Incisional or core biopsy: This involves the surgical removal of a sample directly from the tumor.
- Needle aspiration biopsy: This involves the removal a fluid or a sample of tissue with a needle e.g. for bone marrow biopsy.

Take samples from different parts of the tumor for the most accurate results.

Other investigations include [CT scans to determine the exact location](#), [MRI scans to determine how far it has spread](#), [mammograms](#), [ultrasounds](#), [X-rays](#), Blood test, Protoscopy depending on the location of the tumor.

A colon polyp would require a [colonoscopy](#), and a stomach tumor may require an [endoscopy](#).

For Early Detection of Malignant Tumors (Cancer)

- Ensure routine clinical examination i.e. self-breast examination in women.
- Consider a needle biopsy of any abnormal growth to rule out abnormal cells.
- Ensure routine cytological examinations such as Pap smear for cervical smear.
- Go for radiography such as chest x-ray to detect early abnormal breast lamp that could later turn cancerous.

Management of Malignant Tumors

Curative treatment: This is attempting to ablate the disease completely.

- Surgery (e.g. carcinoma of the lung or colon)
- Radiotherapy alone (e.g. tumours of the mouth and pharynx)
- Cytotoxic chemotherapy when the tumour is particularly sensitive to particular agents, such as teratoma of the testis to platinum compounds.
- A combination of treatment modalities including surgery and/or radiotherapy and/or cytotoxic chemotherapy

Palliative management: Although the disease is incurable or recurs after treatment, still take measures to ease the symptoms of the patient.

- Surgery: Consider palliative excision of a primary lesion, although secondary deposits may be present.

For example, excise a carcinoma of the rectum to prevent pain, bleeding, and mucus discharge, although secondary deposits may already be present in the liver.

Irremovable obstructing growths in the bowel may be stented or bypassed. Inoperable obstructing tumours of the oesophagus or cardiac of the stomach may also be stented so that dysphagia can be relieved.

The bile duct may be stented endoscopically via the duodenal papilla for the relief of jaundice and pruritus in patients with inoperable carcinomas of the head of pancreas.

Surgery may also be used for pain relief by interrupting nerve pathways e.g. cordotomy in which the contralateral spinothalamic tract within the spinal cord is divided.

- Radiotherapy: Give palliative treatment to localized secondary deposits in bone, irremovable breast tumours, and inoperable lymph node deposits.

It is particularly indicated for localized irremovable disease. Radiography destroys cancer cells.

- Cryo-therapy i.e. extreme cold is used to freeze cells
- Hormone therapy: Applicable in carcinoma of the breast and prostate
- Cytotoxic chemotherapy: A wide range of drugs has anticancer action, but this action is not specific.

All the drugs damage normal dividing cells especially those of the bone marrow, gut, skin, and gonads. They may be classified into the following

- Alkylating agents Ex: cyclophosphamide, chlorambucil, busulphan,
- Antimetabolites Ex: fluorouracil, methotrexate, gemcitabine,
- Plant alkaloids Ex: vincristine, vinblastine,
- Cytotoxic antibiotics Ex: bleomycin, doxorubicin
- Platinum compounds Ex: cisplatin, carboplatin
- Epipodophyllotoxins Ex: etoposide,
- Monoclonal antibodies Ex: cetuximab, trastuzumab,
- Taxanes Ex: paclitaxel, docetaxel
- Protein kinase inhibitors Ex: imatinib, erlotinib
- Others include procarbazine

Commonly used are vincristine and methotrexate.

Multiple drugs are frequently used (combination chemotherapy) when their modes of action and toxicity profiles are different.

A balance between the chances of regression of the tumour in relatively fit patients with tumours likely to be sensitive (e.g. breast, ovary, and testis) and the toxic effects of the drug regimen.

- Drugs: Administer these for pain relief (non-steroidal analgesics, opiates), hypnotics, tranquillizers, and anti-emetics (e.g. chlorpromazine).

Others are the antiviral agents such as interferon for hepatitis B virus.

- Nerve blocks, with phenol or alcohol for relief of pain
- Maintenance of morale: This is often impossible, but a cheerful and kindly attitude of medical and nursing staff might improve it.

Note: This management is general, for specific managements refer to **Surgical Nursing II** and **Surgical Nursing III**.

Prevention of Tumors and Cancers

- Ensure early screening, detection and treatment
- Minimize exposure to radiations and toxic chemical
- Reduce sun exposure if with skin issues
- Maintain a healthy lifestyle
- Eat a healthy [balanced diet](#)
- Maintain a healthy weight
- Exercising regularly
- Limit alcohol
- Avoid smoking or chewing tobacco

Table 1: Difference between Benign Tumors and Malignant Tumors

| Benign Tumors | Malignant Tumors |
|--|--|
| <ul style="list-style-type: none"> • They are non-cancerous • They grow slowly • They are encapsulated i.e. limited by a capsule • They do not invade nearby or surrounding tissue or spread to other parts of the body • They are well localized • They do not form metastases • They do not usually reoccur after removal | <ul style="list-style-type: none"> • They are cancerous • They grow rapidly or fast • They are not encapsulated i.e. not limited by a capsule • They invade nearby or surrounding tissue or spread to other parts of the body • They are not localized • They form metastases • They have tendencies to reoccur after removal |

END

TO GOD BE THE GLORY