COURSE GUIDE

NSC 305
MEDICAL SURGICAL NURSING I

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INTRODUCTION

Welcome to the first course in Medical Surgical Nursing. This is the first of the four courses in this specialty area of Nursing. It focuses on updating your knowledge and improving your competency in the care of patients with medical and or surgical conditions. The nurse plays a core and significant role in providing care for patients who have medical and or surgical conditions in the hospital.

This course builds on your previous knowledge and experiences and hopes to see you improve the quality of care given to your patients one-on-one on a daily basis as you apply new knowledge to provide evidence based care in your place of work as well as engage in intellectual presentations in patient care as professionals. The course has theoretical and practical components. This course guide provides you with basic information about how to navigate through the course. It is importnant that you read the guide and seek further information as you may need to get the best out of this course.

Best wishes.

COURSE OVERVIEW

Medical Surgical Nursing (I)
Medical Surgical Nursing (I) is the first of the four Medical Surgical Nursing courses in your degree programme. It is registrable at the first semester of the third year. The course shall improve on your previous knowledge to enhance better understanding of principles, concepts and theories of Medical Surgical Nursing. It also briefly presents the models and theories of nursing that are used to inform current nursing care planning and implementation. The care of patients with diverse medical-surgical conditions is discussed with activities expected of you to be done to aid application of new knowledge to your current practice. The course has the theory, laboratory components as well as clinical practice that spread over 15 weeks. The course is presented in Modules with small units. Each unit is presented to follow the same pattern that guides your learning. Each module and unit have the learning objectives that helps you track what to learn and what you should be able to do after completion. Small units of contents will be presented every week with guidelines of what you should do to enhance knowledge retention as had been laid out in the course materials. Practical sessions will be negotiated online with you as desirable with information about venue, date and title of practical session.

COURSE OBJECTIVES

At the completion of this course, you should be able to:

i. Discuss the concepts and theories of nursing care.
ii. Apply new knowledge in providing care for patients with alterations in fluid and electrolyte balance, shock, stress, pain temperature control and skin care.
iii. Discuss physical and psychosocial needs of clients/patients with special medical/surgical conditions with adequate nursing care.
iv. Discuss the cause, the course and the management of inflammation.

COURSE IMPLEMENTATION
DOING THE COURSE

The course will be delivered adopting the blended learning mode; 70% of online interactive sessions and 30% of face-to-face laboratory sessions. You are expected to register for this course online in order to gain access to all the materials and class sessions online. You will have access to both hard and soft copies of course materials as well as online interactive sessions and face-to-face interaction with instructors during practical sessions in the laboratory. The interactive online activities will be available to you on the course link on the Website of NOUN. There are activities and assignments online for every unit every week. It is important that you visit the course sites weekly and do all assignments to meet deadlines and to contribute to the topical issues that would be raised for everyone's contribution.

You will be expected to read every module along with all assigned readings to prepare you for meaningful contributions to all sessions and completion of all activities. It is important that you attempt all the Self Assessment Questions (SAQ) at the end of every unit to help your understanding of the contents and to help you prepare for the in-course tests and the final examination. You will also be expected to keep a portfolio where you keep all your completed assignments.

COURSE REQUIREMENTS AND EXPECTATIONS OF YOU

Attendance of 95% of all interactive sessions, submission of all assignments to meet deadlines; participation in all CMA, attendance of all laboratory sessions with evidence as provided in the log book, submission of reports from all laboratory practical sessions and attendance of the final course examination.

You are also expected to:
1. Be versatile in basic computer skills
2. Participate in all laboratory practical up to 90% of the time
3. Submit personal reports from laboratory practical sessions on schedule
4. Log in to the class online discussion board at least once a week and contribute to ongoing discussions.
5. Contribute actively to group seminar presentations.

EQUIPMENT AND SOFTWARE NEEDED TO ACCESS COURSE MATERIAL

You will be expected to have the following tools:
1. A computer (laptop or desktop or a tablet)
2. Internet access, preferably broadband rather than dial-up access
3. MS Office software – Word PROCESSOR, PowerPoint, Spreadsheet
4. Browser – Preferably Internet Explorer, Moxilla Firefox
5. Adobe Acrobat Reader

NUMBER AND PLACES OF MEETING (ONLINE, FACE-TO-FACE, LABORATORY PRACTICALS)

The details of these will be provided to you at the time of commencement of this course

DISCUSSION FORUM

There will be an online discussion forum and topics for discussion will be available for your contributions. It is mandatory that you participate in every discussion every week. You participation link you, your face, your ideas and views to that of every member of the class and earns you some mark.

COURSE EVALUATION

There are two forms of evaluation of the progress you are making in this course. The first are the series of activities, assignments and end of unit, computer or tutor marked assignments, and laboratory practical sessions and report that constitute the continuous assessment that all carry 30% of the total mark. The second is a written examination with multiple choice, short answers and essay questions that take 70% of the total mark that you will do on completion of the course.

Students evaluation: The students will be assessed and evaluated based on the following criteria:

- **In-Course Examination:**

In line with the university's regulation, in-course examination will come up in the middle of the semester These would come in form of Computer Marked Assignment. This will be in addition to 1compulsory Tutor Marked Assignment (TMA's) and three Computer marked Assignment that comes after every module…..

- **Laboratory practical:** Attendance, record of participation and other assignments will be graded and added to the other scores from other forms of examinations.
- **Final Examination:** The final written examination will come up at the end of the semester comprising essay and objective questions covering all the contents covered in the course. The final examination will amount to 60% of the total grade for the course.

Learner-Facilitator evaluation of the course

This will be done through group review, written assessment of learning (theory and laboratory practical) by you and the facilitators.

GRADING CRITERIA

Grades will be based on the following Percentages

Tutor-Marked Assignments	10%	
Computer marked Assignment	10%	
Group assignment	5%	40%
Discussion Topic participation	5%	
Laboratory practical	10%	
End of Course examination	60%	

GRADING SCALE

A = 70-100
B = 60 - 69
C= 50 - 59
F = ≤49

SCHEDULE OF ASSIGNMENTS WITH DATES

To be provided for each module by the facilitator in addition to the ones already spelt out in the course materials.

SPECIFIC READING ASSIGNMENTS

To be provided by each module

REFERENCE TEXTBOOKS

Daniel, R., Nicoll, L.H. [2012]. Contemporary Medical-Surgical Nursing, [2nd ed]. New York: Delmar.

Kluwer, W. [2012]. Medical-Surgical Nursing made incredibly easy![3rd ed], Philadelphia PA: Lippincott Williams and Wilkins.

Smeltzer, S., *et al.* [2010]. Brunner and Suddarth's Textbook of Medical-Surgical Nursing, [12th ed]. Philadelphia, PA: Lippincott Williams and Wilkins.

MAIN COURSE

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MODULE 1 INTRODUCTION TO MEDICAL-SURGICAL NURSING

UNIT 1 THE CONTEXT OF CARE – PRINCIPLES, CONCEPTS AND THEORIES OF NURSING CARE

CONTENTS

1.0 INTRODUCTION

This unit will consider the context of care, principles, concepts and theories of nursing practice

Nursing has been described as the study of patients' responses to clinical related phenomena, some of which include health, wellness, diseases, disability and death. In all of these, the nurse must be sufficiently informed so as to make an excellent clinician. One of the platforms to actualize this is to acquire adequate knowledge of Medical-Surgical Nursing. This course is otherwise called Adult Care Nursing and focuses extensively on general management of all range of individual's attitudes during a state of disease that requires both medical and/or surgical interventions. Beyond this, the focus of this course extends to the concept of health, wellness and individuals' attitudes to these concepts with a view to proffering solution to health challenges from the dimension of nursing discipline.

MODULE 2 FUNDAMENTALS OF MEDICAL SURGICAL NURSING

UNIT 1 NUTRITION

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1.0 INTRODUCTION

The picture of a nurse to an average person in the public is to provide care especially for the sick. Caring for patients is a core responsibility of the nurse. As nurses, our aim is to provide quality nursing care to our patients. This module will help you to have in-depth understanding of the bases of medical-surgical nursing and how to care for patients with critical conditions: alteration in nutrition, fluid and electrolyte imbalance and total care of patients with shock. It also reviews other conditions requiring intensive nursing focus. These include, stress, temperature control, pain, sleep, skin and wound care.

Welcome to the world of nutrition. Although you may not always have been aware of it, nutrition has played a significant role in your life. And it will continue to affect you in major ways, depending on the foods you select. Every day, several times a day, you make food choices that

MODULE 3 CARING FOR PATIENTS WITH SPECIAL NEEDS

UNIT 1 CARE OF THE CLIENT HAVING SURGERY

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MODULE 4 THE IMMUNE SYSTEM AND CARE OF PATIENTS WITH INFECTIOUS DISEASES

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1.0. INTRODUCTION

The protective ability of the body to wade off all toxins and invading foreign organisms is called immunity. To perform this vital life process, the immune system has been designed specially to cater for all essential activities involved in performing this function. The immune system functions as the body's defense mechanism against invasion and facilitates a rapid reaction to the action of foreign bodies. The immune system is tasked with three distinct and interrelated duties.

i. Defense of the body from external invaders (pathogens and toxins).
ii. Surveillance in identifying the body's cells that have mutated and may become or have already become neoplasms (tumors).
iii. Maintain homeostasis by removing cellular detritus from the system to ensure uniformity of cells and function.

With so much power over the functioning and viability of the body's cells, it is no coincidence that some of our worst diseases come about as a result of immune dysfunction.

Immunity can be in two forms. These are;

- Innate immunity
- Acquired immunity

Innate Immunity

This is also called non-specific or natural immunity. This form of immunity results from general processes directed at specific disease organism. It provides some form of rapid non-specific immunity and it is present at birth. Innate immunity can be immediate (occurring within four hours) or delayed (occurring between four to ninety six hours) after exposure. This form of immunity includes the following:

i. Phagocytosis of bacteria and other invaders by the white blood cells and cells of the tissue macrophage system.
ii. Destruction of swallowed organism by the acid secretion of the stomach
iii. Resistance of the skin to invasion by organisms
iv. Presence of certain chemicals in the blood that can attach to foreign organisms or toxins and destroy them. Examples of these compounds are; lysozymes, basic polypeptides, the complement complex and natural killer lymphocytes.

Acquired Immunity

It is also called adaptive or specific immunity. It is the body's response against individual invading organisms. It is caused by a special immune system that forms antibodies and/ or activated lymphocytes that attack and destroy the specific invading organism. This form of immunity is not present at birth and develops either as a result of exposure or through an external source such as colostrum or injection of immunoglobulin. Acquired immunity confers great protection as found in the process of immunization against certain infectious diseases. Acquired immunity can be of two types;

a. Humoral or B-cell immunity
b. Cell mediated immunity

a. Humoral or B-cell immunity

The body develops circulating antibodies also called globulin molecules in the blood plasma. These globulins are capable of attacking the invading agent. These antibodies are produced by the B-lymphocytes in response to specific antibodies. The B-lymphocytes produces the globulin while the macrophages of natural immunity and the T-cell lymphocytes of the cellular immunity are involved in recognizing foreign substances and in producing antibodies.

b. Cell mediated immunity

It is also known as T-cell immunity because the activated Lymphocytes are the T-lymphocytes. The T-cells exists with designated roles in defense against bacteria, viruses, fungi, parasite and malignant cells. The T-cells attack foreign bodies directly by producing antibodies. Cellular reactions emerge by the binding of an antigen to an antigen receptor located on the surface of the T-cell. The T-cell then carries antigenic messages to the lymph node where other T-cells are produced.

NOTE: The adaptive immune system requires the innate immune system for initial activation. Once activated, however, much of its effector mechanisms involve potentiating innate immune responses. Thus the innate system forms part of the adaptive system's response and vice versa. The innate immune system can eliminate some threats by itself, but many invaders either overwhelm it or evade detection by it. In these cases, the adaptive immune system is required. It takes four to ten days for the adaptive immune system to mount its first response. Once developed however, the adaptive immune system will retain some of its effector cells as memory cells. Upon subsequent exposures, the adaptive immune system can mount a response almost immediately. The key characteristics of both systems are recognition and effector mechanisms. Recognition mechanisms are the methods by which various immune system cells recognize invading cells and toxins or aberrant host cells. Effector mechanisms are the methods by which the immune system destroys and eliminates these threats.

Inflammation is defined as the reaction of vascularized living tissue to local injury. It is a defensive reaction intended to neutralize, control or eliminate the offending agent and to prepare the site for repair. Inflammation can also serve to destroy, dilute or isolate the injurious agent (microbes, toxins) and eliminate the necrotic cells and tissues arising as a consequence to such injury while initiating a series of events which leads as far as possible to the healing and reconstitution of the damaged tissue.
During repair, the injured tissue is replaced by:

- Regeneration of native parenchyma cells
- Filling of the defect by fibroblastic tissue or both

Inflammation and repair are protective response, however they may induce harm e.g. anaphylactic reaction, rheumatoid arthritis, atherosclerosis or pericarditis.

2.0 OBJECTIVES

Atthe end of this unit, you should be able to:

- define inflammation
- identify the tissues involved in inflammation
- list and describe the types of inflammation
- describe the pathophysiology of inflammation
- enumerate the systemic manifestations of inflammation
- manage inflammation using the nursing process model

- describe the immune system and list the major functions of the system
- list and describe the types of immunity
- enumerate and describe the types of cells that performs immune functions
- describe the functions of the lymphoid organs and chemicals.

Review of Anatomy and Physiology of the Immune System

A number of body cells are involved in immunity. The main cells of the immune system are white blood cells collectively referred to as leukocytes. Like all blood cells, leukocytes originate from the bone marrow. Stem cells (undifferentiated cells) in the marrow develop into the various white blood cells. In addition to serving as the birthplace for leukocytes, the bone marrow also acts as a reservoir for mature cells that may be needed in the event of infection or blood loss. Although most leukocytes originate in the bone marrow along with red blood cells, most spend very little time in the blood. Leukocytes spend most of their time in storage, in lymphoid tissues, or dispersed throughout the host tissues. Leukocytes use blood mainly as a transport system to travel to areas of the body where they are needed.

There are six families of leukocytes that have distinct roles in the body's defense. They are;

- Monocyte-macrophages
- Dendritic cells
- Mast cells
- Granulocytes
- Lymphocytes
- Natural killer cells.

All the leukocytes except the lymphocytes are considered part of the innate immune system. Lymphocytes are the only leukocytes associated with the adaptive immune system. All the leukocyte families originally come from pluripotent hematopoeitic stem cells in the bone marrow. The pluripotent stem cell differentiates into common lymphoid and common myeloid progenitors. All lymphocytes as well as natural killer cells are descended from the common lymphoid progenitor. The common myeloid progenitor differentiates into monocyte, dendritic cells, granulocyte, erythrocyte, and platelet precursors.

The leukocytes found in the blood and lymph tissues are typically not fully differentiated. As a case study, monocytes descend from the common myeloid progenitor. Monocytes circulate in the blood until summoned to the tissues. At this time, they exit the blood vessels through specialized openings in the vessel wall and enter the tissue. Once in the tissue, monocytes differentiate yet again, maturing into macrophages which usually live in the tissues until their death. Thus the macrophage is the monocyte's final differentiation and the monocyte is simply a relatively inert circulation form of the cell. The exception is the granulocytes which circulate in fully differentiated form. Proliferation is the other concept necessary to understand some white blood cells. Although lymphocytes originate in the bone marrow from stem cells, they are also able to reproduce within lymph tissue. When activated, lymphocytes will proliferate (reproduce) first, then differentiate into their final functioning form. This allows the few cells that are able to respond to a given invader to reproduce quickly without a corresponding increase in lymphocytes that are not needed for the present threat.

Types of Cell

1. Monocyte –Macrophages

The immature stage is referred to as monocyte, while the fully differentiated stage is called a macrophage. Monocytes are continuously migrating to tissue and differentiating into tissue macrophages. Tissue macrophages are called different names, depending on the tissue in which they have differentiated. Tissue macrophages in the nervous system are called microglial cells, while macrophages in the liver are call Kupffer cells. Their functions are to monitor the surrounding tissue for invaders and foreign antigen. They are sometimes referred to as mononuclear phagocytes.

Macrophages are one of three phagocytic cells in the immune system. Having differentiated in tissues, macrophages are relatively immobile, monitoring the nearby tissue for invaders. Upon detecting an invader, macrophages attempt to engulf the invader in an amoeboid-like process called phagocytosis. Macrophages are antigen presenting cells (APCs) and act as one of the first responders in the immune response process. Once activated, a macrophage releases cytokines and chemokines which enable the respective immune function.

2. Dendritic cells

Dendritic cells are star-shaped cells that are so called because they resemble a neuron's dendrites. The immature dendritic cells migrate to tissues, particularly the skin, airway, spleen, and lymph nodes. Tissue dendritic cells that live in the skin are called Langerhans cells. (Skin tissue macrophages are also called Langerhans cells.) Immature tissue dendritic cells are both phagocytic and macropinocytic; that is, they can ingest large amounts of surrounding interstitial fluid. Tissue dendritic cells break down proteins and display the ingested antigens on their cell membranes. At the end of their life cycle, they will migrate to lymph nodes and induce tolerance in lymphoctyes, because they do not have co-stimulatory molecules in their immature stage. The signals for maturation are either direct contact with a pathogen or inflammatory cytokines. Pathogens are ingested when they are recognized by their common features as described above. Macropinocytosis allows the dendritic cell to ingest pathogens that have some mechanism to escape detection by phagocytic receptors. As the products are degraded inside the dendritic cell, it is able to recognize bacterial DNA, bacterial heat shock proteins, and viral double stranded RNA. Once activated, they differentiate into mature dendritic cells, develop co-stimulatory molecules, and migrate to the lymph nodes to activate the lymphocytes that migrate through the nodes.

The dendritic cells are able to activate only the specific T lymphocytes that are needed to respond to a given invader, whether it is a virus, bacteria, or fungus.

The dendritic cell's strength is also a key weakness exploited by several viruses, such as HIV and measles. Instead of activating lymphocytes in lymph nodes against these viruses, the infected dendritic cell acts as a transportation system, allowing the virus to then infect the T lymphocytes.

Much of the extracellular debris that is ingested by dendritic cells is harmless, osften byproducts of dead body cells. Dendritic cells are essential in inducing and maintaining tolerance to these antigens, keeping the immune system from reacting to the body's antigens. As T lymphocytes exit the thymus gland, dendritic cells are responsible for destroying cells that are reactive to self-antigens. This process is referred to as central tolerance and removes the majority of self-reactive T lymphocytes. Dendritic cells also induce peripheral tolerance, suppressing self-reactive lymphocytes that escaped central tolerance or cells that are reactive to antigens not expressed in the thymus.

3. Mast cells

Mast cells live near the skin and connective tissue of small blood vessels and contain granules with stored chemicals. When activated, they release substances within the granules (degranulate) that affect vascular permeability, particularly histamine. Mast cells are thought to play an important part in protecting mucosal surfaces from pathogens and help the inflammatory process to begin the process of healing damaged tissue, although they are primarily known for their role in IgE-mediated allergic reactions.

4. Granulocytes

Also known as polymorphonuclear leukocytes (PMNs). The granules are lysosomes—vesicles filled with destructive enzymes. These enzymes are used to destroy invaders. Neutrophils are the most numerous granulocyte performing phagocytic function in the immune system. Upon engulfing an invader, the granules are fused to the vesicle and the enzymes are released into vesicle, destroying the particle.

- Neutrophils are especially reactive to bacteria, as the number of circulating neutrophils greatly increases during bacterial infections. Neutrophils are the first responders to chemotaxis, and are rarely found in healthy tissue. Neutrophils are relatively fragile compared to macrophages. They can only ingest a few bacteria before dying, while macrophages can ingest a hundred bacteria. Pus is mostly made up of bacteria and dead neutrophils. Because of their expendable nature, they appear in the blood in large numbers, with several times that number in reserve in the bone marrow. They are the most numerous granulocytes and often the most numerous leukocyte. The other two classes of granulocyte cells are exocytic, meaning they produce their effects on outside cells as opposed to phagocytosed cells.
- Eosinophils are found in small quantities in the blood as most of them are distributed in the tissues. Their primary effector function is to release their highly toxic granules that can kill parasites and other microorganisms. They also produce cytokines, leukotrienes, and prostaglandins. Eosinophils are involved in defense against parasites and increase in numbers when the body has a parasitic infection. They are most well known for their role in IgE mediated allergic reactions and are often present in mucous secretions during allergic reactions.
- Basophils, are the final and most inscrutable granulocyte. Not much is known about them, but they appear to have an effect against fungus and also play a role in inflammation. They behave very similarly to eosinophils and are distributed throughout the tissues.

5. Natural killer cells

Natural killer (NK) cells arise from the common lymphoid progenitor. They appear as large lymphocytes with cytoplasmic granules and circulate in the blood. Although lacking antigen specific receptors, they are able to detect and attack a limited number of abnormal cells such as tumor cells and cells infected with the herpes simplex virus. They are also able to kill cells that are coated in antibody, a process known as antibody-dependent cell-mediated cytotoxicity (ADCC) and is mediated by some receptors. Natural killer cells are also activated by interferons and macrophage-derived cytokines.

6. Lymphocytes

Some lymphocytes mature in the bone marrow, while others migrate to the thymus for maturation. B lymphocytes (also called B cells) are so called because they mature to their intermediate stage in the bone marrow. When activated, B lymphocytes complete their differentiation process and become plasma cells, releasing antibodies. T lymphocytes (T cells) are so called because they mature in the thymus. The main functional characteristic of lymphocytes is the ability to mount specific immune responses against virtually any foreign antigen. All lymphocytes have a prototype receptor that changes during the intermediate maturation process so that taken as a whole, they are able to react with almost any possible antigen. B cells are lymphocytes that develop in the bone marrow and their function upon activation is to produce antibodies.

T lymphocytes progenitors leave the bone marrow and migrate to the thymus gland where they develop into T lymphocytes instead of B lymphocytes. The T cells later develop into CD4 and CD8 T cells.

<u>Lymphoid Organs and chemicals</u>

Anatomically speaking, the immune system is largely identified with the lymphoid portion of the immune system. The primary lymphoid organs are the bone marrow and thymus gland because lymphocytes develop and mature within them. The thymus gland is located superior to the heart. The thymus gland also serves as a reservoir for T lymphocytes. It is believed that the thymus gland's major function is in the development of the immune system. It is larger in children than in adults. Removal of the thymus in children causes a reduction in the number of T lymphocytes and a higher number of granulocytes.

Although lymphocytes are distributed throughout the body, they are concentrated in several tissues. The tissues where they aggregate and function are called secondary lymphoid tissues, and include the spleen, lymph nodes, and epithelial lymphoid tissues. Secondary lymphoid tissues are strategically placed in the body so that invading pathogens will encounter them as early as possible, allowing the immune system to be activated before extensive damage can be done.

Spleen; is a fist-sized organ located on the left side of the body, behind the stomach. It acts as a filter, collecting antigen from the blood and destroying senescent red blood cells. Most of the spleen is made up of tissue called red pulp which primarily serves as the site of red blood cell destruction and also houses macrophages. Interspersed throughout the red pulp, lymphocytes surround artieroles forming pockets called white pulp. The organization of white pulp consists of two layers, the periarteriolar sheath, consisting mainly of T lymphocytes, and the B-cell corona, consisting of mainly B lymphocytes. The white pulp is responsible for generating immune responses to blood borne immunogens and plays an important role in preventing septicemia. Removal of the spleen often results in life-threatening infections known as overwhelming post-splenectomy infections (OPSI).

Lymph Nodes;The lymph nodes are encapsulated lymphoid structures located throughout the lymphatic vascular system and provide the tissues and lymph with the same function that white pulp of the spleen provides for blood. Ranging in size from 1 mm to 20mm, lymph nodes are responsible for generating immune responses to the immunogens in the lymph drainage and interstitial fluid that drains from local tissues into the lymph vessels. Lymph nodes are typically bean shaped with two layers, an outer cortex and an inner medulla. Several afferent lymphatic vessels enter into the cortex which is separated into several compartments called follicles. Each follicle leads to the medulla where the lymph fluid is consolidated and one larger efferent lymphatic vessel exits from the medulla. The medulla is also associated with an artery and vein that is used for incoming naïve lymphocytes. The lymph nodes also act as a pump for lymph fluid, activated by random skeletal muscle contraction.

Lymph nodes are designed so that antigen presenting cells from the tissues will come into the lymph node through the afferent lymphatic vessel and encounter B lymphocytes first, then T lymphocytes, and will then take up residence in the medullary cords.

Cytokines; Cytokines are small proteins that affect the behavior of cells. The cytokines may act in an autocrine manner (affecting the cell that secreted it), paracrine manner (affecting adjacent cells), or even endocrine manner (affecting distant cells). The ability of a cytokine to act on distant cells depends on its ability to enter the blood and how long it stays in the blood (half-life). Each cytokine has its own set of kinases and kinase inhibitors which are important in the regulation of immune responses. Some diseases may not have anything to do with under or overproduction of cytokines, but rather problems with these regulatory proteins. Too much kinase or too little kinase inhibitor will result in abbreviated immune response, while too little kinase or too much kinase inhibitor will result in prolonged immune response.

Chemokines; Chemokines are a subgroup of cytokines that attract other cells, a process called chemotaxis. They function mainly as chemoattractants, recruiting monocytes, neutrophils, and other leukocytes to the area, however, some chemokines also have roles in lymphocyte development and angiogenesis. Chemokines can be secreted by a wide variety of cells including endothelial cells and keratinocytes (skin cells).

3.1 Tissues and cells involved in inflammatory response

The fluid and proteins of plasma, circulating cells, blood vessels and connective tissue

- The circulating cells: neutrophils, monocytes, eosinophils, lymphocytes, basophils, and platelets.
- The connective tissue cells are the mast cells, the connective tissue fibroblasts, resident macrophage and lymphocytes.
- The extra-cellular matrix, consists of the structural fibrous proteins (collagen, elastin), adhesive glycoproteins (fibronectin, laminin, non-fibrillar collagen, tenascinetc), and proteoglycans.
- The basement membrane is a specialized component of the extracellular matrix consisting of adhesive glycoproteins and proteoglycans.

3.2 Categorization of inflammation

Inflammation can be categorized into:

a. Acute inflammation.
b. Chronic inflammation.

<u>Acute inflammation</u>
It is rapid in onset (seconds or minutes), of relatively short duration, lasting for minutes, several hours, or a few days. Its main characteristics are the exudation of fluid and plasma proteins (edema) and the emigration of leukocytes, predominantly neutrophils. It is the rapid response to an injurious agent that serves to deliver mediators of host defense-leukocytes and plasma proteins-to the site of injury.

Acute inflammatory reactions are triggered by a variety of stimuli:

- Infections (bacterial, viral, parasitic) and microbial toxins
- Trauma (blunt and penetrating)
- Physical and chemical agents (thermal injury, e.g., burns or frostbite; irradiation; some environmental chemicals)
- Tissue necrosis (from any cause)
- Foreign bodies (splinters, dirt, sutures)
- Immune reactions (also called hypersensitivity reactions)

Local clinical signs of acute inflammation are; Heat, Redness, Swelling, Pain and Loss of function
Acute inflammation has three major components:

- Alterations in vascular caliber that lead to an increase in blood flow

- Structural changes in the microvasculature that permit plasma proteins and leukocytes to leave the circulation (increased vascular permeability)
- Emigration of the leukocytes from the microcirculation, their accumulation in the focus of injury, and their activation to eliminate the offending agent

Chronic inflammation

It is of longer duration associated histologically with the presence of lymphocytes and macrophages, the proliferation of blood vessels, fibrosis, and tissue necrosis and it is less uniform. Chronic inflammatory processes are debilitating and can be devastating. The prolongation and chronicity of any inflammation may be the result of an alteration in the immune response.

NOTE; The vascular and cellular reactions of both acute and chronic inflammation are mediated by chemical factors that are derived from plasma proteins or cells/ these chemical factors are produced in response to or activated by the inflammatory stimulus. Such mediators, acting singly, in combinations, or in sequence, then amplify the inflammatory response and influence its evolution. Necrotic cells or tissues themselves can also trigger the elaboration of inflammatory mediators e.g. acute inflammation after myocardial infarction.

Inflammation is terminated when the offending agent is eliminated and the secreted mediators are broken down or dissipated. In addition, there are active anti-inflammatory mechanisms that serve to control the response and prevent it from causing excessive damage to the host.

3.3 Pathophysiology of Inflammation

The inflammatory response is a sequential reaction to cell injury. It neutralizes and dilutes the inflammatory agent, removes necrotic materials, and establishes an environment suitable for healing and repair. Inflammation is always present with infection, but infection is not always present with inflammation. However, a person who is neutropenic may not be able to mount an inflammatory response. An infection involves invasion of tissues or cells by microorganisms such as bacteria, fungi, and viruses. In contrast, inflammation can also be caused by nonliving agents such as heat, radiation, trauma, and allergens.

The mechanism of inflammation is basically the same regardless of the injuring agent. The intensity of the response depends on the extent and severity of injury and on the reactive capacity of the injured person.

The inflammatory response can be divided into:-

- Vascular response
- Cellular response
- Formation of exudates
- Healing.

Vascular Response; after cell injury, arterioles in the area briefly undergo transient vasoconstriction. After the release of histamine and other chemicals by the injured cells, the vessels dilate. This vasodilatation results in hyperemia (increased blood flow in the area), which raise filtration pressure. Vasodilatation and chemical mediators cause endothelial cell retraction, which increases capillary permeability. Movement of fluid from capillaries into tissue spaces is thus facilitated. Initially composed of serous fluid, this inflammatory exudates later contains plasma proteins, mainly albumin. The proteins exert oncotic pressure that further draws fluid from blood vessels. The tissue becomes edematous.

Cellularresponse; this is characterized by extravasation of leucocytes from the lumen into interstitial tissue followed by phagocytosis. Extravasation involve the following sequence of events: -

(a) Margination of leukocytes; It is the adherence of leukocytes to the endothelial cells lining. Mainly to the post Capillary venules.

(b) Transmigration of leukocytes across the endothelium to interstitial tissue (also called diapedesis); it is the movement of leukocytes by extending pseudopodia through the vascular wall by a process called diapedesis. Leukocytes escape from venules and small veins but only occasionally from capillaries.

(c) Migration in the interstitial tissues towards a chemotactic stimulus called Chemotaxis; It is a unidirectional leukocyte attraction within tissue space guided by the presence of bacteria and cellular debris. All granulocytes, monocytes and to a lesser extent lymphocytes respond to chemotactic stimuli.

(d) Phagocytosis; Once the cell has reached the site of injurious agent (in interstitial tissue) phagocytosis ensues. Phagocytic cells include polymorphonuclear leukocytes (particularly neutrophils), monocytes and tissue macrophages. Phagocytosis involves three distinct but interrelated steps:

- Recognition and attachment of the particle to be ingested by the leukocytes: Phagocytosis is enhanced if the material to be phagocyted is coated with certain plasma proteins called opsonins.
- Engulfment; As a result of fusion between the phagosome and lysosome , a phagolysosome is formed and the engulfed particle is exposed to the degradativelysosomal enzymes

- Killing or degradation; the ultimate step in phagocytosis of bacteria (any foreign body) is killing and degradation.

Exudates Formation; Exudates consist of fluid and leukocytes that move from the circulation to the site of injury. The nature and quantity of exudates depend on the type and severity of the injury and the tissues involved .Hyperemia from vasodilatation, Increased metabolism at inflammatory site, Change in PH; Change in ionic concentration; nerve stimulation by chemicals (e.g. histamine, prostaglandins); pressure from fluid exudates, Fluid shift to interstitial spaces; fluid exudates accumulation, Swelling and pain are some of the effects of exudate formation.

3.4 Systemic manifestations of inflammation

Include leukocytosis, malaise, nausea and anorexia, increased pulse and respiratory rate, and fever. Leukocytosis results from the increased release of leukocytes from the bone marrow. An increase in the circulating number of one or more types of leukocytes may be found. Inflammatory responses are accompanied by the vaguely defined constitutional symptoms of malaise, nausea, anorexia, and fatigue. The causes of these systemic changes are poorly understood but are probably due to complement activation and the release of cytokines (soluble factors secreted by WBCs that act as intercellular messengers) from stimulated WBCs. Three of these cytokines, interleukin-1 (IL-1), interleukin-6 (IL-6), and tumor necrosis factor (TNF), are important in causing the constitutional manifestations of inflammation, as well as inducing the production of fever. An increase in pulse and respiration follow the rise in metabolism as a result of an increase in body temperature, Fever; the onset of fever is triggered by the release of cytokines. The most potent of these cytokines are IL-1, IL- 6, and TNF (released from mononuclear phagocytic cells). These cytokines cause fever by their ability to initiate metabolic changes in the temperature-regulating center. The synthesis of prostaglandin E2 (PGE2) is the most critical metabolic change. PGE2 acts directly to increase the thermostatic set point. The hypothalamus then activates the sympathetic branch of the autonomic nervous system to stimulate increased muscle tone and shivering and decreased perspiration and blood flow to the periphery. Epinephrine released from the adrenal medulla increases the metabolic rate. The net result is fever. With the physiologic thermostat fixed at a higher- than –normal temperature, the rate of heat production is increased until the body temperature reaches the new set point. As the set point is raised, the hypothalamus signals and increases in heat production and conservation to raise the body temperature to the new level. At this point the individual feels chilled and shivers. The shivering response is the body’s method of raising the body’s temperature until the new set point is attained. This seeming paradox is dramatic: the body is hot yet an individual piles on blankets and may go to bed to go warm. When the circulating body temperature reaches the set point of the core body temperature, the chills and warmth- seeking behavior cease.

- Nonspecific complaints such as mild headache, fatigue, general malaise, and muscle aches
- Cutaneous vasoconstriction, " goose pimples," pale skin; feeling of being cold; generalized shaking chill; shivering causing body to reach new temperature set by control center in hypothalamus
- Sensation of warmth throughout body; cutaneous vasodilatation; warming and flushing of the skin
- Sweating; decrease in body temperature

The released cytokines and the fever they trigger activate the body's defense mechanisms. Beneficial aspects of fever include increased killing of microorganisms, increased phagocytes by neutrophils, and increased proliferation of T cells. Higher body temperature may also enhance the activity of interferon, body's natural virus- fighting substance.

Healing Processthe final phase of the inflammatory response is healing. Healing includes the two major components of regeneration and repair. Regeneration is the replacement of lost cells and tissues with cells of the same type. Repair is healing as a result of lost cells being replaced by connective tissue of different origin. Repair is the more common type of healing and usually results in scar formation.

3.5 Management

The inflammation resolves following repair of damaged tissue. This process could be natural, if the body's defense mechanism is adequate to bring about resolution without assistance. In cases where resolution does not occur easily, death of some cells may occur as the area inflamed is healed by replacement of destroyed tissue with living cells. The chain of management involves strengthening of the body's defense mechanism and weakening attack

Methods of strengthening defense and weakening the attack includes;

i. Rest; this can be general body rest or locally resting the affected area via the use of splints, slings and sand bags. This further prevents trauma and reduces pain.
ii. Use of the force of gravity; this is done by elevating the affected part to encourage venous and lymphatic drainage, reducing swelling and increasing the flow of fresh blood to the area.
iii. Thermal applications; hot or cold compress can be used, hot compress would cause relaxation of muscle and facilitate blood flow. While cold compress constricts blood vessels, reduces

volume of exudate and degree of exudate causing there to be less pressure of the nerve endings thereby the level of pain.

iv. Nutritional supplements; increased calorie requirement is essential to meet the energy demand of the of the body and tissue catabolism during this period. Among the various vitamins, vitamin c is very essential in the formation of fibrous tissue.

v. Maintaining aseptic technique; this promotes wound healing and reduces further inflammation.

vi. Pharmacological intervention; antibiotics can be used to combat infections which could be further impair healing.

Other nursing care that can be accorded are;

i. A comprehensive history should be obtained about the cause of inflammation, duration of onset and all other associated systemic changes. A typology for assessment can be used to serve as a guide for this assessment e.g. the Gordon's typology. As a head to toe assessment may be needed and a focus assessment may also be needed.

ii. Vital signs are obtained

iii. Other functional or neurological assessment should also be conducted

iv. A microscopic culture and sensitivity may be conducted and this would show elevated levels of white blood cells.

v. A nursing care plan is drawn to guide the care accorded based on the signs and symptoms each patient exhibit. Possible nursing diagnosis are;

a. Impaired tissue integrity
b. Impaired skin integrity
c. Hyperthermia
d. Acute pain
e. Excess fluid volume
f. Risk for infection.

NURSING CARE PLAN USING SELECTED DIAGNOSIS

NURSING DIAGNOSIS	NURSING OUTCOME	NURSING INTERVENTION
Acute pain(00132)	Pain control	Pain management(1400) -Perform a comprehensive assessment to include location, characteristics, onset, duration, frequency, quality, intensity or severity of pain, precipitating factors. -Assure patients of attentive analgesic care. -Explore patient's knowledge and beliefs about pain -Evaluate with the patient and health care team, the effectiveness of past pain control measures that have been used. -Select and implement a variety of

		measures (e.g. Pharmacological, non-pharmacological measures to facilitate pain relief as appropriate). -Teach principles of pain management -Teach the use of non- pharmacological techniques e.g. hot/cold application and massage before and after and if possible during painful activities, before pain increases; along with other pan relief measures. -Encourage patient to use adequate pain medications. -Provide the person optimal pain relief with prescribed analgesics.
Hyperthermia (00007)	Thermoregulati on	Infection control (6540) -Allocate the appropriate square feet per patient as indicated by the Centre for Disease Control (CDC) and prevention using CDC guidelines. -Maintain an optimal aseptic environment during bedside insertions. -Ensure aseptic environment while changing tubes, bottles and IV lines. -Ensure appropriate wound care techniques. -Promote appropriate nutritional intake -Encourage fluid intake as appropriate -Administer antibiotics therapy as appropriate. -Promote safe food preservation and preparation

4.0 SUMMARY

This part of the module has educated you concerning the concept of inflammation. At this juncture, you should be able to;

- Define inflammation
- Identify the tissues involved in inflammation
- List and describe the types of inflammation
- Describe the pathophysiology of inflammation
- Enumerate the systemic manifestations of inflammation
- Manage inflammation using the nursing process model.

5.0 TUTOR-MARKED ASSIGNMENT

You as an individual, should have encountered an individual with inflammationbefore, describe your observation in respect to the individuals experience. Substantiate your fact with the content of the course and share your findings on the class discussion platform.

SELF-ASSESSMENT EXERCISE

Mr. Akinteru, a 35 year old farmer sustained a puncture to the index finger while working on his farm; 3 days later, the finger became swollen, painful and fluctuant exudates around the site of puncture.

i. What is inflammation?
ii. Discuss the types of inflammation.
iii. Discuss the events of an inflammatory process.
iv. Scientifically justify the resultant cardinal manifestations of acute inflammation.
v. Manage Mr. Akinteru within the first few hours of presentation using the nursing process.

UNIT 2 CARING FOR PATIENTS WITH INFECTIOUS DISEASES

CONTENTS

1.0 INTRODUCTION

An infectious disease is the state in which an infected host displays a decline in wellness. It is also defined as the consequences that results from invasion of the body by microorganism or foreign replicators that can produce harm to the body and potentially death. To explain the infectious diseases, an understanding of the chain of infection is necessary.
This unit will explore the care of patients with infectious diseases

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- describe what infectious diseases are
- draw and explain the chain of infection
- list the signs and symptoms of infection
- describe the management of a patient who has infection.

3.0 MAIN CONTENT

3.1 The Chain of Infection

A complete chain is essential for an infection to occur. The elements in the chain are;

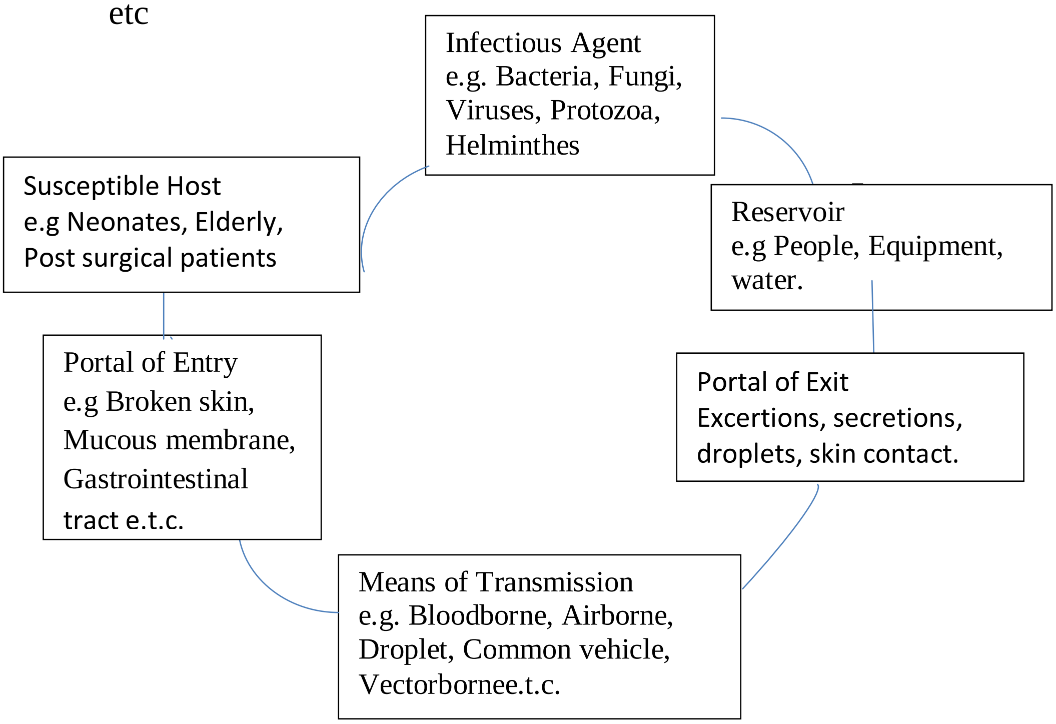
i. Infectious agent/ causative organism; these are microorganisms that cause infections. Examples are bacteria, fungi, viruses, protozoa & helminthes.
ii. Reservoir; this can either be a person, equipment, water or any location that provides nourishment for microorganism and allows for further propagation of the microorganisms.

iii. Portal or mode of exit; this is the exit point of the microorganism from the reservoir. For an infectious agent to be propagated, it has to move out from the reservoir. The point at which the microorganisms move out is the mode of exit. Examples are; excretions, secretions, droplets and skin contacts.

iv. Routes/ means of transmission; this is the medium through which the infectious source is connected with a new host. Examples are; direct contact, ingestion, fomites, airborne, droplet, blood-borne, common vehicle & vector borne.

v. Portal of entry; the intended or new host requires a point of entry for the invading microorganism to come in. this point of entry is called the portal of entry examples are; broken skin, mucous membrane, gastrointestinal tract, respiratory tract, urinary tract etc.

vi. Susceptible host; every organism tries to perform an immune response against an invading agent. The point at which an organism is not able to perform the activity of an immune responseon an invading microorganism, the organism becomes a susceptible host. Examples are, neonates, diabetic patients, patients with immunosuppression, patients who just had surgery etc



The Chain of Infection

Examples of microorganisms that can cause infections include Human immune deficiency virus which causes AIDS, ebola virus which causes ebola virus disease (EVD) etc.

3.2 Relevant terms in infectious diseases

i. Disease; illness or diseases or abnormal functioning of body part/s due to specific cause, such as an infection and identifiable by certain signs and symptoms
ii. Communicable disease; this is any disease caused by micro-organism or parasite that can be transmitted from one person to another. E.g. measles
iii. Contagious disease; is a term used to describe a disease that can be transferred from person to person by social ordinary contact. E.g. common cold, chicken pox, typhoid etc.
iv. Cross infection; it is the process by by which infective agents are transmitted from their sources to another patient or from paint to nurse. It can be direct or indirect.
v. Vector; an animal that transmits a particular infectious disease. A vector picks up the disease causing organism from a source of infection and carries them in or on its body, and later deposits them where they infect the new host, directly or indirectly. E.g. Mosquitoes, fleas, etc.
vi. Vehicle; this is the carrier of active components of infective agents e.g. water in cholera, food in typhoid, housefly in amoebic dysentery.
vii. Virulence or Pathogenicity; the ability of a microorganism to cause disease. It can also be defined as how rapidly the infection spreads through the body or the mortality from the infection.
viii. Normal flora; these are infective agents that normally inhabit the skin and mucous membrane at specific sites of the body without the tissues being affected or the organisms causing infections. They are also known as commensal organism, even though they are mostly non-essential to life, they are helpful in maintaining the health and normal functioning of the body.
ix. Notifiable diseases; these are medical conditions that must be reported to local health authorities. Notification of certain potentially harmful infectious diseases enable health officers to monitor and control spread of infection. E.g. hepatitis, measles, tuberculosis etc.
x. Nosocomial infection; this refers to hospital acquired infection, the infections usually occurs as a result of hospital admissions.

Factors that predispose to infection

i. Poor nutritional status
ii. Age
iii. Occupation
iv. Exposure to cold
v. Exposure to radiation
vi. Metabolic disturbance

vii. Other diseases such as anaemia, sickle cell disease, diabetes mellitus, immune suppression.

Signs and symptoms

The signs and symptoms of infectious diseases can be multifaceted because various infectious conditions have their own unique signs and symptoms. Common signs and symptoms of all infectious diseases include;

i. Pyrexia
ii. Weight loss
iii. Pallor
iv. Rashes
v. Purulent drainage
vi. Pain
vii. Edema
viii. Redness (the last four are common in cases of local infection).

Complications that may arise include;

i. Septicaemia
ii. Septic shock
iii. Dehydration
iv. Abscess formation
v. Endocarditis
vi. Infectious conditions
vii. Congenital abnormalities.

3.3 Management

Nursing care encompasses breaking the chain of infection and according due care to clients who have full blown infections.

In preventing the continuity of the chain of infection, the nurse does the following;

i. Rapid identification of the organism
ii. Environmental sanitation to prevent further brooding of the infecting agent
iii. Disinfectant and sterilization of all items
iv. Paying prompt attention to the health of employees
v. Performing hand hygiene
vi. Control of excretions and secretions
vii. Proper trash and waste disposal system
viii. Isolation and proper quarantine techniques
ix. Proper food handling techniques
x. Air control
xi. Maintaining standard precautions
xii. Wound care, catheter care
xiii. Maintenance of aseptic technique

xiv. Recognition of high risk patients
xv. Treatment of underlying diseases
xvi. Practicing standard precautions
xvii. Vaccination against infectious diseases
xviii. Use of anti-bacterial agents to destroy pathogenic organism and limit their growth.

For clients with infectious diseases, possible diagnosis include;
i. Risk for infection
ii. Deficient knowledge
iii. Ineffective thermoregulation.

Nursing Care Plan of Some Selected Diagnosis of Patients with Infectious Diseases

Nursing diagnosis	Nursing outcome	Nursing interventions
Risk for infection(00004)	Community risk control	Communicable disease management (8820) -Monitor at risk population for compliance with prevention and treatment. -Monitor adequate continuation of immunization in targeted population. -Provide vaccine to targeted population as available. -Monitor sanitation. -Monitor environmental factors that influence the transmission of communicable diseases. -Provide information about adequate control of vector and animal reservoir hosts as needed.
Deficient knowledge (0126)	Knowledge; disease process	Teaching: Disease Process (5602) -Appraise the patient's level of knowledge related to specific disease process. -Explain the pathophysiology of the disease and how it relates to the anatomy and physiology as appropriate -Describe common signs and symptoms of the disease as appropriate. -Identify possible etiologies as appropriate. -Discuss therapy/ treatment

Nursing diagnosis	Nursing outcome	Nursing interventions
		options. -Describe rationale behind management/ therapy/treatment recommendations

4.0 SUMMARY

At this juncture, you should be able to:

- Describe infectious diseases.
- Draw and explain the chain of infection.
- List the signs and symptoms of infection.
- Describe the management of a patient who has infection.

5.0 TUTOR-MARKED ASSIGNMENT

In the course of your clinical practice, you would have come across myriads of infectious disease process; from your wealth of experience, list ten infectious diseases common within your locality of practice stating theircausative microorganisms and the mode of infection ***(use the chain of infection model)***. Please, share your responses in the class discussion platform.

SELF-ASSESSMENT EXERCISE

i. List common manifestations of infections and their scientific justifications.
ii. Describe the management of Angel, a 6 year old girl, who presented in the unit with severe prostration, hyperpyrexia (Temp. $38.7^{o}C$), and one episode of convulsion prior presentation, using the nursing process model.

UNIT 3 CARING FOR PATIENTS WITH ALTERED IMMUNE STATUS

CONTENTS

1.0 INTRODUCTION

The immune system is vital to body function as it rids the body off infectious particles that can cause diseases. This unit will educate you about the concept of altered immune response and managing patients with such conditions.

2.0 OBJECTIVES

At the end of this unit, you will be able to;

- define immunodeficiency
- classify immunodeficiencies
- describe various variants of immunodficiencies
- identify clinically, patients with immunodeficiency
- manage patients with altered immune function.

3.0 MAIN CONTENTS

3.1 Definitions

Immunodeficiency disorders is due to defect in proper functioning of any or all of the component of the immune system which may include defect or deficiency of phagocytic cells, B and T lymphocytes, or even the complement system. Symptoms are specific for which component is affected. Severity of symptoms varies with age of onset and the immune system components affected as well as degree of functional impairment. It presents long standing and recurrent severe infections often may be resistant to conventional treatment. These patients are also vulnerable to developing a wide range of unusual malignancies.

3.2 Classifications of Immunodeficiency Diseases

It can be classified by;
Mode of acquisition as;

i. Primary immunodeficiency diseases; these are genetic in origin and are caused by intrinsic defects in the cells of the immune system or
ii. Secondary immunodeficiency diseases; eg AIDS, caused by infection with human immunodeficiency virus (HIV)

3.3 Primary Immunodeficiencies

Primary immunodeficiencies are rare disorders with genetic origins. They are primarily evident in early stages of life (infancy and early childhood)

Symptoms usually develop early in life after protection from maternal antibodies wanes.
Without treatment, cases barely live to adulthood.

Types of Primary Primary Immunodeficiencies

a. Phagocytic Dysfunction

Common type presents impaired functions of the neutrophils and consequent weak inflammatory response against pathogenic organisms. This manifests as low neutrophil count or paradoxical high count (in some cases) because the neutrophils remain in the vascular system.

The incidence of bacterial and fungal infections is unduly high especially to less virulent micro-organisms. Some common infections include fungal infections (Candida organisms); viral infections (herpes simplex or herpes zoster virus); recurrent furunculosis, cutaneous abscesses, chronic eczema, bronchitis, pneumonia, chronic otitis media, and sinusitis.

Cases associated with hyper-immunoglobulinemia E (HIE) syndrome presents deep-seated cold abscesses (with characteristic lack the classic manifestations of inflammation - redness, heat, and pain).

Chronic granulomatous disease of the soft tissues, lungs, and other organs

Other problems include deep and painful mouth ulcers, gingivitis, stomatitis, and cellulitis.
Death is due to overwhelming infection and severe neutropenia.
Diagnosis is based on the:

i. History: recurrent infection and fever and failure of an infection to resolve with usual treatment.
ii. Laboratory analysis of the cytocidal (causing the death of cells) activity of the phagocytic cells by the nitrobluetetrazoliumreductase test.

Medical Management

Early diagnosis and treatment of infectious complications is vital
Diagnosis is by clinical suspicion because classic manifestations of infection are often suppressed because of an impaired inflammatory response.

Management includes

i. Prophylactic antibiotic therapy
ii. Additional treatment for fungal and viral infections is often needed.
iii. Granulocyte transfusions (seldom successful because of the short half-life of the cells).
iv. Treatment with granulocyte-macrophage colony-stimulating factor (GM-CSF) or granulocyte colony-stimulating factor (G-CSF) may prove successful because these proteins draw non-lymphoid stem cells from the bone marrow and hasten their maturation.

b. B- Cell Deficiencies

This form has two pathologic variants;

i. ***Sex-linked agammaglobulinemia - Bruton's disease:*** due to Lack of differentiation of B-cell precursors into mature B cells; with consequent lack of plasma cells and the germinal centers from all lymphatic tissues: and thus presents with complete lack of antibody synthesis and secretion. B cells in the peripheral blood and the immunoglobulins (IgG, IgM, IgA, IgD&IgE) are characteristically low or absent.
ii. ***Hypogammaglobulinemia (Common Variable Immunodeficiency (CVID)):*** results from lack or diminished differentiation of B cells into plasma cells and consequently results in only diminished antibody production. Some available antibodies are from other antibody producing apparatus like lymph follicles and some viable B lymphocytes. The disease may varying state of defects ranging from;

- Variable Immunoglobulin deficiency e.g. lack of IgA in cases that only lack the plasma cells that produce IgA or
- The extreme severe **panhypoglobulinemiaie g**eneral lack of immunoglobulins in the blood.

CVID is the most common primary immunodeficiency in adults affecting both genders.

Although it can occur at any age, its onset is most often in the second decade of life. The vast majority of patients do not become symptomatic until 15 to 35 years of age.

Its major immunologic features include; recurrent pyogenic infections; increased incidence of autoimmune diseases and decreased level of total immunoglobulins, with IgG below 250 mg/dL with B-cell level usually remain normal.

It presents idiopathic etiology

Clinical Manifestations

i. Sex-linked agammaglobulinemia; presents recurrent pyogenic infections (usually by 5 to 6 months of age).
ii. CVID presents;
    - Pernicious anemia;
    - Lymphoid hyperplasia of the small intestine and spleen;
    - Gastric atrophy
    - Autoimmune diseases, such as arthritis and hypothyroidism
    - Incidence of chronic lung disease, hepatitis, gastric cancer, and malabsorption are high with late-onset disease
    - Infections with encapsulated bacteria, such as *Haemophilusinfluenzae, Streptococcus pneumoniae,* and *Staphylococcus aureus.*
    - Chronic progressive bronchiectasis and pulmonary failure due to frequent respiratory tract infections
    - Commonly, infection with *Giardia lamblia*occurs.
    - Opportunistic infections with *Pneumocystis carinii,* only in patients with a concomitant deficiency in T-cell immunity.

Assessment and Diagnostic Findings

i. Sex-linked agammaglobulinemia is distinguishable with marked deficiency or complete absence of all serum immunoglobulins.
ii. CVID can be diagnosed based on;
    - History of bacterial infections
    - Quantification of B-cell activity and immunoglobulins (total and specific)

- Hemoglobin and hematocrit measurements to detect pernicious anemia

Medical Management

i. Intravenous immunoglobulin (IVIG)
ii. Prophylactic antibiotics especially with chronic respiratory disease to prevent complications such as pneumonia, sinusitis, and otitis media
iii. Parenteral injections of vitamin B12 at monthly to treat pernicious anemia
iv. Physical therapy with postural drainage for patients with chronic lung disease or bronchiectasis

c. T-Cell Deficiencies

Mostly are genetic in origin.
Symptoms vary considerably based on the type of T-cell defect.
It also is associated with B – Cell activity impairment due to the regulatory role of T cells

Variants of T – Cell deficiencies

i. DiGeorge syndrome, or **thymic hypoplasia:** a rare congenital variant due to the absence of several genes on chromosome 22. T-cell deficiency typically occurs due to thymus gland hypogenesis during embryogenesis. Immunodeficiency symptoms presents almost immediately after birth
ii. Chronic mucocutaneous candidiasis with or without endocrinopathy: another T-cell disorder variant, associated with a selective defect in T-cell immunity; it is thought to be caused by an autosomal recessive inheritance, affecting both males and females. It is considered an autoimmune disorder involving the thymus and other endocrine glands
iii. Extensive morbidity obviously results from endocrine dysfunction.

Clinical Manifestations

DiGeorge syndrome presents:

i. Hypoparathyroidism with resultant hypocalcemia, (usually occurs within the first 24 hours of life) and resistant to standard therapy
ii. Congenital diseases of the heart; kidneys and Characteristic facial features
iii. Susceptibility to infections like yeast, fungal, protozoan and viral infections (particularly chickenpox, measles and rubella)
iv. Patients may survive to the second or third decade of life.

v. Hypofunction of the adrenal cortex (Addison's disease) is the major cause of death in these patients as it may develop suddenly and without any history of previous symptoms.

Assessment and Diagnostic Findings

i. Peripheral blood lymphocyte counts.
ii. Evoked T-cell responses through dermal sensitization of the patient
iii. Immunoglobulin evaluation: is not useful in infants because of the presence of maternally transmitted immunoglobulin

Medical Management

i. *P. carinii* prophylaxis.
ii. Management of hypocalcemia with oral calcium supplementation in conjunction with vitamin D or parathyroid hormone administration.
iii. Correction of cardiac abnormalities; may require immediate surgical intervention in a tertiary pediatric center.
iv. Permanent reconstitution of T-cell immunity with transplantation of the fetal thymus, postnatal thymus, and human leukocyte antigen (HLA)-matched bone marrow.
v. IVIG therapy may be used if an antibody deficiency exists to control recurrent infections.

d. Combined B-Cell And T-Cell Deficiencies

Combined B-cell and T-cell deficiencies present dysfunction of both the B cells and T cells.
It follows the genetic pattern of autosomal recessive and X-linked
These conditions generally appear early in life.

Variants of these conditions include:

i. **Ataxia-telangiectasia;** an autosomal recessive disorder affecting both T- and B-cell immunity. A**taxia** (uncoordinated muscle movement) and **telangiectasia** (vascular lesions caused by dilated blood vessels) usually is first noticed in the first 4 years of life.

- **Features include:**
  - o Variants of selective IgA deficiency; IgA and IgG subclass deficiencies, along with IgE deficiencies.
  - o Variable degrees of T-cell deficiencies (more severe with advancing age).
  - o Associated neurologic (progressive cerebellar ataxia), vascular, endocrine, hepatic, and cutaneous abnormalities (telangiectasias), recurrent bacterial infection of the sinuses and lungs, and increased incidence of cancer.

ii. **Severe combined immunodeficiency disease (SCID);** Both B and T cells are missing. Pattern of inheritance can be X-linked, autosomal recessive, or sporadic. The exact incidence of SCID is unknown; and occurs in all racial groups and both genders It is used for a wide variety of congenital and hereditary immunologic defects that are characterized by;

- Early onset of infections
- Defects in both B- and T-cell systems
- Lymphoid aplasia and
- Thymic dysplasia.

Common manifestations include;

- Respiratory infections, pneumonia (often secondary to *P. carinii*), thrush, diarrhea, and failure to thrive
- Persistent shedding of viruses such as respiratory syncytial virus or cytomegalovirus from the respiratory and gastrointestinal tracts
- Maculopapular and erythematous skin rashes
- Vomiting, fever, and a persistent diaper rash are also common manifestations

iii. **Wiskott-Aldrich syndrome:** is SCID plus thrombocytopenia (loss of platelets). The prognosis is generally poor because of associated overwhelming fatal infections.

Medical Management

i. Ataxia-telangiectasia can be treated thus;
    - Early management of infections with antimicrobial therapy
    - Management of chronic lung disease with postural drainage and physical therapy
    - Transplantation of fetal thymus tissue
    - IVIG administration.

ii. SCID:
    - Stem cell and bone marrow transplantation
    - IVIG replacement
    - Administration of thymus-derived factors
    - Thymus gland transplantation
    - Gene therapy.

Nursing Management

i. Preventing infection transmission to patients:
    - Use of standard precautions
    - Meticulous hand hygiene is essential in caring for these patients.

- Reverse isolation procedures, where nurses protect the patient by donning gowns, gloves, caps

ii. Monitor patient's condition all times to detect experiences of reactions to transplantation

e. Deficiencies of The Complement System

The complement system plays an important role in immunity so that alterations in its components or functions can increase susceptibility to infectious diseases and to immune-mediated disorders.

This group of disorders of the complement system can be primary or secondary.

i. C2 and C3 component deficiencies result in diminished resistance to bacterial infections.
ii. **Angioneurotic edema;** is caused by an inherited deficiency of the inhibitor of C1 esterase (which opposes the release of inflammatory mediators), and cause frequent episodes of urticaria and edema in various parts of the body.
iii. Decay-accelerating factor (DAF) lack will result in paroxysmal nocturnal hemoglobinuria (PNH). DAF is found on erythrocytes (red blood cells) and normally protects the erythrocytes from lysis (disintegration). RBC lysis in PNH occurs due to accumulation of the complement component C3b on the CR1 molecule on the erythrocyte and cause lysis.

3.4 Secondary Immunodeficiencies

Secondary immunodeficiencies are more common than the primary variant.

Immunodeficiencies are due to;

i. Underlying disease processes or
ii. Treatment of these diseases.

Common causes of secondary immunodeficiencies include;

i. Malnutrition
ii. Chronic stress
iii. Burns
iv. Uremia
v. Diabetes mellitus
vi. Certain autoimmune disorders
vii. Certain viruses
viii. Exposure to immunotoxic medications and chemicals
ix. Self-administration of recreational drugs and alcohol
x. AIDS; the most common secondary immunodeficiency disorder.

Patients with secondary immunodeficiencies have immunosuppression and are often referred to as **immunocompromised hosts**.

Medical Management

Management includes;

i. Diagnosis and treatment of the underlying disease process
ii. Eliminating the contributing factors
iii. Treating the underlying condition and
iv. Sound principles of infection control.

3.5 Nursing Management for Patients with Immunodeficiencies

Nursing care of patients with primary and secondary immunodeficiencies depends on the;

- Underlying cause of the immunodeficiency
- Type of immunodeficiency and
- Severity.

Nursing management includes assessment, patient teaching and supportive care.

i. Assess the patient for infection: history of past infections, particularly the type and frequency of infection; signs and symptoms of any current skin, respiratory, gastrointestinal, or genitourinary infection.
ii. Assess the patient for response to treatment.
iii. Careful assessment of the patient's immune status.
iv. Monitor the patient for signs and symptoms of infection: such as fever; chills; cough with or without sputum; shortness of breath; difficulty breathing; difficulty swallowing; white patches in the oral cavity; swollen lymph nodes; nausea; vomiting; persistent diarrhea; frequency, urgency, or pain on urination; redness, swelling, or drainage from skin wounds; lesions on the face, lips, or perianal area; persistent vaginal discharge with or without perianal itching; and persistent abdominal pain.
v. Monitor for subtle and unusual changes in physical status which may include vital signs alteration and the development of pain, neurologic signs, cough, and skin lesions.
vi. Monitor pulse and respiratory rates.
vii. Auscultate the chest for assessment of breath sounds to track changes in respiratory status.
viii. Report even subtle changes can signal deterioration in the patient's clinical status.
ix. Note that signs of infection may be subtle due to depressed inflammatory response hence are monitored and reported.

x. Promptly report any significant change in the patient's clinical condition.
xi. Note any unusual response to treatment.
xii. Monitors laboratory values (i.e., white blood cell count and differential cell count) for changes indicating infection.
xiii. Culture and sensitivity reports from wound drainage, lesions, sputum, stool, urine, and blood are monitored to identify pathogenic organisms and appropriate antimicrobial therapy.
xiv. Assess nutritional status; use of alcohol, drugs, or tobacco;
xv. Assess stress level and coping skills and
xvi. Assess general hygiene.
xvii. Institute measures to prevent infection and reduce risk for infection.
i. Assist with medical measures aimed at improving;
- Immune status and treating infection
- Nutritional status and maintaining bowel and bladder function
- These measures include;
  - Careful hand hygiene
  - Encouraging the patient to cough and perform deep-breathing exercises at regular intervals
  - Protecting the integrity of the skin and mucous membranes
  - Strict aseptic technique when performing invasive procedures, such as dressing changes, venipunctures, and bladder catheterizations.

Assisting the patient in managing stress and in adopting a lifestyle that enhances immune system function.

Continuing Care
i. It is focused on the patient and family.
ii. Encourage to notify the hospital on the first sight of signs and symptoms of infection, including any subtle changes.
iii. Encourage to continue disease-prevention strategies as these strategies need to be followed lifelong.
iv. Encourage recommended health screening because of the increased susceptibility for cancer secondary to the immune suppression.
v. Refer for home care if treatment includes IVIG.

4.0 SUMMARY

Now that you have completed this unit, you should be able to:
- Define immunodeficiency
- Classify immunodeficiencies

- Describe various variants of immunodeficiencies
- Identify clinically, patients with immunodeficiency
- Manage patients with altered immune function.

5.0 TUTOR-MARKED ASSIGNMNET

Visit any hospital near you, pick a patient with immunosuppression, negotiate the patient with your facilitator and do a case analysis and report the following about the patient;

1. His type of immunosuppression
2. His nursing needs/problem
3. His present mode of management

Report this in the discussion forum of the class.

SELF-ASSESSMENT EXERCISE

i. Discuss the two main types of immunodeficiencies
ii. Discuss the causes of immunosuppression.
iii. State two likely complications of immunodeficiency.
iv. State how you will prevent these complications.

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1.0 INTRODUCTION

This module will take you through caring for patients with special medical and surgical needs and ways of meeting these needs. You have come across patients with special medical /surgical needs during your basic nursing education and in your practice. At this level, you are expected to develop wider knowledge and improved competence to provide up-to-date and quality care to meet the needs of these patients who would have peculiar needs.

Advancement in surgical techniques in recent time has brought more responsibility for nurses to seek necessary skills and knowledge to meet up with the trend in surgery. Many variables, such as the procedure performed, age of the client, and coexisting medical conditions determine the client’s needs and care need before, during, and after surgery. These variables require standardized and individualized assessments and interventions. The focus of this unit is to increase your knowledge base and competence in caring for patients with surgical needs. The knowledge that will help you to identify surgical patient, meet their caring needs before, during and after for surgery, will be acquired. As you go along with this module, you will understand different types of surgical interventions and different approaches to their care

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- discuss physical and psychosocial needs of the clients/patients with special medical and surgical needs.
- discuss strategies for caring for clients/patients with special needs.
- list the different classifications of surgery?
- explain the phases of surgical patients care.
- provide preoperative physical and psychological care to surgical patients
- discuss the contents of preoperative teaching?
- explain the roles of the surgical team
- explain the stages of general anesthesia?
- explain the different types of sutures
- explain the focus of immediate post operative nursing care of surgical patients in the recovery room.
- explain the post operative management of surgical patient on the ward.

3.0 MAIN CONTENT

3.1 Introduction to Surgery

Surgery was coined from these Greek words cheirourgia, "cheir" meaning "hand" + "ergon" meaning "work". It is the branch of medicine that deals with the physical manipulation of a bodily structure to diagnose, prevent, or cure an ailment. It can also be define as the use of instruments to treat injuries, diseases, and deformities.
Surgical procedures are named according to:
(1) The involved body organ, part, or location and
(2) The suffix that describes what is done during the procedure. Physicians who perform surgery include **surgeons** or other physicians trained to do certain surgical procedures.

Suffix	**Meaning Word-Building**	**Examples**
-ectomy	Removal by cutting	crani (skull) _ ectomy _ craniectomyappen (appendix) _ ectomy _ appendectomy
-orrhaphy	Suture of or repair	colo (colon) _ orrhaphy _colorrhaphy herni (hernia) _ orrhaphy _ herniorrhaphy
-oscopy	Looking into	colon (intestine) _ oscopy _ colonoscopy gastr (stomach) _ oscopy _ gastroscopy
-ostomy	Formation of a permanent artificial opening	ureter _ ostomy _ ureterostomy colo (colon) _ ostomy colostomy oust (bone) _ otomy _ osteotomy
-otomy	Incision or cutting	thoro (thorax) _ otomy _ thoractomy
-plasty	Formation or repair	oto (ear) _ plasty _ otoplasty mamm (breast) _ plasty _ mammoplasty

Surgical Procedure Suffixes

3.2 Classification of Surgery

Surgery is classified based on:
1. The urgency required for a successful outcome for the patient
2. The purpose of the surgery

Classification based on urgency required

1. **Emergency, or immediate**, surgery is needed when life or limb is suddenly threatened and any delay in surgery would jeopardize the patient's life or limb. Examples of the need for emergency surgery are ruptured aortic aneurysm, ruptured appendix, traumatic limb amputation, or loss of pulse due to extremity emboli.
2. **Urgent surgery** is the need for an operation within 24 to 30 hours. Examples of this are fracture repair or an infected gallbladder.
3. **Elective surgery** is that which can be planned and scheduled without any immediate time constraints. Examples of this are joint replacement, hernia repair, or skin lesion removal.
4. **Optional surgery,** such as cosmetic surgery, is done at the request of the patient.

Classification based on purpose of surgery

Surgery is done for several reasons and these include:

1. **Preventive surgery** removes tissue before it causes a problem as in mole or polyp removal to prevent cancer development.

2. **Diagnostic, or exploratory**, surgery takes tissue samples for study to make a diagnosis, uses scopes to look into areas of the body, or involves an incision to open an area of the body for examination. Examples of this surgery are a biopsy or exploratory laparotomy performed with a scope or incision.

3. **Curative surgery** involves the removal of diseased or abnormal tissue as in an inflamed appendix, tumor, or a benign cyst or the repair of defects such as hernias or cleft palate.

4. **Palliative surgery** is done when an underlying condition cannot be corrected but symptoms need to be alleviated. Examples of this are removal of part of a tumor that is causing pain or pressure, a rhizotomy which cuts a nerve root to relieve pain, insertion of a gastrostomy tube.

5. **Reconstuctive surgery :**Repair or reconstruct physical deformities and abnormalities caused by traumatic injuries, birth defects, developmental abnormalities, or disease. Breast reconstruction following mastectomy Cleft lip repair

6. **Aesthetic surgery:** This is usually requested for by patient for beautification or body improvement purpose. e.g. Blepharoplasty, breast augmentation

3.3 The Surgical Team

The surgical team is usually grouped into sterile and unsterile members: Sterile members: they perform surgical hand scrubbing, wear sterile gown and gloves and work within the sterile field during surgery. They consists of the surgeon, his assistants and the scrub nurse

The surgeon: He or she is a physician with specific training and qualifications. The surgeon is responsible for determining the surgical procedure required, obtaining the client's consent, performing the procedure, and following the client after surgery.

The assistants: Surgical assistants are classified as either first, second, or third assistants. The first assistant assists in the surgical procedure and may be involved with the client's preoperative and postoperative care. He or she may be another physician, a surgical resident, or an RN who has appropriate approval and endorsement from the American Operating Room Nurses (AORN) and the American College of Surgeons. Second or third assistants are RNs, licensed practical or vocational nurses (LPNs/LVNs), or surgical technologists who assist the surgeon and first assistant.

The scrub nurse: The scrub nurse is a registered nurse who had completed additional training and passed certification examination. He /She performs a surgical hand scrub, wears a sterile gown and gloves. She/he sets up the sterile tables; preparing sutures, ligatures, and special equipment (such as a laparoscope) and assisting the surgeon and the surgical assistants during the procedure by anticipating the instruments that will be required, such as sponges, drains, and other equipment. Receiving specimens for laboratory examination, and counting sponges and needles is also done by the scrub nurse.

The unsterile members: they are not requested to perform surgical hand scrubbing and are not expected to move closer to sterile field. They include;

The anesthesiologist who can either be:
A Physician who had completed residency training in anesthesia. This person is responsible for administering anesthesia to the client and for monitoring the client during and after the surgical procedure. The anesthesiologist assesses the client before surgery, prescribed preoperative medications, informs the client of the options for anesthesia, and explains the risks involved;

The anesthetist may be a medical doctor who administers anesthesia but has not completed a residency in anesthesia, a dentist who administers limited types of anesthesia; and

A **registered nurse** (RN) who has completed an accredited nurse anesthesia program and passed the certification examination (Certified Registered Nurse Anesthetist [CRNA]).

The anesthesiologist supervises the anesthetist. The anesthetist may assess the client before surgery, discuss options for anesthesia, preoperative medication orders, administer anesthesia, and monitor the client during and after surgery. The anesthesiologist and anesthetist are not sterile members of the surgical team, meaning that they wear OR attire but they do not wear sterile gowns or work within the sterile field. Anesthesiologists or anesthetists classify clients according to their general physical status and assign a risk potential.

The circulating nurse: she/he wears OR attire but not a sterile gown, his/her responsibilities include obtaining and opening wrapped sterile equipment and supplies before and during surgery, keeping records, adjusting lights, receiving specimens for laboratory examination, and coordinating activities of other personnel, such as the pathologist and radiology technician.

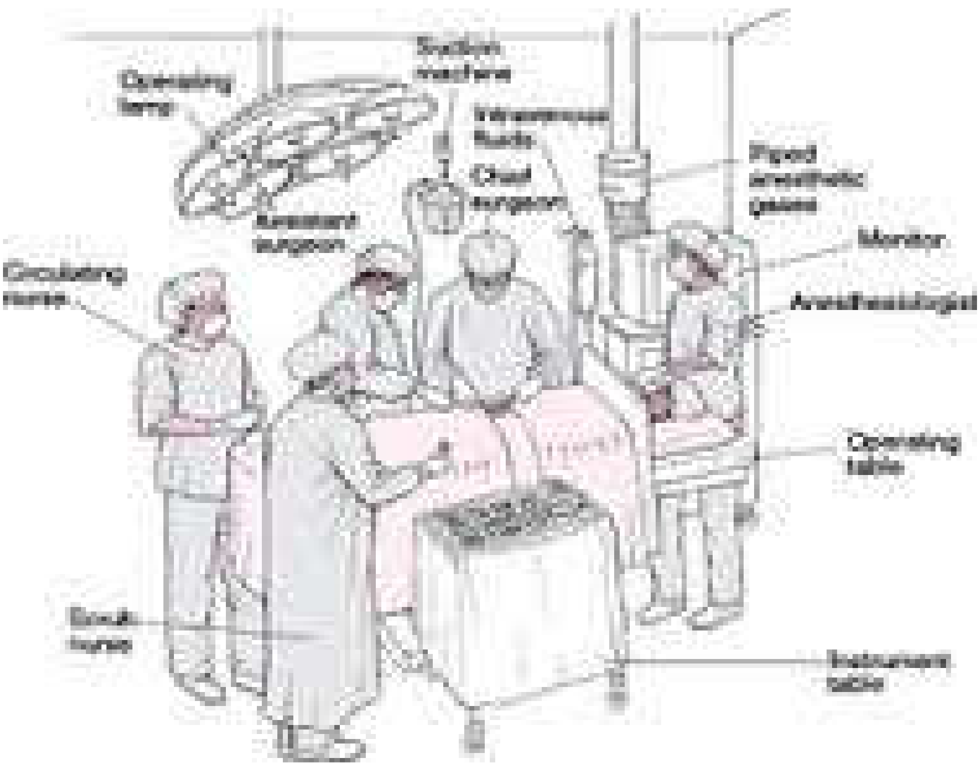


Fig: The Surgical Team in the Operating Room

3.4 Phases of Perioperative Nursing care

There are three phases or stages in the surgical process;

Preoperative phase: Begins with decision for surgery and ends with transfer to the operating room;

Intraoperative phase Begins with transfer to operating room and ends with admission to postanesthesia care unit (PACU); and

Postoperative phase: Begins with admission to Post Anaesthesia Care Unit (recovery room) and continues until the patient is discharged to surgical clinic.

Nursing care of surgical patients is directed toward meeting the psychological and physical needs of the patients and this depends on nature and type of the surgery. To achieve this, nursing process approach should be used in rendering such care.

Preoperative nursing care: Preoperative care requires a complete assessment of the client. The assessment varies, depending on the: urgency of the surgery and whether the client is admitted the same day of surgery or earlier. For any preoperative client, however, the nurse must make every effort to gather as much data as possible.

3.5 Nursing Assessment of the Preoperative Patient

On admission, the nurse reviews preoperative instructions, such as diet restrictions and skin preparations, to ensure the client has followed them. If the client has not carried out a specific portion of the instructions, such as withholding foods and fluids, the nurse immediately notifies the surgeon. He or she identifies the client’s needs to determine if the client is at risk for complications during or after the surgery. General risk factors are related to age; nutritional status; use of alcohol, tobacco, and other substances; and physical condition. When surgery is not an emergency, the nurse performs a thorough history and physical examination. He or she assesses the client’s understanding of the surgical procedure, postoperative expectations, and ability to participate in recovery. The nurse also considers the client’s cultural needs, specifically as they relate to beliefs about surgery, personal privacy, and disposal of body parts, blood transfusions, and presence of family members during the preoperative and postoperative phases. If the surgical procedure is an emergency, the nurse may have to omit some tasks because of the client’s condition or need for rapid preparation. There may not be time to perform a thorough assessment or write a complete care plan. Assessment of the surgical client is essential, but the situation dictates the extent of this process.

For a surgical patient, the following data may be collected as these will help in preparing for the needs of such client:

Subjective Data: Health History Questions
Demographic information: Name, age, marital status, occupation, roles?

History of condition for which surgery is scheduled: Why are you having surgery?

Medical history: Any allergies, acute or chronic conditions, current medications, pain, or prior hospitalizations?

Surgical history: Any reactions or problems with anesthesia? Previous surgeries?

Tobacco use: How much do you smoke? Pack-year history (number of packs per day per number of years)?

Alcohol use: How often do you drink alcohol? How much?

Coping techniques: How do you usually cope with stressful situations? Support systems?

Family history: Hereditary conditions, diabetes, cardiovascular, anesthesia problems?

Female patients: Date of last menses and obstetrical information?

Objective Data: Body System Review
Vital signs, oxygen saturation
Height and weight
Emotional status: calm, anxious, tearful, affect
Neurological: ability to follow instructions
Skin: color, warmth, bruises, lesions, turgor, dryness, mucous membranes

Respiratory: infection: cough; breath sounds; chronic obstructive pulmonary disease; respiratory rate, pattern, and effort; barrel chest

Cardiovascular: angina, myocardial infarction, heart failure, hypertension, valvular heart disease, mitral valve prolapse, heart rate and rhythm, peripheral pulses, edema, jugular vein distention
Gastrointestinal: bowel sounds, date of last bowel movement, abdominal distention, firmness, ostomy

Musculoskeletal: deformities, weakness, decreased range of motion, crepitation, gait, artificial limbs, prostheses.

3.5.1 The physical and psychological needs of surgical patients

Identification of specific needs of a particular patient undergoing surgery can only be achieved when the nurse carried out comprehensive assessment on the patients using the above guideline but generally during the preoperative phase, their psychological needs include:

1. Reduction of fear
2. Anxiety reduction
3. Respect for spiritual and cultural belief

Informed consent: the client must sign a surgical consent form or operative permit. When signed, this form indicates that the client consents to the procedure and understands its risks and benefits as explained by the surgeon. If the client has not understood the explanations, it is the duty of the nurse to notify the surgeon before the client signs the consent form. Clients must sign a consent form for any invasive procedure that requires anesthesia and has risks of complications.
The physical needs are:

1. Bowel preparation
2. Skin preparation and shaving
3. Pre medication
4. Management of valuables
5. Preoperative teaching.

5.5.2 Physical and Psychological preparation of surgical patients

Physical Preparation: Preparing a client for surgery is an essential element of preoperative care. Depending on the time of admission to the hospital or surgical facility, the nurse may perform some of the physical preparation, which includes the following:

- Skin preparation: Skin preparation depends on the surgical procedure and the policies of the surgeon or institution. The goal is to decrease bacteria without compromising skin integrity. For planned surgery, the client may be asked to clean the particular area with detergent germicide soap for several days before surgery. Hair usually is not removed before surgery unless it is likely to interfere with the incision. In that case, the hair is removed with blade at the time of surgery.

- Elimination: The nurse may need to insert an indwelling urinary catheter preoperatively for some surgeries, particularly of the lower abdomen. A distended bladder increases the risk of bladder trauma and difficulty in performing the procedure. The catheter keeps the bladder empty during surgery. If a catheter is not inserted, the nurse instructs the client to void immediately before receiving preoperative medication. Enemas or laxatives may be ordered to clean out the lower bowel if the client is having abdominal or pelvic surgery. A clean bowel allows for accurate visualization of the surgical site and prevents trauma to the intestine or accidental contamination by feces to the peritoneum. A cleansing enema or laxative is prescribed the evening before surgery and may be repeated the morning of surgery.
- Food and fluids: The physician gives specific instructions about how long before surgery food and fluids are to be withheld, often at least 8 to 10 hours before surgery. After midnight the night before surgery, the client usually is not allowed to have anything by mouth (NPO). Many ambulatory surgical centers, however, allow clear fluids up to 3 or 4 hours before surgery. Before these times, the nurse encourages the client to maintain good nutrition to help meet the body's increased need for nutrients during the healing process. Adequate intake of protein and ascorbic acid (vitamin C) is especially important in wound healing.
- Care of valuables: The nurse encourages the client to give valuables to a family member to take home. If this is not possible, however, the nurse itemizes the valuables, places them in an envelope, and locks them in a designated area. The client signs a receipt, and the nurse notes their deposition on the client's chart. If the client is reluctant to remove a wedding band, the nurse may slip gauze under the ring, then loop the gauze around the finger and wrist or apply adhesive tape over a plain wedding band. The client also removes eyeglasses and contact lenses, which the nurse places in a safe location or gives to a family member.
- Attire/grooming: Usually clients wear a hospital gown and a surgical cap in the OR. Hair ornaments and all makeup and nail polish must be removed. If the client is having minor surgery performed under local anesthesia in a room separate from the general surgical suites, the nurse instructs the client on what clothing and cosmetics to remove and provides appropriate hospital attire. The physician may order thigh-high or knee-high anti embolism stockings or order the client's legs to be wrapped

in elastic bandages before surgery to help prevent venous stasis during and after the surgery. Removal of cosmetics assists the surgical team to observe the client's lips, face, and nail beds for cyanosis, pallor, or other signs of decreased oxygenation. If a client has acrylic nails, one usually is removed to attach a pulse oximeter, which measures oxygen saturation.

- Prostheses: Depending on agency policy and physician preference, the client removes full or partial dentures. Doing so prevents the dentures from becoming dislodged or causing airway obstruction during administration of a general anesthetic. Some anesthesiologists prefer that well-fitting dentures be left in place to preserve facial contours. If dentures are removed, the nurse usually places them in a denture container and leaves them at the client's bedside or places them with the client's belongings. Other prostheses, such as artificial limbs, also are removed, unless otherwise ordered.

Preoperative Medications: The anesthesiologist frequently orders preoperative medications; commonly prescribed preoperative medications include the following:

- Anticholinergics, which decrease respiratory tract secretions, dry mucous membranes, and interrupt vagal stimulation
- Histamine2-receptor antagonists, which decrease gastric acidity and volume
- Opioids which decrease the amount of anesthesia needed, help reduce anxiety and pain, and promote sleep
- Sedatives, which promote sleep, decrease anxiety, and reduce the amount of anesthesia needed
- Tranquilizers, which reduce nausea, prevent emesis, enhance preoperative sedation, preoperative anxiety, slow motor activity, and promote induction of anesthesia. Before administering preoperative medications, the nurse checks the client's identification bracelet, asks about drug allergies, obtains blood pressure (BP) and pulse and respiratory rates, ask the client to void, and makes sure the surgical consent form has been signed. The nurse also reviews with the client what to expect after receiving the medications. Immediately after giving the medications, the nurse instructs the client to remain in bed; he or she places side rails in the up position and ensures that the call button is within easy reach.

Preoperative teaching: Teaching clients about their surgical procedure and expectations before and after surgery is best done during the preoperative period. Clients are more alert and free of pain at this time.

Clients and family members can better participate in recovery if they know what to expect. The nurse adapts instructions and explanations to the client's ability to understand. When clients understand what they can do to help themselves recover, they are more likely to follow the preoperative instructions and work with healthcare team members.
Information to include in a preoperative teaching plan varies with the type of surgery and the length. The following are examples of information to include in preoperative teaching:

- Postoperative pain control
- Explanation and description of the postanesthesia recovery room or post surgical area.
- Preoperative medications—when and why they are given and their effects
- Postoperative pain control
- Discussion of the frequency of assessing vital signs and use of monitoring equipment

The nurse also explains and demonstrates deep-breathing and coughing exercises, use of incentive spirometry, how to splint the incision for breathing exercises and moving, position changes, and feet and leg exercises.

In addition, the nurse must inform the client about intravenous (IV) fluids and other lines and tubes. Sometimes IV fluids are initiated before surgery, along with indwelling catheters or nasogastric tubes. When clients receive demonstrations, it is important that they practice these skills and provide an opportunity for the nurse to assess whether they understood the instructions. Preoperative teaching time also gives clients the chance to express any anxieties and fears and for the nurse to provide explanations that will help alleviate those fears. When clients are admitted for emergency surgery, time for detailed explanations of preoperative preparations and the postoperative period is unavailable. If the client is alert, however, the nurse provides brief explanations. During the postoperative period, explanations will be more complete. Family members require as many preoperative explanations as possible.
The purpose of adequate preoperative teaching/learning is for the client to have an uncomplicated and shorter recovery period. He or she will be more likely to deep breathe and cough, move as directed, and require less pain medication. The client and family members will demonstrate sufficient knowledge of the surgical procedure, preoperative preparations, and postoperative procedures, and can participate fully in the client's care.

Components of a preoperative teaching plan: Information to include in a preoperative teaching plan varies with the type of surgery and the length of the hospitalization.

The following are examples of information to include in preoperative teaching:

3.5.3 Psychological preparation of patients

Surgical Consent

Before surgery, clients must sign the consent form before receiving any preoperative sedatives. When the client or designated person has signed the permit, an adult witness also signs it to indicate that the client or designee signed voluntarily. If an adult client is confused, unconscious, or not mentally competent, a family member or guardian must sign the consent form. If the client is younger than 18 years of age, a parent or legal guardian must sign the consent form. Persons younger than age 18 years of age, living away from home and supporting themselves, are regarded as emancipated minors and sign their own consent forms. In an emergency, the surgeon may have to operate without consent. Each nurse must be familiar with agency policies and state laws regarding surgical consent forms.

This witness usually is a member of the healthcare team or an employee in the admissions department. The nurse is responsible for ensuring that all necessary parties have signed the consent form and that it is in the client's chart before the client goes to the operating room (OR).

Criteria for valid informed consent

Voluntary Consent Valid consent must be freely given, without coercion.

Incompetent Client Legal definition: Individual who is not autonomous and cannot give or withhold consent (e.g., individuals who are cognitively impaired, mentally ill, or neurologically incapacitated)

Informed Subject Informed consent should be in writing. The content should contain the following:

- Explanation of procedure and its risks
- Descriptions of benefits and alternatives
- An offer to answer questions about procedure
- Instructions that the client may withdraw consent
- A statement informing the client if the protocol differs from customary procedure.

Client Able to Comprehend Information must be written and delivered in language understandable to the client. Questions must be answered to facilitate comprehension if material is confusing.

Transfer to Surgery
When the surgery department is ready, the patient is taken to the surgical holding area on a stretcher. The patient's chart, inhaler medications for those with asthma, and glasses or hearing aids also go to the surgical holding area. The patient can be accompanied by family members.

During surgery, the family waits in the surgical waiting area, which is a communication center where the family is kept informed regarding the patient's status. The physician calls the family there when surgery is over. Families may be given beepers so that they can walk outside or to other areas of the hospital and still be reached.

After Transfer
After the patient goes to surgery, prepare the patient's room and necessary equipment so it is ready for the patient's return.

3.5.4 Nursing Process for Preoperative Care

Assessment Assess the client's physical and psychological status, as described earlier in this section.

Diagnoses
Anxiety related to upcoming surgery, results of surgery, and postoperative pain.

Interventions
- Ask what concerns the client has about the upcoming surgery. Such discussion provides specific information about the client's fears.
- Provide appropriate explanations for preoperative procedures and postoperative expectations. Clients experience less anxiety if they know what to expect.
- Maintain as much contact as possible with the client. When you are present and approachable, it encourages communication.

Ån Expected Outcome: Client will express feelings of anxiety.

2. Deficient Knowledge related to preoperative procedures and postoperative expectations

Expected Outcome: Clients must sign the consent form before receiving any preoperative sedatives. When the client or designated person has signed the permit, an adult witness also signs it to indicate that the client or designee signed voluntarily.

Client will verbalize understanding of preoperative and postoperative procedures.

Interventions

- Assess client's level of knowledge about the perioperative plans. Building on a client's knowledge assists in reinforcing instructions and helps to correct false information.
- Use audiovisual aids to present information. Verbal reinforcement of other forms of instruction promotes learning.
- Include family members or significant others in preoperative instructions. These people help in reinforcing instructions and providing support to the client.

Evaluation of Expected Outcomes The client reports minimal anxiety. He or she demonstrates knowledge of the preoperative instructions and demonstrates postoperative exercises.

Table 1**: Preoperative Diagnostic Tests**

Diagnostic Test	**Purpose**
Chest x-ray	Detect pulmonary and cardiac abnormalities
Oxygen saturation	Obtain baseline level and detect abnormality
Serum Tests Arterial blood gases	Obtain baseline levels and detect pH and oxygenation abnormalities
Bleeding time	Detect prolonged bleeding problem
Blood urea nitrogen Creatinine	Detect kidney problem Detect kidney problem
Complete blood cell count	Detect anemia, infection, clotting problem
Electrolytes	Detect potassium, sodium, chloride imbalances
Fasting blood glucose	Detect abnormalities, monitor diabetes control
Pregnancy	Detect early, unknown pregnancy
Partial thromboplastin & Time prothrombin time	Detect clotting problem & monitor warfarin therapy
Type and cross match	Identify blood type to match blood

	for possible transfusion
Urine Test Pregnancy Urinalysis	Detect early, unknown pregnancy Detect infection, abnormalities

3.5.5 Intraoperative Care

The intraoperative period begins when the client is transferred to the operating table. The surgical team is responsible for the client's care during this time.

3.6 Anesthesia

It is the partial or complete loss of the sensation of pain with or without loss of consciousness. Surgical procedures are performed with general, regional, or local anesthesia. Procedural sedation may also be used for ambulatory surgery.

General Anesthesia: This acts on the central nervous system to produce loss of sensation, reflexes, and consciousness. Vital functions such as breathing, circulation, and temperature control are not regulated physiologically when general anesthetics are used. General anesthetics are administered as IV, intramuscular (IM), inhaled or rectal medications.

Four stages are used to describe the induction of general anesthesia:

- Stage 1: Beginning anesthesia: This short period is crucial for producing unconsciousness. The client experiences dizziness, detachment, a temporary heightened sense of awareness to noises and movements, and a sensation of ''heavy'' extremities and being unable to move them.

Inhaled or IV anesthetics are used to produce this phase. When the client becomes unconscious, his or her airway is secured with an endotracheal tube.

- Stage 2: Excitement: During this stage the client may struggle, shout, talk, sing, laugh, or cry. He or she may make uncontrolled movements, so team members must protect the client from falling or other injury. Quick and smooth administration of anesthesia can prevent this phase.
- Stage 3: Surgical anesthesia: In this stage the client remains unconscious through continuous administration of the anesthetic agent. This level of anesthesia may be maintained for hours with a range of light to deep anesthesia.

- Stage 4: Medullary depression: This stage occurs when the client receives too much anesthesia. The client will have shallow respirations, weak pulse, and widely dilated.

Other types of anaesthesia are:
Local Anaesthesia
Spinal Anaesthesia
Epidural Anaesthesia.

3.6.1 Suture Materials

Sutures are surgical materials used during operative procedures as ligatures to tie off blood vessels and control bleeding. It is also used to hold a wound together in good apposition until such time as the natural healing process is sufficiently well established to make the support from the suture material unnecessary. The ideal suture material should:

- Have good handling characteristics
- Not induce a significant tissue reaction
- Allow secure knots
- Have adequate tensile strength
- Not cut through tissue
- Be non-electrolytic
- Be non-allergenic
- Cheap and sterile
- Highly uniform tensile strength, permitting use of finer sizes
- High tensile strength retention in vivo, holding the wound securely throughout the critical healing period, followed by rapid absorption
- Consistent uniform diameter and Predictable performance
- Non-capillary, non-allergenic, and non-carcinogenic
- Easy to handle, ties down well, provides optimum knot security.
- Minimally reactive in tissue and not predisposed to bacterial growth
- Capable of holding tissue layers throughout the critical wound healing period securely when, knotted without fraying or cutting.
- Resistant to shrinking in tissues.
- Absorbed completely with minimal tissue reaction after serving its purpose

Classification of sutures: they are classified according to:
Number of strands: Sutures are classified according to the number or strands of which they are comprised. Monofilament sutures are made of a single strand of material. Because of their simplified structure, they encounter less resistance as they pass through tissue than multifilament suture material. They also resist harboring organisms which may cause

suture line infection. These characteristics make monofilament sutures well-suited to vascular surgeries e.g. Polyamide (Nylon), Polypropylene Multifilament sutures consist of several filaments, or strands, twisted or braided together. This affords greater tensile strength, pliability, and flexibility. Multifilament sutures may also be coated to help them pass relatively smoothly through tissue and enhance handling characteristic e.g.: Polyglycolic Acid (PGA), Silk, Polyester.

Basis of Absorption: Absorbable sutures are those that will get absorbed to the body and this may be used to hold wound edges in approximation temporarily, until they have healed sufficiently to withstand normal stress or to secure haemostasis. It may be naturally absorbable and these sutures are prepared from the collagen of healthy mammals. Some are absorbed rapidly, while others are treated or chemically structured to lengthen absorption time (Chromic) Absorbed/ digested by body enzymes which attack and break down the suture strand. Plain sutures are absorbed in 70 days measurable tensile strength for 7-10 days. Chromic sutures are absorbed in over 90 days with measurable tensile strength for 14-21 days.

Synthetic Absorbable sutures: They are made of polymer strands which are braided and impregnated or coated with agents that improve their handling properties and colored with an FDA approved dyes to increase visibility in tissue. Synthetic absorbable sutures are hydrolyzed -- a process by which water gradually penetrates the suture filaments, causing the breakdown of the suture's polymer chain. Absorption normally completes in 60-90 days. Compared to the enzymatic action of naturally absorbable, hydrolyzation results in a lesser degree of tissue reaction following implantation. Varieties of Synthetic Absorbable sutures: Polyglycolic Acid (PGA) Fast Absorbing (SurucrylInstatm), Polyglycolic Acid (PGA) (Surucryl®), Polyglactin 910 (PLA) Suture (Surucryl 910TM), Monofilament Poliglecaprone 25 Suture (Suruglydetm), Monofilament Polydioxanone Suture (Surusynthtm)

Non absorbable Materials: Non-absorbable sutures are those, which are not digested by body enzymes or hydrolyzed in body tissue. They may be used in a variety of applications: Exterior skin closure - to be removed after sufficient healing has occurred. Within the body cavity, where they will remain permanently encapsulated in tissue, where lifelong support is required like in Cardiovascular surgeries. These sutures may be uncoated or coated, uncoloured or naturally coloured or dyed with FDA approved dyes to enhance visibility.

Nature of production: Sutures are classified according to mode of production: Natural and Synthetic materials.

Natural suture materials can either be absorbable or non absorbable: These are called catgut and can be plain of chromic (soaked in chromium solution). Was made from the submucosa of sheep gastrointestinal tract, broken down within about one week. Chromic acid delays hydrolysis and catgut has been replaced by synthetic absorbable polymers

- Non-Absorbable: Silk are strong and handles well but induces strong tissue reaction and its capillarity encourages infection causing suture sinuses and abscesses. Others are Linen and Stainless Steel Wire

Synthetic suture materials: These are made from synthetic materials and may be absorbable or non absorbabl**e**

- Absorbable
  - Polyglycolic Acid (Dexon)
  - Polyglactin (Vicryl)
  - Polydioxone (PDS)
  - Polyglyconate (Maxon)
- Non-Absorbable
  - Polyamide (Nylon)
  - Polyester (Dacron)
  - Polypropylene (Prolene).

Suture sizes

- Sutures are sized by the USP (United States Pharmacopoeia) scale
- The available sizes and diameters are:
  - 6-0 = 0.07 mm
  - 5-0 = 0.10 mm
  - 4-0 = 0.15 mm
  - 3-0 = 0.20 mm
  - 2-0 = 0.30 mm
  - 0 = 0.35 mm
  - 1 = 0.40 mm
  - 2 = 0.5 mm.

Needle points: There are five types of needle points that are in common use:

- Conventional cutting needle
- Reverse cutting needle
- Round-body taper-point needle
- Taper cutting needle
- Blunt point needle.

3.6.2 Nursing Management

Nursing management during the intraoperative period depends on routine tasks performed during surgery as well as on variables such as type of surgery performed, type of anesthesia used, client's age and condition, and any complications. Asepsis in the Operating Room is the responsibility of all personnel in the theatre. Surgical asepsis prevents contamination of surgical wounds. The risk of infection is high because of the break in skin integrity from the surgical incision. The client's own pathogens, plus those found in the OR, create an unsafe environment if personnel neglect to uphold strict aseptic technique. Thus, they strictly follow asepsis protocols to protect the client as much as possible. The client's safety and protection during surgery are essential and the nurse is expected to take the lead.

Intraoperative Assessment: Assessment of the client in the OR is based largely on the type or extent of surgery, the client's age, and any preexisting conditions. Depending on circumstances, assessment before the administration of the anesthetic may include the following:

- BP and pulse and respiratory rates
- Level of consciousness
- General physical condition
- Presence of catheters and tubes
- Review of client's chart, including a signed operative permit, administration of preoperative medications (time, dose, client response), voiding, skin preparation, carrying out other preoperative orders, and laboratory and diagnostic tests.

Counting of sponge sharps, forceps and needles would be done by the scrub and the circulating nurses as part of their intraoperative care before commencement of the surgery and before closing the cavity.

Specimen management: The scrub nurse as a matter of duty receives the specimen from the surgeon and handed it over to the circulating nurse who will add preservative and label it before handing it over to appropriate quarter depending on the hospital policy.

3.6.3 Post Operative Period

The postoperative period begins from when the patient is transferred to the recovery room till when he/she is discharge to the clinic. Many factors such as the client's age and nutritional status, preexisting diseases, type of surgery, and length of anesthesia may affect the duration, type, and extent of nursing management.

3.6.4 Transport of the Client

Immediately after the surgical procedure is complete, the client is transported to the post anesthesia care unit (PACU), also known as the post anesthesia recovery room, located near the OR. The nursing staff there should be someone who is knowledgeable in the care of clients recovering from anesthesia. Specialized equipment is available to monitor and treat the client, and surgical and anesthesia personnel should be readily available for any emergencies.

3.6.5 Nursing Management

This is subdivided into:
Immediate Postoperative Period: When clients are transferred from the OR to the PACU, the anesthesiologist or anesthetist is responsible for the client's safety. Critical considerations include maintaining an intact surgical site (incision), observing for potential vascular changes, and keeping the client warm. Position of the client is also important so that the incision is not compromised, drains do not obstruct, and the client does not experience orthostatic hypotension. The nurse receiving the client from the Operating room needs the following information:

- Medical diagnosis and surgical procedure done
- Past medical history and allergies
- Age, general condition, airway status, and current vital signs
- Anesthetic agents and medications given during surgery
- Complications during surgery
- Any pathology found and if so whether family members are informed
- Amounts of fluids and blood administered and amounts of fluids and blood lost
- Any tubes, catheters, etc.
- Any other pertinent information needed to care for the client.

3.7 Perianesthesia (Recovery Room) Nursing Responsibilities

- Airway maintenance: This can be achieve by assessing for airway patency; effectiveness of respirations; presence of artificial airways, mechanical ventilation, or supplemental oxygen.
- Vital signs: This is recorded every 15 minutes while in the recovery room to monitor circulatory status.
- Neurological assessment: This is achieve through the use of post anesthesia recovery score
- Surgical site status: Inspect the wound dressing for bleeding and draining tube.

- General assessment: include fluid balance monitoring through IV fluids, output from catheters and drains. Ability to void; level of consciousness; and pain should also be assessed. The nurse's major responsibilities during the client's stay in recovery room are to ensure a patent airway; help maintain adequate circulation; prevent or assist with the treatment of shock; maintain proper position and function of drains, tubes, and IV infusions; and monitor for potential complications.
- Patient safety: Patients in the recovery room are usually restless and they must not be allowed to fall, bed with side rails should be used.
- Monitoring and assessing recovery discharge readiness: An important assessment is determining how the client is recovering from anesthesia. A useful assessment tool is the Aldrete scale, which rates the client's mobility, respiratory status, and circulation, consciousness, and pulse oximetry. A score of 9 or greater indicates that the client has recovered from anesthesia
- Pain relief: post operative analgesia is usually given to minimize pain from surgical site when patient is recovering from the effect of anaesthesia.

3.7.1 Prevention of immediate Postoperative Complications

Hemorrhage: Hemorrhage can be internal or external. If the client loses a lot of blood, he or she will exhibit signs and symptoms of shock. The nurse inspects dressings frequently for signs of bleeding and checks the bedding under the client, because blood may pool under the body and be evident on the bedding. If bleeding is internal, the client may need to return to surgery for ligation of the bleeding vessels. Blood transfusions may be necessary to replace lost blood. When bleeding occurs, the nurse notes the amount and color on the chart. Bright red blood signifies fresh bleeding; dark, brownish blood indicates older blood. The nurse may need to reinforce soiled or saturated dressings. A written order is needed to change dressings. The nurse also must be aware of any wound drains and the type and amount of drainage expected. If such drainage is expected, the nurse explains to the client that the drainage is normal and does not indicate a complication.

Shock: Fluid and electrolyte loss, trauma (both physical and psychological), anesthetics, and preoperative medications all may contribute to shock. Signs and symptoms include pallor, fall in BP, weak and rapid pulse rate, restlessness, and cool, moist skin. Shock must be detected early and treated promptly because it can irreversibly damage vital organs such as the brain, kidneys, and heart.

Hypoxia: Factors such as residual drug effects or overdose, pain, poor positioning, pooling of secretions in the lungs, or obstructed airway predispose the client to hypoxia (decreased oxygen). Oxygen and suction equipment must be available for immediate use. The nurse observes the client closely for signs of cyanosis and dyspnea. Breathing may be obstructed if the tongue falls back and blocks the nasopharynx. If this occurs, the nurse pulls the lower jaw and inserts an oropharyngeal airway. Positioning the client on his or her side also may relieve nasopharyngeal obstruction. Restlessness, crowing or grunting respirations, diaphoresis, bounding pulse, and rising BP may indicate respiratory obstruction. If a client cannot breathe effectively, mechanical ventilation is used.

Aspiration: Danger of aspiration from saliva, mucus, vomitus, or blood exists until the client is fully awake and can swallow without difficulty. Suction equipment must be kept at the client's bedside until the danger of aspiration no longer exists. The nurse closely observes the client for difficulty swallowing or handling of oral secretions. Unless contraindicated, the nurse places the client in a side-lying position until the client can swallow oral secretions.

Later Postoperative Period

The later postoperative period begins when the client arrives in the hospital room or postsurgical care unit. Because the nurse can anticipate, prevent, or minimize many postoperative problems, he or she must approach the care of the client systematically.

Later management of surgical patient in the ward: This period includes respiratory function; general condition; vital signs; cardiovascular function and fluid status; pain level; bowel and urinary elimination; and dressings, tubes, drains, and IV lines.

Respiration: The nurse focuses on promoting gas exchange and preventing atelectasis, hypoventilation related to anesthesia, postoperative positioning, and pain is a common problem.

Preoperative and postoperative instructions include teaching the client how to take deep breath and cough, and how to splint the incision to minimize pain. Clients who have abdominal or thoracic surgery have greater difficulty taking deep breaths and coughing. Some clients require supplemental oxygen. Nursing management to prevent postoperative respiratory problems includes early mobility, frequent position changes, deep breathing and coughing exercises, and use of incentive spirometer. Hiccups (singultus) also may interfere with breathing.

They result from intermittent spasms of the diaphragm and may occur after surgery, especially abdominal surgery. They may be mild and last for only a few minutes. Prolonged hiccups not only are unpleasant but also may cause pain or discomfort. They may result in wound dehiscence or evisceration, inability to eat, nausea and vomiting, exhaustion, and fluid, electrolyte, and acid-base imbalances. If hiccups persist, the nurse needs to notify the physician.

Circulation: The nurse must assess the client's BP and circulatory status frequently. Although problems with postoperative bleeding decrease as the recovery time advances, the client is still at risk for bleeding. Some clients experience syncope when moving to an upright position. To prevent this, and the danger of falling, the nurse helps the client to move slowly to an upright or standing position. The client also is at risk for impaired venous circulation related to immobility. When clients lie still for long periods without moving their legs, blood may flow sluggishly through the veins (venous stasis). Venous stasis predisposes the client to venous inflammation and clot formation in the veins (thrombophlebitis), or clot formation with minimal or absent inflammation (phlebothrombosis). These two conditions are most common in the lower extremities. If the clot travels in the bloodstream (an embolus), it may obstruct circulation to a vital organ, such as the lungs, and causes severe symptoms and possibly death. To prevent venous stasis and other circulatory complications, the nurse encourages the client to move his or her legs frequently and do leg exercises. The nurse also does not place pillows under the client's knees or calves unless ordered. He or she avoids placing pressure on the client's lower extremities, applies elastic bandages or anti-embolism stockings as ordered, ambulates the client as ordered, and administers low-dose subcutaneous heparin every 12 hours as ordered.

Pain Management: Most clients experience pain after an operation, and a range of postoperative analgesics usually are ordered. Postoperative pain reaches its peak between 12 and 36 hours after surgery and diminishes significantly after 48 hours. Pain creates varying degrees of anxiety and emotions. If accompanied by great fear, the degree of pain can increase. Clients must receive pain and discomfort relief.

When patient-controlled analgesia (PCA) is used, clients administer their own analgesic. The nurse assesses for adverse effects of analgesics, timing of the medication in relation to other activities, effects of other comfort measures, contraindications, and source of the pain. The need for pain medications depends on the type and extent of the surgery, and the client. Pain unrelieved by medication may signal a developing complication, which underscores the need for a thorough assessment of the cause and type of pain

Fluids and Nutrition: IV fluids usually are administered after surgery. Length of administration depends on the type of surgery and the client's ability to take oral fluids. The nurse monitors the IV fluid flow rate and adjusts it as needed. He or she also assesses for signs of fluid excess or deficit and notifies the physician of any such signs. Many clients complain of thirst in the early postoperative recovery period. Because anesthesia slows peristalsis, ingesting liquids before bowel activity resumes can lead to nausea and vomiting. Pain medications also may cause nausea and vomiting. Once peristalsis has returned and the client is tolerating clear liquids, the nurse helps the client to increase dietary intake. Dietary progression (from clear liquids to a full, solid diet) often depends on the type of surgery, the client's progress, and physician preference. IV fluids usually are discontinued when the client can take oral fluids and food, and nutritional needs are met

Skin Integrity/Wound Healing: A surgical incision is a wound or injury to skin integrity. Initially the client may have a wound or incisional drain, which is a tube that exits from the peri-incisional area into either a dressing or portable wound suction device When assessing the wound, the nurse inspects for approximation of the wound edges, intactness of staples or sutures, redness, warmth, swelling, tenderness, discoloration, or drainage. He or she also notes any reactions to the tape or dressings. The first phase of wound healing is the inflammatory stage, which is when a blood clot forms, swelling occurs, and phagocytes ingest the debris from damaged tissue and the blood clot. This phase lasts 1 to 4 days. The second phase is the proliferative phase, in which collagen is produced and granulation tissue forms. It occurs over 5 to 20 days. The last phase is referred to as the maturation or remodeling phase and lasts from 21 days to several months and even 1 to 2 years. During this phase, the tensile strength of the wound increases through synthesis of collagen by fibroblasts and lysis by collagenase enzymes.

In addition, surgical wounds are formed aseptically, depending on the nature of the incision and the underlying condition.
There are three modes of wound healing:

- **Primary intention:** The wound layers are sutured together so that wound edges are well approximated. This type of incision usually heals in 8 to 10 days, with minimal scarring.
- **Secondary intention:** Granulating tissue fills in the wound for the healing process. The skin edges are not approximated. This method is used for ulcers and infected wounds. This type of

wound healing is slow, although new products, such as antimicrobial under dressings or calcium alginate dressings, promote healing.

- **Tertiary intention:** The approximation of wound edges is delayed secondary to infection. When the wound is drained and cleaned of infection, the wound edges are sutured together. The resulting scar is wider than that with primary intention.

The key to healing is adequate blood flow. Poor blood supply to the wound delays healing, as can excessive tension or pulling on wound edges. The nurse must be alert for signs and symptoms of impaired circulation, such as swelling, coldness, absence of pulse, pallor, or mottling, and report them immediately. Other factors that interfere with healing include malnutrition, impaired inflammatory and immune responses, infection, foreign bodies, and age. Obesity may also contribute to poor wound healing, secondary to impaired oxygenation, hyperglycemia, immobility, and nutritional deficits. Studies show that obese clients are more likely to have wound infections, as well as dehiscence, pressure ulcers, and deep tissue injury (Baugh, 2007). Excess fat prolongs the length of surgery and necessitates the use of more forceful retraction (holding surgical openings open with instruments), which contributes to tissue damage. It also adds to pressure on wound edges, decreasing blood flow and increasing the danger of dehiscence.

Bowel Elimination: Constipation may develop after the client begins to take solid food. Causes of this constipation include inactivity, diet, and narcotic analgesics. Some clients may experience diarrhea as a result of diet, medications such as antibiotics, or the surgical procedure. The nurse maintains a record of bowel movements and notifies the physician of either problem. Abdominal distention results from the accumulation of gas (flatus) in the intestines because of failure of the intestines to propel gas through the intestinal tract by peristalsis.

Contributing factors include manipulation of the intestines during abdominal surgery, inactivity after surgery, interruption of normal food and fluid intake, swallowing of large quantities of air, and anesthetics and medications given during or after surgery. If the symptoms are mild, they can be treated with nursing measures. The nurse encourages and assists clients who are permitted out of bed to ambulate. Sometimes walking, plus privacy in the bathroom, enables the client to expel the gas. The nurse encourages clients to change position frequently and to eat as normally as possible within the allowed dietary limits. If discomfort is severe or not relieved promptly by nursing measures, the nurse must contact the physician.

A serious condition called paralytic ileus may occur in which the intestines are paralyzed and, thus, peristalsis is absent. Fluids, solids, and gas do not move through the intestinal tract. Bowel sounds are absent, the abdomen is distended, and abdominal pain often is severe. Vomiting also may occur. If the client complains of severe abdominal pain, assessment includes inspecting the abdomen for distention, palpating for rigidity, and auscultating for bowel sounds. If bowel sounds are absent or abnormal or the abdomen is distended or rigid, the nurse notifies the physician immediately. A nasogastric tube usually is inserted and food and fluids withheld until bowel sounds return.

Acute gastric dilatation, a condition in which the stomach becomes distended with fluids, is a complication similar to paralytic ileus. The client may regurgitate small amounts of liquid, the abdomen appears distended, and as the condition progresses, symptoms of shock may develop. Treatment includes inserting a nasogastric tube, applying suction, and removing the gas and fluid. Some surgeons routinely use suction of the gastrointestinal tract to prevent paralytic ileus and acute gastric dilatation.

Urinary Elimination: Some clients experience difficulty voiding after surgery, particularly lower abdominal and pelvic surgery. Operative trauma in the region near the bladder may temporarily decrease the voiding sensation. Fear of pain also causes tenseness and difficulty voiding. If the client has an indwelling catheter, the nurse monitors urine output frequently. If the client does not have a catheter, the nurse assesses the client's ability to void and measures urine output. If the client cannot void within 8 hours after surgery, the nurse notifies the physician unless catheterization orders are in place. Signs and symptoms of bladder distention include restlessness, lower abdominal pain, discomfort or distention, and fluid intake without urinary output.

Psychosocial Status: Many clients experience anxiety and fear after surgery, as well as an inability to cope with changes in body image, lifestyle, and other factors. The nurse assesses what the client is experiencing and how the client is dealing with those issues. Many clients need referrals for counseling, support groups, and social services. The nurse acts as an effective listener, identifies areas of concern, and works with other healthcare professionals to assist the client and family to work through the problems.

Client and Family Teaching and Discharge: Before discharge, the client needs to receive instructions on how to carry out treatments at home. The nurse conveys the discharge instructions verbally and in writing. The nurse evaluates clients to determine their ability to carry out their care and to determine their specific needs like Supplies (e.g., dressings, tape, ostomy supplies, crutches), Special dietary needs adjustments to the living environment (e.g., special bed, portable commode, wheelchair access)

3.7.2 Post-Operative Complications

1. Respiratory: Atelectasis Pneumonia, Pulmonary embolism &Aspiration
2. Cardiovascular: Shock & Thrombophlebitis
3. Urinary: Acute urine retention, &Urinary tract infection
4. Neurologic: Delirium& Stroke
5. Gastrointestinal: Constipation Paralytic ileus & Bowel obstruction
6. Functional: Weakness Fatigue& Functional decline
7. Wound: Infection, Dehiscence, Evisceration, Delayed healing, Hemorrhage &Hematoma

4.0 SUMMARY

This unit has been able to equip you with necessary information that will guide you to meet the needs of surgical patient before, during and after surgical intervention. Preoperative assessment and teaching are the corner stone of effective management of surgical patient

5.0 TUTOR-MARKED ASSIGNMENT

Go to surgical ward of your institution and identify patients who had been scheduled for reconstructive and aesthetic surgeries. List the indication(s) for the procedures, conduct a comprehensive preoperative assessment on them and develop comprehensive pre operative nursing care plan for the patients.

SELF-ASSESSMENT EXERCISE

i. What are the different classifications of surgery?
ii. Explain the phases of surgical patients care?
iii. What are the contents of preoperative teaching?
iv. Explain the stages of general anaesthesia?
v. Describe the various classifications of surgical sutures?
vi. Explain the roles of surgical team?
vii. Explain the focus of immediate post operative nursing care of surgical patients in the recovery room?
viii. Explain the post operative management of surgical patient on the ward?

UNIT 2 CARE OF PATIENTS EXPERIENCING TRAUMA

CONTENTS

1.0 INTRODUCTION

Trauma is an unintentional or intentional wound or injury inflicted on the body from a mechanism against which the body cannot protect itself and it is the fourth leading cause of death in the United States. Caring for a patient with trauma is not likely to be a new task for you as you would have come across one as a practicing nurse. This unit is intended to broaden your knowledge base in caring for traumatic patients and make you a better member of emergency management team of your institution.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- mention different classes of trauma
- conduct initial assessment on patient with trauma using AMPLE
- enumerate the general emergency caring needs of patients experiencing trauma.
- discuss the management of patients with specific types of trauma.
- provide emergency care to patients with different types of fractures

- mention different medical approaches used in managing fractures.

3.0 MAIN CONTENT

3.1 Epidemiology of Trauma

Trauma is the leading cause of death in children and in adults younger than 44 years of age and the incidence is increasing in adults older than 44 years of age. Alcohol and drug abuse are often implicated as factors in both blunt and penetrating trauma.

Trauma can be said to have occurred when an individual is subjected to physical or psychological injury or threat of injury. Traumatic events are defined not only by the nature of the event but also the person's perception of it as overwhelming. Traumatic events can be experienced as an individual, as in cases of abuse or neglect, assault or serious medical illness, or as part of a group, such as community violence, war, or a natural disaster. A person need not experience a traumatic event directly in order to feel its effects. Events that threaten an individual's safety, such as witnessing domestic violence, can also cause significant trauma to the exposed individual. Injury that can results from trauma can be classified in two.

3.2 Classification of Trauma

Physical injuries/Trauma: this occur when the body sustains physical injury /injuries from a mechanism against which the body cannot protect itself and it is the fourth leading cause of death in the United States. These include:

- Blunt Trauma: Most often results from vehicular accidents, but may occur in assaults, falls from heights, and sports related injuries. May be caused by accelerating, decelerating, shearing, crushing, and compressing forces. Body tissues respond differently to kinetic energy but low density porous tissues and structures, such as lungs, often experience little damage because of their elasticity. The heart, spleen and liver are less resilient often rupturing or fragmenting.
- Penetrating Trauma: Results from the impalement of foreign objects into the body, more easily diagnosed because of obvious injury signs. Stab wounds are usually low velocity, depending on the direct path, the depth and width. Missiles or bullets that come into contact with internal structures that produce a change in their pathway release more energy and result in more injury than a direct pathway.

- Injuries sustained from penetrating objects must be assessed for the potential for infection from the debris carried by the penetrating object.
- Most severe injuries in mass trauma events are fractures, burns, lacerations, and crush injuries while common injuries are eye injuries, sprains, strains, minor wounds and ear damage.

3.3 Initial Patient Assessment

- History taking : This is done through this acronym **-AMPLE**
- Allergies
- Medications currently used
- Past illnesses/Pregnancy
- Last meal/fluids
- Events leading up to trauma.

3.4 Clinical presentation

- Physical assessment: This is from head to toes to determine the type of trauma- Chest Injuries, Spinal Cord Injuries, Head Injuries, Musculoskeletal Injuries, Abdominal Injuries and Extremity Assessment to check for the 5 P's Pallor, pain, pulses, parethesia and paralysis (describes the neurovascular status of the injured extremity).
- Traumatic soft tissue injuries are categorized as: contusions, abrasions, lacerations punctures, hematomas, amputations, and avulsions. All wounds are considered contaminated.
- Thorough and ongoing examination and assessment by evaluating for other injuries — reassess head and neck, chest; assess abdomen, back, and extremities. Chest and pelvis, extremity X-rays. Abdominal ultrasound and Abdominal CT can be used but in the case of hemodynamic instability Peritoneal lavage is the quick, invasive test of choice.

3.5 Emergency Management of Traumatic Patients

General Management of Patients with Trauma: This depends on the patient's condition on arrival at the emergency unit but basically, resuscitation procedures are usually initiated. The goals of treatment are to determine the extent of injuries and to establish priorities of treatment. Any injury interfering with a vital physiologic function (e.g., airway, breathing, circulation) is an immediate threat to life and has the highest priority for immediate treatment. Trauma predisposes the patient to infection by disruption of mechanical barriers, exposure to exogenous bacteria from the environment at the time of injury, and diagnostic and therapeutic procedures (nosocomial infection). Tetanus prophylaxis and broad spectrum antibiotics are administered as prescribed.

Throughout the stay in the Emergency Department, the patient's condition is continuously monitored for changes. If there is continuing evidence of shock, blood loss, free air under the diaphragm, evisceration, haematuria, or suspected or known abdominal injury, the patient is rapidly transported to surgery. In most cases, blunt liver and spleen injuries are managed non- operatively. Basically, emergency cares include:

1. Establish airway and ventilation through patent airway: The airway is the most important component of the primary survey. The neck should not be hyperextended, flexed, or rotated until spinal injury is ruled out because any movement may worsen an existing cervical spine injury. The airway is inspected for obstruction, including loose teeth, foreign objects, bleeding, and vomitus. Next, any visible airway obstructions are removed using suction. Airway adjuncts, such as nasopharyngeal or oropharyngeal airways, may be used to keep the airway open. When additional airway support and mechanical ventilation are required, advanced airway adjuncts, such as endotracheal intubation or cricothyroidotomy, may be performed by specially trained emergency personnel or physicians.
2. Maintenance of adequate ventilation: After the patency of the airway is ensured, the patient is assessed for spontaneous breathing and respiratory rate and depth. The nurse observes whether the patient's chest rises and falls spontaneously and auscultates the lungs for breath sounds bilaterally. If the patient is not breathing, interventions are conducted before proceeding. The patient may be ventilated with a mouth-to-face mask or a bag-valve-face mask. Endotracheal intubation is the preferred method of maintaining an airway in an unconscious patient because it ensures airway patency and protects the lungs from aspiration.
3. Control of hemorrhage: The Bleeding is controlled by application of direct pressure to any external bleeding wounds and by occlusion of any chest wounds. Circulating blood volume is maintained with intravenous fluid replacement, including blood component therapy. The patient is monitored for signs and symptoms of shock after an initial response to transfusion therapy, because these are often the first signs of internal hemorrhage. The urine output is monitored to prevent hypovolaemic shock and replacing circulating volume will also improve and restore tissue perfusion. Typically, oral fluids are withheld in anticipation of surgery, and the stomach contents are

aspirated with a nasogastric tube to reduce the risk of aspiration. Nasogastric aspiration also decompresses the stomach in preparation for diagnostic procedures.

4. Care of blunt injury: With blunt trauma, the patient is kept on a stretcher to immobilize spine. Assess for head and neck injuries. A backboard may be used for transporting the patient to the x-ray department, to the operating room, or to the intensive care unit. Cervical spine immobilization is maintained cervical x-rays have been obtained and cervical spine injury ruled out. Knowing the mechanism of injury (e.g., penetrating force from a gunshot or knife, blunt force from a blow), is essential to determining the type of management needed. All wounds are located, counted, and documented. If abdominal viscera protrude, the area is covered with sterile, moist saline dressings to keep the viscera from drying.

3.5.1 Management of Specific Traumatic Injuries

Contusion: This is a soft tissue injury produced by blunt force, such as a blow, kick, or fall. Many small blood vessels rupture and bleed into soft tissues (ecchymosis, or bruising). A hematoma develops when the bleeding is sufficient to cause an appreciable collection of blood. Local symptoms (pain, swelling, and discoloration) are controlled with intermittent application of cold. Most contusions resolve in 1 to 2 weeks.

S**train** is a “muscle pull” caused by overuse, overstretching, or excessive stress. Strains are microscopic, incomplete muscle tears with some bleeding into the tissue. The patient experiences soreness or sudden pain, with local tenderness on muscle use and isometric contraction.

Sprain is an injury to the ligaments surrounding a joint that is caused by a wrenching or twisting motion. The function of a ligament is to maintain stability while permitting mobility. A torn ligament loses its stabilizing ability. Blood vessels rupture and edema occurs; the joint is tender, and movement of the joint becomes painful. The degree of disability and pain increases during the first 2 to 3 hours after the injury because of the associated swelling and bleeding. An x-ray should be obtained to rule out bone injury. Avulsion fracture (in which a bone fragment is pulled away by a ligament or tendon) may be associated with a sprain.

Management

Treatment of contusions, strains, and sprains consists of resting and elevating the affected part, applying cold, and using a compression bandage. (The acronym **RICE**—*R*est, *I*ce, *C*ompression, *E*levation—is helpful for remembering treatment interventions.) Rest prevents additional injury and promotes healing. Moist or dry cold applied intermittently for 20 to 30 minutes during the first 24 to 48 hours after injury produces vasoconstriction, which decreases bleeding, edema, and discomfort. Care must be taken to avoid skin and tissue damage from excessive cold. An elastic compression bandage controls bleeding, reduces edema, and provides support for the injured tissues. Elevation controls the swelling. If the sprain is severe (torn muscle fibers and disrupted), surgical repair or cast immobilization may be necessary so that the joint will not lose its stability. The neurovascular status (circulation, motion, sensation) of the injured extremity is monitored frequently. After the acute inflammatory stage (e.g, 24 to 48 hours after injury), heat may be applied intermittently (for 15 to 30 minutes, four times a day) to relieve muscle spasm and to promote vasodilation, absorption, and repair. Depending on the severity of injury, progressive passive and active exercises may begin in 2 to 5 days.

Severe sprains may require 1 to 3 weeks of immobilization before protected exercises are initiated. Excessive exercise early in the course of treatment delays recovery. Strains and sprains take weeks or months to heal. Splinting may be used to prevent re injury.

Hip Dislocation: A dislocation of a joint is a condition in which the articular surfaces of the bones forming the joint are no longer in anatomic contact. The bones are literally “out of joint.” A **subluxation** is a partial dislocation of the articulating surfaces. Traumatic dislocations are orthopedic emergencies because the associated joint structures, blood supply, and nerves are distorted and severely stressed. If the dislocation is not treated promptly, *avascular necrosis* (tissue death due to anoxia and diminished blood supply) and nerve palsy may occur. Dislocations may be congenital, or present at birth (most often the hip); spontaneous or pathologic, caused by disease of the articular or periarticular structures; or traumatic, resulting from injury in which the joint is disrupted by force.

Signs and symptoms of a traumatic dislocation are pain, change in contour of the joint, change in the length of the extremity, loss of normal mobility, and change in the axis of the dislocated bones. X-rays confirm the diagnosis and demonstrate any associated fracture.

Medical Management

The affected joint needs to be immobilized while the patient is transported to the hospital. The dislocation is promptly reduced (ie, displaced parts are brought into normal position) to preserve joint function. Analgesia, muscle relaxants, and possibly anesthesia are used to facilitate closed reduction. The joint is immobilized by bandages, splints, casts, or traction and is maintained in a stable position. Neurovascular status is monitored. After reduction, if the joint is stable, gentle, progressive, active and passive movement is begun to preserve range of motion (ROM) and restore strength. The joint is supported between exercise sessions.

Nursing Management

Nursing care is directed at providing comfort, evaluating the patient's neurovascular status, and protecting the joint during healing. The nurse teaches the patient how to manage the immobilizing devices and how to protect the joint from re injury.

3.6 Fracture

This is a break in the continuity of bone and is defined according to its type and extent. Fractures occur when the bone is subjected to stress greater than it can absorb. Fractures are caused by direct blows, crushing forces, sudden twisting motions, and even extreme muscle contractions. When the bone is broken, adjacent structures are also affected, resulting in soft tissue edema, hemorrhage into the muscles and joints, joint dislocations, ruptured tendons, severed nerves, and damaged blood vessels. Body organs may be injured by the force that caused the fracture or by the fracture fragments.

Types of Fractures

A *complete fracture* involves a break across the entire cross-section of the bone and is frequently displaced (removed from normal position). In an *incomplete fracture* (e.g., greenstick fracture), the break occurs through only part of the cross-section of the bone.

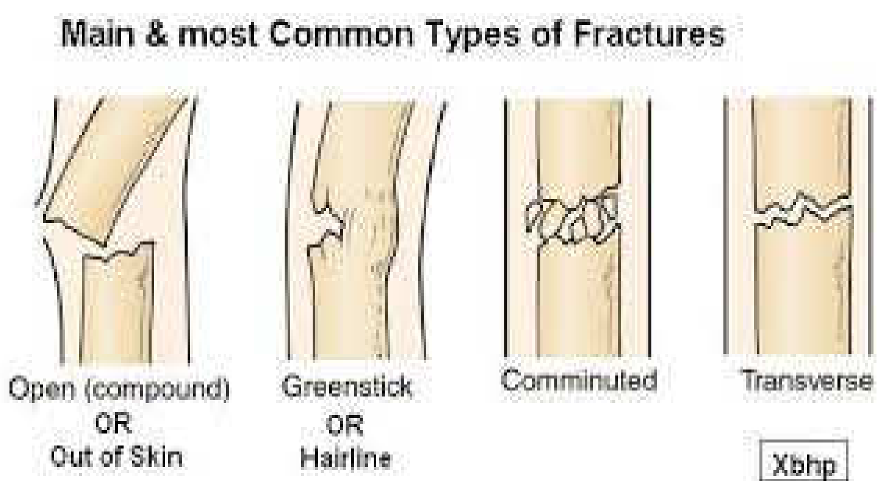
A *comminuted* fracture is one that produces several bone fragments.

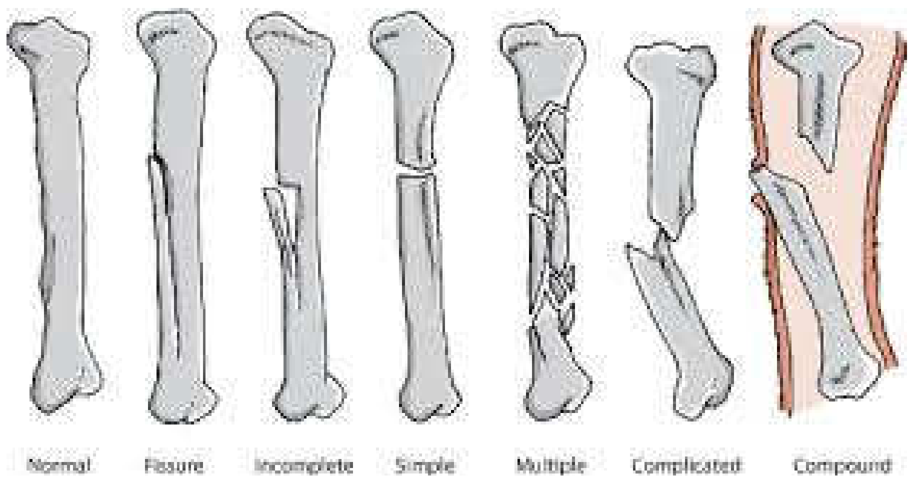
A *closed fracture* (simple fracture) is one that does not cause a break in the skin.

An *open fracture* (compound, or complex, fracture) is one in which the skin or mucous membrane wound extends to the fractured bone.

Open fractures are graded according to the following criteria:

Grade I is a clean wound less than 1 cm long.
Grade II is a larger wound without extensive soft tissue damage.
Grade III is highly contaminated, has extensive soft tissue damage, and is the most severe.
Fractures may also be described according to the anatomic placement of fragments, particularly if they are displaced or not displaced.





Clinical Manifestations
The clinical manifestations of a fracture are pain, loss of function, deformity, shortening of the extremity, crepitus, and local swelling and discoloration. Not all of these clinical manifestations are present in every fracture. For example, many are not present with linear or fissure fractures or with impacted fractures. The diagnosis of a fracture is based on the patient’s symptoms, the physical signs, and the x-ray findings. Usually, the patient reports having sustained an injury to the area.

Pain: The pain is continuous and increases in severity until the bone fragments are immobilized. The muscle spasm that accompanies fracture is a type of natural splinting designed to minimize further movement of the fracture fragments.

Loss of Function: After a fracture, the extremity cannot function properly, because normal function of the muscles depends on the integrity of the bones to which they are attached. Pain contributes to the loss of function. In addition, abnormal movement (false motion) may be present.

Deformity: Displacement, angulation, or rotation of the fragments in a fracture of the arm or leg causes a deformity (either visible or palpable) that is detectable when the limb is compared with the uninjured extremity. Deformity also results from soft tissue swelling.

Shortening: In fractures of long bones, there is actual shortening of the extremity because of the contraction of the muscles that are attached above and below the site of the fracture. The fragments often overlap by as much as 2.5 to 5 cm (1 to 2 inches).

Crepitus: When the extremity is examined with the hands, a grating sensation, called *crepitus*, can be felt. It is caused by the rubbing of the bone fragments against each other.

Swelling and Discoloration: Localized swelling and discoloration of the skin (ecchymosis) occurs after a fracture as a result of trauma and bleeding into the tissues. These signs may not develop for several hours after the injury.

3.6.1 Emergency Management of Fractures

Immediately after injury, whenever a fracture is suspected, it is important to immobilize the body part before the patient is moved. If an injured patient must be removed from a vehicle before splints can be applied, the extremity is supported above and below the fracture site to prevent rotation as well as angular motion. Adequate splinting, including joints adjacent to the fracture, is essential. Movement of fracture fragments causes additional pain, soft tissue damage, and bleeding. Temporary, well-padded splints, firmly bandaged over clothing, serve to immobilize the fracture. Immobilization of the long bones of the lower extremities may be accomplished by bandaging the legs together, with the unaffected extremity serving as a splint for the injured one. In an upper extremity injury, the arm may be bandaged to the chest, or an injured forearm may be placed in a sling. The neurovascular status distal to the injury should be assessed to determine adequacy of peripheral tissue perfusion and nerve function. With an *open fracture*, the wound is covered with a clean (sterile) dressing to prevent contamination of deeper tissues. No attempt is made to reduce the fracture, even if one of the bone fragments is protruding through the wound. Splints are applied for immobilization. In the emergency department, the patient is evaluated completely. The clothes are gently removed, first from the uninjured side of the body and then from the injured side. The patient's clothing may be cut away. The fractured extremity is moved as little as possible to avoid more damage.

3.6.2 Medical Management of Fractures

The principles of fracture treatment include reduction, immobilization, and regaining of normal function and strength through rehabilitation.

Reduction: Reduction of a fracture ("setting" the bone) refers to restoration of the fracture fragments to anatomic alignment and rotation. Either closed reduction or open reduction may be used to reduce a fracture.

The specific method selected depends on the nature of the fracture; however, the underlying principles are the same. Usually, the physician reduces a fracture as soon as possible to prevent loss of elasticity from the tissues through infiltration by edema or hemorrhage. In most cases, **fracture reduction** becomes more difficult as the injury begins healing. Before fracture reduction and immobilization, the patient is prepared for the procedure; permission for the procedure is obtained, and an analgesic is administered as prescribed. Anesthesia may be administered. The injured extremity must be handled gently to avoid additional damage.

Closed Reduction: In most instances, closed reduction is accomplished by bringing the bone fragments into apposition (i.e., placing the ends in contact) through manipulation and manual traction. The extremity is held in the desired position while the physician applies a cast, splint, or other device. Reduction under anesthesia with percutaneous pinning may be used. The immobilizing device maintains the reduction and stabilizes the extremity for bone healing. X-rays are obtained to verify that the bone fragments are correctly aligned. Traction (skin or skeletal) may be used to effect fracture reduction and immobilization. Traction may be used until the patient is physiologically stable and able to withstand surgical fixation.

Open Reduction. Some fractures require open reduction. Through a surgical approach, the fracture fragments are reduced. Internal fixation devices (metallic pins, wires, screws, plates, nails, or rods) may be used to hold the bone fragments in position until solid bone healing occurs.

These devices may be attached to the sides of bone, or they may be inserted through the bony fragments or directly into the medullary cavity of the bone. Internal fixation devices ensure firm approximation and fixation of the bony fragments.

Immobilization: After the fracture has been reduced, the bone fragments must be immobilized, or held in correct position and alignment, until union occurs. Immobilization may be accomplished by external or internal fixation. Methods of external fixation include bandages, casts, splints, continuous traction, and external fixators. Metal implants used for internal fixation serve as internal splints to immobilize the fracture.

3.6.3 Nursing Management of Patients with Closed Fractures

The nurse encourages patients with closed (simple) fractures to return to their usual activities as rapidly as possible. The nurse teaches patients how to control swelling and pain associated with the fracture and with soft tissue trauma and encourages them to be active within the limits of the fracture immobilization. It is important to teach exercises to maintain the health of unaffected limb.

The Process of Bone Healing

The process of Fracture healing restores the tissue to its original physical and mechanical properties and is influenced by a variety of systemic and local factors. Healing occurs in three distinct but overlapping stages:

1. The early inflammatory stage;
2. The repair stage;
3. The late remodeling stage.

Inflammatory stage: Here hematoma develops within the fracture site during the first few hours and days. Inflammatory cells (macrophages, monocytes, lymphocytes, and polymorpho nuclear cells) and fibroblasts infiltrate the bone under prostaglandin mediation. This results in the formation of granulation tissue, in growth of vascular tissue, and migration of mesenchymal cells. The primary nutrient and oxygen supply of this early process is provided by the exposed cancellous bone and muscle. The use of anti inflammatory or cytotoxic medication during this 1st week may alter the inflammatory response and inhibit bone healing.

Repair stage: In this stage, fibroblasts begin to lay down a stroma that helps support vascular in growth. It is during this stage that the presence of nicotine in the system can inhibit this capillary in growth. A significantly decreased union rate had been consistently demonstrated in tobacco abusers. As vascular in growth progresses, a collagen matrix is laid down while osteoid is secreted and subsequently mineralized, which leads to the formation of a soft callus around the repair site. In terms of resistance to movement, this callus is very weak in the first 4 to 6 weeks of the healing process and requires adequate protection in the form of bracing or internal fixation. Eventually, the callus ossifies, forming a bridge of woven bone between the fracture fragments. Alternatively, if proper immobilization is not used, ossification of the callus may not occur, and an unstable fibrous union may develop instead.

Remodeling stage: Fracture healing is completed during this stage and here the healing bone is restored to its original shape, structure, and mechanical strength. Remodeling of the bone occurs slowly over months to years and is facilitated by mechanical stress placed on the bone. As the fracture site is exposed to an axial loading force, bone is generally laid down where it is needed and resorbed from where it is not needed. Adequate strength is typically achieved in 3 to 6 months.

The most critical period of bone healing is the first 1 to 2 weeks in which inflammation and revascularization occur. The incorporation and remodeling of a bone graft require that mesenchymal cells have vascular access to the graft to differentiate into osteoblasts and osteoclasts. A variety of systemic factors can inhibit bone healing, including cigarette smoking, malnutrition, diabetes, rheumatoid arthritis, and osteoporosis. In particular, during the 1st week of bone healing, steroid medications, cytotoxic agents, and nonsteroidalanti inflammatory medications can have harmful effects. Irradiation of the fusion site within the first 2 to 3 weeks can inhibit cell proliferation and induce an acute vasculitis that significantly compromises bone healing

3.7 Psychological Trauma

Can be said to be the effects of major events like war, rape, kidnapping, abuse, surviving a natural disaster, auto accident, the breakup of a significant relationship, a humiliating or deeply disappointing experience, the discovery of a life-threatening illness or disabling condition.
Signs & Symptoms of Psychological Trauma; These may be Physical or emotional:

Physical; Eating disturbances (more or less than usual).Sleep disturbances (more or less than usual), Sexual dysfunction, Low energy &Chronic, unexplained pain Emotional Depression, spontaneous crying, despair and hopelessness, Anxiety, Panic attacks, Fearfulness Compulsive and obsessive behaviours, Feeling out of control, Irritability, angry and resentment, Emotional numbness, Withdrawal from normal routine and relationships Cognitive Memory lapses, especially about the trauma, Difficulty making decisions and decreased ability to concentrate.

4.0 SUMMARY

Caring for patients with different types of trauma can be challenging to you in this 21st century but if adequate assessment is done by using nursing process approach and the recommended interventions that are available in this unit are well implemented, you will be a better nurse that is vast in rendering care to patients with any form of trauma.

5.0 TUTOR-MARKED ASSIGNMENT

Visit the accident and emergency unit of any nearest teaching hospital and identify patient with fracture. Conduct comprehensive assessment on the patient identify the type of fracture and come up with nursing interventions and medical treatment options for such.

SELF-ASSESSMENT EXERCISE

i. Mention different classes of trauma.
ii. Conduct initial assessment on patient with trauma using AMPLE
iii. Enumerate the general emergency caring needs of patients experiencing trauma.
iv. Discuss the management of patients with specific types of trauma.
v. Provide emergency care to patients with different types of fractures.
vi. Mention different medical approaches used in managing fractures.

UNIT 3 CARE OF UNCONSCIOUS PATIENT

CONTENTS

1.0 INTRODUCTION

During your day to day practi**ce,** you often come across patients with varying degree of unconsciousness and you probably had given one form of nursing care or the other to them. Unconscious patients depend on the expertise of the nurse for survival and in order to meet the caring needs of these patients, you must have adequate knowledge and understanding of the immediate and remote care base on the individualized manifestations presented by such patient.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- identify causes of unconsciousness
- describe the pathophysiology of unconsciousness
- conduct assessment on unconscious patients using Glasgow coma scale
- identify diagnostic investigations necessary for unconscious patients
- identify related nursing diagnoses for unconsciousness
- prioritize and meet the caring needs of patients with altered level of consciousness

3.0 MAIN CONTENT

3.1 Definition

Unconsciousness is an altered loss of consciousness in which the patient is unresponsive to and unaware of environmental stimuli, usually for a short duration. Coma is a clinical state of an unarousable and unresponsive condition in which the patient is unaware of self or the environment for prolonged periods (days to months, or even years). Akineticmutism is a state of unresponsiveness to the environment in which the patient makes no voluntary movement.

3.2 Causes of unconsciousness

- Poisons and drugs: alcohol, general anaesthetics, overdose of drugs - legal and illicit, gases (carbon monoxide), heavy metals (lead poisoning).
- Vascular causes: post-cardiac arrest, ischaemia, haemorrhage {subarachnoid), acute hypovolaemia, for example, in trauma.
- Infections: sepsis, viral causes (human immunodeficiency virus), meningitis, protozoan infections (malaria), fungal (aspergillosis).
- Seizures: idiopathic or post-traumatic epilepsy, eclampsiae.t.c .
- Metabolic disorders: hypoglycaemia, hyperglycaemia hypoxia, renal failure, hepatic failure.
- Other causes: neoplasm - primary or secondary, trauma, degenerative disease.

3.3 Pathophysiology

Altered level of Consciousness is not a disorder itself; rather, it is a function and symptom of multiple pathophysiologic phenomena. The cause may be neurologic (head injury, stroke), toxicologic (drug overdose, alcohol intoxication), or metabolic (hepatic or renal failure, diabetic ketoacidosis).The underlying causes of neurologic dysfunction are disruption in the cells of the nervous system, neurotransmitters, or brain anatomy.

A disruption in the basic functional units (neurons) or neurotransmitters results in faulty impulse transmission, impeding communication within the brain or from the brain to other parts of the body. These disruptions are caused by cellular edema and other mechanisms such as antibodies disrupting chemical transmission at receptor sites. Intact anatomic structures of the brain are needed for proper function. The two hemispheres of the cerebrum must communicate, via an intact corpus callosum, and the lobes of the brain (frontal, parietal, temporal, and occipital) must communicate and coordinate their specific functions. Additional anatomic structures of importance are the cerebellum and the brain stem. The cerebellum has both excitatory and inhibitory actions and is largely responsible for coordination of movement. The brain stem contains areas that control the heart, respiration, and blood pressure. Disruptions in the anatomic structures are caused by trauma, edema, pressure from tumors as well as other mechanisms such as an increase or decrease in blood or cerebrospinal fluid (CSF) circulation.

3.4 Clinical Manifestations

Alterations in level of Consciousness occur along a continuum, and the clinical manifestations depend on where the patient is along this continuum. As the patient's state of alertness and consciousness decreases, there will be changes in the pupillary response, eye opening response, verbal response, and motor response. Initial changes may be reflected by subtle behavioral changes such as restlessness or increased anxiety. The pupils, normally round and quickly reactive to light, become sluggish (response is slower); as the patient becomes comatose, the pupils become fixed (no response to light). The patient in a coma does not open the eyes, respond verbally, or move the extremities in response to a request to do so.

3.5 Assessment of the Unconscious Patient

- Assess level of responsiveness (consciousness) using the Glasgow Coma Scale. Assess also the patient's ability to respond verbally. Evaluate pupil size, equality, and reaction to light; note movement of eyes.
- Assess for spontaneous, purposeful, or non purposeful responses: decorticate posturing (arms flexed, adducted, and internally rotated, and legs in extension) or decerebrate posturing (extremities extended and reflexes exaggerated).
- Rule out paralysis or stroke as cause of flaccidity.
- Examine respiratory status, eye signs, reflexes, and body functions (circulation, respiration, elimination, fluid and electrolyte balance) in a systematic manner.

Glasgow Coma Scale

Eye Opening Spontaneous......4
To verbal stimulus…3
To painful stimulus…2
No response…..1
Verbal Response Normal conversation…..5

Confused conversation….4
Inappropriate words…..3
Incomprehensible sounds….2
No response…..1

Motor Response Obeys commands…..6
Localizes pain…..5
Withdraws from pain…..4
Abnormal flexion….3
Abnormal extension….2
No response….1

A score of less than 7 indicates a comatose patient and a score of 15 indicates the patient is fully alert and oriented. When used to score the effects of a head injury, a score of 13 or 14 indicates mild head injury, 9 to 12 indicates moderate injury, and any score of 8 or below indicates severe head injury.

3.6 Diagnostic Methods

- Laboratory tests: analysis of blood glucose, electrolytes, serum ammonia, and liver function tests; blood urea nitrogen (BUN) levels; serum osmolality; calcium level; and partial thromboplastin and prothrombin times.
- Other studies may be used to evaluate serum ketones, alcohol and drug concentrations, and arterial blood gases.
- Neurologic examination (CT Scan, MRI, Positron emission tomography [PET], Electroencephalography [EEG], Single photon emission CT [SPECT]) to identify cause of loss of consciousness.

3.7 Nursing Management

Based on the assessment data, the major nursing diagnoses may include the following:

- Ineffective airway clearance related to altered level of consciousness
- Risk of injury related to decreased level of consciousness
- Deficient fluid volume related to inability to take in fluids by mouth
- Impaired oral mucous membranes related to mouth breathing, absence of pharyngeal reflex, and altered fluid intake
- Risk for impaired skin integrity related to immobility
- Impaired tissue integrity of cornea related to diminished or absent corneal reflex

- Ineffective thermoregulation related to damage to hypothalamic center
- Impaired urinary elimination (incontinence or retention) related to impairment in neurologic sensing and control
- Bowel incontinence related to impairment in neurologic sensing and control and also related to transitions in nutritional delivery methods
- Disturbed sensory perception related to neurologic impairment
- Interrupted family processes related to health crisis

Airway Maintenance: The most important consideration in managing patients with altered level of Consciousness is to establish an adequate airway and ensure ventilation. Obstruction of the airway is a risk because the epiglottis and tongue may relax, occluding the oropharynx, or the patient may aspirate vomitus or nasopharyngeal secretions. The accumulation of secretions in the pharynx presents a serious problem. Because the patient cannot swallow and lack spharyngeal reflexes, these secretions must be removed to eliminate the danger of aspiration. Elevating the head of the bed to30 degrees helps prevent aspiration. Positioning the patient in a lateral or semi prone position will also help as it permits the jaw and tongue to fall forward, thus promoting drainage of secretions. Positioning alone is not always adequate, however. The patient may require suctioning and oral hygiene. Suctioning is performed to remove secretions from the posterior pharynx and upper trachea. With the suction off, a whistle-tip catheter is lubricated with a water-soluble lubricant and inserted to the level of the posterior pharynx and upper trachea. Continuous suction is applied as the catheter is withdrawn using a twisting motion of the thumb and forefinger. This twisting maneuver prevents the suctioning end of the catheter from causing irritation, which increases secretions and causes mucosal trauma and bleeding. Before and after suctioning, the patient is hyperoxygenated and hyperventilated to prevent hypoxia. In addition to these interventions, chest physiotherapy and postural drainage may be initiated to promote pulmonary hygiene, unless contraindicated by the patient's underlying condition. Also, the chest should beauscultated at least every 8 hours to detect adventitious breath sounds or absence of breath sounds. Despite these measures, or because of the severity of impairment, the patient with altered loss of Consciousness often requires intubation and mechanical ventilation. Nursing actions for the mechanically ventilated patient include maintaining the patency of the endotracheal tube or tracheostomy, providing frequent oral care, monitoring arterial blood gas measurements, and maintaining ventilator settings.

Protecting the Patient: For the protection of the patient, padded side rails are provided and raised at all times. Care should be taken to prevent injury from invasive lines and equipment, and other potential sources of injury should be identified (eg, restraints, tight dressings, environmental irritants, damp bedding or dressings, tubes and drains). Protection also encompasses the concept of protecting the patient's dignity during altered LOC. Simple measures such as providing privacy and speaking to the patient during nursing care activities preserve the patient's humanity. Not speaking negatively about the patient's condition or prognosis is also important, because patients in a light coma may be able to hear. The comatose patient has an increased need for advocacy, and it is the nurse's responsibility to see that these advocacy needs are met.

Maintaining Fluid Balance and Managing Nutritional Needs: Hydration status is assessed by examining tissue turgor and mucous membranes, assessing intake and output trends, and analyzing laboratory data. Fluid needs are met initially by giving the required fluids intravenously. However, intravenous solutions and blood transfusions for patients with intracranial conditions must be administered slowly. If given too rapidly, they may increase ICP. The quantity of fluids administered may be restricted to minimize the possibility of producing cerebral edema. If the patient does not recover quickly and sufficiently enough to take adequate fluids and calories by mouth, a feeding tube will be inserted for the administration of fluids and enteral feedings

Providing Mouth Care: The mouth is inspected for dryness, inflammation, and crusting. The unconscious patient requires conscientious oral care because there is a risk of parotitis if the mouth is not kept scrupulously clean. The mouth is cleansed and rinsed carefully to remove secretions and crusts and to keep the mucous membranes moist. A thin coating of petrolatum on the lips prevents drying, cracking, and encrustations. If the patient has an endotracheal tube, the tube should be moved to the opposite side of the mouth daily to prevent ulceration of the mouth and lips.

Maintenance of Skin and Joint Integrity: Preventing skin breakdown requires continuing nursing assessment and intervention. Special attention is given to unconscious patients because they cannot respond to external stimuli. Assessment includes a regular schedule of turning to avoid pressure, which can cause breakdown and necrosis of the skin. Turning also provides kinesthetic (sensation of movement), proprioceptive (awareness of position), and vestibular (equilibrium) stimulation. After turning, the patient is carefully repositioned to prevent ischemic necrosis over pressure areas. Dragging the patient up in bed must be avoided, because this creates a shearing force and friction on the skin surface. Maintaining correct body position is important; equally important is passive exercise of the extremities to prevent contractures. The use of splints or foam boots aids in the prevention of foot drop and eliminates the pressure of bedding on the toes. Trochanter rolls supporting the hip joints keep the legs in proper alignment. The arms should be in abduction, the fingers lightly flexed, and the hands in slight supination. The heels of the feet should be assessed for pressure areas. Specialty beds, such as fluidized or low-air-loss beds, may be used to decrease pressure on bony prominences.

Preserving Corneal Integrity: Some unconscious patients have their eyes open and have inadequate or absent corneal reflexes. The cornea is likely to become irritated or scratched, leading to keratitis and corneal ulcers. The eyes may be cleansed with cotton balls moistened with sterile normal saline to remove debris and discharge. If artificial tears are prescribed, they may be instilled every 2 hours. Periocular edema (swelling around the eyes) often occurs after cranial surgery. Cold compresses may be prescribed, and care must be exerted to avoid contact with the cornea.

Achieving Thermoregulation: High fever in unconscious patients may be caused by infection of the respiratory or urinary tract, drug reactions, or damage to the hypothalamic temperature-regulating center. A slight elevation of temperature may be caused by dehydration. The environment can be adjusted, depending on the patient’s condition, to promote a normal body temperature. If body temperature is elevated, a minimum amount of bedding, a sheet or perhaps only a small drape is used. The room may be cooled to 18.3^o (65^oF). However, if the patient is elderly and does not have an elevated temperature, a warmer environment is needed.

Because of damage to the heat-regulating center in the brain or severe intracranial infection, unconscious patients often develop very high temperatures. Such temperature elevations must be controlled because the increased metabolic demands of the brain can overburden cerebral circulation and oxygenation, resulting in cerebral deterioration. Persistent hyperthermia with no identified clinical source of infection indicates brain stem damage and a poor prognosis.

Strategies for reducing fever include: removing all bedding over the patient (with the possible exception of a light sheet or small drape), Administering repeated doses of acetaminophen as prescribed. Giving a cool sponge bath and allowing an electric fan to blow over the patient to increase surface cooling and using a hypothermia blanket. Frequent temperature monitoring is indicated to assess the response to the therapy and to prevent an excessive decrease in temperature and shivering.

Preventing Urinary Retention: The patient with altered level of Consciousness is often incontinent or has urinary retention. The bladder is palpated or scanned at intervals to determine whether urinary retention is present, because a full bladder may be an overlooked cause of overflow incontinence. A portable bladder ultrasound instrument is a useful tool in bladder management and retraining programs. If there are signs of urinary retention, initially an indwelling urinary catheter attached to a closed drainage system is inserted. A catheter may be inserted during the acute phase of illness to monitor urinary output. Because catheters are a major factor in causing urinary tract infection, the patient is observed for fever and cloudy urine. The area around the urethral orifice is inspected for drainage. The urinary catheter is usually removed when the patient has a stable cardiovascular system and if no diuresis, sepsis, or voiding dysfunction existed before the onset of coma. Although many unconscious patients urinate spontaneously after catheter removal, the bladder should be palpated or scanned with a portable ultrasound device periodically for urinary retention. An intermittent catheterization program may be initiated to ensure complete emptying of the bladder at intervals, if indicated. An external catheter (condom catheter) for the male patient and absorbent pads for the female patient can be used for the unconscious patient who can urinate spontaneously although involuntarily. As soon as consciousness is regained, a bladder-training program is initiated. The incontinent patient is monitored frequently for skin irritation and skin breakdown. Appropriate skin care is implemented to prevent these complications.

Promoting Bowel Function: The abdomen is assessed for distention by listening for bowel sounds and measuring the girth of the abdomen with a tape measure. There is a risk of diarrhea from infection, antibiotics, and hyperosmolar fluids. Frequent loose stools may also occur with fecal impaction. Commercial fecal collection bags are available for patients with fecal incontinence. Immobility and lack of dietary fiber may cause constipation. The nurse monitors the number and consistency of bowel movements and performs a rectal examination for signs of fecal impaction. Stool softeners may be prescribed and can be administered with tube feedings. To facilitate bowel emptying, a glycerine suppository may be indicated. The patient may require an enema every other day to empty the lower colon.

Providing Sensory Stimulation: Sensory stimulation is provided at the appropriate time to help overcome the profound sensory deprivation of the unconscious patient. Efforts are made to maintain the sense of daily rhythm by keeping the usual day and night patterns for activity and sleep. The nurse touches and talks to the patient and encourages family members and friends to do so. Communication is extremely important and includes touching the patient and spending enough time with him or her to become sensitive to his or her needs. It is also important to avoid making any negative comments about the patient's status or prognosis in the patient's presence.

The nurse orients the patient to time and place at least once every 8 hours. Sounds from the patient's home and workplace may be introduced using a tape recorder. Family members can read to the patient from a favorite book and may suggest radio and television programs that the patient previously enjoyed as a means of enriching the environment and providing familiar input. When arousing from coma, many patients experience a period of agitation, indicating that they are becoming more aware of their surroundings but still cannot react or communicate in an appropriate fashion. Although disturbing for many family members, this is actually a good clinical sign. At this time, it is necessary to minimize the stimulation to the patient by limiting background noises, having only one person speak to the patient at a time, giving the patient a longer period of time to respond, and allowing for frequent rest or quiet times. When the patient has regained consciousness, videotaped family or social events may assist the patient in recognizing family and friends and allow him or her to experience missed events.

Meeting Families' Needs: The family of the patient with altered level of Consciousness may be thrown into a sudden state of crisis and go through the process of severe anxiety, denial, anger, remorse, grief, and reconciliation. Depending on the disorder that caused the altered level of Consciousness and the extent of the patient's recovery, the family may be unprepared for the changes in the cognitive and physical status of their loved one.

3.8 Complications

Potential complications for the patients with altered level of Consciousness include:

- Respiratory failure
- Pneumonia
- Pressure ulcers
- Aspiration
- Deep vein thrombosis
- Contractures.

4.0 SUMMARY

This unit has dealt with various causes of Unconsciousness among patients and the nature of nursing care that can be given to them using nursing process to reverse them and prevent complications. The use of Glasgow coma scale to assess the level of unconsciousness was also discussed.

5.0 TUTOR-MARKED ASSIGNMENT

Conduct a comprehensive nursing assessment on an unconscious patient admitted in any health facility nearest to you. Determine the cause of unconsciousness and develop a care plan for the patient.

SELF-ASSESSMENT EXERCISE

i. What are the causes of unconsciousness?
ii. Describe the pathopysiology of unconsciousness.
iii. Conduct assessment on unconscious patients using glasgow coma scale.
iv. List the diagnostic investigations necessary for unconscious patients.
v. Identify six related nursing diagnoses for unconscious patients.
vi. Prioritize and meet seven caring needs of patients with altered level of consciousness.

UNIT 4 CARE OF PATIENTS WITH BURNS

CONTENTS

1.0 INTRODUCTION

Imagine you have a patient with burn injury in your ward and he/she is in serious pain had fluid deficit with pyrexia and the patient is calling on you for help. But you don't know which one to handle first till the patient go to shock state. I know you will not be happy with yourself and that is one of the reasons for developing this unit. Burn is a traumatic injury to the skin and underlying tissues that put the patient at risk of many complications.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- explain various common causes of Burn injury
- discuss the Pathophysiology of burns
- assess burns patients using nursing process
- discuss the assessment tools that can be used to calculate the Total Body Surface Area
- classify burn injury into different categories

- discuss the pre hospital care that can be given to burnt patients.
- describe nursing care for burn patients in emergency, acute and rehabilitative phases
- develop nursing care plan for burn patients
- Identify factors that can promote or inhibit graft in burn patients

3.0 MAIN CONTENT

3.1 Common causes of Burns

Various causes of burns injury include the followings:

Flame: House fire is a common cause. It is usually associated with an inhalation injury. Flash injury occurs from a sudden ignition or explosion.

Contact: Hot tar, hot metals, or hot grease produce a full-thickness injury on contact.

Scald: A burn from hot liquid. This is common among ommon in children less than 5 years and adults older than 65 years. With an immersion scald, there are usually no splash marks; usually involves lower regions of body.

Chemical: Usually occurs in an industrial setting. Extent and depth of injury are directly proportional to concentration and quantity of agent, duration of contact, and chemical activity and penetrability of agent.

Electrical: It is one of the most serious types of burn injury; can be full thickness with possible loss of limbs, as well as cause internal injuries. Entry wound is usually ischemic, charred, and depressed. Exit wound may have an explosive appearance. Extent of injury depends on voltage, resistance of body, type of current, amperage, pathway of current, and duration of contact. Bones offer greatest resistance to the current; can have much damage. Tissue fluid, blood, and nerves offer least resistance; therefore, the current travels this path follows an undetermined course from entrance to exit, causing major damage in its path.

Radiation: This usually occurs in an industrial setting, due to treatment of diseases, or from ultraviolet light (sun or tanning salons). Severity depends on type of radiation, duration of exposure, depth of penetration, distance from source, and absorbed dose.

3.2 Pathophysiology and Etiology

The immediate and initial cause of cell damage is heat. The severity of the burn is related to the temperature of the heat source, its duration of contact, and the thickness of the tissue exposed to the heat source. The location of the burn also is significant. Burns in the perineal area are at increased risk for infection from organisms in the stool. Burns of the face, neck, or chest have the potential to impair ventilation. Burns involving the hands or major joints can affect dexterity and mobility. Thermal injuries cause the protein in cells to coagulate. Chemicals such as strong acids, bases, and organic compounds yield heat during a reaction with substances in cells and tissue. They subsequently liquefy tissue and loosen the attachment to nutritive sub layers in the skin. Electrical burns and lightning also produce heat, which is greatest at the points of entry to and exit from the body. Because deep tissues cool more slowly than those at the surface, it is difficult initially to determine the extent of internal damage. Cardiac dysrhythmias and central nervous system complications are common among victims of electrical burns. The initial burn injury is further extended by inflammatory processes that affect layers of tissue below the initial surface injury. For example, protease enzymes and chemical oxidants are proteolytic, causing additional injury to healing tissue and deactivation of tissue growth factors. Neutrophils, whose mission is to phagocytize debris, consume available oxygen at the wound site, contributing to tissue hypoxia. Injured capillaries thrombose, causing localized ischemia and tissue necrosis. Bacterial colonization, mechanical trauma, and even topically applied antimicrobial agents further damage viable tissue. Serious burns cause various neuroendocrine changes within the first 24 hours. Adrenocorticotropic hormone (ACTH) and antidiuretic hormone (ADH) are released in response to stress and hypovolemia.When the adrenal cortex is stimulated, it releases glucocorticoids, which cause hyperglycemia, and aldosterone, a mineralocorticoid, which causes sodium retention. Sodium retention leads to peripheral edema as a result of fluid shifts and oliguria. The client eventually enters a hypermetabolic state that requires increased oxygen and nutrition to compensate for the accelerated tissue catabolism. After a burn, fluid from the body moves toward the burned area, which accounts for edema at the burn site. Some of the fluid is then trapped in this area and rendered unavailable for use by the body, leading to intravascular fluid deficit. Fluid also is lost from the burned area, often in extremely large amounts, in the forms of water vapor and seepage. Decreased blood pressure follows, and if physiologic changes are not immediately recognized and corrected, irreversible shock is imminent.

These changes usually happen rapidly and the client's status may change from hour to hour, requiring that clients with burns receive intensive care by skilled personnel. Fluid shifts, electrolyte deficits, and loss of extracellular proteins such as albumin from the burn wound affect fluid and electrolyte status. Anemia develops because the heat literally destroys erythrocytes. The client with a burn experiences haemoconcentration when the plasma component of blood is lost or trapped. The sluggish flow of blood cells through blood vessels results in inadequate nutrition to healthy body cells and organs. Myoglobin and hemoglobin are transported to the kidneys, where they may cause tubular necrosis and acute renal failure. The release of histamine as a consequence of the stress response increases gastric acidity. The client with a burn is prone to developing gastric ulcers. Inhalation of hot air, smoke, or toxic chemicals, accompanying injuries such as fractures, concurrent medical problems, and the client's age, increase the mortality rate from burn injuries.

3.3 Burn Assessment Tools

There are two major charts that can be used to calculate the total body surface area of burnt patient. These are:

1. **Wallace Rule of Nines-Adults Only:** It is a chart that can be used to determine the percentage of total body surface area (TBSA) that has been burnt. The chart divides the body into sections that represent 9 percent of the body surface area. It is inaccurate for children, and should be used in adults only.

- Head/neck - 9% TBSA
- Patient's palm is approximately 1% TBSA
- Each arm - 9% TBSA
- Anterior thorax - 18% TBSA
- Posterior thorax - 18% TBSA
- Each leg - 18% TBSA
- Perineum - 1% TBSA

With pediatric patients, the head is a proportionally larger contributor to body surface area (BSA), while the upper legs contribute less. This difference is reflected in the slight differences noted in the pediatric Lund- Browder diagram. A useful tool for estimating BSA of spotty burns is the close approximation of just less than 1% BSA to the patient's palm size. Only second-degree burns or greater should be included in the TBSA determination for burn fluid calculations.

Adult rule of nine and Paediatric Lund- Browder diagram

2. A standard Lund-Browder chart is an assessment tool that is usually available in most emergency departments for a quick assessment of total body surface area burns.

Standard Lund-Browder chart

3.4 Depth of Burn Injury

One method for determining the extent of injury is to assess the depth of the burn. Burn depth is classified as follows:

1. Superficial (first degree)
2. Superficial partial thickness and deep partial thickness (second degree)
3. Full thickness (third and fourth degree)

Burn depth is determined by assessing the color, characteristics of the skin, and sensation in the area of the burn injury.

A superficial burn is similar to a sun burn. The epidermis is injured, but the dermis is unaffected. Although the burn is red and painful, it heals in less than 5 days, usually spontaneously with symptomatic treatment. Infection, increased metabolism, and scarring do not occur.

A partial-thickness burn is classified as either superficial or deep partial thickness, depending on how much dermis is damaged. A superficial partial-thickness burn heals within 14 days, with possibly some pigmentary changes but no scarring; it requires no surgical intervention. A deep partial-thickness burn takes more than 3 weeks to heal, may need debridement, is subject to hypertrophic scarring, and may require skin grafts.

A full-thickness burn destroys all layers of the skin and consequently is painless. The tissue appears charred or lifeless. If not debrided, this type of burn injury leads to sepsis, extensive scarring, and contractures. Skin grafts are necessary for a full-thickness burn because the skin cells no longer are alive to regenerate. The most serious burn can involve muscle and bone.

3.5 Pre Hospital Care of Major Burns

- Remove victim from source of burn.
- Stop the burning process.
- If a chemical burn, carefully remove clothing and flush wound with large amounts of water.
- If an electrical burn and victim is still in contact with source, do not touch victim. Remove electrical source with dry non conductive object.
- Establish patent airway and assess for inhalation injury. Give oxygen if available.
- Start two large bore intravenous lines (IVs) or intra-osseous' (IO)s with normal saline or lactated Ringer's
- Check peripheral pulse to assess circulatory status.
- Assess and initiate treatment for injuries requiring immediate attention.
- Remove tight-fitting jewelry and clothing.
- Cover burn with dry sterile or clean cover.
- Cover victim with warm, dry cover to prevent heat loss.
- Transport victim to nearest acute care facility.
- Control pain.

Various diagnostic tests are performed for systemic reactions, infection, and other complications. Common tests for systemic reactions include complete blood cell count (CBC) and differential, blood urea nitrogen (BUN), serum glucose and electrolytes, arterial blood gases, serum protein and albumin, urine cultures, urinalysis, clotting studies, cervical spine series, electrocardiogram, wound cultures, and, if there is a suspected inhalation injury, arterial blood gases, bronchoscopy and carboxyhemoglobin levels.

3.5.1 Medical Management

The objective of burn management is to prevent infection, decrease inflammation and pain, and promote healing of the areas. Treatment choices depend on the degree of burn and the amount of body surface area that was burned. Any second-degree burn greater than 5 to 10 percent of surface area and all third-degree burns should be managed in a hospital, preferably within a specialized burn unit. All electrical burns and burns of the ears, eyes, face, hands, feet, and perineum require hospital care, as do chemicalburns and burns in infants or the elderly. The outcome of a burn injury depends on the initial first aid provided and the subsequent treatment in the hospital or burn center. Any one of three complications—inhalation injury, hypovolemic shock, and infection—can be life-threatening. Clients with major burns are transported to an institution where there is reconstructive and burn specialist.

3.5.2 Care during Emergent Stage

At the time of injury, the burning process must be stopped. The clothes are removed, and the wound is cooled with tepid water and covered with clean sheets to decrease shivering and contamination. The burn wound itself takes a lower priority to the ABCs (airway, breathing, circulation) of trauma resuscitation. The patient should be stabilized in terms of fractures, hemorrhage, spine immobilization, and other injuries. Inhalation injury is suspected if the patient sustained a burn from a fire in an enclosed space or was exposed to smoldering materials, if the face and neck were burned, if there are vocal changes, and if the patient is coughing up carbon particles. Intravenous fluids are given to prevent and treat hypovolemic shock. The patient is treated for pain with appropriate IV opioid analgesics. Patient-controlled analgesia (PCA) is very effective. An accurate history of the injury is obtained to determine severity, probable complications, and any associated trauma. The patient's medical history is also obtained. Admission to the facility and burn care treatment are explained to the patient and family.

3.5.3 Care at the Acute Stage

If the patient is in a facility with a special burn unit, multidisciplinary care from a burn team is provided during the acute stage. Management goals include wound closure with no infection, minimum scarring, maximum function, maintenance of comfort as much as possible, adequate nutritional support, and maintenance of fluid, electrolyte, and acid-base. Showering using a shower trolley or shower chair, and bedside care should be given.

Debridement, or the removal of nonviable tissue (eschar), can be mechanical, chemical, surgical, or a combination of these methods. Mechanical debridement can involve the use of scissors and forceps to manually excise loose, nonviable tissue, or the use of wet-to-moist or wet-to-dry fine mesh gauze. Chemical debridement involves the use of a proteolytic enzymatic debriding agent that digests necrotic tissue.

Surgical debridement is the excision of full thickness and deep partial-thickness burns. This method is followed by an application of a skin graft. If the patient has a circumferential burn (one that surrounds an extremity or area), an increase in tissue pressure secondary to tissue edema occurs. The burn then acts like a tourniquet, impeding arterial and venous flow. Common sites for these burns are the extremities, trunk, and chest. If this occurs on the chest and trunk, respiratory insufficiency can occur as a result of restricted chest expansion. An **escharotomy**is immediately necessary to relieve this pressure.

An escharotomy is a linear excision through the eschar to the superficial fat that allows for expansion of the skin and return of blood flow. Use of an occlusive dressing over the wound is thus necessary.

General principles for dressing burns injury include the following:

1. Limit the bulk of the dressing to facilitate range of motion.
2. Never wrap skin-to-skin surfaces (e.g., wrap fingers or toes separately; place a donut gauze dressing around the ear).
3. Base dressings on the size of wounds, absorption, protection, and type of debridement.
4. Wrap extremities distal to proximal to promote venous return.
5. Elevate affected extremities.

Biological dressing refers to tissue from living or deceased humans (cadaver skin), deceased animals (e.g., pigskin), or cellular dressings that may use animal tissue, human tissue, and synthetics. Biological dressings assist with wound healing and stimulate **epithelialization.** These dressings may be used as donor site dressings, to manage a partial- thickness burn, and to cover the clean, excised wound before autografting. Some of the cellular wound dressings have varied layers that form a matrix onto which the patient’s own cells migrate over a few weeks and form a new dermis. A very thin layer of the person’s own skin is then grafted onto this new dermis. Synthetic dressings are used in the management of partial-thickness burns and donor sites. These dressings are more readily available, less costly, and easier to store than biological dressings. They are made from a variety of materials and come in many different sizes and shapes. Most of these dressings contain no antimicrobial agents. Biological and synthetic dressings are used as temporary coverings over clean partial- and full-thickness injuries. They act as skin substitutes to help maintain the wound surface until healing occurs, a donor site becomes available, or the wound is ready for auto grafting.

3.6 Skin Grafts

Skin graft involves taking a section of epidermis and dermis which has been completely separated from its blood supply in one part of the body (uninjured area of the body), the donor site, before being transplanted to another area of the body, its recipient site and using it to provide coverage for an open wound. When primary closure is impossible because of soft tissue loss and closure by secondary intention is contraindicated, a skin graft is the next rung on the reconstructive ladder. It is not a technically difficult procedure but does require some surgical skills. The type of skin graft most commonly used is the autograft, when the donor and recipient of the skin graft is the same person, for example when a patient has a skin graft taken from their thigh and applied to a wound on their lower leg.

Classification of skin grafts

Skin grafts may be classified as partial or full-thickness grafts, depending on how much of the dermis is harvested by the surgeon.

Split-thickness Skin Graft

A split-thickness skin graft (STSG) is composed of the top layers of skin and involves excision of the epidermis and part of the dermis but leaves behind sufficient reticular (deep) dermis in the wound bed to enable the skin to regenerate itself. The graft is placed over an open wound to provide coverage and promote healing. The STSG donor site is essentially a second-degree burn because only part of the dermis is included in the graft. An STSG (0.006 to 0.016 inch) may be applied as a sheet graft or a meshed graft. A sheet graft is used for cosmetic effect, such as for a face, neck, upper chest, breast, or hand burn. It is placed on the area as a full sheet. A meshed graft is passed through a mesher that produces tiny splits in the skin, similar to a fishnet, with openings in the shape of diamonds to permit the skin to expand one and a half to nine times its original size. The meshing allows for coverage of a large burn area with a small piece of skin by stretching it and securing it with sutures or staples. A mesh graft is especially useful when there are extensive burns resulting in few available donor sites. Graft “take,” or vascularization, is complete in about 3 to 5 days. The donor site will heal on its own because some dermal elements remain. The most common donor site areas for split-skin grafts include the thigh, buttock, back, upper arm, forearm and abdominal wall.

Indications

An STSG is indicated in most wounds that cannot be closed primarily and when closure by secondary intention is contraindicated. It is also indicated for a relatively large wound (> 5–6 cm in diameter) that would take many weeks to heal secondarily. A skin graft provides more stable coverage for large wounds than the scar that result from secondary closure. A large wound also heals more quickly with a skin graft than with dressing changes alone. The wound must be clean, all necrotic tissue removed before skin grafting, and there should be no signs of infection in the surrounding tissues.

Full-thickness Skin Graft

A full thickness skin graft (FTSG) consists of the epidermis and the full thickness of the dermis but no subcutaneous fat. Since none of the reticular dermis remains to allow spontaneous regeneration of skin, the wound must be directly closed to heal by primary intention. Consequently, the surgeon must select a donor site where a small area of skin may be excised and the wound sutured to leave minimal scarring. Full-thickness skin grafts (0.035 to 0.040 inch) can be sheet grafts or pedicle flaps. FTSGs are used over areas of muscle mass, soft tissue loss, hands, feet, and eyelids. They are not used for extensive wounds because the donor sites usually require an STSG for closure, or closure from the wound edges. A pedicle graft or flap includes the skin flap and subcutaneous tissue that is attached by its pedicle to a blood supply (artery and vein); it is then attached to the area in need of grafting. Once the distal part of the graft takes, it remains in place and the flap is divided, with the remainder returning to the original site. Pedicle flaps are not as popular as free skin flaps because they require more than one surgery and take longer for the graft site and donor site to heal.

Common donor site areas for full-thickness skin grafts include the pre- and post-auricular (ear), supraclavicular and antecubital inner elbow) areas, the upper eyelid, scalp, groin and areola Full-thickness skin grafts do not contract as much as split-skingrafts, so are used to cover exposed areas of the body, usually the face or neck. FTSGs are rarely done, because the wound must be *very* clean for the graft to survive. Most often they are used for a small wound, usually one created surgically (such as a wound on the face created by excision of a malignant skin lesion). The other common use is for open wounds on the palmar surface of the hands and fingers. These areas may scar too tightly if the thinner STSG is used.

Fig: Healing Burns wound Fig: Burns wound with grafted skin

3.7 Factors Inhibiting Graft "Take"

The following factors will not allow graft to take:

- Infection
- Necrotic skin (tissue)
- Anatomic location of graft
- Perineum
- Axillae
- Buttocks
- Poor-quality donor skin
- Poor nutritional status
- Bleeding
- Mechanical trauma
- Shock

3.8 Factors Promoting Graft "Take"

- Adequate haemostasis
- Anatomical location of graft
- Smooth contour
- Non joint areas
- Graft secured well
- Immobilization of graft area
- Good nutritional status

3.8.1 Rehabilitation Phase

The therapy started during the acute phase continues in the rehabilitation phase. There is wound closure, and the goal is to return the patient to an optimum level of physical and psychosocial function. This may take months to years to accomplish, depending on the extent of the injury. Reconstructive surgery can be ongoing for many years. Two things to keep in mind when caring for the patient with a major burn are that (1) the most comfortable position (flexion) is the position of contracture, and (2) the burn wound will shorten until it meets an opposing force. To avoid contractures, a specific exercise program is begun 24 to 48 hours after injury, along with the use of splinting devices to maintain proper positioning and stretching. Hypertrophic scarring, or a proliferation of scar tissue can be minimized or prevented through the use of a pressure garment. The burn affects the patient's psychosocial status in many ways. The magnitude of these effects are related to the age of the patient, location of the burn (e.g., face, hands), recovery from injury, cause of the injury (especially if related to negligence or a deliberate act), and ability to continue at pre burn level of normal daily activities. The patient may experience a disruption of role function and general health and coping ability. Treatment involves the patient and significant others. Support groups, counselors, and psychiatrists should be utilized appropriately.

3.8.2 Nursing management (Nursing process)

Assessment

- Determine the type of burn (thermal, chemical, electrical) and when it occurred.
- Assess vital signs.
- Look for evidence of inhalation injury.
- Determine the oxygen saturation and respiratory effort.
- Evaluate pain intensity.
- Determine the volume and characteristics of urine.
- Note the percentage and depth of burn.
- Auscultate bowel sounds.
- Assess for concurrent medical problems, and review the results of laboratory tests.

3.8.3 Nursing Diagnoses

1. Impaired gas exchange related to upper airway edema, carbon monoxide poisoning, oedema of alveolar capillary membranes

Interventions

Assess respiratory status: auscultate breath sounds every 15 minutes or as necessary; note any adventitious breath sounds; observe for chest excursion: monitor ability to cough.

1. Monitor arterial blood gases and CO level.
2. Monitor for nasal flaring, retractions, wheezing, and stridor.
3. Administer humidified 100% oxygen by tight-fitting face mask for the breathing patient.
4. Elevate head of bed (if no cervical spine injuries or no history of multiple trauma).
5. Provide appropriate pulmonary care: turn, cough, deep breathe every 2–4 hours.
6. Provide incentive spirometer every 2–4 hours,
7. Suction frequently as needed.

2. Impaired skin integrity related to thermal injury

Interventions

1. Assess burning process. If heat is felt on wound, cool with tepid tap water or sterile water.
2. Assist physician to assess the burn area for extent (percentage) and depth (partial thickness, full thickness) of injury.
3. Remove clothing and jewelry.
4. Do not apply ice.
5. Cover patient with clean sheet or blanket.
6. Obtain history of burning agent.
7. Initiate immediate copious tepid water lavage for 20 minutes for all chemical burns, along with simultaneous removal of contaminated clothing. (Do not neutralize chemical because this takes too much time and resulting reaction may generate heat and cause further skin injury.)
8. Brush off dry chemicals before lavage.
9. Use heavy rubber gloves or thick gauze for removal of clothing.
10. Cleanse wound via tubbing or showers.
11. Assist physician with debriding wound via surgical, chemical, or mechanical means.
12. Apply topical agent and dressing as prescribed.

3. Deficient fluid volume related to evaporative losses from wound, capillary leak, and decreased fluid intake.

Interventions

1. Obtain admission weight and monitor weight daily.
2. Record intake and output (I&O) hourly.
3. Assess for signs and symptoms of hypovolemia (hypotension, tachycardia, tachypnea, extreme thirst, restlessness, disorientation).
4. Monitor electrolytes, complete blood count (CBC).
5. Administer IV fluids as ordered via large bore IV catheter.
6. Insert indwelling urinary catheter.
7. Monitor urine for amount, specific gravity, and hemochromogens.
8. Administer osmotic diuretics as ordered; monitor response to therapy.
9. Assess gastrointestinal function for of bowel sounds.
10. Maintain nasogastric tube.

4. Pain related to burns or graft donor sites

Interventions

1. Assess level of pain: nature, location, intensity, and duration at various times (during procedures and at rest).
2. Ask the patient to rate pain on visual analog scale.
3. Observe for varied responses to pain: increase in blood pressure, pulse, respiration; increased restlessness and irritability; increased muscle tension; facial grimaces; guarding.
4. Acknowledge presence of pain.
5. Explain causes of pain.
6. Administer narcotics IV. Utilize patient controlled analgesia (PCA) as appropriate.
7. Offer diversional activities (e.g., music, TV, books, games, relaxation techniques).
8. Properly position patient.
9. Elevate burned extremities.
10. Maintain comfortable environment (e.g., bed cradle; comfortable environmental temperature,86–91.4_F [30–33°C]; quiet environment).

5. Risk for sepsis related to wound infection

Interventions

1. Use sterile technique with wound care.
2. Maintain protective isolation with good hand-washing technique.

3. Administer immune supportive medications as prescribed: tetanus and gamma globulin.
4. Perform wound care as prescribed, which may include the following: inspect and debride wounds daily; culture wound three times a week or at sign of infection; shave hair at least 1 inch around burn areas (excluding eyebrows); inspect invasive line sites for inflammation (especially if line is through a burn area).
5. Continually assess for and report signs and symptoms of sepsis: temperature elevation; change in sensorium; changes in vital signs and bowel sounds; decreased output; positive blood/wound cultures.
6. Administer systemic antibiotics and topical agents as prescribed.

3.9 Complications

1. Shock
2. Wound infection
3. Death

4.0 SUMMARY

Burns patients are always in the need of highly skilled nurses who will be able to give them comprehensive nursing care and to do this, you must be able to apply the knowledge acquired in this unit your day to day practice. In this unit you have been taken through likely causes of burns injury, its Pathophysiology and how to estimate the percentage of total body surface area burnt. Different medical treatments modalities' and nursing process for burns patients were also discussed.

5.0 TUTOR-MARKED ASSIGNMENT

Visit any nearest health institution where they have burns patients, assess the patient and calculate the percentage of total body surface area.

SELF-ASSESSMENT EXERCISE

i. Explain various common causes of Burn injury.
ii. Discuss the Pathophysiology of burns.
iii. Explain how you will assess burns patients using nursing process.
iv. Discuss the assessment tools that can be used to calculate the Total Body Surface Area.
v. Discuss the classification of burn injury.
vi. Discuss the pre hospital care that can be given to burnt patients.
vii. Describe nursing care for burn patients in emergency, acute and rehabilitative phases.

viii. Discuss the types and indications for various types of skin grafts.
ix. Develop four nursing care plan for burn patients.
x. Mention five factors each that can promote or inhibit graft in burn patients.

UNIT 5 CARE OF PATIENTS WITH CANCER

CONTENT

1.0 INTRODUCTION

In recent time, cancer has become a household name with all its associated discomfort. In your daily practice, many cancer patients would have come under your care and you may be limited in what you can offer to reduce their agony just because of the nature of this disease. This unit intends to make you a better professional nurse by improving your knowledge base and skill in caring for cancer patients. To achieve this, this unit is meant to expanciate on pathogenesis, treatment modalities, nursing care etc.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- explain the Process of Cancer cell growth and reproduction
- describe different types of tumour
- describe the Pathophysiology of cancer
- enumerate possible warning signs of cancer
- explain various Radiological and Imaging tests

- explain the stages and grades of tumour
- discuss the medical treatment options for cancer patients
- list the classifications of chemotherapeutic agents and their side effects.

3.0 MAIN CONTENT

3.1 Definition

Cancer is a group of cells that grow out of control, taking over the function of the affected organ. Cancer cells are described as poorly constructed, loosely formed, and with-out organization. An organ with a cancerous tumor eventually ceases to function. A simplistic definition is “confused cell.” Malignant, a term often used as a synonym for cancer, is defined as a growth that resists treatment and tends to worsen and threaten death. Cells that reproduce abnormally result in **neoplasm,** or **tumours**. Neoplasmis a term that combines the Greek word *neo*, meaning “new,” and *plasia*, meaning “growth,” to suggest new tissue growth. The new growth results in enlargement of tissue and the formation of an abnormal mass. Not all neoplasms contain cancer cells; however, a neoplastic cell is responsible for producing a tumor and shows a lively growing cell. A **benign** tumor is defined as a cluster of cells that is not normal to the body but is noncancerous. Benign tumours grow more slowly and have cells that are the same as the original tissue. An organ containing a benign tumour usually continues to function normally. A neoplastic growth is very difficult to detect until it contains about 500 cells and is approximately 1 cm. **Oncology** is the branch of medicine dealing with tumors. Oncology nursing is also called cancer nursing; it is an important component of medical-surgical nursing care

3.2 Process of Cancer cell growth and reproduction

It involves a two-step process:

1. The first step in cancer growth is called initiation. Initiation causes an alteration in the genetic structure of the cell (DNA). Cell alteration is associated with exposure to a **carcinogen**. The cellular change primes the cell to become cancerous.
2. Promotion is the second type of cancer cell growth. It occurs after repeated exposure to carcinogens causes the initiated cells to mutate. During the promotion step, a tumor forms from mutated cell reproduction.

A healthy immune system can often destroy cancer cells before they replicate and become a tumor. It is important to remember that any substance that weakens or alters the immune system puts the individual at risk for cell mutation. Medical researchers support the theory that cancer is a symptom of a weakened immune system.

3.3 Carcinogenesis and Causes of Cancer

Carcinogenesis, or the development of cancer, is a multistep process that involves both the molecular aspects of cell transformation and the overall growth and spread of the tumor mass. Because cancer is not a single disease, it is reasonable to assume that it does not have a single cause. More likely, cancer occurs because of interactions between multiple risk factors or repeated exposure to a single carcinogenic (cancer-producing) agent. Among the risk factors that have been linked to cancer are heredity, chemical and environmental carcinogens, cancer causing viruses, and immunologic defects.

3.4 Tumor Description

	Tumor Type	**Character**	**Origin**
1	Fibroma	Benign	Connective tissue
2	Lipoma	Benign	Fat tissue
3	Carcinoma	Cancerous	Tissue of the skin, glands, and digestive, urinary, and respiratory tract linings
4	Sarcoma	Cancerous	Connective tissue, including bone and muscles
5	Leukemia	Cancerous	Blood, plasma cells, and bone marrow
6	Lymphoma	Cancerous	Lymph tissue
7	Melanoma	Cancerous	Skin cell

3.5 Pathophysiology

Cancer is not one disease, but many diseases with different causes, manifestations, treatments, and prognoses. There are more than 100 different types of cancer caused by mutation of cellular genes. Cancer takes on the characteristics of the cell it mutates and then takes on characteristics of the mutation. Growth-regulating signals in the cell's surrounding environment are ignored as the abnormal cell growth increases. Normal cells are limited to about 50 to 60 divisions before they die. Cancer cells do not have a division limit and are considered immortal. The progression from a normal cell to a malignant cell follows a pattern of mutation, defective division and abnormal growth cycles, and defective cell communication. Cell mutation occurs when a sudden change affects the chromosomes, causing the new cell to differ from the parent. The malignant cell's enzymes destroy the glue-like substance found between normal cells, which disrupt the transfer of information used for normal cell structure. Cancer cells also lack *contact inhibition.* This is a property of normal cells in which contact by the cell with another cell or tissue signals cells to stop dividing. Since cancer cells do not possess contact inhibition, they continue to divide and invade surrounding tissues.

3.5.1 Detection and Prevention of Tumours

Nurses play an important role in preventing and detecting cancer. You can help educate patients about risk factors, self examination, and cancer screening programs. Early diagnosis and treatment provide time to stop the progression of cancer.

Early Detection: An annual physical examination helps medical personnel detect the seven warning signals of cancer promoted by the American Cancer Society. The warning signals can be remembered with the mnemonic CAUTION:

- **C**hange in bowel or bladder habits
- **A** sore that fails to heal
- **U**nusual bleeding or discharge
- **T**hickening or lump in breast or other tissue
- **I**ndigestion or swallowing difficulties
- **O**bvious change in wart or mole
- **N**agging cough or hoarseness

Possible warning signs of specific type of Cancer

- Bladder and Kidney: Blood in urine; pain and burning with urination; increased frequency of urination.
- Breast: Lump(s), thickening, and/or other physical change in the breast; itching, redness, and/or soreness of the nipples not associated with breast-feeding or menstruation.
- Cervical and Uterine: Bleeding between menstrual periods; unusual discharge; painful menstrual periods; heavy periods.
- Colon: Rectal bleeding; blood in stool; changes in bowel habits (persistent diarrhea and/or constipation).
- Endometrial: Same signs as for cervical and uterine cancers above.
- Laryngeal: Persistent cough; hoarse throat.

- Leukemia: Paleness; fatigue; weight loss; repeated infections; easy bruising; bone and joint pain; nosebleeds.
- Lung: A persistent cough; sputum with blood; heavy chest and or chest pain.
- Lymphoma: Enlarged, rubbery lymph nodes; itchy; night sweats; unexplained fever and/or weight loss.
- Mouth and Throat: A chronic ulcer of the mouth, tongue, or throat that does not heal.
- Ovarian: Often no obvious symptoms until it is in later stages of development.
- Prostate: Weak and interrupted urine flow; continuous pain in lower back, pelvis, and/or upper thighs.
- Skin: Tumor or lump under the skin, resembling a wart or an ulceration that never heals; moles that change color or size; flat sores; lesions that look like moles
- Stomach: Indigestion and pain after eating; weight loss; blood in vomit.
- Testicular: Lump(s); enlargement of a testicle; thickening of the scrotum; sudden collection of fluid in the scrotum; pain and discomfort in a testicle or in the scrotum; mild ache in the lower abdomen or groin; enlargement or tenderness of the breasts.

Diagnosis of Cancer: A careful and thorough assessment of the patient's present and past medical and surgical histories and pertinent family history should be obtained.
A complete physical examination provides both objective and subjective data.

The most conclusive information about the health of tissue is acquired by examining cell activity through biopsy.

Biopsy: Accurate identification of a cancer can be done only by **biopsy** (surgical removal of tissue cells). Microscopic examination of a piece of suspected tissue or aspirated body fluid can confirm the presence of mutant cells. A biopsy is commonly done in a physician's office or outpatient surgery department. Incisional biopsy is an invasive procedure that involves the surgical removal of a small amount of tissue for inspection.

Tissue can also be removed during endoscopic procedures (insertion of a tube to observe the inside of a hollow organ or cavity), such as a lung biopsy done during bronchoscopy. Excisional biopsy is used to remove an entire tissue mass. Needle aspiration biopsy involves insertion of a needle into tissue for fluid or tissue aspiration. This procedure is less invasive than incisional or excisional biopsy. Transcutaneous aspiration involves the insertion of a fine needle into tissue such as breast, prostate, or salivary gland and is used for diagnosing metastatic cancers. Frozen section biopsy provides immediate evaluation of the tissue sample during a surgical procedure.

3.5.2 Radiological and Imaging Tests

Radiographic Studies: Radiographs, commonly known as x-rays, are plain films that use contrast media or specialized equipment to detect tumors in specific organs. A contrast medium is a substance that highlights, outlines, or provides more detail than shown in a plain film. A barium enema is an example of a study done with contrast medium.
Computed Tomography: The computed tomography (CT) scan provides three-dimensional cross-sectional views of tissues to determine tumor density, shape, size, volume, and location, as well as highlighting blood vessels that feed the tumor. The views are made through a computer and can be enlarged for better viewing. CT is useful in diagnosing many types of cancer.

Magnetic Resonance Imaging: Producing detailed sectional images, magnetic resonance imaging (MRI) uses magnetic fields to differentiate diseased tissue from healthy tissue and to study blood flow. It helps to visualize tumors hidden by bone or other structures.

Nuclear Scans: Clients ingest or receive intravenous (IV) radioisotopes (also known as tracers). After specific time intervals, images are taken of tissues that are affected by cancer or other diseases; the images distinguish tissues or portions of tissues that absorb more or less of the tracer. ‘‘Hot spots’’ show on an image of a tumor that has increased concentrations of the tracer, whereas ‘‘cold spots’’ can be the image of a tumor that has decreased concentration of the tracer.

Ultrasound: Ultrasound uses high-frequency sound waves to detect abnormalities of a body organ or structure. The sound wave reflections (echoes) are projected on a screen and may be recorded on film. These studies help differentiate solid and cystic tumors of the abdomen, breasts, pelvis, and heart.

Fluoroscopy: Fluoroscopy studies moving body structures with the use of a continuous x-ray beam that passes through the body part being examined. The views are transmitted to a monitor so that both the body part and its motion are examined. An example of fluoroscopy is a barium study.

3.5.3 Staging of Tumours

Tumors are staged and graded based upon how they tend to grow and the cell type before a client is treated for cancer. The American Joint Committee on Cancer developed a staging system referred to as the TNM classification: T indicates the size of the tumor, N stands for the involvement of regional lymph nodes, and M refers to the presence of metastasis. Once the TNM descriptions are established, they are grouped together in a simpler set of stages that include tumor size, evidence of metastasis, and lymph node involvement:

Stage 0: The cancer is in situ, which means the malignant cells are confined to the layer of cells in which they began, with no signs of metastasis.

Stages I, II, and III: Higher numbers indicate that the tumour is of greater size and/or the spread of cancer is to nearby lymph nodes and/or organs near the primary tumor.

Stage IV: Cancer has invaded or metastasized to other organs of the body.

Grading of tumors involves the differentiation of the malignant cells. Basically there are two classifications: differentiated and undifferentiated. Cancer cells are evaluated in comparison with normal cells. Well-differentiated cells are those that most closely resemble the tissue of origin. Undifferentiated cells bear little resemblance to the tissue of origin.

Cell differentiation is graded from I to IV. The higher the number, the less differentiated is the cell type. Tumours with poorly differentiated cells are graded IV; these tumours are very aggressive and unpredictable, and the prognosis usually is not good. Grade IV tumors do not respond well to cancer treatments.

3.5.4 Treatment options for Cancer

There are three main types of treatment for cancer: surgery, radiation therapy, chemotherapy and other method

1. Surgery: Surgery continues to be a primary method for diagnosing, staging, and treating cancer. Newer and less invasive surgical techniques allow for removal of tumors while preserving as much normal tissue and function as possible (American Cancer Society, 2008). Surgery may range from tumor excision alone to extensive excision, including removal of the tumor and adjacent structures such as bone, muscle, and lymph nodes. The type and extent of surgery depend on the extent of the disease, actual pathology, client's age and physical condition, and anticipated results.

Two types of excisions are generally done. The first is local excision, in which the tumor is removed along with a small margin of healthy tissue. The other type is wide or radical excision, which removes the primary tumor, lymph nodes, any involved adjacent structures, and surrounding tissues that pose a risk for metastasis. Diagnostic and staging procedures are also done to obtain tissue samples used to determine cell type and the extent of the cancer.

Salvage surgery is done when there is a local recurrence of cancer. It usually is more extensive. For example, a cancerous tumor may be removed from the breast (lumpectomy). If a tumor reappears, a mastectomy most likely will be done.

Prophylactic or preventive surgery may be done if the client is at considerable risk for cancer. According to Smeltzer et al. (2008), prophylactic surgery may be done when there is a family history or genetic predisposition, ability to detect surgery at an early stage, and client acceptance of the postoperative outcome. Examples of prophylactic surgery include mastectomy and hysterectomy. Clients who choose prophylactic surgery require careful preoperative counseling and teaching so that they are fully aware of the consequences of surgery.
Surgery that helps to relieve uncomfortable symptoms or prolong life is considered palliative. Some palliative surgeries are used to remove excess fluid and increase comfort, such as paracentesis (removal of fluid from the abdominal cavity) and thoracentesis (removal of fluid from the chest).

Surgical procedures used to relieve pain include nerve blocks, placement of epidural catheters for administration of epidural analgesics, and placement of venous access devices for administration of parenteral analgesics.

Reconstructive or plastic surgery may be done after extensive surgery to correct defects caused by the original surgery. Some surgeries are disfiguring or so profound that the client may have difficulty adjusting to body changes. In these cases, radiation therapy may be a better option. Other surgical interventions include the following:

- Cryosurgery—uses liquid nitrogen to freeze tissue, which destroys cells
- Electrosurgery—uses electric current to destroy tumor cells

- Laser (light amplification by stimulated emission of radiation) surgery—uses photo ablation and photocoagulation lasers to aim light and energy aimed directly at an exact tissue location and depth to vaporize cancer cells, destroying tissue or sealing tissues or vessels.
- Mohs surgery (formerly called chemosurgery)—involves shaving off one thin layer of skin, layer-by-layer. Each layer is examined microscopically. Surgery ends when all cells look normal. Chemosurgery involves the use of topical chemicals as layers are removed, but is not part of Mohs surgery.
- Stereotactic radiosurgery (SRS)—uses a single high dose of radiation therapy and very precise administration for some types of brain, head, and neck tumors (see discussion in next section).

2. Radiation Therapy: Radiation therapy uses high-energy ionizing radiation, such as high-energy x-rays, gamma rays, and radioactive particles (alpha and beta particles, neutrons, and protons) to destroy cancer cells, shrink tumors, and relieve symptoms. Radiation destroys cells by breaking a strand of the DNA molecule in the cell, thereby preventing the cell from growing and dividing. Cell death can occur immediately or when the cell can no longer reproduce.

The goal of radiation therapy is to destroy malignant, rapidly dividing cells without permanently damaging surrounding healthy tissues. Although radiation therapy may also destroy some normal cells, rapidly reproducing malignant cells are more sensitive to radiation; it affects cells undergoing mitosis (cancer cells) more than cells in slower growth cycles (normal cells). Radiation therapy may be applied externally or internally, both with curative and palliative intent. Nearly 60% of all clients with cancer receive some form of radiation

3.5.5 Nursing Care of the Patient Receiving Radiation Treatment

Symptoms of tissue reaction to radiation treatment can be expected about 10 to 14 days after the start of the treatment program and continue up to 2 weeks after treatment is completed. Typical reactions and appropriate nursing interventions include the following:

- **Fatigue**: Encourage the patient to nap frequently and prioritize activities and reassure the patient that the feeling will go away when the treatments are completed.
- Nausea, vomiting, and anorexia: Encourage the patient to take prescribed medication for nausea and vomiting. Anorexia can be eased by giving small amounts of high-carbohydrate, high-protein foods and avoiding foods high in fiber.

- **Mucositis :** (inflammation of the mucous membranes, especially of the mouth and throat).

Encourage the patient to avoid irritants such as smoking, alcohol, acidic food or drinks, extremely hot or cold foods and drinks, and commercial mouthwash. Advise the patient to perform mouth care before meals and every 3 to 4 hours. A neutral mouthwash is appropriate and can be made by using 1 ounce of diphenhydramine hydrochloride (Benadryl) elixir diluted in 1 quart of water or normal saline solution. Agents that coat the mouth, such as Maalox, are sometimes used. Lidocaine hydrochloride 2% viscous has an anesthetic effect on the mouth and throat.

- **Xerostomia**(dry mouth): Encourage frequent mouth care. Saliva substitute is available over-the counter and is helpful, especially at night when patients complain of a choking sensation from extreme dryness.
- **Skin reactions:** These can vary from mild redness to moist **desquamation** similar to a second-degree burn. Skin surfaces that are especially warm and moist, such as the groin, perineum, and axillae, have poor tolerance to radiation. Prophylactic skin care includes keeping skin dry; keeping it free from irritants, such as powder, lotions, deodorants, and restrictive clothing; and protecting it against exposure to direct sunlight. Irradiated skin can be fragile during treatment. It is important to wash these areas gently with mild soap and water, rinse well, and pat dry. The skin may have markings and tattoos to delineate the treatment field. Take care not to wash off the markings.
- **Bone marrow depression:** This reaction occurs with both radiation and chemotherapy. Weekly blood cell counts are done to detect low levels of WBCs, red blood cells, and platelets. Transfusions of whole blood, platelets, or other blood components may be necessary

3. Chemotherapy: Chemotherapy is chemical therapy that uses **cytotoxic** drugs to treat cancer. Cytotoxic drugs can be used for cure, control, or palliation of cancerous tumors and are described according to how they affect cell activity. For example, alkylating agents bind with DNA to stop the production of RNA; anti metabolites substitute for nutrients or enzymes in the cell life cycle; mitotic inhibitors interfere with cell division; antibiotics inhibit DNA and RNA synthesis; and hormonal agents alter the hormonal structure of the body. Chemotherapy is usually more effective when multiple drugs are given in multiple doses. The effects of chemotherapy are systemic unless used topically for skin lesions. Chemotherapy is used preoperatively to shrink tumors and postoperatively to treat residual tumors. Factors influencing the effectiveness of chemotherapy are tumor type, available chemotherapeutic drugs, and genetics.

Combination Chemotherapy: Combination chemotherapy means that two or more anti-neoplastic agents are used together to treat a particular type of cancer. This can expose a larger number of cells at different points in the cell cycle to more than one kind of chemotherapy. Combining drugs also decreases the side effects of therapy and decreases the possibility of the tumor becoming resistant to the therapy. In order for drugs to be combined this way, there are several criteria that need to be met. These include being effective when used alone to treat certain cancers and having different toxicities that would limit their use. For example, if three drugs that are all cardiotoxic are given, the patient is more likely to develop cardiotoxicity. Patients are still monitored for toxic effects from the treatment as well as improvement in their status.

Routes of Administration: Chemotherapy may be given via oral, intramuscular, intravenous, or topical routes. The dosage of medication is regulated by the size of the individual and the toxicities of the drug. The administration of intravenous chemotherapeutic agents requires specialized training and knowledge of antineoplastic drugs.

Classification of Chemotherapeutic Agents

	Medication Class	**Action**	**Examples**	**Route**	**Side Effects**	**Nursing Implications**
	Antitumor Antibiotics .	Damage cells' DNA and the ability to make DNA and RNA	Bleomycin (Blenoxane) Doxorubicin (Adriamycin) Mitoxantrone (Novantrone)	Intramuscularly and Intraveno us-ly	Fever, chills, cough, shortness of breath; in severe cases, pulmonary fibrosis, pain at the tumor site, anaphylaxis Red urine, nausea and vomiting, alopecia, cardiac damage Headache, dyspnea, diarrhea, nausea, vomiting, stomatitis, alopecia, fever, bone marrow suppression,	Observe for changes in respiratory status related to pulmonary toxicity. Observe for anaphylaxis. This drug is a vesicant and should be given through a running IV or a central line if it is a continuous infusion. Monitor cardiac status. Lifetime dose is 550 mg/m2.

	Medication Class	Action	Examples	Route	Side Effects	Nursing Implications
					allergic reactions from itching to angioedema	Urine may be a blue-green color for 24 hours after the dose is given. Monitor WBC and platelet count prior to each dose. Observe for signs of allergic reaction. Teach patient signs of bleeding.
	Antimetabolites	Resemble normal metabolites needed for cell function. Once they can trick the cell into gaining entry, cell division becomes impaired.	Capecitabine (Xeloda) Cytabine (Cytosar) Fluorouracil (5-FU) Gemcitabine (Gemzar)	Intravenously	Bone marrow depression, nausea, vomiting, stomatitis, hand and foot syndrome Fever, chills, unusual bleeding or bruising, sore throat, tiredness, loss of appetite, alopecia, skin sensitivity, stomatitis Dyspnea, edema, hamaturia, alopecia, bone marrow suppression	Monitor WBC and platelet count throughout therapy. Teach the patient signs of infection and bleeding. Teach the patient about mouth care. Drug should be taken after a meal with plenty of water. Teach the patient about hand and foot syndrome and to notify you if it should occur. Instruct patient to call you for any temperature increases greater than 37.8_C (100.0_F). Monitor CBC prior to dose. Nadir occurs

	Medication Class	Action	Examples	Route	Side Effects	Nursing Implications
						in 10–14 days. Instruct about mouth care. Premedicate with antiemetics. Instruct patient to report any flu like symptoms to you.
	Alkylating Agents	Cause the DNA strands to bind together and prevent the cell from dividing	Carmustine (BCNU) Cisplatin (Platinol) Cyclophosphamide (Cytoxan) Ifosfamide (Ifex	Intravenously	Fever and chills, nausea and vomiting, pulmonary toxicity, vision changes Ototoxicity, fever and chills, tinnitus, nausea and vomiting, hematuria, alopecia, bone marrow depression CNS toxicity, hemorrhagic cystitis, alopecia	This drug is an irritant. The patient may have pain at the injection site from the drug. Nadir occurs in 3–5 weeks. Monitor labs prior to each dose. Monitor respiratory status. Monitor neurological status, renal function studies. Premedicate with antiemetics. Monitor for signs of anaphylaxis. Monitor CBC prior to each dose. Monitor BUN and creatinine. Teach the patient to drink at least 3 L of fluid a day and to void every 2

	Medication Class	Action	Examples	Route	Side Effects	Nursing Implications
						hours. Oral form should be taken early in the morning so that the drug does not build up in the bladder during the night. Monitor urine for blood. This drug requires hydration before and after each dose. Premedicate with antiemetic.
	Antimitotic Agents	Prevent mitosis from occurring in the cell and then cells cannot divide.	Docetaxel (Taxotere) Paclitaxel (Taxol) Vincristine (Oncovin) Vinorelbine (Navelbine)	Intravenously	Fatigue, edema, nausea and vomiting, stomatitis, anemia,thrombocytopenia, myalgia, alopecia, hypersensitivity, anaphylaxis, bone marrow depression, neuropathy Nausea, vomiting, myalgia, cardiac toxicities, hypersensitivity or anaphylaxis, neuropathy, alopecia, stomatitis, hypotension Constipation, difficulty walking, tingling in	Patient must take dexamethasone starting 1 day prior to the scheduled chemotherapy to prevent hypersensitivity. Nadir occurs on day Monitor weight. Monitor skin for changes. Monitor for changes in neurological status from baseline. Premedicate with antiememtic and dexamethasone. Monitor for signs of

	Medication Class	Action	Examples	Route	Side Effects	Nursing Implications
					fingers and toes Fatigue, constipation,, alopecia, bone marrow suppression.	hypersensitivity. Monitor CBC and platelet counts. Monitor neurological status for changes from baseline. Teach the patient about mouth care. Monitor vital signs for changes. This drug is a vesicant and should be given through a running IV. Assess for neuropathies or changes in neurological status from baseline. Teach patient signs of infection and bleeding. Monitor neurological status and changes from baseline. Teach the patient about mouth care.
	Topoisomerase Inhibitors	Inhibit topoisomerase (the enzyme needed for DNA to copy) and cause cell	Etoposide (VP-16) Irinotecan (Camptosar) Topotecan (Hycamtin)	Intravenously	Nausea and vomiting, alopecia, numbness and tingling in fingers and toes, bone marrow depression Dizziness, headache, insomnia,	Premedicate for nausea. Nadir occurs in 10–14 days; monitor CBC prior to each cycle. Monitor neurological status and changes from baseline.

	Medication Class	Action	Examples	Route	Side Effects	Nursing Implications
		death.			dyspnea, edema, diarrhea, stomatitis, bone marrow suppression, weight loss Headache, dyspnea, nausea, vomiting, diarrhea, hair loss, bone marrow suppression	Teach measures to control diarrhea and to notify you if it occurs. Monitor CBC prior to each dose..
	Hormones	Work by interfering with enzyme systems or metabolic pathways in the cells	Tamoxifen (Nolvadex)	orally	Hot flashes, weight gain, nausea, bone pain	Anticoagulants increase the PT. Instruct the patient not to take antacids within 2 hours of taking tamoxifen. May cause bony pain but the discomfort is temporary.
	Miscellaneous Agents	Work by interfering with enzyme systems or metabolic pathways in the cells	Hydroxyurea (Hydrea) Procarbazine (Matulane) Thalidomide (Thalomid)	Orally	Fever and chills, sore throat, drowsiness, diarrhea, nausea and vomiting Bone marrow depression, MAO inhibitor, drowsiness, nausea and vomiting, peripheral neuropathy Birth defects, peripheral neuropathy, drowsiness, rash, constipation, **neutropenia**	Monitor WBC. Monitor metabolic panel for signs of tumor lysis syndrome. Monitor neurological status and changes from baseline. Monitor CBC prior to each cycle. Premedicate as needed for nausea. Monitor neurological status and

	Medication Class	Action	Examples	Route	Side Effects	Nursing Implications
						changes from baseline. Pregnancy test done before beginning therapy. CONTRAINDICATED IN PREGNANCY. Monitor neurological status and changes from baseline. Teach patient to report any rash to MD. Instruct about measures to prevent constipation. Monitor CBC throughout therapy

3.6 Assessment/Data Collection

Patients with cancer are assessed for many different problems associated with cancer and its treatment. Thorough assessment will assist the health team to build a plan of care relevant to the patient's needs.

Monitor laboratory studies. The normal platelet level is 150,000 to 300,000/mm3. Potential for bleeding exists when the platelet count is 50,000; risk for spontaneous bleeding occurs when the count is less than 20,000. Monitor the white blood cell count for risk for infection and the red cell count for anemia.
Monitor the patient's weight and note complaints of changes in taste, vomiting, and diarrhea related to either the disease or treatment. Monitor oral mucosa for lesions or inflammation. Also monitor for signs of dehydration.

Psychosocial issues related to cancer are as varied as the persons afflicted with the disease. You can help the patient explore perceptions about quality of life. Culture and age affect cancer perceptions (e.g., in a culture in which life expectancy is short, possible death from cancer in the later years is not a significant threat). Assess the patient's ability to cope and what coping strategies have been effective in the past. Determine what information the patient has received and understands about his or her disease and prognosis.

Assess the roles of the patient and caregiver in the family. Be aware of whether the caregiver is able to be at home or whether he or she must work outside the home and care for the patient. Isolation can be either self-imposed or imposed by friends and family, as terminal illness issues are confronted.

3.7 Nursing Diagnoses

Based on the assessment data, nursing diagnoses of the patient with cancer may include the following:

- Impaired oral mucous membrane
- Impaired tissue integrity
- Impaired tissue integrity: malignant skin lesions
- Imbalanced nutrition, less than body requirements
- Anorexia
- Chronic pain
- Fatigue
- Disturbed body image
- Anticipatory grieving.

3.8 Potential Complications

Based on the assessment data, potential complications that may develop include the following:

- Infection and sepsis
- Hemorrhage
- Superior vena cava syndrome
- Spinal cord compression
- Hypercalcemia
- Pericardial effusion.

Disseminated intravascular coagulation

- Syndrome of inappropriate secretion of antidiuretic hormone
- Tumor lysis syndrome.

3.9 Nursing Management

These are common nursing diagnoses for patients with cancer:

(1) Prevention of infection

- Assess patient for evidence of infection: Check vital signs every 4 hours, Monitor WBC count and differential each day, Inspect all sites that may serve as entryports for pathogens (intravenous sites, wounds, skin folds, bony prominences, perineum, and oral cavity).
- Report fever ≥38.3°C (101°F), chills, diaphoresis, swelling, heat, pain, erythema and exudate on anybody surfaces. Also report change in respiratory or mental status, urinary frequency or burning, malaise, myalgias, arthralgias, rash, or diarrhea.
- Obtain cultures and sensitivities as indicated before initiation of antimicrobial treatment (wound exudate, sputum, urine, stool, blood) and initiate measures to minimize infection, discuss with patient and family
- Placing patient in private room if absolute WBC count □1,000/mm3
- Importance of patient avoiding contact with people who have known or recent infection or recent vaccination
- Instruct all personnel in careful hand hygiene before and after entering room.
- Avoid rectal or vaginal procedures (rectal temperatures, examinations, suppositories; vaginal tampons).
- Use stool softeners to prevent constipation and straining.
- Assist patient in practice of meticulous personal hygiene.
- Instruct patient to use electric razor.
- Encourage patient to ambulate in room unless contraindicated.
- Avoid fresh fruits, raw meat, fish, and vegetables if absolute WBC count □1,000/mm3; also remove fresh flowers and potted plants.
- Each day: change drinking water, denture cleaning fluids, and respiratory equipment containing water.
- Assess intravenous sites every day for evidence of infection
- Change intravenous sites every other day.

(2) Maintenance of skin integrity

1. In erythematous areas:

- Avoid the use of soaps, cosmetics, perfumes, powders, lotions and ointments, deodorants.
- Use only lukewarm water to bathe the area.
- Avoid rubbing or scratching the area.
- Avoid shaving the area with a straight edged razor.
- Avoid applying hot-water bottles, heating pads, ice, and adhesive tape to the area.
- Avoid exposing the area to sunlight or cold weather.

- Avoid tight clothing in the area. Use cotton clothing.
- Apply vitamin A&D ointment to the area.

2. If wet desquamation occurs:

- Do not disrupt any blisters that have formed.
- Avoid frequent washing of the area.
- Report any blistering.
- Use *prescribed* creams or ointments.
- If area weeps, apply a thin layer of gauze dressing.

(3) Maintenance of oral mucous membrane:

- Assess oral cavity daily and instruct patient to report oral burning, pain, areas of redness, open lesions on the lips, pain associated with swallowing, or decreased tolerance to temperature extremes of food.
- Encourage and assist in oral hygiene.

Preventive

a. Avoid commercial mouthwashes.
b. Brush with soft toothbrush; use nonabrasive toothpaste after meals and bedtime; floss every 24 h unless painful or platelet count falls below 40,000 cu/mm.

In case of mild stomatitis (generalized erythema, limited ulcerations, and small white patches: *Candida*):

c. Use normal saline mouth rinses every 2 h while awake; every 6 h at night.
d. Use soft toothbrush or toothette.
e. Remove dentures except for meals; be certain dentures fit well.
f. Apply lip lubricant.
g. Avoid foods that are spicy or hard to chew and those with extremes of temperature.

In case severe stomatitis (confluent ulcerations with bleeding and white patches covering more than 25% of oral mucosa)

h. Obtain tissue samples for culture and sensitivity tests of areas of infection.

i. Assess ability to chew and swallow; assess gag reflex.
j. Use oral rinses as prescribed or place patient on side and irrigate mouth; have suction available (may combine in solution saline, anti-*Candida* agent, such as Mycostatin, and topical anesthetic agent as described below).
k. Remove dentures.

l. Use toothette or gauze soaked with solution for cleansing.
m. Use lip lubricant.
n. Provide liquid or pureed diet.
o. Monitor for dehydration.

4. Minimize discomfort.
   a. Consult physician for use of topical anesthetic, such as dyclonine and diphenhydramine, or viscous lidocaine.
   b. Administer systemic analgesics as prescribed.
   c. Perform mouth care as described.

(4) Maintain tissue integrity:

1. Discuss potential hair loss and regrowth with patient and family.
2. Explore potential impact of hair loss on self-image, interpersonal relationships, and sexuality.
3. Prevent or minimize hair loss through the following:
   a. Use scalp hypothermia and scalp tourniquets, if appropriate.
   b. Cut long hair before treatment.
   c. Use mild shampoo and conditioner, gently pat dry, and avoid excessive shampooing.
   d. Avoid electric curlers, curling irons, dryers, clips, barrettes, hair sprays, hair dyes, and permanent waves.
   e. Avoid excessive combing or brushing; use wide-toothed comb.
4. Prevent trauma to scalp.
   a. Lubricate scalp with vitamin A&D ointment to decrease itching.
   b. Have patient use sunscreen or wear hat when in the sun.
5. Suggest ways to assist in coping with hair loss:
   a. Purchase wig or hairpiece before hair loss.
   b. If hair loss has occurred, take photograph to wig shop to assist in selection.
   c. Begin to wear wig before hair loss.
   d. Contact the American Cancer Society for donated wigs, or a store that specializes in this product.
   e. Wear hat, scarf, or turban.
6. Encourage patient to wear own clothes and retain social contacts.
7. Explain that hair growth usually begins again once therapy is completed.

(5) Promotion of balanced nutrition

1. Assess the patient’s previous experiences and expectations of nausea and vomiting, including causes and interventions used.

2. Adjust diet before and after drug administration according to patient preference and tolerance.
3. Teach patient to avoid unpleasant sights, odors, sounds in the environment during mealtime.
4. Suggest foods that are preferred and well tolerated by the patient, preferably high-calorie and high-protein foods.
5. Respect ethnic and cultural food preferences.
6. Encourage adequate fluid intake, but limit fluids at mealtime.
7. Suggest smaller, more frequent meals.
8. Promote relaxed, quiet environment during mealtime with increased social interaction as desired.
9. Consider cold foods, if patient desired.
10. Advocate nutritional supplements and high-protein foods between meals.
11. Encourage frequent oral hygiene.
12. Provide pain relief measures.
13. Provide control of nausea and vomiting.
14. Increase activity level as tolerated
15. Provide parenteral nutrition with lipid supplements as prescribed.
16. Administer appetite stimulants as prescribed by physician.

(6) Relieve of pain and discomfort

1. Use pain scale to assess pain and discomfort characteristics: location, quality, frequency, duration, etc
2. Assure patient that you know that pain is real and will assist him or her in reducing it.
3. Assess other factors contributing to patient’s pain: fear, fatigue, anger, etc.
4. Administer analgesics to promote optimum pain relief within limits of physician’s prescription.
5. Assess patient’s behavioral responses to pain and pain experience.
6. Collaborate with patient, physician, and other health care team members when changes in pain management are necessary.
7. Encourage strategies of pain relief that patient has used successfully in previous pain experience.
8. Teach patient new strategies to relieve pain and discomfort: distraction, imagery, relaxation, cutaneous stimulation, etc.

(7) Prevention of bleeding

1. Assess for potential for bleeding: monitor platelet count.
2. Assess for bleeding:
    a. Petechiae or ecchymosis
    b. Decrease in hemoglobin or hematocrit

   c. Prolonged bleeding from invasive procedures, venipunctures, minor cuts or scratches
   d. Frank or occult blood in any body excretion, emesis, sputum
   e. Bleeding from anybody orifice
   f. Altered mental status
3. Instruct patient and family about ways to minimize bleeding:
   a. Use soft toothbrush or toothette for mouth care.
   b. Avoid commercial mouthwashes.
   c. Use electric razor for shaving.
   d. Use emery board for nail care.
   e. Avoid foods that are difficult to chew.
4. Initiate measures to minimize bleeding.
   a. Draw all blood for lab work with one daily venipuncture.
   b. Avoid taking temperature rectally or administering suppositories and enemas. When platelet count is less than 20,000/mm3, institute the following:
      a. Bed rest with padded side rails
      b. Avoidance of strenuous activity

c. Platelet transfusions as prescribed; administer prescribed diphenhydramine hydrochloride (Benadryl) or hydrocortisone sodium succinate (Solu-Cortef) to prevent reaction to platelet transfusion.
d. Supervise activity when out of bed.
e. Caution against forceful nose blowing.

(8) Increased activity toleranceby

1. Encourage several rest periods during the day, especially before and after physical exertion.
2. Increase total hours of nighttime sleep.
3. Rearrange daily schedule and organize activities to conserve energy expenditure.
4. Encourage patient to ask for others' assistance with necessary chores, such as housework, child care, shopping, cooking.
5. Encourage reduced job workload, if possible, by reducing number of hours worked per week.
6. Encourage adequate protein and calorie intake.
7. Encourage use of relaxation techniques, mental imagery.
8. Encourage participation in planned exercise programs.
9. For collaborative management, administer blood products as prescribed.
10. Assess for fluid and electrolyte disturbances.
11. Assess for sources of discomfort.
12. Provide strategies to facilitate mobility.

4.0 SUMMARY

This unit has extensively dealt with tumour and its characteristics in such a way that you will be able to differentiate one from another. Nursing assessment and nature of nursing cares that can be given to patients with cancerous growth who is on chemotheraphy, receiving radiation or have undergone surgery were also discussed. This will enable you to be more proficient in managing patients.

5.0 TUTOR-MARKED ASSIGMENT

Working with your Preceptor, choose a patient with malignant growth for a case study, utilizing the nursing process, develop care plan for the patient. Present your case study in your group

SELF-ASSESSMENT EXERCISE

I. Explain the process of cancer cell growth and reproduction
Ii. Describe different types of tumour
Iii. Describe the pathophysiology of cancer
Iv. Enumerate all the possible warning signs of cancer
V. Explain various radiological and imaging tests
Vi. Explain the stages and grades of tumour.
Vii. What are the medical treatment options for cancer patients?
Vii. List the classes of chemotherapeutic agents and their side effects
Viii. Discuss nursing interventions that can done for patients under cancer treatment.

UNIT 6 CARE OF PATIENTS RECEIVING PALLIATIVE CARE

CONTENTS

1.0 INTRODUCTION

Patients with life-threatening, life limiting or terminal illnesses are always in need of nurses who can provide holistic care that will improve or prolong their quality of life. This type of care is called palliative care and it is an emerging specialty in nursing. In the clinical area, you regularly come across patients with terminal or life-threatening conditions that need your expertise nursing care but because of your limited knowledge as regard this new and emerging aspect of nursing care, you may not be able to give such patients the best of care. This unit is then intended to reorientate you and improve your knowledge and skill in act of giving palliative care to patients.

2.0 OBJECTIVES

At the end of this unit, you should be able to

- differentiate between life threatening, life limiting and terminal illnesses.
- discuss the focus of palliative care.
- explain the domain of quality palliative care
- discuss the dimensions of care for palliative patients
- conduct nursing assessment and interventions on patients in need of palliative care.
- explain nurses role in pain management during palliative care
- discuss the ethical and legal issues in palliative care.

3.0 MAIN CONTENT

3.1 Meaning of Palliative Care

The word “palliative” has its origin in the Latin word pallium, meaning “a cloak.” When discussing palliative care, one refers to the covering of the effects of illness rather than addressing the actual cause of the illness. Palliation provides protection from the internal and external threats to the individual precipitated by the disease and its treatment.

Palliative care is a multidisciplinary approach to care with a particular emphasis on quality-of-life involving the ***physical, psychological, spiritual and social aspects of well-being*** in patients with life-limiting, life-threatening or terminal illnesses. Palliative care (WHO, 2002) is an approach that improves the quality of life of patients and their families facing the problems associated with life-threatening illness, through the prevention and relief of suffering by means of early identification and impeccable assessment, and treatment of pain and other problems – physical, psychosocial and spiritual. It is provided ***at any stage*** of illness from diagnosis through cure or remission to death. Life-Threatening Illness is a potentially, but not necessarily, fatal severe infection, early stage breast cancer, major trauma from road traffic crash which may go to the brink of death but be saved by medical care and patient can return to normal quality of life . Life-limiting Illness is incurable, progressive illness leading to eventual death as in cases of end-stage CHF, end-stage COPD, Alzheimer’s dementia, advanced cancer that has no medical treatments (no cure) but care may prolong or improve quality-of-life while terminal Illness is a life-limiting illness with death anticipated within months and limited options, if any, to prolong life. Palliative care is an approach that improves the quality of life of patients and their families facing the problems associated with life-threatening illness, through the prevention and relief of suffering by means of early identification and impeccable assessment and treatment of pain and other problems, physical, psychosocial and spiritual. Palliative care is a philosophy of care and therefore it can be delivered in a variety of settings, including institutions such as hospitals, inpatient hospices and care homes for older people as well as in people’s own homes.

3.2 The focus of Palliative care

The care focuses on:

- provision of relief from pain and other distressing symptoms;
- affirmation that life and dying are normal normal processes;
- intention neither to hasten nor postpone death;

- integration of the psychological and spiritual aspects of patient care;
- offering a support system to help patients live as actively as possible until death;
- offering a support system to help the family cope during the patient's illness and in their own bereavement;
- usage of a team approach to address the needs of patients and their families, including bereavement counseling, if indicated;
- enhancing quality of life, and may also positively influence the course of illness;
- applying early in the course of illness, in conjunction with other therapies that are intended to prolong life, such as chemotherapy or radiation therapy, and include those investigations needed to better understand and manage distressing clinical complications.

The goal of palliative care is to improve the patient's and family's quality of life, and many aspects of this type of comprehensive, comfort-focused approach to care are applicable earlier in the process of life-threatening disease in conjunction with cure focused treatment. The goal of palliative care is to prevent and relieve suffering and to support the best possible quality of life for patients and their families, regardless of the stage of the disease or the need for other therapies.

3.3 The Domains of Quality Palliative Care

The domains of quality palliative care are:

1. Structure and processes of care
2. Physical aspects of care
3. Psychosocial and psychiatric aspects of care
4. Social aspects of care
5. Spiritual, religious, and existential aspects of care
6. Cultural aspects of care
7. Care of the imminently dying patient
8. Ethical and legal aspects of care

3.4 Dimensions' of care for Palliative Patients

Spiritual Care: Attention to the spiritual component of the patient's and family's illness experience is not new within the context of nursing care, yet many nurses lack the comfort or skills to assess and intervene in this dimension. **Spirituality** contains features of religiosity, but the two concepts are not interchangeable (Highfield, 2000). Spirituality involves the "search for meaning and purpose in life and to a transcendent dimension" (Hermann, 2001, p. 67).For most people, contemplating their own deaths raises many issues, such as the meaning of existence, the purpose of suffering, and the existence of an afterlife. In a national survey on spiritual beliefs and the dying process conducted by Gallup for the Nathan Cummings Foundation and Fetzer Institute in 1996 and published in 1997, respondents' greatest worries about death included the following:

- The medical matter of greatest worry was the possibility of being vegetable-like for some period of time (73%).
- The emotional matter of greatest worry was not having the will be a cause of inconvenience and stress for those who love them (64%).
- The spiritual matter of greatest worry was not being forgiven by God (56%) or dying when removed or cut off from God or a higher power (51%). The spiritual assessment is a key component of comprehensive nursing assessment for terminally ill patients and their families. Although the nursing assessment should include religious affiliation, spiritual assessment is conceptually much broader than religion and thus is relevant regardless of the patient's expression of religious chance to say goodbye to someone (73%) or the possibility of having great physical pain before death (67%).
- The practical matter of greatest worry was how family or loved ones will be cared for (65%) or thinking that death

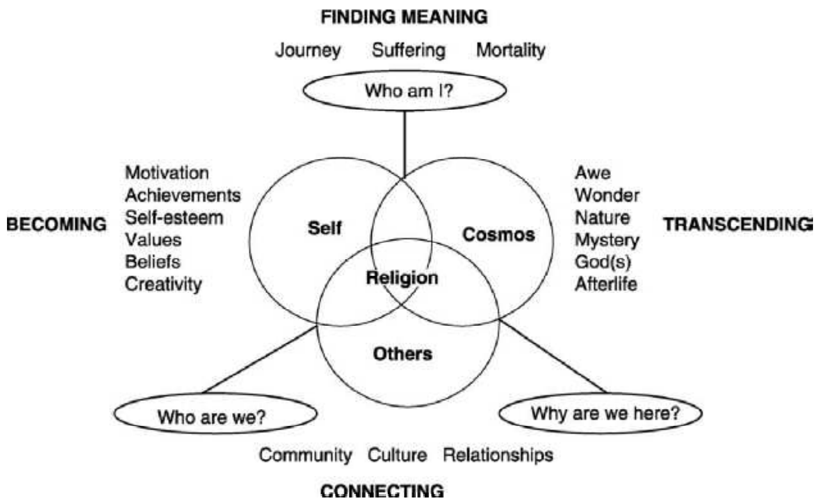


Figure: An inclusive model of the spiritual domain

Pain

Pain and suffering are among the most feared consequences of cancer, pain is a significant symptom for many cancer patients throughout their treatment and disease course; it results both from the disease and the modalities used to treat it. Numerous studies have indicated that patients with advanced illness, particularly cancer, experience considerable pain while the means to relieve pain have existed for many years, the continued, pervasive under treatment of pain has been well documented

(American Pain Society, 1999; Jacox *et al.*, 1994). It is estimated that as many of 70% of patients with advanced cancer experience severe pain (Jacox *et al.*, 1994; World Health Organization, 1990).

The impact of poorly managed pain on patients' psychological, emotional, social, and financial well-being has attracted considerable research interest, but practice has been slow to change (Spross, 1992). Patients who have an established regimen of analgesics should continue to receive those medications as they approach the end of life. Inability to communicate pain should not be equated with the absence of pain. While most pain can be managed effectively using the oral route, as the end of life nears patients may be less able to swallow oral medications due to somnolence or nausea.

3.5 Nursing Assessment and Intervention

As is true in pain assessment and management, the patient's report of dyspnea must be believed. Also like the experience of physical pain, the meaning of the dyspnea to the patient may increase his or her suffering. For example, the patient may interpret increasing dyspnea as a sign that death is approaching. For some patients, sensations of breathlessness may invoke frightening images of drowning or suffocation, and the resulting cycle of fear and anxiety may create even greater sensations of breathlessness. Therefore, the nurse should conduct a careful assessment of the psychosocial and spiritual components of the symptom (see Chart 17-5). Physical assessment parameters include:

- Symptom intensity, distress, and interference with activities (scale of 0 to 10)
- Auscultation of lung sounds
- Assessment of fluid balance
- Measurement of dependent edema (circumference of lower extremities)
- Measurement of abdominal girth
- Temperature
- Skin color
- Sputum quantity and character
- Cough.

To determine the intensity of the symptom and its interference with daily activities, patients can be asked to self-report using a scale of 0 to 10, where 0 is no dyspnea and 10 is the worst imaginable dyspnea. Measurement of the patient's baseline before treatment and subsequently during exacerbation of the symptom (periodically during treatment and whenever the treatment plan changes) will provide ongoing objective evidence for the efficacy of the treatment plan. In addition, physical assessment findings may assist in locating the source of the dyspnea and selecting nursing interventions to relieve the symptom. The components of the assessment will change as the patient's condition changes. For example, when the patient who has been on daily weights can no longer get out of bed, the goal of comfort may outweigh the benefit of continued weights. Like other symptoms at the end of life, dyspnea can be managed effectively in the absence of assessment and diagnostic data (i.e., arterial blood gases) that are standard when the patient's illness or symptom is reversible.

Principle of pain management: This can be achieved by either:
(A) Pharmacological approach: In 1982 World Health Organization developed a three-step analgesic ladder. The three-step ladder is the method most widely accepted and recognized as the basis for adequate pain control. Its methodology involves a stepwise approach to the use of analgesic drugs, going from the first to the third step in analgesic strength.

1. The *first step* is the use of acetaminophen, aspirin or other nonsteroidal anti-inflammatory drug (NSAID) for mild to moderate pain.
2. When pain increases or persists, a 'weak' opioid such as codeine should be added to the NSAID (*second step*).
3. When higher doses of 'weak' opioids are needed and the maximum therapeutic dose has been reached, or the pain has not been well-controlled they should be replaced with strong opioids such as morphine (*third step*). Adjuvant drugs are used at any time to enhance analgesic efficacy (*'broad spectrum analgesia'*). Opioids and non-opioid analgesics are used systematically by the clock, and by the mouth whenever possible. The right dose is the one which relieves the pain in that particular patient (*'individualized treatment'*).

(B) **Non Pharmacological approach** e.g. Cognitive behavioural therapy, Relaxation method, ***Biofeedback, (*** use of instruments to enhance and transform information from the body, such as temperature of the skin or the amount of tension in skeletal muscles, into a vivid form like a flashing light or oscilloscope readout, a tone or a series of clicks ***), Complementary therapies (***massage, aromatherapy, reflexology, hypnosis, guided imagery, visualization) ***Transcutaneous Electrical Nerve Stimulation (TENS).***

Recognize and promptly assess pain in cancer patients.

- Identify psychological and spiritual influences on pain perception and management.

- Aim to alleviate pain first, at night; second, at rest; and finally, on movement.
- Maximize independence and best possible quality of life.
- Address and relief current fears about pain.
- Anticipate and discuss possible concerns about future painful episodes and therapeutic options.
- Provide support and encouragement for family members, friends and professional care-givers.
- Invite participation of the patient, family and other informal carers. Adopt a collaborative, multidisciplinary approach.
- Design analgesic regiments tailored to each patient's needs and tolerance.
- Regular outcome follow up.
- Refer early to pain specialist services if pain control is not achieved.

3.6 Nurses roles in Pain Management

Determine whether the analgesic is to be given and, if so, when.

- Choose the appropriate analgesic(s) when more than one is prescribed.
- Be alert to the possibility of certain side effects as a result of the analgesic.
- Evaluate effectiveness of the analgesic at regular frequent intervals following each administration, but especially the initial doses.
- Report promptly and accurately to the doctor when a change is needed.
- Make suggestions for specific changes, such as route of administration, interval, and formulations.
- Advise the patient about the use of analgesics.
- Inform the patient about non-pharmacological interventions for pain relief.
- Develop a preventive approach with analgesics by teaching the patient to request painkillers as soon as pain occurs or before it increases, and by regularly assessing the patient and enquiring about the pain.

3.7 Ethical and Legal Issues in Palliative Care

There are four ethical principles guiding clinical practice and must also be utilized in the practice of palliative care and these are:

1. Autonomy
2. Nonmaleficence
3. Beneficence

4. Justice.

Autonomy refers to the process of helping patients make the decisions that are right for them. Nurses are in the position to advocate for patients and it is our responsibility to ensure that patients have the knowledge they need to weigh the pros and cons of proposed treatment decisions. It also means making a concerted effort to allow patients to control as many aspects of their care as possible.

Nonmaleficence in palliative care involves avoiding practices that will do harm to the individual. An example of harm would be ordering inappropriate diagnostic tests that cause discomfort but have no real clinical merit. Inappropriate care could also entail withholding pain medication for a patient in pain.

Beneficence is the opposite of Nonmaleficence and this would be which seeks to help the patient while balancing the benefits against the risk of harm. Turning a patient to prevent skin breakdown seems like a reasonable activity unless the patient is imminently dying and has widespread bony metastasis causing severe pain with any movement.

Justice refers to the distribution of resources in a fair and reasonable way. How should healthcare allocation be spent? Should more funding be devoted to research in palliative care? Should a patient with a terminal diagnosis receive care that is comprehensive but devoid of the more expensive tests? How are staffing assignments made in relation to high-acuity patients receiving end-of-life care? How these principles are applied in physician-assisted suicide and euthanasia is the subject of continued debate. Active euthanasia has been defined as “the direct administration of a lethal agent to the patient by another party with merciful intent. These measures should not be confused with terminal sedation and the withholding or discontinuation of life-sustaining therapy. The latter is typically employed in palliative care as a means of providing dignity to a patient when there is believed to be no chance for recovery.

4.0 SUMMARY

In this unit, you have been taken through different issues relating to Palliative care including your role in caring for this group of patients. It is a new area that is just coming up and therefore you must continued to upgrade your knowledge by consulting relevant books as they are becoming available in the market.

5.0 TUTOR-MARKED ASSIGNMENT

Pay a visit to the nearest health institution where you can see a patient receiving palliative care. Assess the patient; determine whether his/her condition is life-limiting, life-threatening or terminal illness and develop a care plan for the patient.

SELF-ASSESSMENT EXERCISE

i. what are differences between life threatening, life limiting and terminal illnesses. Give examples
ii. briefly discuss the focus of palliative care?
iii. explain the domain of quality palliative care
iv. what are the dimensions of care for palliative patients?
v. conduct nursing assessment: identify nursing diagnoses and list likely interventions for your diagnoses on patient in need of palliative care.
vi. explain the expected roles of nurses in pain management during palliative care?
vii. discuss the ethical and legal issues in palliative care.

UNIT 7 LOSS, GRIEF AND END OF LIFE CARE

CONTENTS

1.0 INTRODUCTION

Everyone including you have experienced loss of valued relationship through life changes like moving from one place to another, separation, divorce or death. You can imagine how you feel when you lost a valued or cherishable personal possession not to talk of losing a close relation through death. Loss and grief are two related terms that can be experienced by all at one time or the other and as a professional nurse, you must be able to meet the caring needs of clients that are under your care with this type of life challenge. The aim of this unit is to expand your knowledge and skills concerning the manifestations of clients experiencing this and nature of care that can be given to them when they are faced with loss, grief and end of life.

2.0 OBJECTIVES

At the end of this unit, you should be able to;

- discuss the types and categories of loss
- explain the meaning of grief
- discuss theories of grief
- explain the stages of grieving by Kubler- Ross
- enumerate the factors that affect grief
- explain the contents of end of life care
- discuss the stages of death and dying
- list the clinical signs of impending death
- discuss the care of a deceased body
- explain the legal aspect of end of life care.

3.0 MAIN CONTENT

3.1 Meaning of Loss

Lossis any situation (either actual, potential, or perceived) in which a valued object is changed or is no longer accessible to the individual. Because change is a major constant in life, everyone experiences losses. Loss can be actual (e.g., a spouse is lost through divorce) or anticipated (a person is diagnosed with a terminal illness and has only a short time to live). Loss precipitates anxiety and a feeling of vulnerability— which may lead to crisis. When a significant other dies, one's sense of safety and security is disrupted.

3.2 Types of loss

- *Actual loss:* Death of a loved one, theft of one's property.
- *Perceived loss:* Occurs when a sense of loss is felt by an individual but is not tangible to others.
- *Physical loss:* Loss of an extremity in an accident, scarring from burns, permanent injury.
- *Psychological loss:* Such as a woman feeling inadequate after menopause and resultant infertility.

3.3 Categories of loss

Loss of an External Object: When an object that a person highly values is damaged, changed, or disappears, loss occurs. The significance of the lost object to the individual determines the type and amount of grieving that occurs. The valued object may be a person, pet, prized possession, or one's home. The loss of a pet, especially for those who live alone, can be a devastating loss.

Loss of Familiar Environment: The loss of a familiar environment occurs when a person to another home or a different community, changes schools, or starts a new job. Also, a client who is hospitalized or institutionalized experiences loss when faced with new surroundings. This type of loss evokes anxiety caused by fear of the unknown.

Loss of Aspect of Self: Loss of an aspect of self can be physiological or psychological. A psychological aspect of self that may be lost is ambition, a sense of humor, or enjoyment of life. An example of physiological loss includes loss of physical function as a result of illness or injury. Loss also occurs when there is disfigurement or disappearance of a body part, such as having an amputation or mastectomy. Loss of an aspect of self can result from illness, trauma, or treatment methodologies (such as surgery).

Loss of Significant Other: The loss of a loved one is a significant loss. Such a loss can be the result of separation, divorce, running away, moving to a different area, or death. Responses to loss are highly individualized as each person perceives the meaning of loss differently. For example, the death of a spouse is different for men and women. "Men who are widowed react as if they have lost a part of themselves, whereas women react as if they have been deserted or abandoned"

3.4 Meaning of Grief

Itis a series of intense physical and psychological responses that occur following a loss. It is a normal, natural, necessary, and adaptive response to a loss. "Grieving is a walk through unknown territory. Familiar internal and external stabilities disappear in a whirlwind of changing thoughts, feelings, and emotional flux". Grief is a universal, normal response to loss. Grief drains people, both emotionally and physically. Because grief consumes so much emotional energy, health status may become altered. Grief is a psychological response to loss characterized by deep mental anguish and sorrow. Grieving people experience various stages of grief. The difference between normal and pathologic grief is the inability of the individual to adapt to life without the loved one There are different types of grief including uncomplicated ("normal"), dysfunctional, and anticipatory. Loss leads to the adaptive process of **mourning**, the period of time during which the grief is expressed and resolution and integration of the loss occur. **Bereavement** is the period of grief following the death of a loved one.

3.4.1 Theories of grief

A. **Lindemann's Theory:** Reactions to Normal Grief according to this theorist has the following stages:

1. ***Somatic Distress*** Episodic waves of discomfort in duration of 10–60 minutes; multiple somatic complaints, fatigue, and extreme physical or emotional pain.
2. ***Preoccupation with the Image of the Deceased: The*** bereaved experience a sense of unreality, emotional detachment from others, and an overwhelming preoccupation with visualizing the deceased.
3. ***Guilt: The*** bereaved consider the death to be a result of their own negligence or lack of attentiveness; they look for evidence of how they could have contributed to the death.
4. ***Hostile Reactions:*** Relationships with others become impaired owing to the bereaved desire to be left alone, irritability, and anger.
5. ***Loss of Patterns of Conduct:*** The bereaved exhibit an inability to sit still, generalized restlessness and continually searches for something to do.

B. **Engle's Theory of Grief: Three Stages of Mourning**

Stage I: Shock and Disbelief

- Disorientation
- Feeling of helplessness
- Denial gives protection until person is able to face reality. The stage I can last from minutes to days.

Stage II: Developing Awareness

- Emotional pain occurs with increased reality of loss
- Recognition that one is powerless to change the situation
- Feelings of helplessness
- Anger and hostility may be directed at others
- Guilt
- Sadness
- Isolation
- Loneliness

Stage II may last from 6 to 12 months.

Stage III: Restitution and Resolution

- Emergence of bodily symptoms
- May idealize the deceased
- Mourner starts to come to terms with the loss

- Establishment of new social patterns and relationships. Stage III marks the beginning of the healing process and may take up to several years.

C. ***Bowlby:*** Bowlby stated that grief results when an individual experiences a disruption in attachment to a loved object. His theory proposes that grief occurs when attachment bonds are severed. There are four phases that occur during grieving:
- Numbing
- Yearning and searching
- Disorganization and despair
- Reorganization.

D. Worden: William Worden has identified four tasks that an individual must perform in order to successfully deal with a loss:
- Accept the fact that the loss is real.
- Experience the emotional pain of grief.
- Adjust to an environment without the deceased.
- Reinvest the emotional energy once directed at the deceased into another relationship.

3.4.2 Stages of Grieving by Kubler- Ross

There are five stages that were described by this author and these are:
1. Denial: The individual refuses to believe that the loss is happening and may assume artificial cheerfulness to prolong the denial.
2. Anger: Client of family may direct anger at the nurse or staff about matters that normally would not bother them.
3. Bargaining: the person seeks to bargain to avoid loss and may express feeling of guilt or fear of punishment for past sins, real or imagined.
4. Depression: The client grieves over what has happened and what cannot be. He/she may talk freely or may withdraw.
5. Acceptance: The individual comes to term with the loss and may have decreased interest in surroundings and support people. The client may wish to begin making plan e.g. will, prosthesis, etc.

3.4.3 Types of Grief Responses

People react to normal or complicated (unhealthy) grief in different ways and these are:

Normal grief reaction has the following types of responses: Abbreviated grief is brief but genuinely felt. It occurs when the lost object is not significantly important to the grieving person and it has been replaced immediately by another equally esteemed object.

Anticipatory grief: it is experienced in advance of event, e.g. a wife who grieves before her ailing husband dies or a young girl may grieve in advance of an operation that will leave a scar on her body. Many of the normal symptoms will have already been expressed in anticipation and the reaction when the loss actually occurs is sometimes quite brief.
Disenfranchised grief: this occurs when a person is unable to acknowledge the loss to other persons. Example of situations where this may occur is often related to a socially unacceptable loss that cannot be spoken about like suicide, abortion or giving a child for adoption. Others are homosexual or extramarital relationships.

Unhealthy grief: it is otherwise called pathologic or complicated grief and it occurs when strategies to cope with loss are maladaptive. Factors like prior traumatic loss, family or cultural barriers to the emotional expression of grief and sudden death usually contributed to complicated grief. Forms of complicated grief are as follows:

Unresolved or chronic grief: It extends in length and severity of normal signs and symptoms of normal grief, the bereaved may have difficulty in expressing the grief, may deny the loss and may grieve beyond the expected time.

Inhibited grief: Many symptoms of the normal grief are suppressed
Delayed grief: It occurs when feelings of grief are purposely or subconsciously suppressed until much later time.
Exaggerated grief: It occurs when the bereaved person is using dangerous activities as a method to lessen the pain of grieving.

3.4.4 Factors Affecting Grief

The experience of grief is individual and is influenced by various factors. Factors that influence grief include the person's developmental level, religious and cultural beliefs, relationship to the lost object, support system, gender and the cause of loss or death.

Manifestations of Grief: It is the responsibility of the nurse to assess the client or family members following a loss to determine the stage or phase of the grieving. The following manifestations would be considered normal: verbalization of loss, crying, sleep disturbance, loss of appetite, difficulty in concentrating but complicated grieving may be characterized by extended time of denial, depression, severe physiologic symptoms and or with suicidal thoughts.

3.5 Nursing Process

Assessment

A thorough assessment of the grieving client and family begins with a determination of the personal meaning of the loss. Another key assessment area is deciding where the person is in terms of the grieving process. The nurse understands that the stages of grieving are not necessarily mastered sequentially, but that instead individuals may vacillate in progression through the stages of grief. Levin (1998) recommends that assessment be done to differentiate the signs of healthy grieving from at-risk behavior.

Diagnosis

The North American Nursing Diagnosis Association (NANDA) defines *Dysfunctional Grieving* as "extended, unsuccessful use of intellectual and emotional responses by which individuals (families, communities) attempt to work through the process of modifying self concept based upon the perception of potential loss". Another diagnosis that may be applicable is *Anticipatory Grieving*, defined as "intellectual and emotional responses and behavior by which individuals (families, communities) work through the process of modifying self-concept based on the perception of potential loss". See the accompanying Nursing Process Highlight for a discussion of the two NANDA diagnoses specifically developed to address grieving individuals.

Diagnosis: Dysfunctional Grieving

Defining Characteristics

Major

- Unsuccessful adaptation to loss
- Prolonged denial or depression
- Inability to resume normal living patterns
- Delayed emotional response

Minor

- Failure to restructure life after the loss
- Social isolation or withdrawal from others
- Failure to develop new interests or relationships

Related Factors

- Loss of physiological function related to disease or trauma
- Surgery (colostomy, hysterectomy, mastectomy, amputation)
- Terminal illness
- Chronic pain
- Death

- Developmental life changes
- Loss of a relationship

Diagnosis: Anticipatory Grieving
Defining Characteristics

Major
- Expressed emotional pain over a potential loss

Minor
- Sorrow
- Anger
- Guilt
- Altered sleep patterns
- Changes in eating patterns
- Decreased libido
- Communication alterations

Related Factors
- Diagnosis of terminal illness (self or significant other)
- Upcoming lifestyle change (divorce, child leaving home)
- Potential job loss
- Loss associated with aging

Implementation: Therapeutic nursing care is based on an understanding of the significance of the loss to the client. To understand the client's perspective, the nurse must spend time listening. As the client expresses feelings, the nurse must demonstrate acceptance, even if the client is not responding according to the nurse's expectations or belief system. The nurse's nonjudgmental, accepting attitude is essential while the bereaved expresses anger. The nurse communicates an understanding of the client's anger—and avoids personalizing and using defensive behaviors.
Grieving people need reassurance, counseling, and support. One mechanism of providing support on a long-term basis is support groups. Thus, the nurse needs to be aware of the availability of such groups within the community to make appropriate referrals. When bereaved people join support groups, they will be with others who have experienced the same situation. This sharing decreases the feelings of loneliness and social isolation that are so common in grief. The accompanying Nursing Checklist lists steps for working through loss.

5.5.1 End-Of-Life (EOL) Care

No one expects to die. It is something that happens to someone else and to someone else's loved ones. Yet it is one of two life events that all humans share, the other being birth. Dying was once considered to be a normal part of the life cycle. Today it is often considered to be a medical problem that should be handled by health care providers. Technologic advances in medicine have caused care of those who are dying to become depersonalized and mechanical. In an attempt to humanize care of the dying, proponents of improved EOL care are looking to nurses. Nurses spend more time with patients who are facing the end of life (EOL) than any other member of the health care team. This highly technologic world calls for application of high-touch intervention with the dying. In other words, appropriate care of the dying is administered by compassionate nurses who are both technically competent and able to demonstrate caring.

5.5.2 Stages of Death and Dying

In her classic works, Elizabeth Kübler-Ross (1969, 1974) identified five possible stages of dying experienced by clients and their families. Every person does not move sequentially through each stage. These stages are experienced in varying degrees and for varying lengths of time. The client may express anger and, a few minutes later, express acceptance of the inevitable, then express anger again. The value in Kübler-Ross's work is that it helps increase sensitivity to the needs of the dying client.

Denial

In the first stage of dying, the initial shock can be overwhelming. Denial, which is an immediate response to loss experienced by most people, is a useful tool for coping. It is an essential and protective mechanism that may last for only a few minutes or may manifest itself for months.

Anger

The initial stage of denial is followed by anger. The client's security is being threatened by the unknown. All the normal daily routines have become disrupted. The client has no control over the situation and thus becomes angry in response to this powerlessness. The anger may be directed at self, God, and others. Often the nurse is the recipient of the anger when the client lashes out.

Bargaining

The anticipation of the loss through death brings about bargaining through which the client attempts to postpone or reverse the inevitable. The client promises to do something (such as be a better person, change lifestyle) in exchange for a longer life

Depression
When the realization comes that the loss can no longer be delayed, the client moves to the stage of depression. This depression is different from dysfunctional depression in that it helps the client detach from life to be able to accept death.

Acceptance
The final stage of acceptance may not be reached by every dying client. However, "most dying persons eventually accept the inevitability of death. Many want to talk about their feelings with family members . . ." (Ward, 1999, p. 1). Verbalization of emotions facilitates acceptance. With acceptance comes growing awareness of peace and contentment. The feeling that all that could be done has been done is often expressed during this stage. Reinforcement of the client's feelings and sense of personal worth are important during this stage.

5.5.3 Manifestations of Impending Clinical Death

Loss of Muscle Tone
- Relaxation of the facial muscles (e.g., the jaw may sag)
- Difficulty speaking
- Difficulty swallowing and gradual loss of the gag reflex
- Decreased activity of the gastrointestinal tract, with subsequent nausea, accumulation of flatus, abdominal distention, and retention of feces, especially if narcotics or tranquilizers are being administered
- Possible urinary and rectal incontinence due to decreased sphincter control
- Diminished body movement

Slowing of the Circulation
- Diminished sensation
- Mottling and cyanosis of the extremities
- Cold skin, first in the feet and later in the hand, ears, and nose (the client, however, may feel warm if there is a fever)
- Slower and weaker pulse
- Decreased blood pressure

Changes in Respirations
- Rapid, shallow, irregular, or abnormally slow respirations
- Noisy breathing, referred to as the death rattle, due to collecting of mucus in the throat
- Mouth breathing, dry oral mucous membranes

Sensory Impairment

- Blurred vision
- Impaired senses of taste and smell

5.5.4 Nursing management of patients with End of Life

Assessment Nursing interventions are based on a thorough assessment of the client's holistic needs.

Diagnosis
One NANDA-approved nursing diagnosis that is applicable for many dying clients is *Powerlessness,* that is, "the perception that one's own actions will not significantly affect an outcome; a perceived lack of control over a current situation or immediate happening" (NANDA, 2001). Another response that is often experienced by the dying is described by the diagnosis *Helplessness*, "a subjective state in which an individual sees limited or no alternatives or personal choices available and is unable to mobilize energy on own behalf" (NANDA, 2001). See the accompanying Nursing Process Highlight for discussion of these two diagnoses.

Implementation
Proficient nursing care during the final stage of life requires a unique knowledge base and skills. The American Association of Colleges of Nursing (1999) has developed a list of competencies necessary to provide quality EOL care; see the accompanying display. The nurse's first priority is to communicate a caring attitude to the client. Establishment of rapport facilitates the client's verbalization of feelings. The nurse establishes a safe environment in which the client does not feel chided or chastised for experiencing those feelings.
Nonverbal communication can be used very effectively with dying individuals. "You just need to make space for patients to be themselves. You don't always have to have conversation or be doing something for them. Just be there and hold hands and listen" (Ward, 1999, p. 3).

Physiological Needs
According to Maslow's hierarchy of needs, physiological needs must be met before others because they are essential for existence. Areas that are often problematic for the terminally ill client are nutrition, respiration, elimination, comfort, and mobility.

Promoting Comfort
The primary activities directed at promoting physical comfort include pain relief, keeping the client clean and dry, and providing a safe, nonthreatening environment. The nurse who demonstrates a respectful,

caring attitude promotes the client's psychological comfort by establishing rapport.

Clients may experience many fears related to death. They may fear helplessness, dependence on others, loss of abilities, mutilation, or uncontrollable pain. The fear of a painful death is almost universal. Many, though not all dying clients experience pain. In its position statement on pain relief for the terminally ill, the ANA states that promotion of comfort is the major goal of nursing care (ANA, 1992). Comfort should be maximized by management of pain and other discomforting factors. The American Society of Pain Management Nurses (ASPMN) advocates "for a healthcare environment that fosters humane and dignified care. ASPMN promotes ethical and effective pain and symptom management as an integral part of palliative care" (ASPMN, 1999, p. 2).

Hospice Care

Hospice, a type of care for the terminally ill, is founded on the concept of allowing individuals to die with dignity and be surrounded by those who love them. Hospice care is one of the fastest growing segments of the health care industry. There are currently over 1,800 hospice programs in the United States (Roach & Nieto, 1997). Clients enter hospice care when aggressive medical treatment is no longer an option or when the client refuses further aggressive medical treatment. Hospice provides an environment that emphasizes caring instead of curing. The emphasis is on **palliative care** (control of the symptoms rather than cure).Managing the care of a dying person requires many skills. Because of the complexity of care required by the hospice client, an interdisciplinary team is essential for delivering quality, compassionate care. The interdisciplinary team consists of nurses, physicians, social workers, psychologists, clergy, ancillary personnel, and volunteers. The health care team members meet regularly to solve problems, make decisions, and assure that care is coordinated.

Home Care

A dying person is often not given the opportunity to be surrounded by family and friends. Approximately 75% of Americans die in either hospitals or nursing homes. Home care is an alternative for the dying client, if the family members are physically and emotionally able to provide care.

Hospices provide therapeutic interventions to bereaved family members. Ideally, health care providers should share the responsibility of home care of the dying with the family. This sharing could include respite time and frequent visits.

Psychosocial Needs

Death presents a threat not only to one's physical existence but also to psychological integrity. The nurse can meet the psychosocial needs of the dying patients through the following:

a. Spend as much time as possible with the dying client. Encourage verbalization with the patient and listen in nonjudgmental manner of feelings.
b. Encourage family and friends to spend time with client and involve client in developing plan of care.
c. Encourage continued interaction of client with family.
d. Assist the client to develop goals that are realistic within the limitations of the illness (realistic hope).
e. Avoid always emphasizing limitations.
f. Allow client and family to ventilate feelings about not being able to change the course of events.
g. Help the client to identify those things over which he does have power.
h. Encourage family to remain with the dying person and be available to discuss the client's situation.
i. Use touch to communicate caring and provide explanation of all procedures.
j. Stay with the dying person as much as possible.
k. Provide support through your presence and active listening.
l. Provide meaningful sensory stimuli.

Spiritual Needs

In times of crisis, such as death, spirituality may be a source of comfort and support for the client and family. Spiritual and religious beliefs often determine the appropriate course of action. Nurses respect clients' reliance on spiritual support by listening and contacting clergy/spiritual guides if requested.

Nurses play a major role in promoting the dying client's spiritual comfort. Dying is a personal and, frequently, lonely process. The nurse can serve as a sounding board for the client who expresses values and beliefs related to death. The following are therapeutic nursing interventions that address the spiritual needs of the dying:

- Communicating empathy
- Playing music
- Using touch
- Praying with the client
- Contacting the clergy if requested by the client
- Reading religious literature aloud at the client's request

Support for the Family

Family members need to be involved in the care of their dying loved one. Unrealistic guilt is increased by feelings of powerlessness, thus it is important to involve family members in the care giving. Families facing the impending death of a loved one require much support from nurses and other caregivers. The nurse's presence, just being there with the family, is extremely important.

Learning Needs of Client and Family

Bereaved families need much support and information. The nurse's role is to teach family members what they need to know. For instance, families must be assisted with acquiring the tools that will help them help their loved one. An example might be the need for the family to understand that the dying person needs to conserve energy. Some simple actions on the part of the family could be to schedule activities after a rest period or early in the morning when the client is strongest. This is not an earth-shattering revelation, but simple interventions can be overlooked during this highly charged emotional time.

3.5.5 Care of the Body

The body of the deceased should be treated in a way that respects the sanctity of the human body. Nursing care includes maintaining privacy and preventing damage to the body.

Physiological Changes

Several physiological changes occur after death. The body temperature decreases with a resultant lack of skin elasticity **(algor mortis)**. Therefore, the nurse must use caution when removing tape from the body to avoid skin breakdown. Another physiological change, **liver mortis**, is the bluish purple discoloration that is a byproduct of red blood cell destruction. This discoloration occurs in dependent areas of the body; therefore, the nurse should elevate the head to prevent discoloration from the pooling of blood.

Approximately 2 to 4 hours after death, **rigor mortis** occurs; this is stiffening of the body caused by contraction of skeletal and smooth muscles. To prevent disfiguring effects of rigor mortis, as soon as possible after death the nurse should close the eyelids, insert dentures (if applicable), close the mouth, and position the body in a natural position. In preparing the body for family viewing, the nurse seeks to make the body look comfortable and natural. This means removing all tubes and positioning the body as described. After the family has viewed the body, the nurse places identification tags on the body's toe and wrist. The body is then placed in a plastic or fabric shroud and the shroud is tagged. Then the body is transported to the morgue according to the agency's policy. The nurse is also responsible for returning the deceased's possessions to the family. Jewelry, eyeglasses, clothing, and all other personal items are returned to the family.

5.6 Legal Aspects

In most cases, the physician is legally responsible for determining the cause of death and signing the death certificate. The nurse may, in certain situations, be the person responsible for certifying the death.
It is important for nurses to know their legal responsibilities, which are defined by their state or provincial board of nursing.

Autopsy
An **autopsy** (postmortem examination to determine the cause of death) is mandated in situations in which an unusual death has occurred. For example, an unexpected death and a violent death are circumstances that would necessitate an autopsy. Families must give consent for an autopsy to be performed.

Organ Donation
The donation of organs for transplantation is a matter that requires compassion and sensitivity from the caregivers.

Health care institutions are required to have policies related to the referral of potential donors to organ procurement agencies. It is important that families of the deceased know the importance of and process for organ donation. There is an inadequate supply of organs and tissues to meet the demand for transplants. The following organs and tissues are used for transplantation:

- Kidneys
- Heart
- Lungs
- Liver
- Pancreas
- Skin
- Corneas
- Bones (long bones and middle ear bones)

At the time the family gives consent for donation, the nurse notifies the donor team that an organ is available for transplant. Time is of the essence because the organ or tissue must be harvested and transplanted quickly to maintain viability.

5.7 Care of the Family

At the time of death, the nurse provides invaluable support to the family of the deceased. When an individual dies, family members' anxiety is increased due to their uncertainties about what to do .Informing the family of the type and circumstances surrounding the death are extremely important. The nurse provides information about viewing the body, asks the family about donating organs, and offers to contact support people (e.g., other relatives, clergy). Sometimes, the nurse needs to help the family with decision making regarding a funeral home, transportation, and removal of the deceased's belongings. Using sensitive and compassionate interpersonal skills is essential in providing information and support to families.

5.8 Nurse's Self-Care

Working with dying clients can evoke both a personal and a professional threat in the nurse. "Death, and the process of dying, represent a personal crisis not only for the dying person but for the caregivers who share life's most profound moment". Because many nurses are confronted with death and loss daily, grief is a common experience for nurses. Frequent exposure to death can interfere in the nurse's effectiveness because of subsequent anxiety and denial. Whether working in a hospice, hospital, long-term care facility, or the home, nurses are at particular risk for experiencing negative effects from caring for the dying. Often nurses do not want to confront their grief and will use some of the common defenses against grieving: keeping busy, taking care of others, being strong, and suffering in silence. Nurses need to stop pretending that they do not experience grief and subsequent suffering and to talk about the intense emotions associated with care giving. To cope with their own grief, nurses need support, education, and assistance in coping with the death of clients. Staff education should focus on decreasing staff anxiety about working with grieving clients and families, how to seek support, and how to provide support to coworkers. Often, the nurse's fears and doubts about death and its meaning surface, causing anxiety related to feelings about mortality. Even though such feelings are normal, caring for the dying client and the family can be emotionally draining. Therefore, nurses must remember to care for themselves.

4.0 SUMMARY

Loss, Grief and end of life are three related concept that nurses must have adequate knowledge about in other to be able to help clients and family members that may be experiencing any of these. This unit has

extensively discussed different types of loss, theories, stages and factors related to grief, the roles expected from you and nursing managements that can be given to dying or dead patients and their families were also discussed. The legal aspects of the care were not left out in this unit.

5.0 TUTOR-MARKED ASSIGNMENT

Interact with the family of a dying or dead patient in a hospital nearest to you, identify the type of loss and the type of grief response they are exhibiting. Provide nursing care for them.

SELF-ASSESSMENT EXERCISE

i. What are the types and categories of Loss?
ii. Discuss various theories of Grief?
iii. Explain the stages of Grieving by Kubler-Ross
iv. What are the factors that can affect Grief?
v. List and explain the stages of dying and death?
vi. List the manifestations of impending clinical death?
vii. Describe the nursing management of patients with end of life?
viii. Discuss how you will care for the human body after death?
ix. What are the legal issues in end of life care?
x. Explain the care you will give to family of a deceased person?

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influence your body's health for better or worse. Each day's choices may benefit or harm your health only a little, but when these choices are repeated over years and decades, the rewards or consequences become major. That being the case, paying close attention to good eating habits now can bring you health benefits later. Conversely, carelessness about food choices can contribute too many chronic diseases.

www.virginiawomenscenter.com

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- Apply new knowledge in providing care for patients with alteration in nutrition, fluid and electrolyte balance, shock, stress, temperature control, pain sleep and skin care and wound management.
- discuss the nutrients that foods deliver and show how they participate in dynamic process
- discuss energy yielding nutrients.
- assess patients nutritional status

3.0 MAIN CONTENT

3.1 Nutrients in Foods and in the Body

Amazingly, our bodies can derive all the energy, structural materials, and regulating agents we need from the foods we eat. This section introduces the nutrients that foods deliver and shows how they participate in the dynamic processes that keep people alive and well.

Composition of Foods
Chemical analysis of a food such as a tomato shows that it is composed primarily of water (95 percent). Most of the solid materials are carbohydrates, lipidsand proteins.Water, carbohydrates, lipids, proteins, vitamins, and some of the minerals found in foods are nutrient substances the body uses for the growth, maintenance, and repair of its tissues. Carbohydrates are to be found in sugar ,jam , cereals , bread , biscuits' ,potatoes ,fruit and vegetables. They consist of carbon , hydrogen and oxygen , the hydrogen and oxygen being in the same proportion as in water. Carbohydrates are classified according to the complexity of the chemical substances of which they are formed.

Monosaccharide: Theses are chemically, the simplest form in which a carbohydrate can exist. They are made up of single units or molecules which, if they were broken down further, would cease to be monosaccharides. Carbohydrates are absorbed from the alimentary canal as monosaccharides and more complex carbohydrates are broken down to this form by digestion

3.2 Chemical Composition of Nutrients

The simplest of the nutrients are the minerals. Each mineral is a chemical element; its atoms are all alike. As a result, its identity never changes. For example, iron may have different electrical charges, but the individual iron atoms remain the same when they are in a food, when a person eats the food, when the iron becomes part of a red blood cell, when the cell is broken down, and when the iron is lost from the body by excretion. The next simplest nutrient is water, a compound made of two elements—hydrogen and oxygen. Minerals and water are inorganic nutrient— which means they do not contain carbon. The other four classes of nutrients (carbohydrates, lipids, proteins, and vitamins) are more complex. In addition to hydrogen and oxygen, they all contain carbon, an element found in all living things. They are therefore called organic compounds (meaning, literally, "alive"). Protein and some vitamins also contain nitrogen and may contain other elements as well.

Essential Nutrients: The body can make some nutrients, but it cannot make all of them. Also, it makes some in insufficient quantities to meet its needs and, therefore, must obtain these nutrients from foods. The nutrients that foods must supply are essentialnutrients**.** When used to refer to nutrients, the word *essential* means more than just “necessary”; it means “needed from outside the body”—normally, from foods.

3.3 The Energy-Yielding Nutrients

Carbohydrate, Fat, and Protein

In the body, three organic nutrients can be used to provide energy: carbohydrate, fat, and protein. In contrast to these energy-yielding nutrients, vitamins, minerals, and water do not yield energy in the human body. The energy released from carbohydrates, fats, and proteins can be measured in calories—tiny units of energy so small that a single apple provides tens of thousands of them. To ease calculations, energy is expressed in 1000-calorie metric units known as kilocalories (shortened to kcalories, but commonly called “calories”).

3.4 Energy from Foods

The amount of energy a food provides depends on how much carbohydrate, fat, and protein it contains. When completely broken down in the body, a gram of carbohydrate yields about 4 kcalories of energy; a gram of protein also yields 4 kcalories; and a gram of fat yields 9 kcalories. Fat, therefore, has a greater energy density than either carbohydrate or protein. One other substance contributes energy—alcohol. Alcohol is not considered a nutrient because it interferes with the growth, maintenance, and repair of the body, but it does yield energy (7 kcalories per gram) when metabolized in the body.

Most foods contain all three energy-yielding nutrients, as well as water, vitamins, minerals, and other substances. For example, meat contains water, fat, vitamins, and minerals as well as protein. Bread contains water, a trace of fat, a little protein, and some vitamins and minerals in addition to its carbohydrate. Only a few foods are exceptions to this rule, the common ones being sugar (pure carbohydrate) and oil (essentially pure fat).

3.5 Energy in the Body

The body uses the energy-yielding nutrients to fuel all its activities. When the body uses carbohydrate, fat, or protein for energy, the bonds between the nutrient’s atoms break. As the bonds break, they release energy. Some of this energy is released as heat, but some is used to send electrical impulses through the brain and nerves, to synthesize body compounds, and to move muscles. Thus the energy from food supports every activity from quiet thought to vigorous sports. If the body does not use these nutrients to fuel its current activities, it rearranges them into storage compounds (such as body fat), to be used between meals and overnight when fresh energy supplies run low. If more energy is consumed than expended, the result is an increase in energy stores and weight gain. Similarly, if less energy is consumed than expended, the result is a decrease in energy stores and weight los

In addition to providing energy, carbohydrates, fats, and proteins provide the raw materials for building the body's tissues and regulating its many activities. In fact, protein's role as a fuel source is relatively minor compared with both the other two nutrients and its other roles. Proteinsare found in structures such as the muscles and skin and help to regulate activities such as digestion and energy metabolism.

i. **The Vitamins**

The vitamins are also organic, but they do not provide energy. Instead, they facilitate the release of energy from carbohydrate, fat, and protein and participate in numerous other activities throughout the body. Vitamins are chemical compounds which are essential for health. They are found widely distributed in food. They are divided in to two main groups: Fat soluble vitamins which are A,D,E, and K and water soluble , which are b complex ,c and p.

Fat soluble vitamins

a) Vitamin A

The vitamin is found in such foods as cream. egg yolk , fish oil, milk, cheese and butter .It can be formed in the body from certain carotenes of which the main dietary sources are green vegetables and carrots.

Functions

1. it influences the nutrition of epithelial cells , thus tending to reduce the incidence and severity of micro-organism infection.
2. It is necessary for the regeneration of the visual purple in the retina of the eye which encourages rapid sight adaptation in the dark
3. It is necessary to maintain the cornea of the eye in a healthy state

b. Vitamin D3

It is sometimes called antirachitic vitamin. It is found mainly in animal fats such as eggs ,butter, cheese. it regulates calcium and phosphorous metabolism.

c. Vitamin E or tocopherol

This source of vitamin includes milk, butter , egg yolk etc. Lack of the vitamin in animal causes muscle wasting and infertility.

d. Vitamin K

The sources of vitamin K are fish, liver, leafy green vegetables. It is necessary for the formation of prothrombin by the liver.

ii. The Minerals

In the body, some mineralsare put together in orderly arrays in such structures as bones and teeth. Minerals are also found in the fluids of the body, which influences fluid properties. Whatever their roles, minerals do not yield energy. Only 16 minerals are known to be essential in human nutrition. Others are being studied to determine whether they play significant roles in the human body. Still other minerals are environmental contaminants that displace the nutrientminerals from their workplaces in the body, disrupting body functions.

Because minerals are inorganic, they are indestructible and need not be handled with the special care that vitamins require. Minerals can, however, be bound by substances that interfere with the body's ability to absorb them. They can also be lost during food-refining processes or during cooking when they leach into water that is discarded. Some minerals are essential nutrients required in small amounts by the body for health. The major minerals are calcium, phosphorus, potassium, sodium, chloride, magnesium, and sulfate. The trace minerals are iron, iodine, zinc, chromium, selenium, fluoride, molybdenum, copper, and manganese.

iii. Water

Water, indispensable and abundant, provides the environment in which nearly all the body's activities are conducted. It participates in many metabolic reactions and supplies the medium for transporting vital materials to cells and carrying waste products away from them.

3.6 Nutrition Assessment

What happens when a person doesn't get enough or gets too much of a nutrient or energy? If the deficiency or excess is significant over time, the person exhibits signs of malnutrition. With a deficiency of energy, the person may display the symptoms of under nutritionby becoming extremely thin, losing muscle tissue, and becoming prone to infection and disease. With a deficiency of a nutrient, the person may experience skin rashes, depression, hair loss, bleeding gums, muscle spasms, night blindness, or other symptoms. With an excess of energy, the person may become obese and vulnerable to diseases associated with over nutritionsuch as heart disease and diabetes.

With a sudden nutrient overdose, the person may experience hot flashes, yellowing skin, a rapid heart rate, low blood pressure, or other symptoms. Similarly, over time, regular intakes in excess of needs may also have adverse effects. Malnutrition symptoms—such as diarrhea, skin rashes, and fatigue— are easy to miss because they resemble the symptoms of other diseases. But a person who has learned how to use assessment techniques to detect malnutrition can identify when these conditions are caused by poor nutrition and can recommend steps to correct it.

3.7 Nutrition Assessment of Individuals

To prepare a nutrition assessment, a registered dietitian or other trained health care professional uses:

i. Historical Information

One step in evaluating nutrition status is to obtain information about a person's history with respect to health status, socioeconomic status, drug use, and diet. The health history reflects a person's medical record and may reveal a disease that interferes with the person's ability to eat or the body's use of nutrients. The person's family history of major diseases is also noteworthy, especially for conditions such as heart disease that have a genetic tendency to run in families. Economic circumstances may show a financial inability to buy foods or inadequate kitchen facilities in which to prepare them. Social factors such as marital status, ethnic background, and educational level also influence food choices and nutrition status.

A drug history, including all prescribed and over-the-counter medications as well as illegal substances, may highlight possible interactions that lead to nutrient deficiencies. A diet history that examines a person's intake of foods, beverages, and supplementsmay reveal either a surplusor inadequacy of nutrients or energy.

To take a diet history, the assessor collects data about the foods a person eats. The data may be collected by recording the foods the person has eaten over a period of 24 hours, three days, or a week or more or by asking what foods the person typically eats and how much of each. The days in the record must be fairly typical of the person's diet, and portion sizes must be recorded accurately. To determine the amounts of nutrients consumed, the assessor usually enters the foods and their portion sizes into a computer using a diet analysis program.

An estimate of energy and nutrient intakes from a diet history, when combined with other sources of information, can help confirm or rule out the *possibility* of suspected nutrition problems. A sufficient intake of a nutrient does not guarantee adequacy,and an insufficient intake does not always indicate a deficiency. Such findings, however, warn of possible problems.

ii. Anthropometric Data

A second technique that may help to reveal nutrition problems is taking **anthropometric** measures such as height and weight. The assessor compares a person's measurements with standards specific for gender and age or with previous measures on the same individual.

Measurements taken periodically and compared withprevious measurementsreveal patterns and indicate trends in a person's overall nutrition status, but theyprovide little information about specific nutrients. Instead, measurements out ofline with expectations may reveal such problems as growth failure in children,wasting or swelling of body tissues in adults, and obesity conditions that may reflectenergy or nutrient deficiencies or excesses.

iii. Physical Examinations

A third nutrition assessment technique is a physical examination looking for clues to poor nutrition status. Every part of the body that can be inspected may offer such clues: the hair, eyes, skin, posture, tongue, fingernails, and others. The examination requires skill because many physical signs reflect more than one nutrient deficiency or toxicity—or even non nutrition conditions. Like the other assessment techniques, a physical examination alone does not yield firm conclusions. Instead, physical examinations reveal possible imbalances that must be confirmed by other assessment techniques, or they confirm results from other assessment measures.

iv. Laboratory Tests

A fourth way to detect a developing deficiency, imbalance, or toxicity is to take samples of blood or urine, analyze them in the laboratory, and compare the results with normal values for a similar population.

4.0 SUMMARY

In this unit, you have learnt that;

- Essentials of diet such as carbohydrates , proteins , fat , vitamins , mineral salts and water and its function
- Nutrition assessment of a patient

5.0 TUTOR-MARKED ASSIGNMENT

Conductnutrition assessment for2 patients whereyou work and report your findings.

SELF-ASSESSMENT EXERCISE

i. discuss the nutrients that foods deliver and show how they participate in dynamic process
ii. discuss energy yielding nutrients.
iii. assess patients nutritional status

6.0 REFERENCES/FURTHER READING

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UNIT 2 FLUID AND ELECTROLYTE BALANCE

CONTENTS

1.0 INTRODUCTION

You must have learnt in physiology and biochemistry that, fluid; electrolyte and acid-base balance is maintained by the body's homeostatic mechanism. This unit enables you to comprehend the bases of fluid and electrolyte balance in order to identify patients who are at risk for the development of fluid and electrolyte imbalance and to institute nursing measures to prevent or promote resolution of the fluid, electrolyte or acid-base balance.

2.0 OBJECTIVES

At end of this unit, you should be able to:

- discuss distribution of body water, solutes in body water and electrolyte composition of the fluids
- discuss relevant application of osmosis, diffusion, filtration, and active transport mechanisms in the body.
- describe the mechanisms of fluid volume regulation.
- plan effective care of patients with fluid and electrolyte imbalances.
- relate the etiology, clinical manifestations, to nursing interventions in patients with fluid and electrolyte imbalances
- describe the mechanisms for maintaining electrolyte and acid-base balance.

- compare metabolic acidosis and alkalosis .viii. compare respiratory acidosis and alkalosis .

3.0 MAIN CONTENT

3.1 Fluid and Electrolyte Balance

Fluid and electrolyte balance is a dynamic process that is crucial for life. Potential and actual disorders of fluid and electrolyte balance occur in every setting, with every disorder, and with a variety of changes that affect well people (e .g, increased fluid and sodium loss with strenuous exercise and high environmental temperature; inadequate intake of fluid and electrolytes) as well as those who are ill. The term body fluid refers to the water found in the body and the dissolved substances present in it (water). About 60% of a typical adult's weight consists of fluid (water and electrolytes). Factors that influence the amount of body fluid are age, gender, and body fat. In general, younger people have a higher percentage of body fluid than older people, and men have proportionately more body fluid than women. Obese people have less fluid than thin people because fat cells contain little water.

3.2 Distribution of Body Water

Body fluid is located in two fluid compartments: the intracellular space (fluid in the cells) and the extracellular space (fluid outside the cells). Intracellular fluid comprises about 40% o of the body weight and is located primarily in the skeletal muscle mass. The extracellular fluid (ECF) compartment is further divided into the intravascular, interstitial, and transcellular fluid spaces.

The intravascular fluid is that contained within the blood vessel and refers to plasma component of the blood. Approximately 3 L of the average 6 L of blood volume is made up of plasma.

The remaining 3 L is made up of erythrocytes, leukocytes, and thrombocytes. The interstitial fluid is that contained in tissue spaces between blood vessels and the cell and includes that found within the lymph vessels. The interstitial fluid provides an internal environment for all cells as well as an exchange medium between the blood and the cells. It is about 11 to 12 L in an adult.

Lymph is an example of interstitial fluid. The transcellular space is the smallest division of the ECF compartment and contains approximately 1 L of fluid at any given time. Examples of transcellular fluid are cerebrospinal, pericardial, synovial, intraocular, and pleural fluids;

sweat; and digestive secretions. This is less significance in assessing the patients' hydration status and maintaining normal fluid balance.

The major fluid compartments are separated by semi permeable membranes. Normally, body water is in a dynamic state, there is constant loss and replacement and changes in location and volume. Water enters the body through the intestinal tract via mouth and leaves the body through the various organ of the body such as

a. Kidneys

The usual daily urine volume in the adult is 1 to 2 L. A general rule is that the output is approximately 1mL of urine per kilogram of body weight per hour (1 mL/kg/h) in all age groups.

b. **Skin**

Sensible perspiration refers to visible water and electrolyte loss through the skin (sweating). The chief solutes in sweat are sodium, chloride, and potassium. Actual sweat losses can vary from 0 to 1,000 mL or more every hour, depending on the environmental temperature. Continuous water loss by evaporation (approximately 600mL/day) occurs through the skin as insensible perspiration, a nonvisible form of water loss. Fever and burns greatly increases insensible water loss through the lungs and the skin.

c. Lungs

The lungs normally eliminate water vapor (insensible loss) at a rate of approximately 400 mL every day. The loss is much greater with increased respiratory rate or depth, or in a dry climate.

d. GI Tract

The usual loss through the GI tract is only 100 to 200 mL daily, even though approximately 8 L of fluid circulates through the GI system every 24 hours (called the GI circulation). Because the bulk of fluid is reabsorbed in the small intestine, diarrhea and fistulas cause large losses. In healthy people, the daily average intake and output of water are approximately equal.

3.3 Solutes in Body Water

Solutes are minute particles dissolved in the body fluid and may be molecules or fragments of molecules. They include inorganic and organic substances which are important for their impact on the electrochemical and osmotic activity within each fluid compartment.

When the inorganic Solutes dissolve in water they dissociate into separate electrically charged atoms or radicals called ions. These charged particles are called electrolytes and act as conductors of electrical current in the solution. For example: sodium chloride (Nacl) in solution forms sodium ions (Na^+) and chloride ions (Cl^-).The organic solutes are both large and small molecular size. The smaller organic solutes (e.g. amino acids ,urea) diffuse across semi permeable membranes and are less important in the distribution of water, but if present in excessive amounts they may promote the retention of water. The large molecular organic substances are the blood proteins (albumin, globulin, fibrinogen), which have a major influence on the movement of fluid between the intravascular and interstitial compartments. The size of the molecules inhibits free diffusion of the blood proteins across the capillary membrane.

3.4 Electrolytes

Electrolytes in body fluids are active chemicals (cations, which carry positive charges, and anions, which carry negative charges). The major cations in body fluid are sodium, potassium, calcium, magnesium, and hydrogen ions. The major anions are chloride, bicarbonate, phosphate, sulfate, and proteinate ions. These chemicals unite in varying combinations. Therefore, electrolyte concentration in the body is expressed in terms of milliequivalents (mEq) per liter, a measure of chemical activity, rather than in terms of milligrams (mg), a unit of weight. More specifically, a mill equivalent is defined as being equivalent to the electrochemical activity of 1 mg of hydrogen. In a solution, cations and anions are equal in mEq/L. The positive ions called cations while the negative ions are called the anions. Acids, bases and salts are electrolytes. Cations are bases and anions are acids or hydrogen acceptors.

Electrolyte concentrations in the ICF differ from those in the ECF. The major cations of the extracellular fluid are sodium, calcium, potassium and magnesium. The anions are chloride, bicarbonate, phosphate, sulfate and protein. Sodium, chloride and bicarbonate are dominant electrolytes in extracellular fluid. Intracellular fluid contains electrolytes similar to those found in ECF. However, potassium and phosphate are dominant intracellular electrolytes.

3.5 Regulation of Body Fluid Compartments

There is constant exchange of fluid between the fluid compartments in the body so that a balance is maintained. This is achieved through various means. The processes include:

- Osmosis
- Diffusion
- Filtration
- Sodium-Potassium pump.

Osmosis and Osmolality

When two different solutions are separated by a membrane that is impermeable to the dissolved substances, fluid shifts through the membrane from the region of low solute concentration to the region of high solute concentration until the solutions are of equal concentration; this diffusion of water caused by a fluid concentration gradient is known as osmosis.The direction and degree of osmotic activity is proportional to the number of solute particles and is not influenced by the molecular weight of the particles. As the concentrations of solute in the two solutions approach equalization, pressure develops which decreases the flow of solvent across the membrane. The pressure is referred to as osmotic pressure. Osmolality is the osmole concentration per unit of solvent. While osmole (osmol) is the unit of measurement of osmotic pressure .One milliosmole (mosmol) is one thousandth of an osmole. Tonicity refers to the effective osmolality of a solution.

Diffusion

Thisis the natural tendency of a substance to move from an area of higher concentration to one of lower concentration. It occurs through the random movement of ions and molecules. Examples of diffusion are the exchange of oxygen and carbon dioxide between the pulmonary capillaries and alveoli and the tendency of sodium to move from the ECF compartment, where the sodium concentration is high, to the ICF, where its concentration is low.

Filtration

The process involves the forcing of water and small molecular solutes through the semi permeable membranes. The force is created by a difference in hydrostatic pressure on the two sides of a membrane .Hydrostatic pressure in the capillaries tends to filter fluid out of the vascular compartment into the interstitial fluid. Movement of water and solutes occurs from an area of high hydrostatic pressure to an area of low hydrostatic pressure. Filtration allows the kidneys to filter 180 L of plasma per day. Another example of filtration is the passage of water and electrolytes from the arterial capillary bed to the interstitial fluid; in this instance, the hydrostatic pressure is furnished by the pumping action of the heart.

Sodium-potassium pump
As stated earlier, the sodium concentration is greater in the ECF than in the ICF, and because of this, sodium tends to enter the cell by diffusion. This tendency is offset by the sodium–potassiumPump, which is located in the cell membrane and actively, moves sodium from the cell into the ECF. Conversely, the high intracellular potassium concentration is maintained by pumping potassium into the cell. By definit**ion, active transport** implies that energy must be expended for the movement to occur against a concentration gradient.

3.6 Homeostatic Mechanisms

The body is equipped with remarkable homeostatic mechanisms to keep the composition and volume of body fluid within narrow limits of normal. Organs involved in homeostasis include the kidneys, lungs, heart, adrenal glands, parathyroid glands, and pituitary gland.

The kidneys
The kidneys perform the most important role in regulating the volume and chemical composition of body fluids. Certain factors from outside the kidneys influence them in the amount of fluid and electrolytes they should absorb or eliminate in the urine to preserve homeostasis. The kidney filters 170litres of plasma everyday in the adult and excretes 1.5litre of urine. Per minute, the volume of glomerular filtrate is 120ml.119ml of water is reabsorbed, leaving only1ml per minute to pass to the bladder. About 80% of the filtrate is quickly reabsorbed in the proximal portion of the renal tubules. Absorption of water and salts in the distal portion of the tubules is adjusted to the amount necessary to maintain normal volume and osmotic pressure of the body fluid. The amount of water reabsorbed by the tubules is governed by antiduiretic hormone (ADH).This hormone is secreted by the hypothalamus and is delivered to the posterior lobe of the pituitary gland ,where it is stored and released as required.

An increase in the osmolality of extracellular fluid results in impulses being delivered to the posterior pituitary lobe, which bring about the release of ADH. The osmotic pressure may due to water deficit, an increased intake of sodium chloride or an excessive amount of glucose. The hormone stimulates the wall of collecting ducts of the renal tubules, making them permeable to water. Water is thus removed from the collecting ducts causing an increase in volume and a decrease in the osmolality of the extracellular fluid, this result in a decrease in the volume and an increase in the concentration of urine. Conversely, a fluid intake lowers the osmotic pressure results in ADH being withheld and the kidneys then allow a greater loss of water.

A second hormone that indirectly influences water balance is aldosterone, which is secreted by the adrenal cortex. It stimulates the renal cortical collecting ducts and distal tubules to reabsorb sodium and excrete potassium and hydrogen. Sodium is chiefly responsible for the osmotic pressure of the extracellular fluid: an increased absorption brings about the release of ADH and a resulting decrease in the water loss. Aldosterone is the primary regulator of sodium reabsorption in the renal distal tubules

Heart and blood vessel functions

The pumping action of the heart circulates blood through the kidneys under sufficient pressure to allow for urine formation. Failure of this pumping action interferes with renal perfusion and thus with water and electrolyte regulation.

Lung Functions

The lungs are also vital in maintaining homeostasis. Through exhalation, the lungs remove approximately 300 mL of water daily in the normal adult. Abnormal conditions, such as hyperpnea (abnormally deep respiration) or continuous coughing, increase this loss; mechanical ventilation with excessive moisture decreases it. The lungs also have a major role in maintaining acid–base balance. Changes from normal aging result in decreased respiratory function, causing increased difficulty in pH regulation in older adults with major illness or trauma.

OTHER MECHANISMS

Renin–angiotensin–aldosterone system

Renin is an enzyme that converts angiotensinogen, an inactive substance formed by the liver, into angiotensin I. Renin is released by the juxtaglomerular cells of the kidneys in response to decreased renal perfusion. Angiotensin-converting enzyme (ACE) converts angiotensin I to angiotensin II. Angiotensin II, with its vasoconstrictor properties, increases arterial perfusion pressure and stimulates thirst. As the sympathetic nervous system is stimulated, aldosterone is released in response to an increased release of renin. Aldosterone is a volume regulator and is also released as serum potassium increases, serum sodium decreases, or adrenocorticotropic
Hormone increases.

ADH and Thirst

ADH and the thirst mechanism have important roles in maintaining sodium concentration and oral intake of fluids. Oral intake is controlled by the thirst center located in the hypothalamus. As
serum concentration or osmolality increases or blood volume decreases, neurons in the hypothalamus are stimulated by intracellular

dehydration; thirst then occurs, and the person increases oral intake of fluids. Water excretion is controlled by ADH, aldosterone, and baroreceptors, as mentioned previously. The presence or absence of ADH is the most significant factor in determining whether the urine that is excreted is concentrated or dilute.

Baroreceptors

The baroreceptors are small nerve receptors that detect changes in pressure within blood vessels and transmit this information to the central nervous system. They are responsible for monitoring the circulating volume, and they regulate sympathetic and parasympathetic neural activity as well as endocrine activities. They are categorized as low-pressure and high-pressure baroreceptorsystems. Low-pressure baroreceptors are located in the cardiac atria, particularly the left atrium. The high-pressure baroreceptors are nerve endings in the aortic arch and in the cardiac sinus.

Another high-pressure baroreceptor is located in the afferent arteriole of the juxtaglomerular apparatus of the nephron. As arterial pressure decreases, baroreceptors transmit fewer impulsesfrom the carotid sinuses and the aortic arch to the vasomotor center. A decrease in impulses stimulates the sympathetic nervous system and inhibits the parasympathetic nervous system. The outcome is an increase in cardiac rate, conduction, and contractility and in circulating blood volume. Sympathetic stimulation constricts renal arterioles; this increases the release of aldosterone, decreases glomerular filtration, and increases sodium and water reabsorption.

Osmoreceptors

Located on the surface of the hypothalamus, osmoreceptors sense changes in sodium concentration. As osmotic pressure increases, the neurons become dehydrated and quickly release impulses to the posterior pituitary, which increases the release of ADH. ADH travels in the blood to the kidneys, where it alters permeability to water, causing increased reabsorption of water and decreased urine output. The retained water dilutes the ECF and returns its concentration to normal. Restoration of normal osmotic pressure provides feedback to the osmoreceptors to inhibit further ADH release.

3.7 Fluid Volume Disturbances

FLUID VOLUME DEFICIT (HYPOVOLEMIA)

Fluid volume deficit (FVD) occurs when loss of extracellular fluid volume exceeds the intake of fluid. It occurs when water and electrolytes are lost in the same proportion as they exist in normal body fluids, so that the ratio of serum electrolytes to water remains the same. Fluid volume deficit (hypovolemia) should not be confused with the term dehydration, which refers to loss of water alone with increased serum sodium levels. FVD may occur alone or in combination with other imbalances. Unless other imbalances are present concurrently, serum electrolyte concentrations remain essentially unchanged.

Pathophysiology

FVD results from loss of body fluids and occurs more rapidly when coupled with decreased fluid intake. FVD can develop from inadequate intake alone if the decreased intake is prolonged. Causes of FVD include abnormal fluid losses, such as those resulting from vomiting, diarrhea, GI suctioning, and sweating, and decreased intake, as in nausea or inability to gain access to fluids Additional risk factors include diabetes insipidus, adrenal insufficiency, osmotic diuresis, hemorrhage, and coma. Third-space fluid shifts, or the movement of fluid from the vascular system to other body spaces (e.g., with edema formation in burns or ascites with liver dysfunction), also produce FVD.

Clinical Manifestations

FVD can develop rapidly and can be mild, moderate, or severe, depending on the degree of fluid loss. Important characteristics of FVD include acute weight loss; decreased skin turgor; oliguria; concentrated urine; postural hypotension; a weak, rapid heart rate; flattened neck veins; increased temperature; decreased central venous pressure; cool, clammy skin related to peripheral vasoconstriction; thirst; anorexia; nausea; lassitude; muscle weakness; and cramps.

Assessment and Diagnostic Findings

Laboratory data useful in evaluating fluid volume status include

- BUN and its relation to the serum creatinine concentration: The BUN can be elevated due to dehydration or decreased renal perfusion and function.
- Check for Serum electrolyte:. Potassium and sodium levels can be reduced (hypokalemia, hyponatremia) or elevated (hyperkalemia, hypernatremia).
- Urine specific gravity (1.016–1.022 is increased in relation to the kidneys’ attempt to conserve water and decreased with diabetes insipidus. Urine osmolality is greater than 450 mOsm/Kg, since the kidneys try to compensate by conserving water.
- Haematocrit level : the value Males: 42–52% Females: 35–47%

Medical Management

When planning the correction of fluid loss for the patient with FVD, the health care provider considers the usual maintenance requirements of the patient and other factors (such as fever) thatcan influence fluid needs. When the deficit is not severe, the oral route is preferred, provided the patient can drink. When fluid losses are acute or severe, however, the IV route is required. Isotonic electrolyte solutions (eg, lactated Ringer's or 0.9% sodium chloride) are frequently used to treat the hypotensive patient with FVD because they expand plasma volume. As soon as the patient becomes normotensive, a hypotonic electrolyte solution (e.g., 0.45% sodium chloride) is often used to provide both electrolytes and water for renal excretion of metabolic wastes.

Accurate and frequent assessments of intake and output, weight, vital signs, central venous pressure, level of consciousness, breath sounds, and skin color should be performed to determine when therapy should be slowed to avoid volume overload. The rate of fluid administration is based on the severity of loss and the patient's hemodynamic response to volume replacement.

If the patient with severe FVD is not excreting enough urine and is therefore oliguric, the health care provider needs to determine whether the depressed renal function is the result of reduced renal blood flow secondary to FVD (prerenal azotemia) or, more seriously, to acute tubular necrosis from prolonged FVD

Preventing fluid volume deficit

To prevent FVD, the nurse identifies patients at risk and takes measures to minimize fluid losses. For example, if the patient has diarrhea, diarrhea control measures should be implemented and replacement fluids administered. These measures may include administering antidiarrheal medications and small volumes of oral fluids at frequent intervals.

Nursing Management

- The nurse is responsible for maintaining the desired rate of flow, detecting any difficulties and noting the patient's reactions.
- The site of infusion and vein pathway are examined for possible interstitial infusion and irritation of the vein by the solution
- To assess for FVD, the nurse monitors and measures fluid intake and output at least every 8 hours and sometimes hourly.
- The volume, type and method of administration of fluid intake should be noted and documented.
- The nurse should also monitor the Vital signs closely. The nurse observes for weak, rapid pulse and postural hypotension (ie, a

drop in systolic pressure exceeding 15 mm Hg when the patient moves from a lying to a sitting position). A decrease in body temperature often accompanies FVD, unless there is a concurrent infection. Skin and tongue turgor is monitored on a regular basis. In a healthy person, pinched skin immediately returns to its normal position when released. This elastic property, referred to as turgor, is partially dependent on interstitial fluid volume. In a person with FVD, the skin flattens more slowly after the pinch is released. When FVD is severe, the skin may remain elevated for many seconds. Tissue turgor is best measured by pinching the skin over the sternum, inner aspects of the thighs, or forehead.

Fluid Volume Excess (Hypervolemia)

Fluid volume excess (FVE) refers to an isotonic expansion of the ECF caused by the abnormal retention of water and sodium in approximately the same proportions in which they normally exist in the ECF. It is always secondary to an increase in the total body sodium content, which, in turn, leads to an increase in total body water. Because there is isotonic retention of body substances, the serum sodium concentration remains essentially normal.

Pathophysiology

FVE may be related to simple fluid overload or diminished function of the homeostatic mechanisms responsible for regulating fluid balance. Contributing factors can include heart failure, renal failure, and cirrhosis of the liver. Another contributing factor is consumption of excessive amounts of table or other sodium salts. Excessive administration of sodium-containing fluids in a patient with impaired regulatory mechanisms may predispose him or her to a serious FVE as well.

Clinical manifestations

Clinical manifestations of FVE include edema, distended neck veins, and crackles (abnormallung sounds) , tachycardia; increased blood pressure, pulse pressure, and central venous pressure;increased weight; increased urine output; and shortness of breath and wheezing , anorexia, confusion, fatigue ,restlessness and anxiety.

Assessment and diagnostic findings

- BUN and hematocrit levels: both of these values may be decreased because of plasma dilution.
- Chest x-rays may reveal pulmonary congestion.
- Serum electrolyte: Urine sodium levels, therefore, will not rise in these conditions.

Medical management

Management of FVE is directed at the causes. When the fluid excess is related to excessive administration of sodium-containing fluids, discontinuing the infusion may be all that is needed. Symptomatic treatment consists of administering diuretics and restricting fluids and sodium intake.

Pharmacologic therapy

Diuretics are prescribed when dietary restriction of sodium alone is insufficient to reduce edema by inhibiting the reabsorption of sodium and water by the kidneys. The choice of diuretic is based on the severity of the hypervolemic state, the degree of impairment of renal function, and the potency of the diuretic. Thiazide diuretics block sodium reabsorption in the distal tubule while. Loop diuretics, such as furosemide, bumetanide can cause a greater loss of both sodium and water because they block sodium reabsorption in the ascending limb of the loop of Henle, where 20% to 30% of filtered sodium is normally reabsorbed. Generally, thiazide diuretics, such as hydrochlorothiazide are prescribed for mild to moderate hypervolemia and loop diuretics for severe hypervolemia.

Electrolyte imbalances may result from the effect of the diuretic. Hypokalemia can occur with all diuretics except those that work in the last distal tubule of the nephrons (e.g. spironolactone).

Potassium supplements can be prescribed to avoid this complication. Hyperkalemia can occur with diuretics that working the last distal tubule, especially in patients with decreased renal function. Hyponatremia occurs with diuresis due to increased release of ADH secondary to reduction in circulating volume. Decreased magnesium levels occur with administration of loop and thiazide diuretics due to decreased reabsorption and increased excretion of magnesium by the kidney. Azotemia (increased nitrogen levels in the blood) can occur with FVE when urea and creatinine are not excreted due to decreased perfusion by the kidneys and decreased excretion ofwastes. High uric acid levels (hyperuricemia) can also occur from increased reabsorption and decreased excretion of uric acid by the kidneys.

Hemodialysis

When renal function is so severely impaired that pharmacologic agents cannot act efficiently, other modalities are considered to remove sodium and fluid from the body. Hemodialysis or peritoneal dialysis may be used to remove nitrogenous wastes and control potassium and acid–base balance, and to remove sodium and fluid. Continuous renal replacement therapy may also be considered.

Nutritional Therapy

Treatment of FVE usually involves dietary restriction of sodium. An average daily diet not restricted in sodium contains 6 to 15 g of salt, whereas low-sodium diets can range from a mild restriction to as little as 250 mg of sodium per day, depending on the patient's needs. A mild sodium-restricted diet allows only light salting of food (about half the amount as usual) in cooking and at the table, and no addition of salt to commercially prepared foods that are already seasoned. Of course, foods high in sodium must be avoided. It is the sodium salt, sodium chloride, rather than sodium itself that contributes to edema. Therefore, patients need to read food labels carefully to determine salt content. Because about half of ingested sodium is in the form of seasoning, seasoning substitutes can play a major role in decreasing sodium intake. Lemon juice, onions, and garlic are excellent substitute flavorings, although some patients prefer salt substitutes. Most salt substitutes contain potassium and must therefore be used cautiously by patients taking potassium-sparing diuretics e.g., spironolactone, triamterene, amiloride). They should not be used at all in conditions associated with potassium retention, such as advanced renal disease.

Nursing Management

- The nurse must measures intake and output at regular intervals to identify excessive fluid retention.
- Weigh patient daily and acute weight gain is noted. An acute weight gain of 0.9 kg (about 2 lb) represents a gain of approximately 1 L of fluid.
- The nurse also needs to assess breath sounds at regular intervals in at-risk patients, particularly when parenteral fluids are being administered.
- Monitors the degree of edema in the most dependent parts of the body, such as the feet and ankles in ambulatory patients and the sacral region in bedridden patients.
- Assess the degree of pitting edema, and the extent of peripheral edema is monitored by measuring the circumference of the extremity with a tape marked in millimeters.

3.8 Electrolyte Imbalances

Disturbances in electrolyte balances occur in clinical practice and must be corrected for the patient's health and safety. An example of an electrolyte imbalance is an altered sodium balance.

Significance of Sodium

Sodium is the most abundant electrolyte in the ECF; its concentration ranges from 135 to 145 mEq/L (135—145 mmol/L).Consequently, sodium is the primary determinant of ECF osmolality. Decreased sodium is associated with parallel changes in osmolality. The fact that sodium does not easily cross the cell wall membrane, plus its abundance or high concentration, accounts for its primary role in controlling water distribution throughout the body. In addition, sodium is the primary regulator of ECF volume. A loss or gain of sodium is usually accompanied by a loss or gain of water. Sodium also functions in establishing the electrochemical state necessary for muscle contraction and the transmission of nerve impulses. Sodium imbalance occurs frequently in clinical practice and can develop under simple and complex circumstances. Sodium deficit and excess are the two most common sodium imbalances

Sodium Deficit (Hyponatremia)

Hyponatremia refers to a serum sodium level that is below normal(less than 135 mEq/L).Plasma sodium concentration represents the ratio of total body sodium to total body water. A decrease in this ratio can occur from a low quantity of total body sodium with a lesser reduction in total body water, normal total body sodium content with excess total body water, and an excess of total body sodium with an even greater excess of total body water. Sodium may be lost by way of vomiting, diarrhea, fistula, in use of diuretics, loss of GI fluids, renal disease, and adrenal insufficiency, Hyperglycemia and heart failure cause a loss of sodium or sweating or it may be associated with the use of diuretics, particularly in combination with a low-salt diet. A deficiency of aldosterone, as occurs in adrenal insufficiency, also predisposes the patient to sodium deficiency.

Causes of Hyponatremia : Excess Water or Loss of Sodium

Decreased plasma sodium concentration can result from loss of sodium chloride from the extracellular fluid or addition of excess water to the extracellular fluid. A primary loss of sodium chloride usually results in hypo-osmotic dehydration and is associated with decreased extracellular fluid volume. Conditions that can cause hyponatremia owing to loss of sodium chloride include diarrhea and vomiting. Overuse of diuretics that inhibit the ability of the kidneys to conserve sodium and certain types of sodium-wasting kidney diseases can also cause modest degrees of hyponatremia. Finally, Addison’s disease, which results from decreased secretion of the hormone aldosterone, impairs the ability of the kidneys to reabsorb sodium and can cause a modest degree of hyponatremia. Hyponatremia can also be associated with excess water retention, which dilutes the sodium in the extracellular fluid, a condition that is referred to as hypoosmotic overhydration. For example, excessive secretion of antidiuretic hormone, which causes the kidney tubules to reabsorb more water, can lead to hyponatremia and overhydration.

Clinical Manifestations

Clinical manifestations of hyponatremia depend on the cause, magnitude, and speed with which the deficit occurs. Poor skin turgor, dry mucosa, decreased saliva production, orthostatic fall in blood pressure, nausea, and abdominal cramping occur. Neurologic changes, including altered mental status, are probably related to the cellular swelling and cerebral edema associated with hyponatremia. As the extracellular sodium level decreases, the cellular fluid becomes relatively more concentrated and pulls water into the cells. Features of hyponatremia associated with sodium loss and water gain include anorexia, muscle cramps, and a feeling of exhaustion. When the serum sodium level drops below 115mEq/L (115 mmol/L), signs of increasing intracranial pressure, such as lethargy, confusion, muscle twitching, focal weakness, hemiparesis, papilledema, and seizures, may occur.

Assessment and Diagnostic Findings

- Serum electrolyte sodium test: result can review sodium less than 135 mEq/L ,
- Specific gravity: will is low, such as 1.002 to 1.004.

Medical Management

Sodium Replacement

The obvious treatment for hyponatremia is careful administration of sodium by mouth, nasogastric tube, or the parenteral route. For patients who can eat and drink, sodium is easily replaced, because sodium is consumed abundantly in a normal diet. For those who cannot consume sodium, lactated Ringer's solution or isotonic saline (0.9% sodium chloride) solution may be prescribed. . The usual daily sodium requirement in adults is approximately 100 mEq, provided there are no abnormal losses.

Water Restriction

In a patient with normal or excess fluid volume, hyponatremia is treated by restricting fluid to a total of 800 mL in 24 hours. This is far safer than sodium administration and is usually effective.

When neurologic symptoms are present, however, it may be necessary to administer small volumes of a hypertonic sodium solution, such as 3% or 5% sodium chloride. Incorrect use of these fluids is extremely dangerous because 1 L of 3% sodium chloride, solution contains 513 mEq of sodium, and 1 L of 5% sodium chloride solution contains 855 mEq of sodium. If edema exists alone, sodium is restricted; if edema and hyponatremia occur together, both sodium and water are restricted.

Nursing Management

The nurse needs to identify patients at risk for hyponatremia so that they can be monitored. Early detection and treatment of this disorder are necessary to prevent serious consequences.

- The nursing intervention and treatment of hyponatraemia consists of the administration of a salt-containing solution or an intravenous infusion of an isotonic sodium chloride solution (0.9%)
- For patients at risk, the nurse monitors fluid intake and output as well as daily body weights. Abnormal losses of sodium or gains of water are noted. GI manifestations, such as anorexia, nausea, vomiting, and abdominal cramping, are also noted.
- The nurse must be particularly alert for central nervous system changes, such as lethargy, confusion, muscle twitching, and seizures.
- Serum sodium levels are monitored very closely in patients at risk for hyponatremia; when indicated, urinary sodium levels and specific gravity are also monitored

Sodium Excess (Hypernatremia)

Hypernatremia is characterized by serum sodium level (exceeding 145 mEq/L 145 mmol/L). It can be caused by a gain of sodium in excess of water or by a loss of water in excess of sodium. It can occur in patients with normal fluid volume or in those with FVD or FVE. With a water loss, the patient loses more water than sodium; as a result, the serum sodium concentration increases and the increased concentration pulls fluid out of the cell. In sodium excess, the patient ingests or retains more sodium than water.

Causes of hypernatremia: water loss or excess sodium

Increased plasma sodium concentration, which also causes increased osmolarity, can be due to either loss of water from the extracellular fluid, which concentrates the sodium ions, or excess sodium in the extracellular fluid. It may develop as a result o an excessive ingestion of sodium chloride, inadequate water intake, water loss without corresponding excretion of sodium or decreased renal excretion of sodium .When there is primary loss of water from the extracellular fluid, this results in hyperosmotic dehydration. This condition can occur from an inability to secrete antidiuretic hormone, which is needed for the kidneys to conserve water. As a result of lack of antidiuretic hormone, the kidneys excrete large amounts of dilute urine (a disorder referred to as diabetes insipidus), causing dehydration and increased concentration of sodium chloride in the extracellular fluid. In certain types of renal diseases, the kidneys cannot respond to antidiuretic hormone, also causing a type of nephrogenic diabetes insipidus. A more common cause of hypernatremia associated with decreased extracellular fluid volume is dehydration caused by water intake that is less than water loss, as can occur with sweating during prolonged, heavy exercise. Hypernatremia can also occur as a result of excessive sodium chloride added to the extracellular fluid. This often results in hyperosmotic overhydration because excess extracellular sodium chloride is usually associated with at least some degree of water retention by the kidneys as well. For example, excessive secretion of the sodium-retaining hormone aldosterone can cause a mild degree of hypernatremia and overhydration. The reason that the hypernatremia is not more severe is that increased aldosterone secretion causes the kidneys to reabsorb greater amounts of water as well as sodium. Thus, in analyzing abnormalities of plasma sodium concentration and deciding on proper therapy, one should first determine whether the abnormality is caused by a primary loss or gain of sodium or a primary loss or gain of water.

Pathophysiology of hypernatremia

A common cause of hypernatremia is fluid deprivation in unconscious patients who cannot perceive, respond to, or communicate their thirst, Most often affected in this regard are very old, very young, and cognitively impaired patients. Administration of hypertonic enteral feedings without adequate water supplements leads to hypernatremia, as does watery diarrhea and greatly increased insensible water loss (e.g., hyperventilation, denuding effects of burns). Diabetes insipidus, a deficiency of ADH from the posterior pituitary gland, leads to hypernatremia if the patient does not experience, or cannot respond to, thirst or if fluids are excessively restricted. IV administration of hypertonic saline or excessive use or intravenous administration of sodium bicarbonate also causes hypernatremia. Normally the responses to an increase in the osmolality of the extracellular fluids include an increased release of ADH, thirst, decrease in sweating and movement of water out of the cells.

Clinical Manifestations

The clinical manifestations of hypernatremia are primarily neurologic and are presumably the consequence of cellular dehydration .Hypernatremia results in a relatively concentrated ECF, causing water to be pulled from the cells. Clinically, these changes may be manifested by restlessness and weakness in moderate hypernatremia and by disorientation, delusions, and hallucinations in severe hypernatremia. Dehydration (resulting in hypernatremia) is often overlooked as the primary reason for behavioral changes in the elderly patient. If hypernatremia is severe, permanent brain damage can occur (especially in children). Brain damage is apparently due to subarachnoid hemorrhages that result from brain contraction. Other signs include a dry, swollen tongue and sticky mucous membranes. Thirst, Flushed skin, peripheral and pulmonary edema, postural hypotension, and increased muscle tone, deep tendon reflexes and body temperature may rise mildly but returns to normal when the hypernatremia is corrected.

Assessment and Diagnostic Findings

- Serum electrolyte : the serum sodium level exceeds 145 mEq/L and the serum osmolality exceeds 295 mOsm/kg.
- Urine specific gravity and urine osmolality can be checked: This can increase as the kidneys attempt to conserve water (provided the water loss is from a route other than the kidneys).

Medical Management

- Hypernatremia treatment consists of a gradual lowering of the serum sodium level by the infusion of a hypotonic electrolyte solution (eg, 0.3% sodium chloride) or an isotonic nonsaline solution (eg, dextrose 5% in water [D5W]). D5W is indicated when water needs to be replaced without sodium. Many clinicians consider a hypotonic sodium solution to be safer than D5W because it allows a gradual reduction in the serum sodium level and thereby decreases the risk of cerebral edema. It is the solution of choice in severe hyperglycemia with hypernatremia. A rapid reduction in the serum sodium level temporarily decreases the plasma osmolality below that of the fluid in the brain tissue, causing dangerous cerebral edema.
- Diuretics also may be prescribed to treat the sodium gain. There is no consensus about the exact rate at which serum sodium levels should be reduced. As a general rule, the serum sodium level is reduced at a rate no faster than 0.5 to 1 mEq/L to allow sufficient time for readjustment through diffusion across fluid compartments.
- Desmopressin acetate (DDAVP) may be prescribed to treat diabetes insipidus if it is the cause of hypernatremia.

Nursing Management

- The nurse should assess for abnormal losses of water or low water intake and for large gains of sodium, as might occur with ingestion of over-the-counter medications with a high sodium content. it is important to obtain a medication history because some prescription medications have a high sodium content.

- Low sodium diet can be prescribed depending on the cause, restriction may vary from " No added salt" to more severe restriction.
- The nurse should observe for thirst, elevated body temperature, and monitors for changes in behavior, such as restlessness, disorientation, and lethargy etc.
- Low sodium diet can be prescribed depending on the cause, restriction may vary from " No added salt" to more severe restriction.
- Encourage and maintain fluid intake.
- Documentation of intake and output.

Preventing Hypernatremia

The nurse attempts to prevent hypernatremia by offering fluids at regular intervals, particularly in debilitated patients unable to perceive or respond to thirst. If fluid intake remains inadequate, the nurse consults with the physician to plan an alternate route for intake, either by enteral feedings or by the parenteral route. If enteral feedings are used, sufficient water should be administered to keep the serum sodium and BUN within normal limits. As a rule, the higher the osmolality of the enteral feeding, the greater the need for water supplementation. For patients with diabetes insipidus, adequate water intake .must be ensured. If the patient is alert and has an intact thirst mechanism, merely providing access to water may be sufficient. If the patient has a decreased level of consciousness or other disability interfering with adequate fluid intake, parenteral fluid replacement may be prescribed. This therapy can be anticipated in patients with neurologic disorders, particularly in the early postoperative period.

Potassium

Potassium is the major intracellular electrolyte; in fact, 98% of the body's potassium is inside the cells. The remaining 2% is in the ECF, and it is this 2% that is important in neuromuscular function. Potassium influences both skeletal and cardiac muscle activity. In conjunction with sodium and calcium, potassium regulates neuromuscular excitability and stimulation and is necessary for the transmission of the nerve impulses that prompt contraction of muscle fibers. For example, alterations in its concentration change myocardial irritability and rhythm. Under the influence of the sodium potassium pump and based on the body needs, potassium is constantly moving in and out of cells. It is also active in carbohydrate metabolism. It is required in the conversion of glucose to glycogen and its subsequent storage. This is also used in fairly amounts in synthesis of muscle protein. The normal serum potassium concentration ranges from 3.5 to 5.5 mEq/L (3.5.5.5 mmol/L).

Requirement, Sources, Metabolism

Potassium is widely distributed in foods: a deficiency is unlikely if there is an inadequate intake of food, since the average daily diet contains 2-4g. Foods where k+ can be found includes: meats, whole grain , bananas , oranges ,apricots ,prunes ,tomatoes ,legumes and broccoli. Potassium is readily absorbed from the small intestine. The digestive secretions contain potassium but this portion, as well as much of that found in digested foods is normally reabsorbed. To maintain potassium balance, the renal system must function because 80% of the potassium is excreted daily from the body by way of the kidneys; the other 20% is lost through the bowel and in sweat. The kidneys are the primary regulators of potassium balance and accomplish this by adjusting the amount of potassium that is excreted in the urine. As serum potassium levels increase, so does the potassium level in the renal tubular cell. A concentration gradient occurs, favoring the movement of potassium into the renal tubule with the loss of potassium in the urine. Aldosterone also increases the excretion of potassium by the kidney. Because the kidneys do not conserve potassium as well as they conserve sodium, potassium may still be lost in urine in the presence of a potassium deficit.

Potassium Deficit (hypokalemia)

Hypokalemia usually indicates an actual deficit in total potassium stores (less than 3.5mEq/L). When the potassium concentration of the extracellular fluid is depleted, potassium tends to move out of the cells, creating an intracellular deficit. The cells retain more sodium and hydrogen ions in effort to establish an ionic balance.

Causes of hypokalemia

- GI loss of potassium is probably the most common cause of potassium depletion such as Vomiting and gastric suction frequently , diarrhea, prolonged intestinal suctioning, recent ileostomy and villous adenoma(a tumor of the intestinal tract characterized by excretion of potassium rich mucus partly because potassium is actually lost when gastric fluid is lost, but more so because potassium is lost through the kidneys in association with metabolic alkalosis. Because relatively large amounts of potassium are contained in intestinal fluids.. Intestinal fluid may contain as much potassium as 30 mEq/L.
- Alkalosis. : Hypokalemia can cause alkalosis, and in turn alkalosis can cause hypokalemia.
- Hyperaldosteronism increases renal potassium wasting and canlead to severe potassium depletion. Primary hyperaldosteronism is seen in patients with adrenal adenomas. Secondary hyperaldosteronism occurs in patients with cirrhosis, nephrotic syndrome, heart failure, and malignant hypertension

- Potassium-losing diuretics, such as the thiazides can induce hypokalemia, particularly when administered in large doses to patients with inadequate potassium intake. Other medications include corticosteroids, sodium penicillin, carbenicillin, and amphotericin.
- Persistent insulin hypersecretion: insulin promotes the entry of potassium into skeletal

muscle and hepatic cells, patients with this may experience hypokalemia,.

- Patients who are unable or unwilling to eat a normal diet for a prolonged period are at risk for hypokalemia. This may occur in debilitated elderly people, alcoholics, and patients with anorexia nervosa. In addition to poor intake, people with bulimia frequently suffer increased potassium loss through self-induced vomiting and laxative and diuretic abuse.
- Magnesium depletion causes renal potassium loss but must be corrected first; otherwise, urine loss of potassium will continue.

Clinical Manifestations

Potassium deficiency can result in widespread derangements in physiologic function. Severe hypokalemia can cause death through cardiac or respiratory arrest. Clinical signs rarely develop before the serum potassium level has fallen below 3 mEq/L (3 mmol/L) unless the rate of fall has been rapid. Manifestations of hypokalemia include fatigue, anorexia, nausea, vomiting, muscle weakness, leg cramps, decreased bowel motility and sound , paresthesias (numbness and tingling), dysrhythmias, and increased sensitivity to digitalis ,ECG changes, hypotension ,abdominal distention ,If prolonged, hypokalemia can lead to an inability of the kidneys to concentrate urine, causing dilute urine (resulting in polyuria, nocturia) and excessive thirst. Potassium depletion depresses the release of insulin and results in glucose intolerance.

Assessment and Diagnostic Findings

- Serum potassium level : potassium level less than 3.5mEq/L
- Electrocardiogram: (ECG) changes can include flat T waves and/or inverted T waves, suggesting ischemia, and depressed ST segments. An elevated U wave is specific to hypokalemia. Hypokalemia increases sensitivity to digitalis, predisposing the patient to digitalis toxicity at lower digitalis levels. Metabolic alkalosis is commonly associated
- 24-hour urinary potassium excretion test can be performed to distinguish between renal and extrarenal loss. Urinary potassium excretion exceeding 20 mEq/24 h with hypokalemia suggests that renal potassium loss is the cause.

Medical Management

If hypokalemia cannot be prevented by conventional measures such as increased intake in the daily diet, it is treated with oral or IV replacement therapy Potassium loss must be corrected daily; administration of 40 to 80 mEq/day of potassium is adequate in the adult if there are no abnormal losses of potassium. For patients at risk for hypokalemia, a diet containing sufficientpotassium should be provided. Dietary intake of potassium in the average adult is 50 to 100 mEq/day. Foods high in potassium include fruits (especially raisins, bananas, apricots, and oranges), vegetables, legumes, whole grains, milk, and meat. When dietary intake is inadequate for any reason, the physician may prescribe oral or IV potassium supplements. Patients usually are given normal saline rather than dextrose 5% because glucose promotes movement of potassium into the cells thereby decreasing serum levels.

Nursing Management

- The nurse has to monitor for early signs of hypokaelamia in patients who are at risk such as Fatigue, anorexia, muscle weakness, decreased bowel motility, paresthesias, and dysrhythmias are signals that warrant assessing the serum potassium concentration.
- Patients receiving digitalis who are at risk for potassium deficiency should be monitored closely for signs of digitalis toxicity, because hypokalemia potentiates the action of digitalis. Physicians usually prefer to keep the serum potassium level above 3.5 mEq/L (3.5 mmol/L) in patients receiving digitalis medications such as digoxin. Patient could manifest symptoms like bradycardia (slow pulse),irregular pulse, anorexia and vomiting etc and at the same time patient should be taught to observe for signs and symptoms of potassium deficiency and of digitalis toxicity
- Patients should be taught to include foods high in potassium such as citrus fruits, yeast extract and bananas.
- The nurses must closely monitor patient receiving potassium by intravenous infusion. It is necessary to note what the patients urinary output has been and to keep a close record of it during and following the infusion.

Preventing Hypokalemia

Prevention may involve encouraging the patient at risk to eat foods rich in potassium (when the diet allows) such as bananas, melon, citrus, fresh and frozen vegetables, fresh meats, and processed foods. When hypokalemia is due to abuse of laxatives or diuretics, patient should be educated . Careful monitoring of fluid intake and output is necessary because 40 mEq of potassium is lost for every liter of urine output. The

ECG is monitored for changes, and arterial blood gas values are checked for elevated bicarbonate and pH levels.

Administering IV Potassium

Potassium should be administered only after adequate urine flow has been established. A decrease in urine volume to less than 20 mL/h for 2 consecutive hours is an indication to stop thepotassium infusion until the situation is evaluated. Potassium is primarily excreted by the kidneys; therefore, when oliguria occurs, potassium administration can cause the serum potassium concentration to rise dangerously. Each health care facility has its own standard of care, which should be consulted; however, IV potassium should not be administered faster than 20 mEq/h or in concentrations greater than 30 to 40 mEq/L unless hypokalemia is severe, because this can cause life-threatening dysrhythmias. When potassium is administered through a peripheral vein, the rate of administration must be decreased to avoid irritating the vein and causing a burning sensation during administration. In general, concentrations greater than 60 mEq/L are not administered in peripheral veins because venous pain and sclerosis may occur. Potassium should be administered no faster than 20 to 40 mEq/h (suitably diluted). In such a situation, the patient must be monitored by ECG and observed closely for other signs and symptoms, such as changes in muscle strength.

Potassium Excess (hyperkalemia)

Hyperkalemia is an excessive concentration of serum potassium (greater than 5.5mEq/L)may be the result of decreased renal excretion, increased catabolism , or the administration of excessive amount . Hyperkalemia is usually more dangerous because cardiac arrest is more frequently associated with high serum potassium levels. The major cause of hyperkalemia is decreased renal excretion of potassium. Thus, significant hyperkalemia is commonly seen in patients with untreated renal failure, particularly those in whom potassium levels rise as a result of infection or excessive intake of potassium in food or medications. Other patients with hypoaldosteronism and Addison disease are at risk for hyperkalemia because these conditions are characterized by deficient adrenal hormones, leading to sodium loss and potassium retention. Medications commonly implicated are potassium chloride, heparin, ACE inhibitors, captopril, NSAIDs, and potassium-sparing diuretics. Excessive intake with rapid intravenous administration can also cause hyperkalemia.

Clinical Manifestations

The most important consequence of hyperkalemia is its effect on the myocardium. Cardiac .As the plasma potassium level rises, disturbances in cardiac conduction occur. ECG changes may occur if serum potassium level greater than 6 mEq/L such as narrow T waves; ST-segment depression; and a shortened QT interval. If the serum potassium level continues to rise, the PR interval becomes prolonged and is followed by disappearance of the P waves. Ventricular dysrhythmias and cardiac arrest may occur at any point in this progression. Severe hyperkalemia causes skeletal muscle weakness and even paralysis, related to a depolarization block in muscle.

Hyperkalemia has marked effects on the peripheral nervous system, it has little effect on the central nervous system. Rapidly ascending muscular weakness leading to flaccid quadriplegia has been reported in patients with very high serum potassium levels. Paralysis of respiratory andspeech muscles can also occur. Additionally, GI manifestations, such as nausea, intermittent intestinal colic, and diarrhea, may occur in hyperkalemic patients.

Assessment and Diagnostic Findings

- Serum potassium levels- will be greater than5.5mEq/L
- Electrocardiogram: should be obtained to detect changes. Shortened repolarization and peaked T waves are seen initially
- Arterial blood gas analysis: may reveal metabolic acidosis; in many cases

Medical Management

In nonacute situations, restriction of dietary potassium and potassium-containing medications may suffice. For example, eliminating the use of potassium-containing salt substitutes in the patient taking a potassium-conserving diuretic may be all that is needed to deal with mild hyperkalemia. Potassium ions may be removed from the body by giving a cation-exchange resin such as calcium resonium. It may be prescribed to be given orally (20-50g) or by rectum(50g dissolved in 200ml of water and given as a retention enema).When oliguria is present, heamodialysis or peritoneal dialysis may be used to reduce extracellular potassium ions.

Glucose and regular insulin may be given intravenously to promote the movement of potassium ions into the cells. If there is no edema or cardiovascular overload, a solution of sodium bicarbonate may be added to the glucose or administered separately intravenously to enhance the shift of potassium into the cells, especially if the ECG reflects serious cardiac disturbance.

Aged (stored) blood should not be administered to patients with impaired renal function because the serum potassium concentration of stored blood increases as the storage time increases a result of red blood cell deterioration. It is possible to exceed the renal tolerance of any patient with rapid IV potassium administration, as well as when large amounts of oral potassium supplements are ingested. Note patient with renal failure or dysfunction should not be given potassium sparing diuretics such as such as spironolactone (Aldactone), triamterene (Dyrenium), and amiloride (Midamor); potassium supplements; and salt substitutes.

Emergency Pharmacologic Therapy

When serum potassium levels are dangerously elevated, it may be necessary to administer IV calcium gluconate. Within minutes after administration, calcium antagonizes the action of hyperkalemia on the heart. Infusion of calcium does not reduce the serum potassium concentration but immediately antagonizes the adverse cardiac conduction abnormalities. Calcium chloride and calcium gluconate are not interchangeable: calcium gluconate contains 4.5 mEq of calcium and calcium chloride contains 13.6 mEq of calcium; therefore, caution must be used. Monitoring the blood pressure is essential to detect hypotension, which may result from the rapid IV administration of calcium gluconate. The ECG should be continuously monitored during administration; the appearance of bradycardia is an indication to stop the infusion. The myocardial protective effects of calcium are transient, lasting about 30 minutes. Extra caution isrequired if the patient has been digitalized because parenteral administration of calcium sensitizes the heart to digitalis and may precipitate digitalis toxicity.

IV administration of sodium bicarbonate may be necessary to alkalinize the plasma and cause a temporary shift of potassium into the cells. Also, sodium bicarbonate furnishes sodium to antagonize the cardiac effects of potassium. Effects of this therapy begin within 30 to 60 minutes and may persist for hours; however, they are temporary. IV administration of regular insulin and a hypertonic dextrose solution causes a temporary shift of potassium into the cells. Glucose and insulin therapy has an onset of action within 30 minutes and lasts for several hours. If the hyperkalemic condition is not transient, actual removal of potassium from the body is required; this may be accomplished by using cation exchange resins, peritoneal dialysis, hemodialysis or other forms of renal replacement therapy.

Nursing Management

- The nurse should ensure serum level is checked, the intake controlled and observations made for early identifications of increased extracellular potassium

- As myocardial contraction and the conduction of cardiac impulses are impaired ,the electrocardiogram should be monitored
- Patients at risk for potassium excess, for example those with renal failure, should be identified so they can be monitored closely for signs of hyperkalemia.
- The nurse observes for signs of muscle weakness and dysrhythmias. The presence of paresthesias is noted, as are GI symptoms such as nausea and intestinal colic.
- The nurse should avoid the administration of potassium supplement to renalfailure patient because of their inability to excrete potassium.
- The nurse should avoid prolonged use of tourniquet while drawing sample and caution patient not to exercise the extremity immediately before the blood sample is obtained to avoid false report of hyperkalemia.
- The nurse must ensure the blood sample is delivered immediately to the laboratory because hemolysis of the sample results in a falsely elevated serum potassium level.

Preventing Hyperkalemia

Measures are taken to prevent hyperkalemia in patients at risk, when possible, by encouraging the patient to adhere to the prescribed potassium restriction. Potassium-rich foods to be avoidedinclude coffee, cocoa, tea, dried fruits, dried beans, and wholegrain breads. Milk and eggs also contain substantial amounts of potassium. Conversely, foods with minimal potassium contentinclude butter, margarine, cranberry juice or sauce, ginger ale, gumdrops or jellybeans, hard candy, root beer, sugar, and honey.

Calcium/Calcium Imbalance

Calcium is present in the body in greater amount than any other mineral. It comprises about 2% of the body weight and most of it (approximately 99%) is in the bones and teeth (skeletal system) in form of calcium phosphate. A relatively small amount is present and essential in the body fluids. Normal total serum calcium is within the range of 2.2-2.6 mEq/L. About half of this calcium is in the form of free diffusible calcium ions (1.1-1.3mmol) and the remainder is bound with plasma proteins or occurs as part of other compounds. The degree of protein building decreases with acidosis and increases with alkalosis.

Functions

Calcium plays a major role in transmitting nerve impulses and helps to regulate muscle contractionand relaxation, including cardiac muscle. Calcium is instrumentalin activating enzymes that stimulate many

essential chemical reactionsin the body, and it also plays a role in blood coagulation. It exists in plasma in three forms: ionized, bound, and complexed. About 50% of the serum calcium exists inan ionized form that is physiologically active and important for
neuromuscular activity and blood coagulation.

Requirement, Sources, Metabolism

Dairy products are the richest source of calcium , other sources include egg yolks, fish, nuts, green leafy vegetables, legumes and whole grains. Absorption of calcium from the intestine is largely dependent upon the presence of vitamin D .It is also influenced by the contents of the diet; a high phosphate concentration tends to reduce absorption and free fatty acids may cause the formation of insoluble , non- absorbable calcium salts. An increased Ph (increased alkalinity) of intestinal fluid reduces absorption. Calcium is excreted primarily in the feaces, the remainder in urine. The principal regulator of calcium concentration in the body fluids is the parathyroid hormone which is secreted by the parathyroid glands. A decrease in serum ionized calcium stimulates the secretion of PTH hormone, which in the presence of vitamin D causes withdrawal from the stores of calcium within bone tissue, decreased excretion by the kidneys and probably increased reabsorption of the mineral from the intestine. When the serum level of calcium is increased above normal, the PTH hormone is not released, less calcium is added to the body fluids and more is secreted by the kidneys. Calcitonin also secreted by the parathyroid glands, functions to decrease blood calcium ion concentration. Its effect on plasma calcium is transient, but it produces a prolonged effect by decreasing the rate of bone remodeling and increasing the amount of calcium salts deposited in bone.

Calcium Deficit (Hypocalcemia)

Calcium is the mineral most likely to be deficient in the human diet because of its relatively limited sources and characterized by serum calcium level less than 2.2mmol/l. Hypocalcaemia can be occur in variety of clinical situations such as A patient may have a total body calcium deficit (as in osteoporosis) but a normal serum calcium level. Osteoporosis is associated with prolonged low intake of calcium and represents a total body calcium deficit, even though serum calcium levels are usually normal. Elderly people with osteoporosis, who spend an increased amount of time in bed, are at increased risk for hypocalcemia as bed rest increases bone resorption. Primary hypoparathyroidism is another cause in which causes low concentration of calcium. This may occur as a result of new growth in the parathyroid glands or trauma during a surgical procedure such as thyroidectomy. Transient hypocalcemia can occur with massive administration of citrated blood (as in exchange transfusions in newborns), because citrate can combine with ionized calcium and temporarily remove it from the circulation. It has also been suggested that hypocalcemia might be related to excessive secretion of glucagon from the inflamed pancreas, resulting in increased secretion of calcitonin (a hormone that lowers serum calcium). Hypocalcemia is common in patients with renal failure because these patients frequently have elevated serum phosphate levels. Hyperphosphatemia usually causes a reciprocal drop in the serum calcium level. Other causes of hypocalcemia include inadequate vitamin D consumption, magnesium deficiency, medullary thyroid carcinoma, low serum albumin levels, alkalosis, and alcohol abuse. Medications predisposing to hypocalcemia include aluminum-containing antacids, aminoglycosides, caffeine,cisplatin, corticosteroids, mithramycin, phosphates, isoniazid, and loop diuretics.

Clinical Manifestations

Tetany is the most characteristic manifestation of hypocalcemia and hypomagnesemia. Tetany refers to the entire symptom complex induced by increased neural excitability. These symptomsare due to spontaneous discharges of both sensory and motor fibers in peripheral nerves. Sensations of tingling may occur in the tips of the fingers, around the mouth, and less commonly in the feet. Spasms of the muscles of the extremities and face may occur. Pain may develop as a result of these spasms. Seizures may occur because hypocalcemia increases irritability of the central nervous system as well as of the peripheral nerves. Other changes associated with hypocalcemia include mental changes such as depression, impaired memory, confusion, delirium, and even hallucinations. A prolonged QT interval is seen on the ECG due to prolongation of the ST segment; a form of ventricular tachycardia called torsades de pointes may also occur.

Assessment and Diagnostic Findings

- Serum calcium levels, serum albumin level and arterial pH can be measured: because abnormalities in serum albumin levels may affect interpretation of the serum calcium level, it may be necessary to calculate the corrected serum calcium if the serum albumin level is abnormal. For every decrease in serum albumin of 1 g/dL below 4 g/dL, the total serum calcium level is underestimated by approximately 0.8 mg/dL. When the arterial pH increases (alkalosis), more calcium becomes bound to protein. As a result, the ionized portion decreases. Symptoms of hypocalcemia may occur with alkalosis. Acidosis (low pH) has the opposite effect that is, less calcium is bound to protein and thus more exists in the ionized form. However, relatively small changes in serum calcium levels occur in these acid base abnormalities.

Medical Management

Acute hypocalcaemia may be corrected by the intravenous administration of calcium solution (e.g. calcium gluconate 10% or calcium chloride 5%). Although calcium chloride produces a significantly higher ionized calcium level than calcium gluconate, it is not used as often because it is more irritating and can cause sloughing of tissue if it infiltrates. Too-rapid IV administration of calcium can cause cardiac arrest, preceded by bradycardia. IV calcium administration is particularly dangerous in patients receiving digitalis-derived medications because calcium ions exert an effect similar to that of digitalis and can cause digitalis toxicity, with adverse cardiac effects. IV calcium should be diluted in dextrose 5% water and given as a slow IV bolus or a slow IV infusion using a volumetric infusion pump. A 0.9% sodium chloride solution should not be used with calcium because it will increase renal calcium loss. Solutions containing phosphates or bicarbonate should not be used with calcium because they will cause precipitation when calcium is added.

Vitamin D therapy may be instituted to increase calcium absorption from the GI tract. Aluminum hydroxide, calcium acetate, or calcium carbonate antacids may be prescribed to decrease elevated phosphorus levels before treating hypocalcemia for the patient with chronic renal failure. Increasing the dietary intake of calcium to at least 1,000 to 1,500 mg/day in the adult is recommended (e.g., milk products; green, leafy vegetables; canned salmon; sardines; fresh oysters).

Nursing Management

The status of the airway is closely monitored because laryngeal stridor can occur. Safety precautions are taken, as indicated, the nurse should instruct those are at risk of osteoporosis about the need for adequate dietary calcium intake and also the value of regular weight-bearing exercise in decreasing bone loss should be emphasized.

Patient should also be educated that alcohol and caffeine in high doses inhibit calcium absorption, and moderate cigarette smoking increases urinary calcium excretion, therefore must be avoided.. Additional teaching topics may involve discussion of medications such as raloxifene (Evista), and calcitonin to reduce the rate of bone loss. Teaching also addresses strategies to reduce risk for falls.

Calcium Excess (Hypercalcemia)

Hypercalcemia (excess of calcium in the plasma) is a dangerous imbalance when severe; in fact, hypercalcemic crisis has a mortality rate as high as 50% if not treated promptly.

Causes: The most common causes of hypercalcemia are malignancies and hyperparathyroidism. The increased parathyroid hormone secretion increases calcium uptake from the bones into the blood and enhances phosphorus excretion by the kidney. Some malignant tumors secrete PTH –like substances that function in a similar manner. Excessive intake of vitamin D leads to increased intestinal absorption of calcium. Prolonged immobility may lead to increased bone remodeling and release of calcium into the blood. Symptomatic hypercalcemia from immobilization, however, is rare; when it does occur, it is virtually limited to people with high calcium turnover rates (e.g., adolescents during a growth spurt). Most cases of hypercalcemia secondary to immobility occur after severe or multiple fractures or spinal cord injury.

Also medication like thiazide diuretics may cause a slight elevation in serum calcium levels because they potentiate the action of PTH on the kidneys, reducing urinary calcium excretion. The milk-alkali syndrome can occur in patients with peptic ulcer treated for a prolonged period with milk and alkaline antacids, particularly calcium carbonate. Vitamin A and D intoxication, as well as the use of lithium, can cause calcium excess.

Clinical Manifestations

Clinical characteristics include muscle weakness, incoordination, anorexia, and constipation may be due to decreased tone in smooth and striated muscle. Anorexia, nausea, vomiting, and constipation are common symptoms of hypercalcemia. Dehydration occurs with nausea, vomiting, anorexia, and calcium reabsorption at the proximal renal tubule. Abdominal and bone pain may also be present. Abdominal distention and paralytic ileus may complicate severe hypercalcemic crisis. Excessive urination due to disturbed renal tubular function produced by hypercalcemia may be present. Severe thirst may occur secondary to the polyuria caused by thehigh solute (calcium) load. Patients with chronic hypercalcemia may develop symptoms similar to those of peptic ulcer because hypercalcemia increases the secretion of acid and pepsin by thestomach. Confusion, impaired memory, slurred speech, lethargy, acute psychotic behavior, or coma may occur. Hypercalcemic crisis refers to an acute rise in the serum calcium level to 17 mg/dL (4.3 mmol/L) or higher. Severe thirst and polyuria are characteristically present. Other findings may include muscle weakness, intractable nausea, abdominal cramps, obstipation (very severe constipation) or diarrhea, peptic ulcer symptoms, and bone pain. Lethargy, confusion, and coma may also occur. This condition is very dangerous and may result in cardiac arrest.

Assessment and Diagnostic Findings

- Serum calcium level test : result may reveal calcium level greater than 10.5 mg/dL (2.6 mmol/L).
- Electrocardiaogram : Cardiovascular changes may include a variety of dysrhythmias and shortening of the QT interval and ST segment. The PR interval is sometimes prolonged.
- The double-antibody PTH test may be used to differentiate between primary hyperparathyroidism and malignancy as a cause of hypocalcaemia: PTH levels are increased in primary or secondary hyperparathyroidism and suppressed in malignancy.
- X-rays may reveal the presence of osteoporosis, bone cavitation, or urinary calculi.
- The Sulkowitch test analyzes the amount of calcium in the urine; in hypercalcemia, dense precipitation is observed due to hypercalciuria.

Medical Management

Therapeutic aims in hypercalcemia include decreasing the serum calcium level and reversing the process causing hypercalcemia. Treating the underlying cause (e.g., chemotherapy for a malignancy or partial parathyroidectomy for hyperparathyroidism) is essential.

Pharmacologic Therapy

General measures include administering fluids to dilute serum calcium and promote its excretion by the kidneys, mobilizing the patient, and restricting dietary calcium intake. IV administration
of 0.9% sodium chloride solution temporarily dilutes the serum calcium level and increases urinary calcium excretion by inhibiting tubular reabsorption of calcium. Administering IV phosphate can cause a reciprocal drop in serum calcium. Furosemide (Lasix) is often used in conjunction with administration of a saline solution; in addition to causing diuresis, furosemide increases calcium excretion.

Calcitonin can be used to lower the serum calcium level and is particularly useful for patients with heart disease or renal failure who cannot tolerate large sodium loads. Calcitonin reduces bone resorption, increases the deposit of calcium and phosphorus in the bones, and increases urinary excretion of calcium and phosphorus. Although available in several forms, calcitonin derived from salmon is commonly used. Skin testing for allergy to salmon calcitonin is necessary before the hormone is administered. Systemic allergic reactions are possible since this hormone is a protein; resistance to the medication may develop later because of antibody formation. Calcitonin is administered by intramuscular injection rather than subcutaneously because patients with hypercalcemia have poor perfusion of subcutaneous tissue. If the increased serum calcium is the result of malignant neoplasm in bone tissue, mithramycin , a cytotoxic chemotherapeutic agent is occasionally administered intravenously .For patients with cancer, treatment is directed at controlling the condition by surgery, chemotherapy, or radiation therapy. Corticosteroids may be used to decrease bone turnover and tubular reabsorption for patients with sarcoidosis, myelomas, lymphomas, and leukemias; patients with solid tumors are less responsive. IV phosphate therapy is used with extreme caution in the treatment of hypercalcemia because it can cause severe calcification in various tissues, hypotension, tetany, and acute renal failure.

Nursing Management

The nurse is expected to carry out the following responsibilities:

- The nurse is expected to encourage hospitalized patient at risk of hypercalcemia to ambulate as soon as possible and encourage fluid intake. When encouraging oral fluids, the nurse considers the patient likes and dislikes. Fluids containing sodium should be administered unless contraindicated by other conditions, because sodium favors calcium excretion. Patients are encouraged to drink 3 to 4 quarts of fluid daily. Adequate fiber should be provided in the diet to offset the tendency for constipation.
- The nurse should restrict dietary intake high in calcium content and assess patient for signs of digitalis toxicity; ECG changes (premature ventricular contractions, paroxysmal atrial tachycardia, and heart block) can occur; therefore, the cardiac rate and rhythm should be monitored for any abnormalities.

Magnesium

Magnesium is the most abundant intracellular cation, next to potassium. The adult body contains about 20-21g of magnesium: 50-60% is insoluble and in combination with calcium and phosphorus in bone tissue. The remainder is found in soft tissue and in body fluids. The normal serum level of magnesium is within the range of 0.8 – 1.3mmmol/l.

Functions

Magnesium is essential in the function of many enzyme systems, especially those involved with carbohydrate metabolism and protein synthesis. It also influences the maintenance of normal ionic balance ,osmotic pressure and bone metabolism. Magnesium balance is important in neuromuscular function. Because magnesium acts directly on the myoneural junction, variations in the serum concentration of magnesium affect neuromuscular irritability and contractility and plays a role in both carbohydrate and protein metabolism. For example, an excess of magnesium diminishes the excitability of the muscle cells, whereas a deficit increases neuromuscular irritability and contractility. Magnesium produces its sedative effect at the neuromuscular junction, probably by inhibiting the release of the neurotransmitter acetylcholine. It also increases the stimulus threshold in nerve fibers. Magnesium exerts effects on the cardiovascular system, acting peripherally to produce vasodilation. Magnesium is thought to have a direct effect on peripheral arteries and arterioles, which results in a decreased total peripheral resistance.

Requirement, Sources, Metabolism

The suggested daily requirement for an adult is 350-500mg.The main food sources are wholegrain , legumes , seafood ,soy beans , cocoa and milk. The metabolism of magnesium is similar to that of calcium.

Magnesium Imbalance

Magnesium Deficit (Hypomagnesemia)

Hypomagnesemia refers to a below-normal serum magnesium concentration. The normal serum magnesium level is 1.5 to 2.5mEq/L (or 0.8 to 1.2 mmol/L). Approximately one third of serum magnesium is bound to protein; the remaining two thirds exists as free cations (Mg ++). Like calcium, it is the ionized fraction that is primarily involved in neuromuscular activity and other physiologic processes. As with calcium levels, magnesium levels should be evaluated in combination with albumin levels. Low serum albumin levels decrease total magnesium.

An important route for magnesium loss is the GI tract. Loss of magnesium from the GI tract may occur with nasogastric suction, diarrhea, or fistulas. Because fluid from the lower GI tracthas a higher concentration of magnesium (10.14 mEq/L) than fluid from the upper tract (1.2 mEq/L), losses from diarrhea and intestinal fistulas are more likely to induce magnesium deficitthan are those from gastric suction. Although magnesium losses are relatively small in nasogastric suction, hypomagnesemia will occur if losses are prolonged and magnesium is not replaced through IV infusion. Because the distal small bowel is the major site of magnesium absorption, any disruption in small bowel function, as in intestinal resection or inflammatory bowel disease, can lead to hypomagnesemia. Other causes of hypomagnesemia include the administration of aminoglycosides, cyclosporine, cisplatin, diuretics, digitalis, and amphotericinand the rapid administration of citrated blood, especially to patients with renal or hepatic disease. Magnesium deficiency often occurs in diabetic ketoacidosis, secondary to increased renal excretion during osmotic diuresis and shifting of magnesium into the cells with insulin therapy. Other contributing causes are sepsis, burns, and hypothermia.

Clinical Manifestations

Clinical manifestations of hypomagnesemia are largely confined to the neuromuscular system. Serum magnesium less than 0.8mmol/l , neuromuscular changes such as hyperexcitability with muscle weakness, tremors, and athetoid movements (slow, involuntary twisting and writhing). Others include tetany, generalized tonic-clonic or focal seizures, laryngeal stridor, and positive

Also this can affect ECG by prolonging the QRS, depressing the ST segment, and predisposing to cardiac dysrhythmias, such as premature ventricular contractions, supraventricular tachycardia, torsades de pointes (a form of ventricular tachycardia), and ventricular fibrillation.
Hypomagnesemia may be accompanied by marked alterationsin mood. Apathy, depression, apprehension, and extreme agitation have been noted, as well as ataxia, dizziness, insomnia, andconfusion. At times, delirium, auditory or visual hallucinations, and frank psychoses may occur.

Assessment and Diagnostic Findings

- Serum magnesium level test: result will show serum magnesium less than 1.5 mEq/L or 1.8 mg/dL (0.8 mmol/L).
- Serum albumin level.
- ECG evaluations reflect magnesium, calcium, and potassium deficiencies, tachydysrhythmias, prolonged PR and QT intervals, widening QRS, ST segment depression, flattened T waves, and a prominent U wave. Torsades de pointes is associated with a low magnesium level.
- Urinary magnesium levels test: may be helpful in identifying causes of magnesium depletion and are measured after a loading dose of magnesium sulfate is administered.
- Nuclear magnetic resonance spectroscopy and the ion selective electrode are sensitive and direct means to measure ionized serum magnesium levels.

Medical Management

Mild magnesium deficiency can be corrected by diet alone. Principal dietary sources of magnesium are green leafy vegetables, nuts, legumes, whole grains, and seafood. Magnesium is also plentiful in peanut butter and chocolate. When necessary, magnesium salts can be administered orally to replace continuous excessive losses. Diarrhea is a common complication of excessive ingestion of magnesium. Patients receiving parenteral nutrition require magnesiumin the IV solution to prevent hypomagnesemia. IV administration of magnesium sulfate must be given by an infusion pump and at a rate not to exceed 150 mg/min. A bolus dose of magnesium sulfate given too rapidly can produce cardiac arrest. Vital signs must be assessed frequently during magnesium administration to detect changes in cardiac rate or rhythm, hypotension, and respiratory distress. Monitoring urine output is essential before, during, and after magnesium administration; the physician is notified if urine volume decreases to less than 100 mL over 4 hours. Magnesium sulfate is the most commonly used magnesium salt. Serial magnesium concentrations can be used to regulate the dosage.

Nursing Management

The nurse should be aware of patients at risk for hypomagnesemia and observe for its signs and symptoms. Patients receiving digitalis are monitored closely because a deficit of magnesium canpredispose them to digitalis toxicity. When hypomagnesemia is severe, seizure precautions are implemented. Other safety precautions are instituted, as indicated, if confusion is observed. Because difficulty in swallowing (dysphagia) may occur in magnesium-depleted patients, the ability to swallow should be tested with water before oral medications or foods are offered. To determine neuromuscular irritability, the nurse needs to assess and grade deep tendon reflexes.

Teaching plays a major role in treating magnesium deficit, particularly that resulting from abuse of diuretic or laxative medications. In such cases, the nurse can instruct the patient about the need to consume magnesium-rich foods. For patients experiencing hypomagnesemia from abuse of alcohol, the nurse can provide teaching, counseling, support, and possible referral to alcohol abstinence programs or other professional help.

Magnesium Excess (Hypermagnesemia)

Hypermagnesemia is an excessive contration of magnesium (greater than 1.3mmol/l) .A serum magnesium level can appear falsely elevated when blood specimens are allowed to hemolyze or are drawn from an extremity with a tourniquet that was applied too tightly.By far the most common cause of hypermagnesemia is renal failure. In fact, most patients with advanced renal failure have at least a slight elevation in serum magnesium levels. This condition is aggravated when such patients receive magnesium to control seizures or inadvertently take one of the many commercial antacids that contain magnesium salts.

Hypermagnesemia can occur in a patient with untreated diabetic ketoacidosis when catabolism causes the release of cellular magnesium that cannot be excreted because of profound fluid volume depletion and resulting oliguria. An excess of magnesium can also result from excessive magnesium administered to treat hypertension of pregnancy and to lower serum magnesium levels. Increased serum magnesium levels can also occur in adrenocortical insufficiency, Addison disease and excessive use of antacids and laxatives (Milk of Magnesia) also increases serum magnesium levels.

Clinical Manifestations

the central nervous system as well as the peripheral neuromuscular junction depresses when serum magnesium is high. At mildly elevated levels, there is a tendency for lowered blood pressure because of peripheral vasodilation. Nausea, vomiting, soft tissue calcifications, facial flushing, and sensations of warmth may also occur. At higher magnesium concentrations, lethargy, difficulty speaking (dysarthria), and drowsiness can occur. Deep tendon reflexes are lost, and muscle weakness and paralysis may develop. The respiratory center is depressed whenserum magnesium levels exceed 10 mEq/L (5 mmol/L). Coma, atrioventricular heart block, and cardiac arrest can occur when the serum magnesium level is greatly elevated and not treated.

Assessment and Diagnostic Findings

- Serum magnesium level is greater than 2.5 mEq/L or 3.0 mg/dL (1.25 mmol/L).
- Electrocardiogram findings may include a prolonged PR interval, tall T waves, and a widened QRS. ECG findings demonstrate a prolonged QT interval and atrioventricular blocks.

Medical Management

Hypermagnesemia can be prevented by avoiding the administration of magnesium to patients with renal failure and by carefully monitoring seriously ill patients who are receiving magnesiumsalts. In patients with severe hypermagnesemia, all parenteral and oral magnesium salts are discontinued. In emergencies, such as respiratory depression or defective cardiac conduction, ventilator support and IV calcium are indicated. In addition, hemodialysis with a magnesium-free dialysate can reduce the serum magnesium to a safe level within hours. Loop diuretics and 0.45% sodium chloride (half-strength saline) solution enhance magnesium excretion in patients with adequate renal function. IV calcium gluconate (10 mL of a 10% solution) antagonizes the neuromuscular effects of magnesium.

Nursing Management

Treatment is directed toward promoting urinary output and magnesium excretion.

- When hypermagnesemia is suspected, the nurse monitors the vital signs, noting hypotension and shallow respirations.

- The nurse also observes for decreased patellar reflexes and changes in the level of consciousness. Medications that contain magnesium are not given to patients with renal failure or compromised renal function and patients with renal failure are cautioned to check with their health care providers before taking over-the-counter medications.
- The nurse also ensure patient at risk of hypermagnesaemia decreases magnesium rich foods.

Phosphorus and Phosphorus Imbalance

Phosphorus is closely associated with calcium in the body and occurs mainly in the form of phosphate. Phosphorus is the primary anion of the ICF. About 85% of phosphorus is located in bones and teeth, 14% in soft tissue, and less than 1% in the ECF. The remainder is combined with protein, lipid and carbohydrate compounds and with enzymes and other substances throughout all the body cells. The normal serum level is 0.8-1.5mmol/l or 2.5 to 4.5 mg/dL) and may be as high as 6 mg/dL (1.94 mmol/L) in infants and children.

Functions

Phosphorus is a critical constituent of all the body tissues. It is essential to the function of muscle and red blood cells, the formation of adenosine triphosphate (ATP) and 2,3-diphosphoglycerate,and the maintenance of acid. base balance, as well as to the nervous system and the intermediary metabolism of carbohydrate, protein, and fat. Serum phosphorus levels are presumably greater in children because of the high rate of skeletal growth. Phosphorus is critical to nerve and muscle functions and provides structural support to bones and teeth. Phosphorus levels decrease with age.

Requirement, Sources, Metabolism: The requirement is comparable to that of calcium and since phosphorus is present in nearly all foods , a dietary deficiency is not likely to occur. Dairy products and lean meats have a high phosphate content. The metabolism is closely associated with that of calcium. Vitamin D facilitates the absorption of phosphorus from the intestine but is not actually essential for its transfer. The kidneys regulate the serum phosphorous level by their tubular excretion and reabsorption mechanisms. This regulation is influenced by parathyroid hormone. With an increase above normal in serum phosphate level ,the parathyroid hormone is released into block renal tubular reabsorption of phosphorous from glomerular filtrate ,with an ensuing increase in the amount excreted in the urine. Conversely , a decrease below the normal serum level results in increased reabsorption in the renal tubules.

Phosphorus Deficit (Hypophosphatemia)

Hypophosphatemia is a below-normal serum concentration of inorganic phosphorus. Although it often indicates phosphorus deficiency, hypophosphatemia may occur under a variety of circumstances in which total body phosphorus stores are normal. Hypophosphatemia may occur during the administration of calories to patients with severe protein-calorie malnutrition. It ismost likely to occur with overzealous intake or administration of simple carbohydrates. This syndrome can be induced in anyone with severe protein-calorie malnutrition (eg, patients with anorexia nervosa or alcoholism, or elderly debilitated patients unable to eat). As many as 50% of patients hospitalized because of chronic alcoholism have hypophosphatemia. Marked hypophosphatemia may develop in malnourished patients who receive parenteral nutrition if the phosphorus loss is not adequately corrected.

Other causes of hypophosphatemia include prolonged intense hyperventilation, alcohol withdrawal, poor dietary intake, diabetic ketoacidosis, and major thermal burns. Low magnesium levels, low potassium levels, and hyperparathyroidism related to increased urinary losses of phosphorus contribute to hypophosphatemia. Respiratory alkalosis can cause a decrease in phosphorus because of an intracellular shift of phosphorus. Excess phosphorus binding by antacids containing magnesium, calcium, or albumin may decrease the phosphorus available from the diet to amounts below that required to maintain serum phosphorus balance. A deficiency of vitamin D may cause decreased calcium and phosphorus levels, which may lead to osteomalacia (softened, brittle bones).

Clinical Manifestations

Most of the signs and symptoms of phosphorus deficiency appear to result from a deficiency of ATP, 2,3-diphosphoglycerate, or both. ATP deficiency impairs cellular energy resources; diphosphoglycerate deficiency impairs oxygen delivery to tissues. A wide range of neurologic symptoms may occur, such as irritability, fatigue, apprehension, weakness, numbness, paresthesias, confusion, seizures, and coma. Low levels of diphosphoglycerate may reduce the delivery of oxygen to peripheral tissues, resulting in tissue anoxia. Hypoxia then leads to an increase in respiratory rate and respiratory alkalosis, causing phosphorus to move into the cells and potentiating hypophosphatemia. Muscle damage may develop as the ATP level in the muscletissue declines. Other symptoms include muscle weakness, muscle pain, and at times acute rhabdomyolysis (disintegration of striated muscle). Weakness of respiratory muscles may greatlyimpair ventilation.

Hypophosphatemia also may predispose a person to insulin resistance and thus hyperglycemia. Chronic loss of phosphorus can cause bruising and bleeding from plateletdysfunction.

Assessment and Diagnostic findings

- Serum phosphorus level test: is less than .5 mg/dL (0.80 mmol/L) in adults. When reviewing laboratory results, the nurse should keep in mind that glucose or insulin administration causes a slight decrease in the serum phosphorus level.
- Urine testing : Serum magnesium may decrease due to increased urinary excretion of magnesium.
- X-rays may show skeletal changes of osteomalacia or rickets.

Medical Management

Serum phosphate levels should be closely monitored and correction initiated before deficits become severe. Adequate amounts of phosphorus should be added to parenteral solutions, and attention should be paid to the phosphorus levels in enteral feeding solutions. Severe hypophosphatemia is dangerous and requires prompt attention. Aggressive IV phosphorus correction is usually limited to patients whose serum phosphorus levels fall below 1 mg/dL(0.3 mmol/L) and whose GI tract is not functioning. Possible dangers of IV phosphorus administration include tetany from hypocalcemia and metastatic calcification from hyperphosphatemia. The rate of phosphorus administration should not exceed 10 mEq/h, and the site should be carefully monitored because tissue sloughing and necrosis can occur with infiltration. In less acute situations, oral phosphorus replacement is usually adequate.

Nursing Management

- The nurse identifies patients at risk for hypophosphatemia and monitors for it. Because malnourished patients receiving parenteral nutrition are at risk when calories are introduced too aggressively, preventive measures involve gradually introducing the solution to avoid rapid shifts of phosphorus into the cells. For patients with documented hypophosphatemia, careful attention is given to preventing infection because hypophosphatemia may alter the granulocytes. In patients requiring correction of phosphorus losses.
- The nurse frequently monitors serum phosphorus levels and documents and reports early signs of hypophosphatemia (apprehension, confusion, change in level of consciousness).
- The nurse should also encourage and instruct patient experiences mild hypophosphatemia, to take foods such as milk and milk

products, organ meats, nuts, fish, poultry, and whole grains should be encouraged.

Phosphorus Excess (Hyperphosphatemia)

Hyperphosphatemia is a serum phosphorus level that exceeds normal. Various conditions can lead to this imbalance, but the most common is renal failure. Other causes include chemotherapy for neoplastic disease, hypoparathyroidism, respiratory acidosis or diabetic ketoacidosis, high phosphate intake, profound muscle necrosis, and increased phosphorus absorption. The primary complication of increased phosphorus is metastatic calcification (soft tissue, joints, and arteries), which results when the calcium. magnesium product (calcium ~ magnesium) exceeds 70 mg/dL.

Clinical manifestations

An elevated serum phosphorus level causes few symptoms. Symptoms that do occur usually result from decreased calcium levels and soft tissue calcifications. The most important short-term consequence istetany. Because of the reciprocal relationship between phosphorus and calcium, a high serum phosphorus level tends to cause a low serum calcium concentration. Tetany can result, causing tingling sensations in the fingertips and around the mouth. Anorexia, nausea, vomiting, muscle weakness, hyperreflexia, and tachycardia may occur. The major long-term consequence is soft tissue calcification, which occurs mainly in patients with a reduced glomerular filtration rate. High serum levels of inorganic phosphorus promote precipitation of calcium phosphate in nonosseous sites, decreasing urine output, impairing vision, and producing palpitations.

Assessment and Diagnostic findings

- Serum phosphorus level test: exceeds 4.5 mg/dL (1.5 mmol/L) in adults. Serum phosphorus levels are normally higher in children, presumably because of the high rate of skeletal growth.
- Serum calcium level is useful also for diagnosing the primary disorder and assessing the effects of treatments.
- X-ray studies may show skeletal changes with abnormal bone development.
- BUN and creatinine levels are used to assess renal function.

Medical management

When possible, treatment is directed at the underlying disorder. For example, hyperphosphatemia may be related to volume depletion or respiratory or metabolic acidosis. In renal failure, elevated
PTH production contributes to a high phosphorus level and bone disease. Measures to decrease the serum phosphate level in these

patients include vitamin D preparations such as calcitol (Rocaltrol, in oral preparation), Calcijex (for IV administration), or paricalcitol (Zemplar). Vitamin D does not increase the serumcalcium, thus permitting more aggressive treatment of hyperphosphatemia with calcium-binding antacids, phosphate-binding gels or antacids, restriction of dietary phosphate, and dialysis.

Nursing Management

The nurse monitors patients at risk for hyperphosphatemia. When a low-phosphorus diet is prescribed, the patient is instructed to avoid phosphorus-rich foods such as hard cheese, cream, nuts, whole-grain cereals, dried fruits, dried vegetables, kidneys, sardines, sweetbreads, and foods made with milk. When appropriate, the nurse instructs the patient to avoid phosphate- containing substances such as laxatives and enemas that contain phosphate. The nurse also teaches the patient to recognize the signs of impending hypocalcemia and to monitor for changes in urine output.

Chloride

Chloride, the major anion of the ECF, is found more in interstitial and lymph fluid compartments than in blood. Chloride is also contained in gastric and pancreatic juices and sweat. Sodium andchloride in water make up the composition of the ECF and assist in determining osmotic pressure. The serum level of chloride reflects a change in dilution or concentration of the ECF and does so in direct proportion to sodium. Aldosterone secretion increases sodium reabsorption, there by increasing chloride reabsorption. The choroid plexus, where cerebrospinal fluid forms in the brain, depends on sodium and chloride to attract water to form the fluid portion of the cerebrospinal fluid. Bicarbonate has an inverse relationship with chloride. As chloride moves from plasma into the red blood cells(called the chloride shift), bicarbonate moves back into the plasma. Hydrogen ions are formed, which then help to release oxygen from hemoglobin. When the level of one of these three electrolytes (sodium, bicarbonate, or chloride) is disturbed, the other two will be affected as well.

Chloride Imbalance

Chloride Deficit (Hypochloremia)

Chloride control depends on the intake of chloride and the excretion and reabsorption of its ions in the kidneys. Chloride is produced in the stomach as hydrochloric acid; a small amount of chloride is lost in the feces. Chloride-deficient formulas, saltrestricted diets, GI tube drainage, and severe vomiting and diarrhea are risk factors for hypochloremia. As chloride decreases (usually because of volume depletion), sodium and bicarbonate ions are retained by the kidney to balance the loss.

Bicarbonate accumulates in the ECF, which raises the pH and leads to hypochloremic metabolic alkalosis.

Clinical Manifestations

The signs and symptoms of hypochloremia are those of acid. base and electrolyte imbalances. The signs and symptoms of hyponatremia, hypokalemia, and metabolic alkalosis may also be noted. Metabolic alkalosis is a disorder that results in a high pH and a high serum bicarbonate level as a result of excess alkali intake or loss of hydrogen ions. With compensation, the $PaCO_2$ increases to 50 mm Hg. Hyperexcitability of muscles, tetany, hyperactive deep tendon reflexes, weakness, twitching, and muscle cramps may result. Hypokalemia can cause hypochloremia, resulting in cardiac dysrhythmias. In addition, because low chloride levels parallel low sodium levels, a water excess may occur. Hyponatremia can cause seizures and coma.

Assessment and Diagnostic Findings

- Serum chloride level: The normal serum chloride level is 96 to 106 mEq/L (96.106 mmol/L). Inside the cell, the chloride level is 4 mEq/L. In addition to the chloride level, sodium and potassium levels are also evaluated because these electrolytes are lost along with chloride.
- Arterial blood gas analysis identifies the acid. base imbalance, which is usually metabolic alkalosis.
- The urine chloride level, which is also measured, decreases in hypochloremia.

Medical Management

Treatment involves correcting the cause of hypochloremia and contributing electrolyte and acid base imbalances. Normal saline (0.9% sodium chloride) or half-strength saline (0.45% sodium chloride) solution is administered IV to replace the chloride. The physician may reevaluate whether patients receiving diuretics (loop, osmotic, or thiazide) should discontinue these medications or change to another diuretic.

Foods high in chloride are provided; these include tomato juice, salty broth, canned vegetables, processed meats, and fruits. A patient who drinks free water (water without electrolytes) or bottled water will excrete large amounts of chloride; therefore, this kind of water should be avoided. Ammonium chloride, an acidifying agent, may be prescribed to treat metabolic alkalosis; the dosage depends on the patient weight and serum chloride level. This agent is metabolized by the liver, and its effects last for about 3 days.

Nursing Management

- The nurse monitors intake and output, arterial blood gas values, and serum electrolyte levels, as well as the patient level of consciousness and muscle strength and movement. Changes are reported to the physician promptly.
- Vital signs are monitored and respiratory assessment is carried out frequently. The nurse teaches the patient about foods with high chloride content.

C**hloride Excess (Hyperchloremia)**: Hyperchloremia exists when the serum level exceeds 106 mEq/L (106 mmol/L). Hypernatremia, bicarbonate loss, and metabolic acidosis can occur with high chloride levels. It is usually caused by the loss of bicarbonate ions via the kidney or the GI tract with a corresponding increase in chloride ions. Chloride ions in the form of acidifying salts accumulate and acidosis occurs with a decrease in bicarbonate ions.

Clinical Manifestations

The signs and symptoms of hyperchloremia are the same as those of metabolic acidosis, hypervolemia, and hypernatremia. Tachypnea; weakness; lethargy; deep, rapid respirations; diminished cognitive ability; and hypertension occur. If untreated, hyperchloremia can lead to a decrease in cardiac output, dysrhythmias, and coma. A high chloride level is accompanied by a high sodium level and fluid retention.

Assessment and Diagnostic Findings

- Serum chloride level : is 108 mEq/L (108 mmol/L) or greater, the serum sodium level is greater than 145 mEq/L (145 mmol/L), the serum pH is less than 7.35, the serum bicarbonate level is less than 22 mEq/L (22 mmol/L), and there is a normal anion gap of 8 to 12 mEq/L (8.12 mmol/L).
- Urine chloride level: Urine chloride excretion increases.

Medical Management

Correcting the underlying cause of hyperchloremia and restoring electrolyte, fluid, and acid.base balance are essential. Lactated Ringer solution may be prescribed to convert lactate to bicarbonate in the liver, which will increase the base bicarbonate level and correct the acidosis. Sodium bicarbonate may be given IV to increase bicarbonate levels, which leads to the renal excretion of chloride ions as bicarbonate and chloride compete for combination with sodium. Diuretics may be administered to eliminate chloride as well. Sodium, fluids, and chloride are restricted.

Nursing Management

The nurse should monitor vital signs, arterial blood gas values, and intake and output and assessment findings related to respiratory, neurologic, and cardiac systems are documented and changes must be communicated to the physician. The nurse also teaches the patient about the diet that should be followed to manage hyperchloremia.

3.9 Acid-Base Disorders

Maintenance of Normal Acid Base Balance

Buffer systems prevent major changes in the pH of body fluids by removing or releasing H+; they can act quickly to prevent excessive changes in H+ concentration. Hydrogen ions are buffered by both intracellular and extracellular buffers. The body's major extracellular buffer system is the bicarbonate-carbonic acid buffer system. This is the system that is assessed when arterial blood gases are measured. Normally, there are 20 parts of bicarbonate (HCO_3^-) to one part of carbonic acid (H_2CO_3). If this ratio is altered, the pH will change. It is the ratio of HCO_3^- to H_2CO_3 that is important in maintaining pH, not absolute values. Carbon dioxide (CO_2) is a potential acid; when dissolved in water, it becomes carbonic acid ($CO_2 + H_2O = H_2CO_3$). Thus, when CO_2 is increased, the carbonic acid content is also increased, and vice versa. If either bicarbonate or carbonic acid is increased or decreased so that the 20:1 ratio is no longer maintained, acid–base imbalance results. Less important buffer systems in the ECF include the inorganic phosphates and the plasma proteins. Intracellular buffers include proteins, organic and inorganic phosphates, and, in red blood cells, hemoglobin.

Acidosis

When the hydrogen ion concentration is increased in body fluids , the three control mechanisms (buffer systems , respiration and kidney activity) endeavor to re-establish a normal pH. If the carbonic acid-bicarbonate ratio can be kept normal by increased respiratory elimination of carbon dioxide and by increased kidney elimination of hydrogen ions and formation of sodium bicarbonate, the pH(and hydrogen ion concentration) is kept within normal range. The condition is said to be compensated acidosis. If the mechanism cannot compensate adequately, a decrease in the carbonic acid: bicarbonate ratio develops , the pH falls below normal (i.e the hydrogen ion concentration rises) and a state of uncompensated acidosis exists.

It can be classified according to the cause as respiratory or metabolic.

Respiratory Acidosis

This condition develops as a result of hypoventilation; the elimination of carbon dioxide does not keep pace with its production. The Paco2 level is elevated and the condition may be referred to as hypercapnia. The level of serum carbonic acid rises above normal and the pH of body fluids decreases. Impaired carbon dioxide excretion by the lungs is usually accompanied by reduced Pao2 (hypoxia) because of the decreased alveolar gas exchange. Since respiratory impairment is the cause of the acidosis , the primary adaptive response is increased renal excretion of acid.

The kidneys respond to the increased level of carbon dioxide by secreting an excess of hydrogen ions , resulting in an increase in sodium bicarbonate in the extracellular fluid. The kidneys also increase their formation and excretion of ammonia , which uses more hydrogen ions and results in hydrogen carbonate production. The serum bicarbonate concentration increases, correcting the carbonic acid –hydrogen carbonate ion ratio and the pH moves towards normal. These renal compensatory responses require one or more days to be effective , provided that there is adequate blood circulation. The compensation is of greater value in acidosis associated with chronic respiratory diseases such as emphysema and bronchiectasis.

Causes

This includes Acute or chronic respiratory disease, circulatory failure, impaired alveolar perfusion, neuromuscular response3s and depression of respiratory center

Clinical manifestations

Clinical signs in acute and chronic respiratory acidosis vary. Sudden hypercapnia (elevated $PaCO_2$) can cause increased pulse and respiratory rate, increased blood pressure, mental cloudiness, and feeling of fullness in the head. An elevated $PaCO_2$ causes cerebrovascular vasodilation and increased cerebral blood flow, particularly when it is higher than 60 mm Hg. Ventricular fibrillation may be the first sign of respiratory acidosis in anesthetized patients.

If respiratory acidosis is severe, intracranial pressure may increase, resulting in papilledema and dilated conjunctival blood vessels. Hyperkalemia may result as hydrogen concentration overwhelms the compensatory mechanisms and moves into cells, causing a shift of potassium out of the cell. Chronic respiratory acidosis occurs with pulmonary diseases such as chronic emphysema and bronchitis, obstructive sleep apnea, and obesity. As long as the $PaCO_2$ does not exceed the body's ability to compensate, the patient will be asymptomatic.

However, if the PaCO2 rises rapidly, cerebral vasodilation will increase intracranial pressure; cyanosis and tachypnea will develop. Patients with chronic obstructive pulmonary disease who gradually accumulate CO2 over a prolonged period (days to months) may not develop symptoms of hypercapnia because compensatory renal changes have had time to occur.

Metabolic Acidosis

This occurs as a result of an excessive production or ingestion of acid or depletion of the hydrogen carbonate base. For example, a patient in a diabetic coma (hyperglycaemia) will metabolize fats to produce energy , producing ketones which are acid and hence a metabolic acidosis may arise.

An adaptive response to the increased hydrogen ion concentration is to increase pulmonary ventilation. Respirations are increased in rate and volume to promote carbon dioxide elimination.

C**auses**

This include increased acid production; such as uncontrolled diabetes mellitus , starvation diet(fat catabolism), alcoholism, lactic acidosis. Increased acid ingestion: excessive administration of ammonium chloride. Decreased urinary output of acid: renal disease, dehydration, shock and hyperkalaemia. Vomiting, diarrhea can also cause it.

C**linical manifestation**

Signs and symptoms of metabolic acidosis vary with the severity of the acidosis. They may include headache, confusion, drowsiness, increased respiratory rate and depth, nausea, and vomiting. Peripheral vasodilation and decreased cardiac output occur when the pH falls below 7. Additional physical assessment findings include decreased blood pressure, cold and clammy skin, dysrhythmias, and shock. Chronic metabolic acidosis is usually seen with chronic renal failure. The bicarbonate and pH decrease slowly; thus, the patient is asymptomatic until the bicarbonate is approximately 15 mEq/L or less.

Assessment and Diagnostic Findings

Arterial blood gas evaluation reveals a pH less than 7.35, a PaCO2 greater than 42 mm Hg, and a variation in the bicarbonate level, depending on the duration of the acidosis in acute respiratory acidosis. When compensation (renal retention of bicarbonate) has fully occurred, the arterial pH may be within the lower limits of normal. Depending on the cause of respiratory acidosis, other diagnostic measures would include monitoring of serum electrolyte levels, chest x-ray for determining any respiratory disease, and a drug screen if an overdose is suspected. An ECG to identify any cardiac involvement as a result of chronic obstructive pulmonary disease may be indicated as well.

Medical Management

Treatment is directed at improving ventilation. Pharmacologic agents can be used such as bronchodilators help reduce bronchial spasm, antibiotics are used for respiratory infections, and thrombolytics or anticoagulants are used for pulmonary emboli. Adequate hydration (2–3 L/day) is indicated to keep the mucous membranes moist and thereby facilitate the removal of secretions. Mechanical ventilation, used appropriately, may improve pulmonary and supplemental oxygen can be used necessary. Patient can also be placed in semi-fowler position to facilitates expansion of the chest wall.

Alkalosis

This is an acid-base imbalance in which there is an increase in the pH in excess of 7.45 due to a carbonic acid deficit or an excessive amount of bicarbonate . It may be classified as respiratory or metabolic.

Respiratory Alkalosis

This disorder is due to an excessive loss of carbonic acid by hyperventilation. Carbon dioxide is being excreted by the lungs in excess of its production. The pH of the blood and the ratio of carbonic acid to bicarbonate are increased. If the condition is prolonged, large amounts of base are excreted by the kidneys, resulting in increased losses of sodium and potassium. There is a corresponding decrease in the excretion of chloride and hydrogen ions. Respiratory alkalosis is always due to hyperventilation, whichcauses excessive "blowing off" of CO2 and, hence, a decrease in theplasma carbonic acid concentration. Causes can include extremeanxiety, hypoxemia, the early phase of salicylate intoxication,gram-negative bacteremia, and inappropriate ventilator settingsthat do not match the patient's requirements.Chronic respiratory alkalosis results from chronic hypocapnia, and decreased serum bicarbonate levels are the consequence.Chronic hepatic insufficiency and cerebral tumors are predisposingfactors.

Clinical Manifestations

Clinical signs consist of lightheadedness due to vasoconstriction and decreased cerebral blood flow, inability to concentrate, numbness and tingling from decreased calcium ionization, tinnitus, and at times loss of consciousness. Cardiac effects of respiratory alkalosis include tachycardia and ventricular and atrial dysrhythmias.

Assessment and Diagnostic Findings

Analysis of arterial blood gases assists in the diagnosis of respiratory alkalosis. In the acute state, the pH is elevated above normal as a result of a low $PaCO_2$ and a normal bicarbonate level. (The kidneys cannot alter the bicarbonate level quickly.) In the compensated state, the kidneys have had sufficient time to lower the bicarbonate level to a near-normal level.

Evaluation of serum electrolytes is indicated to identify any decrease in potassium as hydrogen is pulled out of the cells in exchange for potassium; decreased calcium, as severe alkalosis inhibits calcium ionization, resulting in carpopedal spasms and tetany; or decreased phosphate due to alkalosis, causing an increased uptake of phosphate by the cells. A toxicology screen should be performed to rule out salicylate intoxication.

Medical Management

Treatment depends on the underlying cause of respiratory alkalosis. If the cause is anxiety, the patient is instructed to breathe more slowly to allow CO_2 to accumulate or to breathe into a closed system (such as a paper bag). A sedative may be required to relieve hyperventilation in very anxious patients. Treatment for other causes of respiratory alkalosis is directed at correcting the underlying problem.

Metabolic Alkalosis

This decrease in hydrogen ion concentration and increase in Ph may develop as the result of an abnormal loss of hydrochloric acid from the stomach in vomiting or gastric suctioning , excessive ingestion of alkaline substances (e.g. sodium bicarbonate) or a potassium deficit. The plasma concentration of bicarbonate is elevated with a corresponding increase in the pH and carbonic acid: bicarbonate ratio. Respirations become slow and shallow in an effort to increase the carbonic acid content of the blood. If this is prolonged , it may produce an oxygen deficiency and the patient becomes cyanotic.

Kidney compensation is by conservation of hydrogen and chloride ions and by increased excretion of hydrogen carbonate. Probably the most common cause of metabolic alkalosis is vomiting or gastric suction with loss of hydrogen and chloride ions. The disorder also occurs in pyloric stenosis, in which only gastric fluid is lost. Gastric fluid has an acid pH (usually 1–3); therefore, loss of this highly acidic fluid increases the alkalinity of body fluids. Other situations predisposing to metabolic alkalosis include those associated with loss of potassium, such as diuretic therapy that promotes excretion of potassium (e.g., thiazides, furosemide), and excessive adrenocorticoid hormones (as in hyperaldosteronism and Cushing's syndrome). Hypokalemia produces alkalosis in two ways: (1) the kidneys conserve potassium, and thus H+ excretion increases; and (2) cellular potassium moves out of the cells into the ECF in an attempt to maintain near-normal serum levels (as potassium ions leave the cells, hydrogen ions must enter to maintain electroneutrality). Excessive alkali ingestion from antacids containing bicarbonateor from using sodium bicarbonate during cardiopulmonary resuscitation can also cause metabolic alkalosis.

Clinical Manifestations

Alkalosis is primarily manifested by symptoms related to decreased calcium ionization, such as tingling of the fingers and toes, dizziness, and hypertonic muscles. The ionized fraction of serum calcium decreases in alkalosis as more calcium combines with serum proteins. Because it is the ionized fraction of calcium that influences neuromuscular activity, symptoms of hypocalcemia are often the predominant symptoms of alkalosis. Respirations are depressed as a compensatory action by the lungs. Atria tachycardia may occur. As the pH increases above 7.6 and hypokalemia develops, ventricular disturbances may occur. Decreased motility and paralytic ileus may also occur. Symptoms of chronic metabolic alkalosis are the same as for acute metabolic alkalosis, and as potassium decreases, frequent premature ventricular contractions or U waves are seen on the ECG.

Assessment and Diagnostic Findings

Evaluation of arterial blood gases reveals a pH greater than 7.45 and a serum bicarbonate concentration greater than 26 mEq/L. The $PaCO_2$ increases as the lungs attempt to compensate for the excess bicarbonate by retaining CO_2. Urinary chloride levels may help to identify the cause of metabolic alkalosis if the patient's history provides inadequate information.

Medical Management

Treatment of metabolic alkalosis is aimed at reversing the underlying disorder. Sufficient chloride must be supplied for the kidney to absorb sodium with chloride (allowing the excretion of excess bicarbonate). Treatment also includes restoring normal fluid volume by administering sodium chloride fluids (because continued volume depletion serves to maintain the alkalosis). In patients with hypokalemia, potassium is administered as KCl to replace both K^+ and Cl^- losses. Histamine-2 receptor antagonists, such as cimetidine (Tagamet), reduce the production of gastric HCl, thereby decreasing the metabolic alkalosis associated with gastric suction. Carbonic anhydrase inhibitors are useful in treating metabolic alkalosis in patients who cannot tolerate rapid volume expansion (e.g., patients with heart failure). Because of volume depletion from GI loss, the patient's fluid intake and output must be monitored carefully. Management of chronic metabolic alkalosis is aimed at correcting the underlying acid–base disorder.

3.10 Nursing diagnoses

Fluid volume deficit related to heamorrhage as evidenced by loss of skin tugorFluid volume excess related to renal dysfunction as evidenced by pedal edema.

Hypokalemia, hypochloremia and metabolic alkalosis related to loss of electrolyes as evidenced by vomiting.

4.0 SUMMARY

In this unit you have learnt about

- Distribution of body water, solutes in body water and electrolyte composition of fluid.
- Osmosis , diffusion and filtration
- Mechanism of fluid and electrolyte regulation
- Fluid and electrolyte imbalances with their managements.
- Acid-base balance. (metabolic acidosis and alkalosis , respiratory acidosis and alkalosis.

5.0 TUTOR-MARKED ASSIGNMENT

During your posting visit to the hospital, pick a patient with fluid and electrolyte imbalance, identify three nursing diagnoses and draw a nursing care plan in order of priority.

SELF-ASSESSMENT EXERCISE

i. discuss distribution of body water, solutes in body water and electrolyte composition of the fluids
ii. discuss relevant application of osmosis, diffusion, filtration, and active transport mechanisms in the body.
iii. describe the mechanisms of fluid volume regulation.
iv. plan effective care of patients with fluid and electrolyte imbalances.
v. relate the etiology, clinical manifestations, to nursing interventions in patients with fluid and electrolyte imbalances
vi. describe the mechanisms for maintaining electrolyte and acid-base balance.
vii. compare metabolic acidosis and alkalosis.

viii. compare respiratory acidosis and alkalosis.

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UNIT 3 SHOCK

www.wikipedia.com

CONTENTS

1.0 INTRODUCTION

Shock is a devastating cycle of compensation/decompensation that may progress to an irreversible state wherein death may occur in an otherwise healthy individual. This unit will enable you comprehend what shock entails, pathophysiology, the classification of shock and what measures to take, to care for patients with such conditions.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- describe the pathophysiological mechanism of shock.
- describe factors contributing to the development of shock.
- describe clinical characteristics of shock.
- discuss signs and symptoms of identifying the early indications of shock.
- identify complications of shock.
- plan , implement and evaluate nursing intervention for the person in shock
- discuss the role of the nurse in relation to the early identification, control and management of the person in shock.

3.0 MAIN CONTENT

3.1 Shock

In order to sustain life, the body requires equilibrium or homeostasis. Shock or cardiovascular collapse is the final common pathway for a number of potentially lethal clinical events. The organs of the body must be adequately supplied with blood to enhance their effective functioning in addition to oxygen and nutrients derived by these structures from blood circulation. Regardless of the underlying pathology, shock constitutes systemic hypoperfusion owing to reduction either in cardiac output or in the effective circulating blood volume. The end results are hypotension and subsequent reduction in blood supply to most vital structures in the body (impaired tissue perfusion) and cellular hypoxia. When this occurs, the condition is referred to as shock. Shock affects all body systems. It may develop rapidly or slowly, depending on the underlying cause. During shock, the body struggles to survive, calling on all its homeostatic mechanisms to restore blood flow and tissue perfusion.

Shock is an abnormal physiological state in which there is wide-spread, serious reduction of tissue perfusion that if prolonged will lead to generalized impairment of cellular function. Also is characterized by inadequate tissue perfusion leading to tissue hypoxia and altered cellular metabolism

3.2 Classification of Shock

Shock can be grouped into three general categories (1) hypovolemic shock, (2) cardiogenic shock, or (3) circulatory or distributive shock. Some authors identify a fourth category, obstructiveshock, that results from disorders that cause mechanicalobstruction to blood flow through the central circulatory systemdespite normal myocardial function and intravascular volume.Examples include pulmonary embolism, cardiac tamponade, dissecting aortic aneurysm, and tension pneumothorax. In this discussion, obstructive disorders are discussed as examples of noncoronary cardiogenic shock.

3.3 Normal Cellular Function

Energy metabolism occurs within the cell, where nutrients are chemically broken down and stored in the form of adenosine triphosphate (ATP). Cells use this stored energy to perform necessary functions, such as active transport, muscle contraction, and biochemical synthesis, as well as specialized cellular functions, such as the conduction of electrical impulses. ATP can be synthesized aerobically (in the presence of oxygen) or anaerobically (in the absence of oxygen). Aerobic metabolism yields far greater amounts of ATP per mole of glucose than does anaerobic metabolism and, therefore, is a more efficient and effective means of producing energy. Additionally, anaerobic metabolism results in the accumulation of the toxic end product lactic acid, which must be removed from the cell and transported to the liver for conversion into glucose and glycogen.

3.4 Pathophysiology

In shock, the cells lack an adequate blood supply and are deprived of oxygen and nutrients; therefore, they must produce energy through anaerobic metabolism. This results in low energy yields from nutrients and an acidosis intracellular environment. Because of these changes, normal cell function ceases .The cell swells and the cell membrane becomes more permeable, allowing electrolytes and fluids to seep out of and into the cell. The sodium-potassium pump becomes impaired; cell structures, primarily the mitochondria, are damaged; and death of the cellresults.

3.5 Stages of Shock

i. Compensatory Stage

In the compensatory stage of shock, the patient’s blood pressure remains within normal limits. Vasoconstriction, increased heart rate, and increased contractility of the heart contribute to maintaining adequate cardiac output. This results from stimulation of the sympathetic nervous system and subsequent release of catecholamines (epinephrine and norepinephrine) , activation of rennin-angiotensin axis , and antidiuretic hormone release. The patient displays the often-described “fight or flight” response. The body shunts blood from organs such as the skin, kidneys, and gastrointestinal tract to the brain and heart to ensure adequate blood supply to these vital organs. As a result, the patient’s skin is cold and clammy, bowel sounds are hypoactive, and urine output decreases in response to the release of aldosterone and ADH.

Clinical Manifestations

Despite a normal blood pressure, the patient shows numerous clinical signs indicating inadequate organ perfusion .The result of inadequate perfusion is anaerobic metabolism and a buildup of lactic acid, producing metabolic acidosis. The respiratory rate increases in response to metabolic acidosis. This rapid respiratory rate facilitates removal of excess carbon dioxide but raises the blood pH and often causes a compensatory respiratory alkalosis. The alkalotic state causes mental status changes, such as confusion or combativeness, as well as arteriolar dilation. If treatment begins in this stage of shock, the prognosis for the patient is good.

Medical Management

Medical treatment is directed toward identifying the cause of the shock, correcting the underlying disorder so that shock does not progress, and supporting those physiologic processes. Measures include fluid replacement and medication therapy must be initiated to maintain an adequate blood pressure and reestablish and maintain adequate tissue perfusion.

Nursing Management

- The nurse needs to assess systematically those patients at risk for shock to recognize the subtle clinical signs of the compensatory stage before the patient’s blood pressure drops.
- Monitors for tissue perfusion : In assessing tissue perfusion, the nurse observes for changes in level of consciousness, vital signs (including pulse pressure), urinary output, skin, and serum sodium and blood glucose levels , which may be elevated in response to the release of aldosterone and catecholamines.
- The nurse must also monitor the patient’s hemodynamic status and promptly report deviations to the physician, administer prescribed fluids and medications, and promote patient safety. Vital signs are key indicators of the patient’s hemodynamic status; however, blood pressure is an indirect method of

monitoring tissue hypoxia. Pulse pressure correlates well to stroke volume, the amount of blood ejected from the heart with systole. Pulse pressure is calculated by subtracting the diastolic measurement from the systolic measurement; the difference is the pulse pressure. Normally, the `pulse pressure is 30 to 40 mm Hg Narrowing or decreased pulse pressure is an earlier indicator of shock than a drop in systolic blood pressure. Elevation in the diastolic blood pressure with release of catecholamines and attempts to increase venous return through vasoconstriction is an early compensatory mechanism in response to decreased stroke volume, blood pressure, and overall cardiac output. Additionally, the nurse assesses the response of the patient and the family to the crisis and to treatment.

- Reducing of anxiety : The nurse should also provide measures in reducing patient anxiety at this stage such as providing brief explanations about the diagnostic and treatment procedures, supporting the patient during those procedures, and providing information about their outcomes are usually effective in reducing stress and anxiety and thus promoting the patient's physical and mental well-being when patient experience shock.
- Promoting Safety: The nurse should ensure such patients are closely observed in order not to disrupt intravenous lines and catheters and complicate their condition because some might experience confusion.

ii. Progressive Stage

If the underlying causes are not corrected, shock passes imperceptibly to the progressive phase during which there is widespread tissue hypoxia. In the setting of persistent oxygen deficit, intracellular aerobic respiration is replaced by anaerobic glycolysis with excessive production of lactic acid. The resultant metabolic lactic acidosis lowers the tissue PH and blunts the vasomotor response: arterioles dilate and blood begins to pool in the microcirculation. Peripheral pooling not only worsens the cardiac output but also puts endothelial cells at risk for developing disseminated intravascular coagulation (DIC). With widespread tissue hypoxia, vital organs are affected and begin to fail; clinically the patient may become confused and urinary output declines.

iii. Irreversible Stage

Unless there is intervention, the process eventually enters an irreversible stage. The irreversible (or refractory) stage of shock represents the point along the shock continuum at which organ damage is so severe that the patient does not respond to treatment and cannot survive. Despite treatment, blood pressure remains low. Complete renal and liver failure, compounded by the release of necrotic issue toxins, creates an overwhelming metabolic acidosis. Anaerobic metabolism contributes to a worsening lactic acidosis. Reserves of ATP are almost totally depleted, and mechanisms for storing new supplies of energy have been destroyed. There is also multiple organ dysfunction progressing to complete organ failure and death is imminent. Multiple organ dysfunctions can occur as a progression along the shock continuum or as a syndrome unto itself.

3.6 Classification of Shock

i. Hypovolemic Shock

This occurs as a result of the loss of intravascular fluid (inside blood vessels) volume, which may be caused by hemorrhage , dehydration due to vomiting and diarrhea , loss of plasma in burns ,inadequate fluid intake and excessive use of diuretics, which results in decreased venous return of blood to the heart and subsequent decreased ventricular filling and decreased ventricular filling results in decreased stroke volume (amount of blood ejected from the heart) and decreased cardiac output. When cardiac output drops, blood pressure drops and tissues cannot be adequately perfused.

Medical Management

Major goals in treating hypovolemic shock are to (1) restore intravascular volume to reverse the sequence of events leading to inadequate tissue perfusion, (2) redistribute fluid volume, and (3) correct the underlying cause of the fluid loss as quickly as possible.

- Treating of the underlying cause: Here , patients are treated based on the cause such as If the cause of the hypovolemia is diarrhea or vomiting, medications to treat diarrhea and vomiting are administered .
- Fluid and blood replacement: This is ultimate goal of hypovolemic shock. Fluid regimen or blood transfusion must be administered intravenously, depending on the severity in order to restore the intravascular volume . Fluids used in the management of shock includes; Lactated Ringer’s and 0.9% sodium chloride solutions are isotonic crystalloid fluids commonly used in treating hypovolemic shock). Large amounts of fluid must be administered to restore intravascular volume because isotonic crystalloid solutions move freely between the fluid compartments of the body and do not remain in the vascular system. Colloids (e.g., albumin, hetastarch, and dextran) may also be used. Dextran is not indicated if the cause of the hypovolemic shock is hemorrhage because it interferes with platelet aggregation. Blood products, also colloids, may need to be administered, when the cause of the hypovolemic shock is hemorrhage. Because of the

risk of transmitting blood borne viruses and the scarcity of blood products, however, these products are used only if other alternatives are unavailable or blood loss is extensive and rapid. Packed red blood cells are administered to replenish the patient's oxygen-carrying capacity in conjunction with other fluids that will expand volume. Current recommendations are to base the need for transfusions on the patient's oxygenation needs, which are determined by vital signs, blood gas values, and clinical appearance rather than using an arbitrary laboratory value. Synthetic forms of blood (i.e., compounds capable of carrying oxygen in the same way that blood does) are potential alternatives.

- Pharmacologic therapy: If fluid administration fails to reverse hypovolemic shock, then the same medications given in cardiogenic shock are used because unreversed hypovolemic shock progresses to cardiogenic shock. If the underlying cause of the hypovolemia is dehydration, medications are also administered to reverse the cause of the dehydration. , antidiarrheal agents for diarrhea and antiemetic medications for vomiting.

Nursing Management:

- Nursing care focuses on assisting with treatment targeted at treating its cause and restoring intravascular volume.
- General nursing measures include ensuring safe administration of prescribed fluids and medications and documenting their administration and effects
- The nurse administers oxygen via nasal cannula or face mask and monitors the concentration.
- Another important nursing role is monitoring for signs of complications and side effects of treatment and reporting these signs early in treatment
- . Proper positioning (modified Trendelenburg) for the patient who shows signs of shock must be ensure and the lower extremities are elevated to an angle of about 20 degrees; the knees are straight, the trunk is horizontal, and the head is slightly elevated.
- The nurse has a vital role to play in administering blood and fluids safely; She is expected to ensure blood specimens are quickly obtained and grouping and cross match done in anticipation of blood transfusions. Then she monitors vital signs quarter hourly and observe patient who receives a transfusion of blood products for adverse effects. Fluid replacement complications can occur, often when large volumes are

administered rapidly. Therefore, the nurse monitors the patient closely for cardiovascular overload and pulmonary edema.

- The nurse also monitors hemodynamic pressure, vital signs, arterial blood gases, hemoglobin and hematocrit levels, and fluid intake and output are among the parameters monitored.
- The patient's temperature should also be monitored closely to ensure that rapid fluid resuscitation does not precipitate hypothermia. Intravenous fluids may need to be warmed during the administration of large volumes.
- Physical assessment must be done focusing on observing the jugular veins for distention and monitoring jugular venous pressure. Jugular venous pressure is low in hypovolemic shock; it increases with effective treatment and is significantly increased with fluid overload and heart failure.
- The nurse needs to monitor cardiac and respiratory status closely and report changes in blood pressure, pulse pressure, heart rate, rhythm, and lung sounds to the physician.

ii. Cardiogenic Shock

Cardiogenic shock occurs when the heart's ability to contract and to pump blood is impaired and the supply of oxygen is inadequate for the heart and tissues. This type of shock is often associated with acute myocardial infarction, usually involving at least 40% of the left ventricle. The vascular system and circulating volume are intact but the pumps action is inadequate to maintain tissue perfusion. The causes of cardiogenic shock are known as either coronary or noncoronary. Coronary cardiogenic shock is more common than noncoronary cardiogenic shock and is seen most often in patients with myocardial infarction. Coronary cardiogenic shock occurs when a significant amount of the left ventricular myocardium has been destroyed. Non-coronary causes can be related to severe metabolic problems (severe hypoxemia, acidosis, hypoglycemia, and hypocalcemia) and tension pneumothorax.

Pathophysiology: In cardiogenic shock, cardiac output, which is a function of both stroke volume and heart rate, is compromised. When stroke volume and heart rate decrease or become erratic, blood pressure drops and tissue perfusion is compromised. Along with other tissues and organs being deprived of adequate blood supply, the heart muscle itself receives inadequate blood. The result is impaired tissue perfusion. Because impaired tissue perfusion weakens the heart and impairs its ability to pump blood forward, the ventricle does not fully eject its volume of blood at systole. As a result, fluid accumulates in the lungs. This sequence of events can occur rapidly or over a period of days.

Patients with this condition may experience angina pain and develop dysrhythmias and hemodynamic instability.

Management
The goals of medical management are to (1) limit further myocardial damage and preserve the healthy myocardium and (2) improve the cardiac function by increasing cardiac contractility, decreasing ventricular after load and also increase oxygen supply to the heart muscle is the ultimate goal. The following can be done for patients with cardiogenic shock.

Oxygen Supply: In the early stages of shock, supplemental oxygen is administered by nasal cannula at a rate of 2 to 6 L/min to achieve an oxygen saturation exceeding 90%. Monitoring arterial blood gas values and pulse oximetry values helps to indicate whether the patient requires a more aggressive method of oxygen delivery.

Pain Relief: Analgesics can be given such as morphine sulfate, administered intravenously for pain relief. In addition to relieving pain, morphine dilates the blood vessels , reduces the workload of the heart by both decreasing the cardiac filling pressure (preload) and reducing the pressure against which the heart muscle has to eject blood (afterload) and at the same time relieves the patient's anxiety.

Fluid Therapy: In addition to medications, appropriate fluid is necessary in treating cardiogenic shock. Administration of fluids must be monitored closely to detect signs of fluid overload. Incremental intravenous fluid boluses are cautiously administered to determine optimal filling pressures for improving cardiac output. **Note**: A fluid bolus should never be given quickly because rapid fluid administration in patients with cardiac failure may result in acute pulmonary edema. The nurse has a critical role in safe and accurate administration of intravenous fluids. Fluid overload and pulmonary edema are risks because of ineffective cardiac function and accumulation of blood and fluid in the pulmonary tissues. The nurse documents and records fluid intake and output.

Hemodynamic Monitoring: This is usually done by the intensive care unit whereby Arterial line is inserted which enables accurate and continuous monitoring of blood pressure and provides a port from which to obtain frequent arterial blood samples without having to perform repeated arterial punctures and a multilumen pulmonary artery catheter is inserted to allow measurement of the pulmonary artery pressures, myocardial filling pressures, cardiac output, and pulmonary and systemic resistance. The nurse observes the arterial and venous puncture sites for bleeding and pressure must be applied at the sites if bleeding occurs.

Pharmacologic Therapy

Vasoactive medication can be administered , two classification are usually administered sympathomimetic agents and vasodilators the such as dobutamine, dopamine, and nitroglycerin can be administered . In coronary cardiogenic shock, the aims of vasoactive medication therapy are improved cardiac contractility, decreased preload and afterload, or stable heart rate. Sympathomimetic medications increase cardiac output by mimicking the action of the sympathetic nervous system through vasoconstriction, resulting in increased preload, and by increasing myocardial contractility (inotropic action) or increasing the heart rate (chronotropic action) while Vasodilators are used to decrease preload and afterload, thus reducing the workload of the heart and the oxygen demand. For example Dobutamine (Dobutrex) produces inotropic effects by stimulating myocardial beta receptors, increasing the strength of myocardial activity and improving cardiac output. It enhances the strength of cardiac contraction, improving stroke volume ejection and overall cardiac output. Other vasoactive medications include: norepinephrine (Levophed), epinephrine (Adrenalin), milrinone (Primacor), amrinone (Inocor), vasopressin (Pitressin), and phenylephrine (Neo-Synephrine). Each of these medications stimulates different receptors of the sympathetic nervous system. A combination of these medications may be prescribed, depending on the patient’s response to treatment. Diuretics such as furosemide (Lasix) may be administered to reduce the workload of the heart by reducing fluid accumulation .Antiarrhythmic medication is also part of the medication regimen in cardiogenic shock , which are used to stabilize heart rate. The nurse is expected to give patient the right dosage, right drug at the right time and via the right route to the right patient and document. The nurse needs to be knowledgeable about the desired effects as well as the side effects of medications and report if it occurs to the physician. . For example, it is important for the nurse to monitor the patient for decreased blood pressure after administering morphine or nitroglycerin. The patient receiving thrombolytic therapy must be monitored for bleeding.

The following activities are expected to be carried out by the nurse in the management of patient with cardiogenic shock:

- Assess the neurologic status after administration of thrombolytictherapy to assess for the potential complication of cerebralhemorrhage associated with the therapy.

- Intravenous infusionsmust be observed closely because tissue necrosis and sloughingmay occur if vasopressor medications infiltrate the tissues.
- Monitoring of urineoutput, BUN, and serum creatinine levels to detectdecreased renal function secondary to the effects of cardiogenicshock or its treatment.
- The nurse must ensure safety; enhance comfort, and reducing anxiety by administering medication to relieve chest pain, preventinginfection at the multiple arterial and venous line insertionsites, protecting the skin, and monitoring respiratory function.
- Ensure properpositioning of the patient promotes effective breathingwithout decreasing blood pressure and may also increase the patient'scomfort while reducing anxiety.

iii. Circulatory Shock

Circulatory also known as distributive shock can be defined as a relative hypovalemia because of loss of vascular tone or integrity. The blood or fluid volume and pump are intact, but the pipes are too large. It occurs when blood volume is abnormally displaced in the vasculature—for example, when blood volume pools in peripheral blood vessels. The displacement of blood volume causes a relative hypovolemia because not enough blood returns to the heart, which leads to subsequent inadequate tissue perfusion. Therefore, circulatory shock can be caused either by a loss of sympathetic tone or by release of biochemical mediators from cells.

Circulatory shock can be further classified into: (1) **s**eptic shock, (2) neurogenic shock, and(3) anaphylactic shock.

iv. Septic Shock

Septic shock is the most common type of circulatory shock and is caused by widespread infection. The most common causative microorganisms of septic shock are the gram-negative bacteria such as Escherichia Coli, Klebsiella, Pseudomona Aeuginosa.. When a microorganism invades body tissues, the patient exhibits an immune response which provokes the activation of biochemical mediators associated with an inflammatory response and produces a variety of effects leading to shock. Increased capillary permeability, which leads to fluid seeping from the capillaries, and vasodilation are two such effects that interrupt the ability of the body to provide adequate perfusion, oxygen, and nutrients to the tissues and cells.

The greatest risk of sepsis occurs in patients with bacteremia (bloodstream) and pneumonia. Other infections that may progress to septic shock include intra-abdominal infections, wound infections, bacteremia associated with intravascular catheters and indwelling urinary catheters. Additional risk factors that contribute to the growing incidence of septic shock are the increased awareness and identification of septic shock; the increased number of immune compromised patients (due to malnutrition, alcoholism, malignancy, and diabetes mellitus); the increased incidence of invasive procedures and indwelling medical devices; the increased number of resistant microorganisms; and the increasingly older population. The incidence of septic shock can be reduced by debriding wounds to remove necrotic tissue and carrying out infection control practices, including the use of meticulous aseptic technique, properly cleaning and maintaining equipment, and using thorough hand-hygiene techniques.

Septic shock typically occurs in **two phases**:

- **Phase one**

It is referred to as the hyperdynamic, progressive phase, is characterized by a high cardiac output with systemic vasodilation. The blood pressure may remain within normal limits. The heart rate increases, progressing to tachycardia. The patient becomes hyperthermic and febrile, with warm, flushed skin and bounding pulses. The respiratory rate is elevated. Urinary output may remain at normal levels or decrease. Gastrointestinal status may be compromised as evidenced by nausea, vomiting, diarrhea, or decreased bowel sounds. The patient may exhibit subtle changes in mental status, such as confusion or agitation. The later phase, referred to as the hypodynamic, irreversible phase, is characterized by low cardiac output with vasoconstriction, reflecting the body's effort to compensate for the hypovolemia caused by the loss of intravascular volume through the capillaries. In this phase, the blood pressure drops and the skin is cool and pale. Temperature may be normal or below normal. Heart and respiratory rates remain rapid. The patient no longer produces urine, and multiple organ dysfunctions progressing to failure develops.

Medical Management

Current treatment of septic shock involves identifying and eliminating the cause of infection. Specimens of blood, sputum, urine, wound drainage, and invasive catheter tips are collected forCulture using aseptic technique. Any potential routes of infection must be eliminated. Intravenous lines are removed and reinserted at other body sites. Antibiotic-coated intravenous central lines may be placed to decrease the risk of invasive line-related bacteremia in high-risk patients, such as the elderly. If possible, urinary catheters are removed. Any abscesses are drained and necrotic areas debrided. Fluid replacement must be instituted to correct the hypovolemia that results from the incompetent vasculature and inflammatory response. Crystalloids, colloids, and blood products may be administered to increase the intravascular volume.

Pharmacologic Therapy

If the infecting organism is unknown, broad-spectrum antibiotic agents are started until culture and sensitivity reports are received .A third-generation cephalosporin plus an aminoglycoside may be prescribed initially. This combination works against most gram-negative and some gram-positive organisms. When culture and sensitivity reports are available, the antibiotic agent may be changed to one that is more specific to the infecting organism and less toxic to the patient.

Nutritional Therapy

Aggressive nutritional supplementation is critical in the management of septic shock because malnutrition further impairs the patient's resistance to infection. Nutritional supplementation should be initiated within the first 24 hours of the onset of shock. Enteral feedings are preferred to the parenteral route because of the increased risk of iatrogenic infection associated with intravenous catheters; however, enteral feedings may not be possible if decreased perfusion to the gastrointestinal tract reduces peristalsis and impairs absorption.

Nursing Management

The nurse caring for any patient in any setting must keep in mind the risks of sepsis and the high mortality rate associated with septic shock. All invasive procedures must be carried out with aseptic technique after careful hand hygiene. Additionally, intravenous lines, arterial and venous puncture sites, surgical incisions, traumatic wounds, urinary catheters, and pressure ulcers are monitored for signs of infection in all patients.

The nurse identifies patients at particular risk for sepsis and septic shock (i.e., elderly and immune suppressed patients or patients with extensive trauma or burns or diabetes), keeping in mind that these high-risk patients may not develop typical or classic signs of infection and sepsis.
The nurse should also collaborate with other members of the health care team to identify the site and source of sepsis and the specific organisms involved. Appropriate specimens for culture and sensitivity are often obtained by the nurse.

Elevated body temperature (hyperthermia) is common with sepsis and raises the patient's metabolic rate and oxygen consumption, fighting infections. Thus, an elevated temperature may not be treated unless it reaches dangerous levels (more than 40°C [104°F]) or unless the patient is uncomfortable. Efforts may be made to reduce the temperature by administering acetaminophen , tepid sponged or applying hypothermia blankets. During these therapies, the nurse monitors the patient closely for shivering, which increases oxygen consumption. Efforts to increase comfort are important. The nurse also monitors blood levels (antibiotic agent, BUN, creatinine, white blood count) including fluid intake and output and reports increased levels to the physician.

v. Neurogenic Shock

In neurogenic shock, vasodilation occurs as a result of a loss of sympathetic tone. This can be caused by spinal cord injury, spinal anesthesia, severe pain, or nervous system damage. It can also result from the depressant action of medications such as barbiturate injection, extreme fright or lack of glucose (e.g., insulin reaction or shock). Neurogenic shock may have a prolonged course (spinal cord injury) or a short one (syncope or fainting). It is characterized by dry, warm skin rather than the cool, moist skin seen in hypovolemic shock. Another characteristic is bradycardia, rather than the tachycardia that characterizes other forms of shock.

Medical Management

Treatment of neurogenic shock involves restoring sympathetic tone either through the stabilization of a spinal cord injury or, in the instance of spinal anesthesia, by positioning the patient properly. However, specific treatment of neurogenic shock depends on its cause.

Nursing management

Elevation and maintaining the head of the bed at least 30 degrees to prevent neurogenic shock when a patient is receiving spinal or epidural anesthesia ,this will help to prevent the spread of the anesthetic agent up the spinal cord. Immobilization must be done in patient suspected to have spinal cord injury, to prevent further damage to the spinal cord. Applying elastic compression stockings and elevating the foot of the bed may minimize pooling of blood in the legs. Pooled blood increases the risk for thrombus formation. Therefore, the nurse needs to check the patient daily for any redness, tenderness, warmth of the calves, and positive Homans' sign (calf pain on dorsiflexion of the foot). To elicit Homans' sign, the nurse lifts the patient's leg, flexing it at the knee and dorsiflexing the foot. If the patient complains of pain in the calf, the sign is positive and suggestive of deep vein thrombosis. Administering heparin or low-molecular-weight heparin (Lovenox) as prescribed, applying elastic compression stockings,or initiating pneumatic compression of the legs may prevent thrombus formation Passive range of motion of the immobile extremities will help in promoting circulation.

Patients who have experienced a spinal cord injury may not report pain caused by internal injuries. Therefore, in the immediate Post injury period, the nurse must monitor the patient closely for signs of internal bleeding that could lead to hypovolemic shock.

vi. Anaphylactic Shock

Anaphylactic shock is caused by a severe allergic reaction(to drugs ,insect ,food or pollens etc) when a patient who has already produced antibodies to a foreign substance (antigen) develops a systemic antigen–antibody reaction. Initial introduction of an antigen into the body results in the production of an antibody specific to that antigen. Subsequent presentations of the antigen may induce the physiological reactions that characterize anaphylaxis. Antibody response releases histamines, bradykinins and other vasoactive substances. In combination, these substances produce vasodilation, increased capillary permeability and sever bronchoconstriction. Because anaphylactic shock occurs in patients already exposed to an antigen who have developed antibodies to it, it can often be prevented. Therefore, patients with known allergies need to understand the consequences of subsequent exposure to the antigen and should wear medical identification that lists their sensitivities. This could prevent inadvertent administration of a medication that would lead to anaphylactic shock.

Medical Management

Treatment of anaphylactic shock requires removing the causative antigen (e.g., discontinuing an antibiotic agent), administering medications that restore vascular tone, and providing emergency support of basic life functions. Epinephrine is given for its vasoconstrictive action. Diphenhydramine (Benadryl) is administered to reverse the effects of histamine, thereby reducing capillary permeability. These medications are given intravenously. Nebulized medications, such as albuterol (Proventil), may be given to reverse histamine-induced bronchospasm. If cardiac arrest and respiratory arrest are imminent or have occurred, cardiopulmonary resuscitation is performed. Endotracheal intubation or tracheotomy may be necessary to establish an airway. Intravenous lines are inserted to provide access for administering fluids and medications.

Nursing Management

The nurse has an important role in preventing anaphylactic shock: assessing all patients for allergies or previous reactions to antigens (e.g., medications, blood products, foods, contrast agents, latex) and communicating the existence of these allergies or reactions to other healthcare team. Additionally, the nurse assesses the patient’s understanding of previous reactions and steps taken by the patient and family to prevent further exposure to antigens. When new allergies are identified, the nurse advises the patient to wear or carry identification that names the specific allergen or antigen. When administering any new medication, the nurse observes the patient for an allergic reaction. This is especially important with intravenous medications. If the elderly patient reports an allergy to a medication, the nurse must be aware of the risks involved in the administration of similar medications. In the hospital and outpatient diagnostic testing sites, thenurse must identify patients at risk for anaphylactic reactions to contrast agents (radiopaque, dye-like substances that may contain iodine) used for diagnostic tests. These include patients with a known allergy to iodine or fish or those who have had previous allergic reactions to contrast agents. This information must be conveyed to the staff at the diagnostic testing site, including x-ray personnel. The nurse must be knowledgeable about the clinical signs of anaphylaxis, must take immediate action if signs and symptoms occur, and must be prepared to begin cardiopulmonary resuscitation if cardiorespiratory arrest occurs. In addition to monitoring the patient's response to treatment, the nurse assists with intubation if needed, monitors the hemodynamic status, ensures intravenous access for administration of medications, administersprescribed medications and fluids, and documents treatments and their effects. After recovery from anaphylaxis, the patient and family require an explanation of the event. Further, the nurse provides instruction about avoiding future exposure to antigens and administering emergency medications to treat anaphylaxis.

3.7 Complications of Shock

Alteration in tissue perfusion account for the overt complication of shock throughout the body. Damage to the larger organ systems as well as to microcirculation may progress to the point where it is irreversible and death ensues. Complications of shock include:

i. Respiratory Effects

The lungs, which become compromised early in shock, are affected at this stage. Subsequent decompensation of the lungs increases the likelihood that mechanical ventilation will be neededif shock progresses. Respirations are rapid and shallow. Crackles are heard over the lung fields. Decreased pulmonary blood flow causes arterial oxygen levels to decrease and carbon dioxide levels to increase. Hypoxemia and biochemical mediators cause an intense inflammatory response and pulmonary vasoconstriction, perpetuating the pulmonary capillary hypoperfusion and hypoxemia. The hypoperfused alveoli stop producing surfactant and subsequently collapse. Pulmonary capillaries begin to leak their contents, causing pulmonary edema, diffusion abnormalities (shunting), and additional alveolar collapse. Interstitial inflammation and fibrosis are common as the pulmonary damage progresses. This condition is sometimes referred to as acute respiratory distress syndrome (ARDS), acute lung injury (ALI), shock lung, or noncardiogenic pulmonary edema.

iiCardiovascular Effects

A lack of adequate blood supply leads to dysrhythmias and ischemia. The patient has a rapid heart rate, sometimes exceeding 150 bpm. The patient may complain of chest pain and even suffer a myocardial infarction. In addition, myocardial depression and ventricular dilation may further impair the heart's ability to pump enough blood to the tissues to meet oxygen requirements.

i. Neurologic Effects

As blood flow to the brain becomes impaired, the patient's mental status deteriorates. Changes in mental status occur as a result of decreased cerebral perfusion and hypoxia; the patient may initially exhibit confusion or a subtle change in behavior, lethargy increases, loss of consciousness may occur and pupils dilate.

ii. Renal Effects

When the MAP falls below 80 mm Hg ,n the glomerular filtration rate of the kidneys cannot be maintained, and drastic changes in renal function occur. Acute renal failure (ARF) can develop. ARF is characterized by an increase in blood urea nitrogen (BUN) and serum creatinine levels, fluid and electrolyte shifts, acid–base imbalances, and a loss of the renal hormonal regulation of blood pressure. Urinary output usually decreases to below 0.5/mL/kg per hour (or below 30 mL per hour) but can be variable depending on the phase of ARF.

iii. Hepatic Effects

Decreased blood flow to the liver impairs the liver cells' ability to perform metabolic and phagocytic functions. Consequently, the patient is less able to metabolize medications and metabolic waste products, such as ammonia and lactic acid. The patient becomes more susceptible to infection as the liver fails to filter bacteria from the blood. Liver enzymes (aspartate aminotransferase [AST]; alanine aminotransferase [ALT] ; lactate dehydrogenase) and bilirubin levels are elevated, and the patient appears jaundiced.

iv. Gastrointestinal Effects

Gastrointestinal ischemia can cause stress ulcers in the stomach, placing the patient at risk for gastrointestinal bleeding. In the small intestine, the mucosa can become necrotic and slough off,causing bloody diarrhea.

Beyond the local effects of impaired perfusion, gastrointestinal ischemia leads to bacterial toxin translocation, in which bacterial toxins enter the bloodstream through the lymph system. In addition to causing infection, bacterial toxins can cause cardiac depression, vasodilation, increased capillary permeability, and an intense inflammatory response with activation of additional biochemical mediators. The net result is interference with healthy cells and their ability to metabolize nutrients

v. Hematologic Effects

The combination of hypotension, sluggish blood flow, metabolic acidosis, and generalized hypoxemia can interfere with normal hemostatic mechanisms. Disseminated intravascular coagulation. (DIC) can occur either as a cause or as a complication of shock. In this condition, widespread clotting and bleeding occur simultaneously. Bruises (ecchymoses) and bleeding (petechiae) may appear in the skin. Coagulation times (prothrombin time, partial thromboplastin time) are prolonged. Clotting factors and platelets are consumed and require replacement therapy to achieve hemostasis.

3.8 Nursing diagnosis associated with patients with shock

- Altered tissue perfusion
- Impaired gas exchange
- Altered level of consciousness related to diminished perfusion of the central nervous system
- Alteration in comfort related to pain , immobility , anxiety

4.0 SUMMARY

In this unit, you have learnt

- Definition of shock and classification of shock
- Pathophysiology of shock
- Nursing management of shock
- Complications of shock

5.0 TUTOR-MARKED ASSIGNMENT

In the hospital where you work, identify any patient with shock indicating the type and draw a nursing care plan to manage the patient.

SELF-ASSESSMENT EXERCISE

i. describe the pathophysiological mechanism of shock.
ii. describe factors contributing to the development of shock.

iii. describe clinical characteristics of shock.
iv. discuss signs and symptoms of identifying the early indications of shock.
v. identify complications of shock.
vi plan , implement and evaluate nursing intervention for the person in shock
vii. discuss the role of the nurse in relation to the early identification, control and management of the person in shock

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UNIT 4 STRESS

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CONTENTS

1.0 INTRODUCTION

You are welcome to this unit. I know one way or the other you have undergone stress, this unit will help you to understand the concept of stress and how to manage it.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- Relate the principles of internal constancy, homeostasis, stress, and adaptation to the concept of steady state.

- Identify the significance of the body's compensatory mechanisms in promoting adaptation and maintaining the steady state.
- Identify physiologic and psychosocial stressors.
- Compare the sympathetic-adrenal-medullary response to stress to the hypothalamic-pituitary response to stress.
- Describe the general adaptation syndrome as a theory of adaptation to biologic stress.
- Discuss the nursing management of stress.

3.0 MAIN CONTENT

3.1 Stress

When the body is threatened or suffers an injury, its response may involve functional and structural changes; these changes may be adaptive (having a positive effect) or maladaptive (having a negative effect). The defense mechanisms that the body exhibits determine the difference between adaptation and maladaptation — health and disease.

3.2 Stress and Adaptation

Stress is a difficult term to define while some people use it to describe feelings ,others use it to describe the source of their feelings. Despite the difficulty in defining stress , some definition abound. Engel defines stress as "all processes, whether originating in the eternal environment or within the person which impose a demand or requirement upon the organism ,the resolution or handling of which necessitates work or activity of the mental apparatus before any other system is involved or activated. Stress according to coleman refers to the adjustive demands made upon the individual to the problems in living , with which he must cope if he is to meet his needs.

Stress is a state produced by a change in the environment that is perceived as challenging, threatening, or damaging to the person's dynamic balance or equilibrium. The person is, or feels, unable to meet the demands of the new situation. The change or stimulus that evokes this state is the stressor. The nature of the stressor is variable; an event or change that will produce stress inone person may be neutral for another, and an event that produces stress at one time and place for one person may not do so for the same person at another time and place. A person appraisesand copes with changing situations. The desired goal is adaptation, or adjustment to the change so that the person is again in equilibrium and has the energy and ability to meet new demands.

This is the process of coping with the stress, a compensatory process with physiologic and psychological components. Adaptation is a constant, ongoing process that requires a change in structure, function, or behavior so that the person is better suited to the environment; it involves an interaction between the person and the environment. The outcome depends on the degreeof “fit” between the skills and capacities of the person, the type of social support available, and the various challenges or stressors being confronted. As such, adaptation is an individual process: each individual has varying abilities to cope or respond.

As new challenges are met, this ability to cope and adapt can change, thereby providing the individual with wide range of adaptive ability. Adaptation occurs throughout the life span as theindividual encounters many developmental and situational challenges, especially related to health and illness. The goal of these encounters is to promote adaptation. In situations of health and illness, this goal is realized by optimal wellness. Because both stress and adaptation may exist at different levels of a system, it is possible to study these reactions at the cellular, tissue, and organ levels. Biologists are concerned mainly with subcellular components or with subsystems of the total body. Adaptation is a continuous process of seeking harmony in an environment. The desired goals of adaptation for any system are survival, growth, and reproduction.

3.3 Stress and Function

Physiology is the study of the functional activities of the living organism and its parts. pathophysiology is the study of disordered function of the body. Each different body system performs specific functions to sustain optimal life for the organism. Mechanisms for adjusting internal conditions promote the normal steady state of the organism and ultimately its survival. These mechanisms are compensatory in nature and work to restore balance in the body. An example of this restorative effort is the development of rapid breathing (hyperpnea) after intense exercise in an attempt to compensate for an oxygen deficit and excess lactic acid accumulated in the muscle tissue. Pathophysiologic processes result when cellular injury occurs at such a rapid rate that the body’s compensatory mechanisms can no longer make the adaptive changes necessary to remain healthy. An example of a pathophysiologic change is the development ofheart failure: the body reacts by retaining sodium and water and increasing venous pressure, which worsens the condition. These pathophysiologic mechanisms give rise to signs that are observed by the patient, nurse, or other health care provider, or symptoms that are reported by the patient. These observations, plus a sound knowledge of physiologic and pathophysiologic processes, can assist in determining the existence of a problem and can guide the nurse in planning the appropriate course of action.

3.4 Common Reactions to Stress

- Disbelief and shock
- Fear and anxiety
- Loss of interest in normal activities
- Crying
- Sleep problems
- Headaches
- Sadness
- Feeling powerless

3.5 Dynamic Balance: The Steady State

Physiologic mechanisms must be understood in the context of the body as a whole. The person, as a living system, has both an internal and an external environment, between which informationand matter are continuously exchanged. Within the internal environment each organ, tissue, and cell is also a system or subsystem of the whole, each with its own internal and external environment, each exchanging information and matter. The goal of the interaction of the body's subsystems is to produce a dynamic balance or **steady state** (even in the presence of change), so that all subsystems are in harmony with each other. Four concepts—constancy, homeostasis, stress, and adaptation— enhance the nurse's understanding of steady state.

Rene Jules Dubos (1965) provided further insight into the dynamic nature of the internal environment with his theory that two complementary concepts, homeostasis and adaptation, werenecessary for balance. Homeostatic processes occurred quickly in response to stress, rapidly making the adjustments necessary to\ maintain the internal environment. Adaptive processes resulted in structural or functional changes over time. Dubos also emphasized that acceptable ranges of response to stimuli existed and that these responses varied for different individuals: "Absolute constancy is only a concept of the ideal." Homeostasis and adaptation were both necessary for survival in a changing world. Homeostasis, then, refers to a steady state within the body. When a change or stress occurs that causes a body function to deviate from its stable range, processes are initiated to restore and maintain the dynamic balance. When these adjustment processes or compensatory mechanisms are not adequate, the steady state is threatened, function becomes disordered, and pathophysiologic mechanisms occur. The pathophysiologic processes can lead to disease and may be active during disease, which is a threat to the steady state. Disease is an abnormal variation in the structure or function of any part of the body. It disrupts function and therefore limits the person's freedom of action.

3.6 Stressors: Threats to the Steady State

Each person operates at a certain level of adaptation and regularly encounters a certain amount of change. Such change is expected; it contributes to growth and enhances life. Stressors, however, can upset this equilibrium. A stressor may be defined as an internal or external event or situation that creates the potential for physiologic, emotional, cognitive, or behavioral changes in an individual.

Types of Stressors

Stressors exist in many forms and categories. They may be described as physical, physiologic, or psychosocial. Physical stressors include cold, heat, and chemical agents; physiologic stressors include pain and fatigue. Examples of psychosocial stressors are fear of failing an examination and losing a job. Stressors can also occur as normal life transitions that require some adjustment,such as going from childhood into puberty, getting married, or giving birth.

Stressors have also been classified as: (1) day-to-day frustrations or hassles; (2) major complex occurrences involving large groups, even entire nations; and (3) stressors that occur less frequently and involve fewer people. The first group, the day-to-day stressors, includes such common occurrences as getting caught in a traffic jam, experiencing computer downtime, and having an argument with a spouse or roommate. These experiences vary in effect; for example, encountering a rainstorm while one is vacationing at the beach will most likely evoke a more negative response than it might at another time. These less dramatic, frustrating, and irritating events—daily hassles—have been shown to have a greater health impact than major life events because of the cumulative effect they have over time. They can lead to high blood pressure, palpitations, or other physiologic problems.

The second group of stressors influences larger groups of people, possibly even entire nations. These include events of history, such as terrorism and war, which are threatening situations when experienced either directly, in the war zone, or indirectly, as through live news coverage. The demographic, economic, and technological changes occurring in society also serve as stressors.

The tension produced by any stressor is sometimes a result not only of the change itself, but also of the speed with which the change occurs.
The third group of stressors has been studied most extensively and concerns relatively infrequent situations that directly affect the individual. This category includes the influence of life eventssuch as death, birth, marriage, divorce, and retirement. It also includes the psychosocial crises described by Erikson as occurring in the life cycle stages of the human experience. More enduring chronic stressors have also been placed in this category and may include such things as having a permanent functional disability or coping with the difficulties of providing long-term care to a frail elderly parent.
A stressor can also be categorized according to duration. It may be

- An acute, time-limited stressor, such as studying for final examinations
- A stressor sequence—a series of stressful events that result from an initial event such as job loss or divorce
- A chronic intermittent stressor, such as daily hassles
- A chronic enduring stressor that persists over time, such as chronic illness, a disability, or poverty

3.7 Stress as a Stimulus for Disease

Holmes and Rahe developed life events scales that assign numerical values, called life-change units, to typical life events. Because the items in the scales reflect events that require a change in a person's life pattern, and stress is defined as an accumulation of changes in one's life that require psychological adaptation, one can theoretically predict the likelihood of illness by checking off the number of recent events and deriving a total score. People typically experience distress related to alterations in their physical and emotional health status, changes in their level of daily functioning, and decreased social support or the loss of significant others. Fears of immobilization, isolation, loneliness, sensory changes, financial problems, and death or disability increase a person's anxiety level.

Loss of one's role or perceived purpose in life can cause intense discomfort. Any of these identified variables plus a myriad of other conditions or overwhelming demands are likely to cause ineffective coping, and a lack of necessary coping skills is often a source of additional distress for an individual. When a person endures prolonged or unrelenting suffering, the outcome is frequently the development of a stress-related illness. Nurses possess the skills to assist people to alter their distressing circumstances and manage their responses to stress.
There are different responses to stress:

i. Psychological Responses to Stress

After the recognition of a stressor, an individual consciously or unconsciously reacts to manage the situation. This is called the mediating process. A theory developed by Lazarus emphasizescognitive appraisal and coping as important mediators of stress. Appraisal and coping are influenced by antecedent variables that include the internal and external resources of the person.

Cognitive appraisal is a process by which an event is evaluated with respect to what is at stake (primary appraisal) and what might and can be done (secondary appraisal). What individuals see as being at stake is influenced by their personal goals, commitments, or motivations. Important factors include how important or relevant the event is to them, whether the event conflicts with what they want or desire, and whether the situation threatens their own sense of strength and ego identity. As an outcome of primary appraisal, the situation is identified as either nonstressful or stressful. If nonstressful, the situation is irrelevant or benign (positive). A stressful situation may be one of three kinds:

(1) One in which harm or loss has occurred;
(2) One that is threatening, in that harm or loss is anticipated; and
(3) One that is challenging, in that some opportunity or gain is anticipated. Secondary appraisal is an evaluation of what might and can be done about this situation Actions include assigning blame to those responsible for a frustrating event, thinking about whether one can do something about the situation (coping potential), and determining future expectancy, or whether things are likely to change for better or worse (A comparisonof what is at stake and what can be done about it (a type of risk–benefit analysis) determines the degree of stress. Reappraisal, a change of opinion based on new information, also occurs. The appraisal process is not necessarily sequential; primary and secondary appraisal and reappraisal may occur simultaneously. Information learned from an adaptational encounter can be stored, so that when a similar situation is encountered again the whole process does not need to be repeated. The appraisal process contributes to the development of an emotion. Negative emotions such as fear and anger accompany harm/loss appraisals, and positive emotions accompany challenge.

In addition to the subjective component or feeling that accompanies a particular emotion, each emotion also includes a tendency to act in a certain way. For example, an unexpected quiz in theclassroom might be judged as threatening by unprepared students. They might feel fear, anger, and resentment and might express these emotions outwardly with hostile behavior or comments.

Lazarus expanded his former ideas about stress, appraisal, and coping into a more complex model relating emotion to adaptation.

Coping, with stressful event according to Lazarus, consists of the cognitive and behavioral efforts made to manage the specific external or internal demands that tax a person's resources and may be emotion focused or problem-focused. Coping that is emotion focused seeks to make the person feel better by lessening the emotional distress felt. Problem-focused coping aims to make direct changes in the environment so that the situation can be managed more effectively. Both types of coping usually occur in a stressful situation. Even if the situation is viewed as challenging or beneficial, coping efforts may be required to develop and sustain the challenge— that is, to maintain the positive benefits of the challenge and to ward off any threats. In harmful or threatening situations, successful coping reduces or eliminates the source of stress and relieves the emotion it generated.

Appraisal and coping are affected by internal characteristics such as health, energy, personal belief systems, commitments or life goals, self-esteem, control, mastery, knowledge, problem solving skills, and social skills. The health-promoting lifestyle buffers the effect of stressors. From a nursing practice standpoint, this outcome— buffering the effect of stressors—supports nursing's goal of promoting health. In many circumstances, promoting a healthy lifestyle is more achievable than altering the stressors.

ii. Physiologic Response to Stress

The physiologic response to a stressor, whether it is a physical stressor or a psychological stressor, is a protective and adaptive mechanism to maintain the homeostatic balance of the body. The stress response is a "cascade of neural and hormonal events that have short- and long-lasting consequences for both brain and body ; a stressor is an event that challenges homeostasis, with a disease outcome being looked upon as a failure of the normal process of adaptation to the stress"

iii. Sympathetic Nervous System Response

The sympathetic nervous system response is rapid and short-lived. Norepinephrine is released at nerve endings that are in direct contact with their respective end organs to cause an increase in function of the vital organs and a state of general body arousal. The heart rate is increased and peripheral **vasoconstriction** occurs, raising the blood pressure. Blood is also shunted away fromabdominal organs. The purpose of these activities is to provide better perfusion of vital organs (brain, heart, skeletal muscles). Blood glucose is increased, supplying more readily available energy. The pupils are dilated, and mental activity is increased; a greater sense of awareness exists. Constriction of the blood vessels of the skin limits bleeding in the event of trauma. The person is likely to experience cold feet, clammy skin and hands, chills, palpitations, and a knot in the stomach. Typically, the person appears tense, with the muscles of the neck, upper back, andShoulders tightened; respirations may be rapid and shallow, with the diaphragm tense.

iv. Sympathetic-Adrenal-Medullary Response

In addition to its direct effect on major end organs, the sympathetic nervous system also stimulates the medulla of the adrenal gland to release the hormones epinephrine and norepinephrine into the bloodstream. The action of these hormones is similar to that of the sympathetic nervous system and have the effect of sustaining and prolonging its actions. Epinephrine and norepinephrine are catecholamines that stimulate the nervous system and produce metabolic effects that increase the blood glucose level by the sympathetic nervous system and the hypothalamic–pituitary–adrenocortical axis. The responses are mutually reinforcing, at both the central and peripheral levels. Negative feedback by cortisol also can limit an over response that might be harmful to the individual. There can also be increased heart rate, blood pressure, etc.

v. Hypothalamic-Pituitary Response

The longest-acting phase of the physiologic response, which is more likely to occur in persistent stress, involves the hypothalamic pituitary pathway. The hypothalamus secretes corticotrophin releasing factor, which stimulates the anterior pituitary to produce ACTH. ACTH in turn stimulates the adrenal cortex to produce **glucocorticoids**, primarily cortisol. Cortisol stimulates protein catabolism, releasing amino acids; stimulates liver uptake of amino acids and their conversion to glucose (**gluconeogenesis**); and inhibits glucose uptake (anti-insulin action) by many body cells but not those of the brain and heart. These cortisol-induced metabolic effects provide the body with a ready source of energy during a stressful situation. This effect has some important implications. For example, a person with diabetes who is under stress, such as that caused by an infection, needs more insulin than usual. Any patient who is under stress (caused, for example, by illness, surgery, trauma or prolonged psychological stress) catabolizes body protein and needs supplements. Children subjected to severe stress have retarded growth.

The actions of the catecholamines (epinephrine and norepinephrine) and cortisol are the most important in the general response to stress. Other hormones released are **antidiuretic hormone(ADH)** from the posterior pituitary and aldosterone from the adrenal cortex. ADH and aldosterone promote sodium and water retention, which is an adaptive mechanism in the event ofhemorrhage or loss of fluids through excessive perspiration. ADH has also been shown to influence learning and may thus facilitate coping in new and threatening situations. Secretion of growth hormone and glucagon stimulates the uptake of amino acids by cells, helping to mobilize energy resources. Endorphins, which are endogenous opiates, increase during stress and enhance the threshold for tolerance of painful stimuli. They may also affect mood and have been implicated in the so-called "high" that long distance runners experience. The secretion of other hormones is also affected, but their adaptive function is less clear.

vi. Immunologic Response

Research findings show that the immune system is connected to the neuroendocrine and autonomic systems. Lymphoid tissue is richly supplied by autonomic nerves capable of releasing a number of different neuropeptides that can have a direct effect on leukocyte regulation and the inflammatory response. Neuroendocrine hormones released by the central nervous system andendocrine tissues can inhibit or stimulate leukocyte function. The wide variety of stressors people experience may result in different alterations in autonomic activity and subtle variations in neurohormone and neuropeptide synthesis. All of these possible autonomic and neuroendocrine responses can interact to initiate, weaken, enhance, or terminate an immune response.

3.8 Maladaptive Responses to Stress

The stress response, which, as indicated earlier facilitates adaptation to threatening situations, has been retained from our evolutionary past. The "fight-or-flight" response, for example, is ananticipatory response that mobilized the bodily resources of our ancestors to deal with predators and other harsh factors in their environment. This same mobilization comes into play in responseto emotional stimuli unrelated to danger. For example, a person may get an "adrenaline rush" when competing over a decisive point in a ball game, or when excited about attending a party. When the responses to stress are ineffective, they are referred to as maladaptive.Maladaptive responses are chronic, recurrent responses or patterns of response over time that do not promote the goals of adaptation. The goals of adaptation are somatic or physical health (optimal wellness); psychological health or having a sense of well-being (happiness, satisfaction with life, morale); and enhanced social functioning, which includes work, social life, and family (positive relationships). Maladaptive responses that threaten these goals include faulty appraisals and inappropriate coping . The frequency, intensity, and duration of stressful situations contribute to the development of negative emotions and subsequent patterns of neurochemical discharge. By appraising situations more adequately and coping more appropriately, it is possible to anticipate and defuse some of these situations. For example, frequent potentially stressful encounters (e.g., marital discord) might be avoided with better communication and problem solving, or a pattern of procrastination (e.g., delaying work on tasks) could be corrected to reduce stress when deadlines approach. Coping processes that include the use of alcohol or drugs to reduce stress increase the risk of illness. Other inappropriate coping patterns may increase the risk of illness less directly.

The General Adaptation Syndrome

Hans Selye developed a theory of adaptation that profoundly influenced the scientific study of stress. In 1936, Selye, experimenting with animals, first described a syndrome consisting of enlargement of the adrenal cortex; shrinkage of the thymus, spleen, lymph nodes, and other lymphatic structures; and the appearance of deep, bleeding ulcers in the stomach and duodenum. He identified this as a nonspecific response to diverse, noxious stimuli. From this beginning, he developed a theory of adaptation to biologic stress that he named the general adaptation syndrome.

- **Phases of the General Adaptation Syndrome**

The general adaptation syndrome has three phases: alarm, resistance, and exhaustion.

a) State of Alarm Phase

During the alarm phase, the sympathetic “fight-or-flight” response is activated with release of catecholamines and the onset of the adrenocorticotropic hormone(ACTH**)**–adrenal cortical response. The alarm reaction is defensive and anti-inflammatory but self-limited. Because living in a continuous state of alarm would result in death, the person moves into the second stage, resistance. During this stage, adaptation to the noxious stressor occurs, and cortisol activity is still increased. If exposure to the stressor is prolonged, exhaustion sets in and endocrine activity increases. This produces deleterious effects on the body systems (especially the circulatory, digestive, and immune systems) that can lead to death. Stages one and two of this syndrome are repeated, in different degrees, throughout life as the person encounters stressors.

Selye compared the general adaptation syndrome with the life process. During childhood, there are too few encounters with stress to promote the development of adaptive functioning, andthe child is vulnerable. During adulthood, the person encounters a number of life's stressful events and develops a resistance or adaptation. During the later years, the accumulation of life's stressors and the wear and tear on the organism again deplete the person's ability to adapt, resistance falls, and eventually death occurs.

b. State of Resistance

This stage can be referred to as state of adaptation. It is characterized by the following: Weight returns to normal, Adrenal cortex becomes smaller, Lymph gland returns to normal, Hormone levels are constant. At this stage nerves and glands aid body tissue in resisting the stress.

c. State of Exhaustion

In this state the tissue surrenders to stress. This state is brought about as a result of overwhelming intensity of the stressful situation or when multiple stressors affect the body simultaneously or the stressors are applied repeatedly. Resistance and adaptation depend upon the ability to re-establish a proper balance in the internal milieu. It is important to note the stages one and two are experienced repeatedly throughout lifetime. For learning, growth ,development and survival to occur ,the person must experience and cope experience and cope effectively with stresses. Mental and physical activities, emotions and relationship with others are in and of themselves stressful and unavoidable.

3.9 Indicators of Stress

Indicators of stress and the stress response include both subjective and objective measures. They are psychological, physiologic, or behavioral and reflect social behaviors and thought processes. Some of these reactions may be coping behaviors. Over time, each person tends to develop a characteristic pattern of behavior during stress that is a warning that the system is out of balance. Laboratory measurements of indicators of stress have helpedin understanding this complex process. Among the measures,blood and urine analysis can be used to demonstrate changes inhormonal levels and hormonal breakdown products. Reliable measures of stress include blood levels of catecholamines, corticoids, ACTH, and eosinophils. The serum creatine/creatinine ratio and elevations of cholesterol and free fatty acids can also be measured. Immunoglobulin assays, increased in blood pressure, heart rate may be also be determined . In addition to using laboratory tests, researchers have developed questionnaires to identify and assess stressors, stress, and coping strategies Such as a stress profile measurement tool.

3.10 Stress Management: Nursing Interventions

Stress or the potential for stress is ubiquitous; that is, it is everywhere and anywhere at once. Anxiety, frustration, anger, and feelings of inadequacy, helplessness, or powerlessness are emotions often associated with stress. In the presence of these emotions, the customary activities of daily living may be disrupted; for example, a sleep disturbance may be present, eating and activity patterns may be altered, and family processes or role performance may be disrupted.

Many nursing diagnoses are possible for patients suffering from stress. One nursing diagnosis related to stress is Anxiety, which is defined as a vague, uneasy feeling, the source of which may be nonspecific or not known to the person. Stress may also be manifested as ineffective coping patterns, impaired thought processes, or disrupted relationships. These human responses are reflected in the nursing diagnoses of Impaired adjustment, Ineffective coping, Defensive coping, and Ineffective denial, all of which indicate poor adaptive responses. Other possible nursing diagnoses include Social isolation, Risk for impaired parenting, Spiritual distress, Readiness for family coping, Decisional conflict, Situational low self-esteem, and Powerlessness, among others. Because human responses to stress are varied, as are the sources of stress, arriving atan accurate diagnosis allows interventions and goals to be more specific and leads to improved outcomes. Stress management is directed toward reducing and controllingstress and improving coping. Nurses might use these methodsnot only with their patients but also in their own lives. Theneed to prevent illness, improve the quality of life, and decreasethe cost of health care makes efforts to promote health essential,and stress control is a significant health-promotion goal. Stress reductionmethods and coping enhancements can derive fromeither internal or external sources. For example, adopting healthyeating habits and practicing relaxation techniques are internal resourcesthat help to reduce stress; developing a broad social networkis an external resource that helps reduce stress.

4.0 SUMMARY

In this unit you have learnt about what stress is, causes of stress, stress and adaptation, maladaptative response to stress, general adaptation syndrome (i.e. physiologic response to stress) and nursing management of stress.

5.0 TUTOR-MARKED ASSIGNMENT

1. Search the Internet for tools that can be used to measure levels of stress. Adopt one and use it to stress level of 10 persons. Counsel your respondents on stress management. Report your findings on the discussion forum.

SELF-ASSESSMENT EXERCISE

i. Relate the principles of internal constancy, homeostasis, stress, and adaptation to the concept of steady state.
ii. Identify the significance of the body's compensatory mechanisms in promoting adaptation and maintaining the steady state.
iii. Identify physiologic and psychosocial stressors.
iv. Compare the sympathetic-adrenal-medullary response to stress to the hypothalamic-pituitary response to stress.
v. Describe the general adaptation syndrome as a theory of adaptation to biologic stress.
vi. Discuss the nursing management of stress

6.0 REFERENCES/FURTHER READING

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UNIT 5 TEMPERATURE CONTROL

CONTENTS

1.0 INTRODUCTION

You must have learnt in foundation of nursing what body temperature is, stages of fever, and how to take body temperature using your procedure manual. However, this unit will help you have an understanding of temperature control mechanism, types of fever, how to identify deviation from normal body temperature and how to care for patients with disorders of body temperature.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- define body temperature
- identify sites of measuring body temperature.
- identify the normal average and range of body temperature
- describe heat production and dissipation
- describe temperature control mechanism
- explain factors increasing and decreasing heat production
- explain in details the causes , clinical manifestation and nursing management of hypothermia and hyperthermia
- use the nursing process as a framework for the care of patients with temperature disorders.

3.0 MAIN CONTENT

3.1 Temperature Control

Temperature is a state of heat or coldness within a substance which can be measured against a standard scale. Body temperature results from the balance between heat produced and acquired by the body and the amount lost. Normally, the body maintains a relatively constant core temperature within the range of 36 – 37 degree centigrade regardless of the environmental temperature. For this reason, man is classified as homothermic or warm-blooded as opposed to the poikilothermic or cold- blooded species whose body temperature fluctuates with variations in the environmental temperature.

3.2 Heat Production and Dissipation

Increased production of heat e.g. after an exercise is compensated by increasing heat loss (sweating), while a fall in body temperature leads to increased heat production and attempts to conserve heat. Heat is generated in the body by chemical reactions within the cells. The more active the tissue, the greater is its production of heat as a result; especially large amounts of heat are produced by the muscles and liver. Heat production is dependent upon cellular activity and biochemical reaction (metabolism) increase as body temperature increases. A decrease in body temperature slows the rate of cellular activity, decreasing heat production.

Normally, an excess of het is produced within the body and must be eliminated to maintain a normal temperature. The excess is dissipated by the physical processes of radiation, convention conduction and evaporation.

Radiation is the process by which radiant energy is transmitted from one object to another without direct contact. The heat is carried from one object to the other in form of rays. For example the use of heat lamp involves the transfer of heat by radiation.

Conduction is the transfer of heat between two objects that are in contact. Heat is passes from the warmer object to the colder e.g. contact between skin of increased temperature and cold water, swimming or cold showers.

Convention is heat loss through convention when air currents pass over a warm object, carrying its heat away from them such as using of fans, open doors and windows. Finally, if the environmental temperature is equal to or greater than that of the body, then heat dissipation becomes completely dependent on the evaporation process.

3.3 Temperature Control Mechanism

Temperature regulating mechanisms are essential to prevent the damaging effects on body tissues by extremes of heat and cold. Regulation of body temperature is co –ordinated by the hypothalamic thermostat. Body temperature is maintained at a constant level, or set point, which varies only about 1 degree centigrade throughout the day. Responses to changes in the body temperature are evoked by sensory nerve impulses that originate in temperature receptors in the skin and by direct effect of the blood temperature on the preoptic area of the hypothalamus, and possibly from other receptors in the body core. Receptors cells that are sensitive to heat and cold are located in the skin. When changes in the cutaneous temperature occur the receptors, give rise to nerve impulses that are delivered to the cerebral cortex and hypothalamus of the brain. Those that reach the cerebral cortex make the individual conscious of the temperature change. Behavioral responses aid in correcting the change may then be produced. For example, if experiencing the sensation of cold, the individual may voluntarily increase muscle activity to generate more heat or seek a warmer environment or in the hot environment, responses might be to decrease activity in order to lower heat production and change to lighter clothing to permit more radiation. In the anterior portion of the hypothalamus is a group of neurons referred to as thermostatic or heat-regulating centre. This centre responds to cutaneous temperature impulses and to changes in temperature of the blood. When body temperature rises above normal, noradrenergic impulses responsible for peripheral vasoconstriction are reduced, resulting in passive dilation of the cutaneous blood vessels; pseudomotor nerves stimulate the sweat glands. Heat production is decreased by the inhibition of shivering and decreased production of thyroxine , adrenaline and noradrenaline. If the normal body temperature is threatened by a reduction in body heat, the centre imitates impulses which reduce heat loss and increase production of heat. Superficial blood vessels constrict, secretion by the sweat glands is inhibited, shivering and non- shivering thermogenesis occurs.

3.4 Sites and normal ranges of measuring body temperature

- No single temperature is normal for all people.
- The average of normal oral temperature is 37C.

- The acceptable temperature of human being ranges from 36 c – 37 C.
- The normal range of oral temperature is 36.1c – 37.5 C.
- The normal range of rectal temperature is 36.1c– 38.1 C.
- The normal range of axillary temperature is 35.5–36.4 C.
- The normal range of tympanic temperature is 36.4 C - 38.1C.

3.5 Factors Increasing heat Production

1. **Muscular activity**: leads to an increase in tissue metabolism which in turn increases heat production, e.g. shivering, muscular exercises.
2. **Ingestion of food**: by increasing the fuel supply, body heat is increase.
3. **Time of day**: Body temperature tends to be at its highest in the late afternoon or early evening
4. **Emotion:** stimulate the sympathetic nervous system with release of epinephrine and nor epinephrine, which increases the metabolic activities of body tissues which in turn increases heat production.
5. **Hormones:** increase in the production of thyroxin by the thyroid gland increases basal metabolic rate thereby stimulates heat production.
6. **Infections or diseases:** cause increase in body temperature. Infection is the most common cause of elevated body temperature. Mental confusion, cardiovascular, neural and endocrine and respiratory disorders, dehydration and physical trauma all interfere with thermoregulation
7. **Increased temperature of the environment:** high room temperature or a hot water bath mayincrease body temperature. Extremes of heat and cold in the environment affect body temperature. The body acclimatizes to cold through adaptive changes, including increased thyroid activity and metabolism and reduction in visible shivering.
8. **Menstruation and pregnancy**: At a time of ovulation a woman's body temperature may raise as much as 0.3oC. It falls again one or two days before the onset of menstruation. The first 3 to 4 months of pregnancy are characterised by a slight rise of the temperature, then falls slightly below normal for the remainder of the pregnancy. It returns to normal after child birth.

3.6 Factors Decreasing heat Production

1. **Prolonged illness:** muscular activity is diminished and less heat is produced.

2. **Fasting:** an inadequate supply of food or fuel leads to decreased heat production.
3. **Sleep:** during sleep, when the body is less active, less heat is produced and body temperature is lowered.
4. **Depression of the nervous system:** mental depression, unconsciousness and the use of Narcotic drugs, all act to lessen body activity and thus, decrease heat production.
5. **Time of day:** body temperature tends to be at its lowest in the morning
6. **Age:** the body temperature of young children tends to vary more than that of adults. This is due to the relative immaturity of the child's nervous system. In the aged the temperature is subnormal because the body is less active, the circulation is feeble, and therefore, old people are intolerable extremes of external temperature.

3.7 Disorders of body Temperature

Disorders of body temperature may be either elevation or reduction of temperature above or below normal range.

1. **Hyperthermia:** This is an elevation of body temperature above normal. It is a manifestation of tissue injury or disorder that results in an increase in heat production in excess of the rate of dissipation or in an impairment of heat –dissipating or control mechanism.

Causes of Hyperthermia

- Invasion of micro-organisms and inflammation due to any other cause.
- Toxic conditions
- Continuous pain
- Infection caused by micro-organisms such as pneumonia or wound infection etc
- Extreme nervousness.
- Emotional stress.

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Types of fever:

- Constant fever (continuous fever): Temperature remains constantly elevated and fluctuates very little (1.2 °C) within twenty –four hour period
- Remittent: There are variations of more than 1.1 degree centigrade(2 degree Fahrenheit) in twenty –four hours ,but the lowest temperature does not reach normal within the period.
- Intermittent

This type may be also called hectic or swinging , the temperature swinging from normal or subnormal to moderate or high pyrexia at intervals of one ,two , or three days. There is a variation of more than 1.1 degree centigrade between high and low temperature, the lowest being normal or below normal.

- Irregular

This type of pyrexia does not come into any other clearly defined group but may show some of the characteristics of some or all of them.

Clinical manifestations

The onset of hyperthermia or fever may be sudden and rapid or rise in body heat may develop gradually. If elevation is moderate and gradual, the patient may experience slight chillness for a brief period, general malaise and headache. With a sudden and greater degree of stimulation of the centre, the patient may have chills. Nausea and vomiting can also occur. The patient skin becomes hot and flushed and he or she may complain of feeling hot. If temperature rises above 40.5degree centigrade, cellular damage can occur. The hypothalamus may lose its capacity for temperature regulation resulting in progressive increase in fever until death

Nursing Management

- Increasing the rate of heat loss by exposing the patient, removing extra clothing or fanning should be done.
- The nurse should ensure the patient receives the prescribed antibiotic regimen accurately and ensure aseptic techniques are used for all procedure.
- The nurse should support the patient psychologically
- Tepid sponging and cold drink can be offered to patient to reduce temperature
- Fluid and food intake must be ensured because of increase metabolism associated with pyrexia places extra demand upon the patient's resources.
- The nurse can administer prescribed antipyretic drugs and chart

2. **Hypothermia:** This is a condition in which, response to exposure to a cold environment, the patients temperature falls below normal. This process may be exacerbated by a loss of thermoregulation, typically seen in neonates or the elderly.

Causes

- Extreme exposure to cold
- Lowered metabolism.
- . Decreased activity usually occurs in elderly.
- . Heavy sedation.

- Circulatory failure

Clinical manifestation
The familiar response of shivering is associated with the early stages of hypothermia. , as core temperature falls below 34 degree centigrade, this mechanism ceases progressive muscle weakness ensues. This coupled with deterioration in mental status , makes the person less able to care for himself or herself. Cold and clammy skin, chills, Circulatory collapse and shock may also occur.

Nursing Management
- Monitoring of vital signs is very important and charted
- Rewarming: This should be carried out gradually because too rapid rewarming can result in circulatory collapse. This can be done by offering hot drinks, removing of extra linen , close of door and nearby windows etc.
- Activities can also be increased to generate heat.
- Patient should be psychologically supported and nursing care must be evaluated in order to check patient progress.

Nursing diagnosis.
Hyperthermia related to inflammatory response.
Hypothermia related to inflammatory response.

4.0 SUMMARY

In this unit, you have learnt:
i. definition of body temperature and sites of measuring body temperature.
ii. temperature range , heat production and dissipation.
iii. mechanism of temperature control and factors increasing and decreasing heat production.
iv. the causes , clinical manifestation and nursing management of hypothermia and hyperthermia.

5.0 TUTOR-MARKED ASSIGNMENT

In the hospital where you work, using your procedure manual, identify a patient with disordersof body temperature, take the temperature of that patient and report your findings and draw a nursingcare plan for the patient.

SELF-ASSESSMENT EXERCISE

i. define body temperature.

ii. identify sites of measuring body temperature. Identify the normal average and range of body temperature.
iii. describe heat production and dissipation
iv. describe temperature control mechanism.
v. explain factors increasing and decreasing heat production.
vi. explain in details the causes, clinical manifestation and nursing management of hypothermia and hyperthermia.

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WWW.NURFAC.MANS.EDU.EG / BODY TEMPERATURE

UNIT 6 PAIN

CONTENTS

1.0 INTRODUCTION

Have you ever experienced pain or you have encountered someone who had experienced pain. If, yes or no this unit will help you to understand what pain is, what people go through when they experience pain and what measures to take as a nurse, to care for patients experiencing pain.

2.0 OBJECTIVES

At the end of this unit, you will be able to:

- differentiate between acute pain, chronic pain, and cancer pain.
- describe the path physiology of pain.
- describe factors that can alter the perception of pain.
- explain the physiologic basis of pain relief interventions.
- discuss when opioid tolerance may be a problem.
- identify appropriate pain relief interventions
- use the nursing process as a framework for the care of patients with pain.

3.0 MAIN CONTENT

3.1 Pain

Pain is a complex distressing experience involving sensory, emotional and cognitive components. The intensity of and quality of pain varies with individual and are influenced by psychological and socio-cultural factors. Pain plays an important protective role; one progressively learns from early childhood to avoid situations which cause pain. When sensation is lost in an area of the body, as it is in spinal cord injury , the lack of awareness of injury and the absence of normal protective responses may lead to extensive tissue damage. Nurses encounter patients in pain in a variety of settings, including acute care, outpatient, and long-term care settings, as well as in the home. Thus, they must have the knowledge and skills to assess pain, to implement pain relief strategies, and to evaluate the effectiveness of these strategies, regardless of setting.

3.2 Fifth Vital Sign

Pain management is considered such an important part of care that the American Pain Society coined the phrase "Pain: The 5th Vital Sign". Documentation of pain assessment is now as prominent as the documentation of the "traditional" vital signs. Calling pain the fifth vital sign suggests that the assessment of pain should be as automatic as taking a patient's blood pressure and pulse. The nurse collaborates with other health care professionals while administering most pain relief interventions, evaluating their effectiveness, and serving as patient advocate when the intervention is ineffective. In addition, the nurse serves as an educator to the patient and family, teaching them to manage the pain relief regimen themselves when appropriate. A broad definition of pain is "whatever the person says it is, existing whenever the experiencing person says it does". This definition emphasizes the highly subjective nature of pain and pain management. The patient is the best authority on the existence of pain. Therefore, validation of the existence of pain is based on the patient's report that it exists.

Sources or Causes of Pain
This can be described under 3 classifications;

Physical causes : this sources of pain can be from external and or internal environment. Noxious stimuli applied directly to the body create a pain sensation which originates from a damaged or irritated nerve endings as well as the body's secondary response to damage. For example, application of direct heat or cold to the skin can cause pain. The presence of hemorrhage and fluid in the area can produce pressure on the nerve endings and cause pain.

Psychological causes: There are several potential psychologic causes of pain, an example is individual inability to handle stressful situation which then manifest in form of pain. Pain of psychologic sources can be emotional response to or an attempt to cope with a threat to individual's functioning.

Environmental causes: Pain resulting from environmental sources has received less attention in the past but recently the influence of noise and high frequency sound causes pain sensation. This stimulus serves to intensify pain intensity.

Types of Pain

Pain is categorized according to its duration, location, and etiology. Three basic categories of pain are generally recognized: acute pain, chronic (nonmalignant) pain, and cancer-related pain.

i. Acute Pain

Usually of recent onset and commonly associated with a specific injury, acute pain indicates that damage or injury has occurred. Pain is significant in that it draws attention to its existence and teaches the person to avoid similar potentially painful situations. If no lasting damage occurs and no systemic disease exists, acute pain usually decreases along with healing. For purposes of definition, acute pain can be described as lasting from seconds to 6 months. However, the 6 month time frame has been criticized as inaccurate since many acute injuries heal within a few

Weeks and most heal by 6 weeks. In a situation where healing is expected in 3 weeks and the patient continues to suffer pain, it should be considered chronic and treated with interventions used for chronic pain. Waiting for the full 6-month time frame in this example could cause needless suffering.

Effects of acute pain

Unrelieved acute pain can affect the pulmonary, cardiovascular, gastrointestinal, endocrine, and immune systems. The stress response ("neuroendocrine response to stress") that occurs with trauma also occurs with other causes of severe pain. The widespread endocrine, immunologic, and inflammatory changes that occur with stress can have significant negative effects. This is particularly harmful in patients compromised by age, illness, or injury. The stress response generally consists of increased metabolic rate and cardiac output, impaired insulin response, increased production of cortisol, and increased retention of fluids. The stress response may increase the patient's risk for physiologic disorders (e.g. myocardial infarction, pulmonary infection, thromboembolism, and prolonged paralytic ileus). The patient with severe pain and associated stress may be unable to take a deep breath and may experience increased fatigue and decreased mobility. Although these effects may be tolerated by a young, healthy person, they may hamper recovery in an elderly, debilitated, or critically ill person. Effective pain relief may result in a faster recovery and improved outcomes.

ii. Chronic (Non-Malignant) Pain

Chronic pain is constant or intermittent pain that persists beyond the expected healing time and that can seldom be attributed to a specific cause or injury. It may have a poorly defined onset, and it is often difficult to treat because the cause or origin may be unclear.. Chronic pain may be defined as pain that lasts for 6 months or longer, although 6 months is an arbitrary period for differentiating between acute and chronic pain. An episode of pain may assume the characteristics of chronic pain before 6 months have elapsed, or some types of pain may remain primarily acute in nature for longer than 6 months. Nevertheless, after 6 months, most pain experiences are accompanied by problems related to the pain itself. Chronic pain serves no useful purpose. If it persists, it may become the patient’s primary disorder.

Effects of chronic pain

Like acute pain, chronic pain also has adverse effects. Suppression of the immune function associated with chronic pain may promote tumor growth. Also, chronic pain often results in depression and disability. Although health care providers express concern about the large quantities of opioid medications required to relieve chronic pain in some patients, it is safe to use large doses of these medications to control progressive chronic pain. Patients with a number of chronic pain syndromes report depression, anger, and fatigue .The patient may be unable to continue the activities and interpersonal relationships he or she engaged in before the pain began. Disabilities may range from curtailing participation in physical activities to being unable to take care of personal needs, such as dressing or eating. The nurse needs to understand the effects of chronic pain on the patient and family and needs to be knowledgeable about pain relief strategies and appropriate resources to assist effectively with pain management.

iii. Cancer-Related Pain

Pain associated with cancer may be acute or chronic. Pain resulting from cancer is so ubiquitous that after fear of dying, it is the second most common fear of newly diagnosed cancer patients.

Pain in the patient suffering from cancer can be directly associated with the cancer (e.g., bony infiltration with tumor cells or nerve compression), a result of cancer treatment (e.g., surgery or radiation), or not associated with the cancer (e.g., trauma). Most pain associated with cancer, however, is a direct result of tumor involvement.

- **Pain Classified by Location**

Pain is sometimes categorized according to location, such as pelvic pain, headache, and chest pain. This type of categorization is helpful in communicating and treating pain. For example, chest pain suggests angina or a myocardial infarction and indicates the need for treatment according to cardiac care standards.

- **Pain Classified by Etiology**

Categorizing pain according to etiology is another way to think about pain and its management. Burn pain and post herpetic neuralgia are examples of pain described by their etiology. Clinicians often can predict the course of pain and plan effective treatment using this categorization.

3.3 Pain Mechanism

The structures essential for the pain sensation are receptors that are sensitive to pain stimuli, impulse pathways to and within the central nervous system (brain and spinal cord) , and areas within the brain for perception , interpretation and the initiation of responses.

A wide variety of stimuli evoke pain; these stimuli may be classified as mechanical (e.g. pressure from a blow or distention) , thermal 9 extremes of heat or cold) or chemicals (e.g. chemicals released by injured cells or micro-organism.) prostaglandins are chemical agents released by damaged tissues which act as powerful pain stimuli. Many stimuli are non-specific but elicit pain through their intensity. For instance, light pressure produces an awareness of touch but increasing the intensity of pressure causes pain. Similarly heat and cold must reach a certain intensity to stimulate pain receptors.

3.4 Pain Impulse Pathways

The sensory or afferent, nerve fibers, whose bare terminal branches form the pain receptors, provide pathways to conduct the impulses into the spinal cord or brain stem. Motor or efferent nerve fibers transmit impulses from the central nervous system to peripheral structures. These sensory nerve fibers are of two types :some have a fatty insulating sheath (myelin) and are classified as A delta fibers; the others are non – myelinated and designated C fibres. The myelinated fibres transmit the impulses very rapidly . A sudden pain-producing stimulus causes two-pain sensations. The impulses transmitted by the myelinated fibres produce the sharp, pricking localized pain that is felt immediately when the injury occurs. While the non –myelinated fibres conduct more slowly and are responsible for the more diffuse, throbbing pain , burning type of pain or ache that follows the immediate sharp pain associated with the initial injury.

The gate control theory explains the physiology of pain. Impulses can be prevented from reaching the transmission cells of the posterior column by the action of the substantiagelatinosa cells ,which are said to " close the gate ". Whether or not the gate is open to permit the conduction of impulses through the posterior horn cells and hence to higher levels is dependent upon the nature of the impulses delivered to the substantiagelatinosa , which is an area of special neurons located close to each posterior column of grey matter and extending the length of the spinal cord. When cutaneous impulses aroused by such stimuli as vibration , scratching , cold and heat are transmitted by large fibres in the afferent nerve they can negate the input of the fibres of smaller diameter, i.e. they close the gate. It remains open to impulses transmitted by small fibres. The gate control theory establishes a basis for the following procedures in lessening pain and suffering ; use of sensory input such as distraction and guided imagery, reducing fear and lowering the level of anxiety , patient teaching about the cause and relief of pain , massage and heat applications , electrical stimulation and acupuncture.

3.5Pain Response

Individuals vary not only in pain perception and pain tolerance but also in their response to pain. These responses or expressions of pain may be physical (skeletal muscle and autonomic nervous system) and behavioural.

i. Muscle responses

Skeletal muscle reaction may be immediate with-drawal reflex , involuntary contraction or increased tone in an attempt to splint or immobilize the affected part. The individual may support or rub the part , change position frequently etc.

ii. Autonomic responses

The physiological responses seen most commonly in acute pain are mediated by sympathetic innervations and the secretion of adrenaline. The individual may manifests pallor, cold clammy skin and dry lips and mouth. If the pain is deep, severe and prolonged, the above reactions may not develop and patient may exhibit shock.

iii. Behavioural responses

a. Previous pain experience.

It is tempting to expect that a person who has had multiple or prolonged experiences with pain would be less anxious and more tolerant of pain than one who has had little pain. For most people, however, this is not true. Often, the more experience a person has had with pain, the more frightened he or she is about subsequent painful events. This person may be less able to tolerate pain; that is, he or she wants relief from pain sooner and before it becomes severe. This reaction is more likely to occur if the person has received inadequate pain relief in the past. A person with repeated pain experiences may have learned to fear the escalation of pain and its inadequate treatment. Once a person experiences severe pain, that person knows just how severe it can be. Conversely, someone who has never had severe pain may have no fear of such pain.

The way a person responds to pain is a result of many separate painful events during a lifetime.

b. Emotional state

Anxiety and depression can lower the pain threshold and could increase patient’s perception of the pain. Antidepressants can be used to help reduce the pain in a patient who is clinically depressed. Anxiety may be related to the illness or treatment, to the anticipation of pain to come or to other problems not related to illness such as home or work concerns. The most effective way to relieve pain is by directing the treatment at the pain rather than at the anxiety. Just as anxiety is associated with pain because of concerns and fears about the underlying disease, depression is associated with chronic pain and unrelieved cancer pain. In chronic pain situations, depression is associated with major life changes due to the limiting effects of the pain, specifically unemployment. . Unrelieved cancer pain drastically interfereswith the patient’s quality of life, and relieving the pain may go a long way toward treating the depression.

c. Culture

Beliefs about pain and how to respond to it differ from one culture to the next. Early in childhood, individuals learn from those around them what responses to pain are acceptable or unacceptable. For example, a child may learn that a sports injury is not expected to hurt as much as a comparable injury caused by a motor vehicle crash. The child also learns what stimuli are expected to be painful and what behavioral responses are acceptable. These beliefs vary from one culture to another; therefore, people from different cultures who experience the same intensity of pain may not report it or respond to it in the same ways. Factors that help to explain differences in a cultural group include age, gender, education level, and income. In addition, the degree to which a patient identifies with a culture influences the degree to which he or she will adopt new health behaviors or cling to traditional health beliefs and practices.

d. Age

Age has long been the focus of research on pain perception and pain tolerance, and again the results have been inconsistent. For example, although some researchers have found that older adults require a higher intensity of noxious stimuli than do younger adults before they report pain ,others have found no differences in responses of younger and older adults while other researchers have found that elderly patients (older than 65 years of age) reported significantly less pain than younger patients .

e. Physical condition

Psychological reactions are usually greater in weak and fatigued persons. For instance, the obstetric patient whose labor is prolonged may be quite calm and uncomplaining at first but as she becomes tired and anxious that something is wrong , her pain becomes less tolerable.

Characteristics of pain

The factors to consider in a complete pain assessment are the intensity, timing, location, quality, personal meaning, aggravating and alleviating factors, and pain behaviors. The pain assessment begins by observing the patient carefully, noting the patient's overall posture and presence or absence of overt pain behaviours and asking the person to describe, in his or her own words, the specifics of the pain. The words used to describe the pain may point toward the etiology. For example, the classic description of chest pain that results from a myocardial infarction includes pressure or squeezing on the chest. A detailed history should follow the initial description of pain.

- **Intensity**

The intensity of pain ranges from none to mild discomfort to excruciating. There is no correlation between reported intensity and the stimulus that produced it. The reported intensity is influenced nby the person's pain threshold and pain tolerance. Pain threshold is the smallest stimulus for which a person reports pain and the tolerance is the maximum amount of pain a person can tolerate. To understand variations, the nurse can ask about the present pain intensity as well as the least and the worst pain intensity.

- **Timing**

Sometimes the etiology of pain can be determined when time aspects are known. Therefore, the nurse inquires about the onset, duration, relationship between time and intensity, and whether there are changes in rhythmic patterns. The patient is asked if the pain began suddenly or increased gradually. Sudden pain that rapidly reaches maximum intensity is indicative of tissue rupture, and immediate intervention is necessary. Pain from ischemia gradually increases and becomes intense over a longer time. The chronic pain of arthritis illustrates the usefulness of determining the relationship between time and intensity, because people with arthritis usually report that pain is worse in the morning

- **Location**

The location of pain is best determined by having the patient point to the area of the body involved. Some general assessment forms have drawings of human figures, and the patient is asked to shade in the area involved. This is especially helpful if the pain radiates (referred pain). The shaded figures are helpful in determining the effectiveness of treatment or change in the location of pain over time.

- **Quality**

The nurse can ask the patient to describe the pain in his or her own words without offering clues. For example, the patient is asked to describe what the pain feels like. Sufficient time must be allowed for the patient to describe the pain and for the nurse to carefully record all words that are used. If the patient cannot describe the quality of the pain, words such as burning, aching, throbbing, or stabbing can be offered. It is important to document the exact words used to describe the pain and which words were suggested by the nurse conducting the assessment.

- **Personal Meaning**

Patients experience pain differently, and the pain experience can mean many different things. It is important to ask how the pain has affected the person’s daily life. Some people can continue to work or study, while others may be disabled. The patient is asked if family finances have been affected. For others, the recurrence of pain may mean worsening of the disease, such as the spread of cancer. The meaning attached to the pain experience helps the nurse understand how the patient is affected and assists in planning treatment.

3.6 Nursing Management

The nurse helps relieve pain by administering pain-relieving interventions (including both pharmacologic and non pharmacologic approaches), assessing the effectiveness of those interventions, monitoring for adverse effects, and serving as an advocate for the patient when the prescribed intervention is ineffective in relieving pain. In addition, the nurse serves as an educator to the patient and family to enable them to manage the prescribed intervention themselves when appropriate.

i. Providing Physical Care

The patient in pain may be unable to participate in the usual activities of daily living or to perform usual self-care and may need assistance to carry out these activities. The patient is usually more comfortable when physical and self-care needs have been met and efforts have been made to ensure as comfortable a position as possible. A fresh gown and change of bed linens, along with efforts to make the person feel refreshed (e.g., brushing teeth, combing hair), often increase the level of comfort and improve the effectiveness of the pain relief measures. Providing physical care to the patient also gives the nurse (in acute, long-term, and home settings) the opportunity to perform a complete assessment and to identify problems that may contribute to the patient's discomfort and pain. Appropriate and gentle physical touch during care may be reassuring and comforting.

ii. Managing Anxiety Related to Pain

Anxiety may affect a patient's response to pain. The patient who anticipates pain may become increasingly anxious. Teaching the patient about the nature of the impending painful experience and the ways to reduce pain often decreases anxiety; a person who is experiencing pain will use previously learned strategies to reduce anxiety and pain. Learning about measures to relieve pain may. What the nurse explains about the available pain relief measures and their effectiveness may also affect the patient's anxiety level. The patient's anxiety may be reduced by explanations that point out the degree of pain relief that can be expected from each measure. For example, the patient who is informed beforehand that an intervention may not eliminate pain completely is less likely to become anxious when a certain amount of pain persists. Consequently, pain relief measures should be used before pain becomes severe. Many patients believe that they should not request pain relief measures until they cannot tolerate the pain, making it difficult for medications to provide relief. Therefore, it is important to explain to all patients that pain relief or control is more successful if such measures begin before the pain becomes unbearable.

3.7 Pharmacologic Interventions

These includes medications such as:

i. Local Anesthetic Agents

Local anesthetics work can be used to relief pain by blocking nerve conduction when applied

directly to the nerve fibers. They can be applied directly to the site of injury (eg, a topical anesthetic spray for sunburn) or directly to nerve fibers by injection or at the time of surgery. They can also be administered through an epidural catheter. Local anesthetic agents have been successful in reducing the pain associated with thoracic or upper abdominal surgery when injected by the surgeon intercostally. Local anesthetic agents are rapidly absorbed into the bloodstream, resulting in decreased availability at the surgical or injury site and an increased anesthetic level in the blood, increasing the risk of toxicity.

ii. Opioid Analgesic Agents

Opioids can be administered by various routes, including oral, intravenous, subcutaneous, intraspinal, intranasal, rectal, and transdermal routes. The goal of administering opioids is to relieve pain and improve quality of life. Examples include of opiods Morphine sulfate , Codeine, Hydromorphone , Levorphanol Meperidine , Methadone , Oxycodone, Oxymorphone. Usage of opiods can cause the following adverse effect : Respiratory depression , nausea and vomiting which can be treated by ensuring adequate hydration and the administration of antiemetic agents.; Constipation may be relieved by mild laxatives , stool softeners and a high intake of fluid and fiber may be effective. Other effects of opoids include pruritus which can be relieved by administering prescribed antihistamines; and tolerance and addiction can also occur. Therefore, the nurse has to monitor for this adverse reaction and communicate it to the physician

iii. Nonsteroidal Anti-inflammatory Drugs

NSAID can also be given such as ibuprofen to decrease pain. It acts by inhibiting cyclo-oxygenase. They are very helpful in treating arthritic diseases and may be especially powerful in treating cancer-related bone pain. They have been effectively combined with opioids to treat postoperative and other severe pain.

iv. Tricyclic Antidepressant Agents and Anticonvulsant Medications

Tricyclic antidepressant agents, such as amitriptyline (Elavil) or imipramine (Tofranil), are prescribed in doses considerably smaller than those generally used for depression. The patient needs to know that a therapeutic effect may not occur before 3 weeks. Antiseizure medications such as phenytoin (Dilantin) or carbamazepine (Tegretol) also are used in doses lower than those prescribed for seizure disorders.

3.8 Non-Pharmacologic Interventions

Although pain medication is the most powerful pain relief tool available to nurses, it is not the only one. Non -pharmacologic nursing activities can assist in relieving pain with usually low risk to the patient. Although such measures are not a substitute for medication, they may be all that is necessary or appropriate to relieve episodes of pain lasting only seconds or minutes. In instances of severe pain that lasts for hours or days, combining non-pharmacologic interventions with medications may be the most effective way to relieve pain. It includes:

i. Cutaneous Stimulation and Massage

Massage, which is generalized cutaneous stimulation of the body, often concentrates on the back and shoulders. A massage does not specifically stimulate the non-pain receptors in the same receptor field as the pain receptors, but it may have an impact through the descending control system). Massage also promotes comfort because it produces muscle relaxation.

ii. Ice and Heat Therapies

The application of moist or dry heat. Ice therapy after joint surgery can significantly reduce the amount of analgesic medication required subsequently. Ice therapy may also relieve pain if applied later. Care must be taken to assess the skin prior to treatment and to protect the skin from direct application of the ice. Ice should be applied to an area for no longer than 20 minutes at a time. This prevents the rebound phenomenon that occurs as the body attempts to warm up, rendering the treatment useless. Long applications of ice may result in frostbite or nerve injury. Both ice and heat therapy must be applied carefully and monitored closely to avoid injuring the patients skin. Neither therapy should be applied to areas with impaired circulation or used with impaired sensation. Application of heat increases blood flow to an area and contributes to pain reduction by speeding healing. Both dry and moist heat may provide some analgesia, but their mechanisms of action are not well understood. Application of heat to inflamed joints, for example, may provide temporary comfort, but increasing the intra-articular temperature may impair healing

iii. Transcutaneous Electrical Nerve Stimulation

This uses a battery operated unit with electrodes applied to the skin to produce a tingling, vibrating, or buzzing sensation in the area of pain. It has been used in both acute and chronic pain relief and is thought todecrease pain by stimulating the non-pain receptors in the samearea as the fibers that transmit the pain.

- Distraction

It helps focus attention away from the pain and to some extent any contact the nurse has with the patient which is not focused on the pain per se. Distraction is thought to reduce the perception of pain by stimulating the descending control system, resulting in fewer painful stimuli being transmitted to the brain. It also increase pain tolerance(makes pain more bearable). Naturally – occurring activities such as meals ,radio ,television and arrival of visitor\s e.t.c can be used as distraction.

iv. Guided Imagery

Guided imagery is using one's imagination in a special way to achieve a specific positive effect. Guided imagery for relaxation and pain relief may consist of combining slow, rhythmic breathing with a mental image of relaxation and comfort. The nurse instructs the patient to close the eyes and breathe slowly in and out. With each slowly exhaled breath, the patient imagines muscle tension and discomfort being breathed out, carrying away pain and tension and leaving behind a relaxed and comfortable body. With each inhaled breath, the patient imagines healing energy flowing to the area of discomfort. Other management of pain include neurectomy; is the destruction of pain transmission pathway by excising offending nerve, Cordotomy : is the interruption of the ascending cord tracts by surgical transaction and lobotomy : modifies motivational – affective component of pain perception through destruction of tissue in frontal lobes.

In conclusion, with the understanding of this course note student will be able help to care for patient experiencing pain irrespective of the type.

4.0 SUMMARY

In this unit, you have learnt:

- Definition of pain
- Sources and causes of pain
- Types of pain and pain mechanism
- Pain responses
- Nursing management, pharmacologic and non pharmacologic interventions of pain.

5.0 TUTOR-MARKED ASSIGNMENT

During your clinical posting, identify a patient going through pain and manage patient using the **nursing care plan.**

SELF-ASSESSMENT EXERCISE

i. differentiate between acute pain, chronic pain, and cancer pain.
ii. describe the path physiology of pain.
iii. describe factors that can alter the perception of pain.
iv. explain the physiologic basis of pain relief interventions.
v. discuss when opioid tolerance may be a problem.

vi. identify appropriate pain relief interventions
vii. use the nursing process as a framework for the care of patients with pain.

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UNIT 7 SLEEP

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CONTENTS

1.0 INTRODUCTION

Sleep is an essential life process and we all sleep every day. However this unit will help you to understand the mechanism of sleep , types of sleep and what happens in each stage of sleep.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- define and describe the stages of sleep
- describe the theories of sleep
- discuss possible cause of rem sleep

- describe cycle between wakefulness and sleep and physiologic effect of sleep
- describe brain waves origin and changes in the at electroencephalography, different stages of wakefulness and sleep.

3.0 MAIN CONTENT

3.1 Sleep

Sleep is defined as unconsciousness from which the person can be aroused by sensory or other stimuli. It is to be distinguished from coma, which is unconsciousness from which the person cannot be aroused. There are multiple stages of sleep, from very light sleep to very deep sleep; sleep researchers also divide sleep into two entirely different types of sleep that have different qualities, as follows.During each night, a person goes through stages of two types of sleep that alternate with each other. They are called (i) slow-wave sleep, because in this type of sleep the brain waves are very strong and very low frequency, as we discuss later, and (ii) rapid eye movement sleep (REM sleep), because in this type of sleep the eyes undergo rapid movements despite the fact that the person is still asleep. Most sleep during each night is of the slow-wave variety; this is the deep, restful sleep that the person experiences during the first hour of sleep after having been awake for many hours. REM sleep, on the other hand, occurs in episodes that occupy about 25 per cent of the sleep time in young adults; each episode normally recurs about every 90 minutes. This type of sleep is not so restful, and it is usually associated with vivid dreaming.

i. Slow-Wave Sleep(Non -Rem)

Most of us can understand the characteristics of deep slow-wave sleep by remembering the last time we were kept awake for more than 24 hours and then the deep sleep that occurred during the first hour after going to sleep. This sleep is exceedingly restful and is associated with decrease in both peripheral vascular tone and many other vegetative functions of the body. For instance, there are 10 to 30 per cent decreases in blood pressure, respiratory rate, and basal metabolic rate.

Although slow-wave sleep is frequently called “dreamless sleep,” dreams and sometimes even nightmares do occur during slow-wave sleep. The difference between the dreams that occur in slow-wave sleep and those that occur in REM sleep is that those of REM sleep are associated with more bodily muscle activity, and the dreams of slow-wave sleep usually are not remembered. That is, during slow-wave sleep, consolidation of the dreams in memory does not occur.

ii. Rem Sleep (Paradoxical Sleep, Desynchronized Sleep)

In a normal night of sleep, bouts of REM sleep lasting5 to 30 minutes usually appear on the average every90 minutes. When the person is extremely sleepy, eachbout of REM sleep is short, and it may even be absent.Conversely, as the person becomes more rested through the night, the durations of the REM boutsincrease.There are several important characteristics of REMsleep:

1. It is usually associated with active dreaming and active bodily muscle movements.
2. The person is even more difficult to arouse by sensory stimuli than during deep slow-wave sleep, and yet people usually awaken spontaneously in the morning during an episode of REM sleep.
3. Muscle tone throughout the body is exceedingly depressed, indicating strong inhibition of the spinal muscle control areas.
4. Heart rate and respiratory rate usually becomes irregular, which is characteristic of the dream state.
5. Despite the extreme inhibition of the peripheral muscles, irregular muscle movements do occur. These are in addition to the rapid movements of the eyes.
6. The brain is highly active in REM sleep, and overall brain metabolism may be increased as much as 20 per cent. The electroencephalogram (EEG) shows a pattern of brain waves similar tothose that occur during wakefulness. This type of sleep is also called paradoxical sleep because it is a paradox that a person can still be asleep despite marked activity in the brain.

In summary, REM sleep is a type of sleep in which the brain is quite active. However, the brain activity is not channeled in the proper direction for the person to be fully aware of his or her surroundings, and therefore the person is truly asleep.

3.2 Basic Theories of Sleep

i. Sleep Is Believed to Be Caused by an Active Inhibitory Process

An earlier theory of sleep was that the excitatory areas of the upper brain stem, the reticular activating system, simply fatigued during the waking day and became inactive as a result. This was called the passive theoryof sleep. An important experiment changed this view to the current belief that sleep is caused by an active inhibitory process: it was discovered that transecting the brain stem at the level of the midpons creates a brain whose cortex never goes to sleep. In other words, there seems to be some center located below the midpontile level of the brain stem that is required to cause sleep by inhibiting other parts of the brain.

ii. Neuronal Centers, Neurohumoral Substances, and Mechanisms That Can Cause Sleep— A Possible Specific Role for Serotonin

Stimulation of several specific areas of the brain can produce sleep with characteristics near those of natural sleep. Some of these areas are the following:

1. Themost conspicuous stimulation area for causing almost natural sleep is the raphe nuclei in thelower half of the pons and in the medulla. These nuclei are a thin sheet of special neurons located in the midline. Nerve fibers from these nuclei spread locally in the brain stem reticular formation and also upward into the thalamus, hypothalamus, most areas of the limbic system, and even the neocortex of the cerebrum. In addition, fibers extend downward into the spinal cord, terminating in the posterior horns where they can inhibit incoming sensory signals, including pain. It is also known that many nerve endings of fibers from these raphe neurons secrete serotonin. When a drug that blocks the formation of serotonin is administered to an animal, the animal often cannot sleep for the next several days. Therefore, it has been assumed that serotonin is a transmitter substance associated with production of sleep.
2. Stimulation of some areas in the nucleus of the tractussolitariuscan also cause sleep. This nucleusis the termination in the medulla and pons forvisceral sensory signals entering by way of thevagus and glossopharyngeal nerves.
3. Stimulation of several regions in the diencephalon can also promote sleep, including (1) the rostral part of the hypothalamus, mainly in the suprachiasmal area, and (2) an occasional area in the diffuse nuclei of the thalamus.

iii. Lesions in Sleep-Promoting Centers Can Cause Intense Wakefulness

Discrete lesions in the raphe nuclei lead to a high state of wakefulness. This is also true of bilateral lesions in the medial rostral suprachiasmal area in the anterior hypothalamus. In both instances, the excitatory reticular nuclei of the mesencephalon and upper pons seem to become released from inhibition, thus causing the intense wakefulness. Indeed, sometimes lesions of the anterior hypothalamus can cause such intense wakefulness that the animal actually dies of exhaustion.

3.3 Possible Cause of Rem Sleep

Why slow-wave sleep is broken periodically by REM sleep is not understood. However, drugs that mimic the action of acetylcholine increase the occurrence of REM sleep. Therefore, it has been postulated that the large acetylcholine secreting neurons in the upper brain stem reticular formation might, through their extensive efferent fibers, activate many portions of the brain. This theoretically could cause the excess activity that occurs in certain brain regions in REM sleep, even though the signals are not channeled appropriately in the brain to cause normal conscious awareness that is characteristic of wakefulness.

3.4 Cycle Between Sleep and Wakefulness

The preceding discussions have merely identified neuronal areas, transmitters, and mechanisms that are related to sleep. They have not explained the cyclical, reciprocal operation of the sleep-wakefulness cycle. There is as yet no explanation. Therefore, we can let our imaginations run wild and suggest the following possible mechanism for causing the sleep-wakefulness cycle.

When the sleep centers are not activated, the mesencephalic and upper pontile reticular activatingnuclei are released from inhibition, which allows the reticular activating nuclei to become spontaneously active. This in turn excites both the cerebral cortex and the peripheral nervous system, both of which send numerous positive feedback signals back to the same reticular activating nuclei to activate them still further. Therefore, once wakefulness begins, it has a natural tendency to sustain itself because of all this positive feedback activity. Then, after the brain remains activated for many hours, even the neurons themselves in the activating system presumably become fatigued. Consequently, the positive feedback cycle between the mesencephalic reticular nuclei and the cerebral cortex fades, and the sleep-promoting effects of the sleep centers take over, leading to rapid transition from wakefulness back to sleep.

This overall theory could explain the rapid transitions from sleep to wakefulness and from wakefulness to sleep. It could also explain arousal, the insomnia that occurs when a person's mind becomes preoccupied with a thought, and the wakefulness that is produced by bodily physical activity.

3.5 Physiologic Effects of Sleep

Sleep causes two major types of physiologic effects: first, effects on the nervous system itself, and second, effects on other functional systems of the body. The nervous system effects seem to be by far the more important because any person who has a transected spinal cord in the neck (and therefore has no sleepwakefulness cycle below the transection) shows no harmful effects in the body beneath the level of transection that can be attributed directly to a sleep wakefulness cycle. Lack of sleep certainly does, however, affect the functions of the central nervous system. Prolonged wakefulness is often associated with progressive malfunction of the thought processes and sometimes even causes abnormal behavioral activities. We are all familiar with the increased sluggishness of thought that occurs toward the end of a prolonged wakeful period, but in addition, a person can become irritable or even psychotic after forced wakefulness. Therefore, we can assume that sleep in multiple ways restores both normal levels of brain activity and normal "balance" among the different functions of the central nervous system. This might be likened to the "rezeroing" of electronic analog computers after prolonged use, because computers of this type gradually lose their "baseline" of operation; it is reasonable to assume that the same effect occurs in the central nervous system because overuse of some brain areas during wakefulness could easily throw these areas out of balance with the remainder of the nervous system. We might postulate that the principal value of sleepis to restore natural balances among the neuronalcenters. The specific physiologic functions of sleep remain a mystery, and they are the subject of much research.

3.6 Brain Waves

Electrical recordings from the surface of the brain or even from the outer surface of the head demonstrate that there is continuous electrical activity in the brain. Both the intensity and the patterns of this electrical activity are determined by the level of excitation of different parts of the brain resulting from sleep, wakefulness, or brain diseases such as epilepsy or even psychoses. The intensities of brain waves recorded from the surface of the scalp range from 0 to 200 microvolts, and their frequencies range from once every few seconds to 50 or more per second. The character of the waves is dependent on the degree of activity in respective parts of the cerebral cortex, and the waves change markedly between the states of wakefulness and sleep and coma. Much of the time, the brain waves are irregular, and no specific pattern can be discerned in the EEG.

Origin of Brain Waves

The discharge of a single neuron or single nerve fiber in the brain can never be recorded from the surface of the head. Instead, many thousands or even millions of neurons or fibers must fire synchronously; only then will the potentials from the individual neurons or fibers summate enough to be recorded all the way through the skull. Thus, the intensity of the brain waves from the scalp is determined mainly by the numbers of neurons and fibers that fire in synchrony with one another, not by the total level of electrical activity in the brain. In fact, strong nonsynchronous nerve signals often nullify one another in the recorded brain waves because ofopposing polarities. when the eyes were closed, synchronous discharge of many neurons in the cerebral cortex at a frequency of about 12 per second, thus causing alphawaves. Then, when the eyes were opened, the activity of the brain increased greatly, but synchronization of the signals became so little that the brain waves mainly nullified one another, and the resultant effect was very low voltage waves of generally high but irregular frequency, the beta waves.

Origin of Alpha Waves

Alpha waves will not occur in the cerebral cortex without cortical connections with the thalamus. Conversely, stimulation in the nonspecific layer of reticular nuclei that surround the thalamus or in "diffuse" nuclei deep inside the thalamus often sets up electrical waves in the thalamocortical system at a frequency between 8 and 13 per second, which is the natural frequency of the alpha waves. Therefore, it is believed that the alpha waves result from spontaneous feedback oscillation in this diffuse thalamocortical system, possibly including the reticular activating system in the brain stem as well. This oscillation presumably causes both the periodicity of the alpha waves and the synchronous activation of literally millions of cortical neurons during each wave.

- **Origin of Delta Waves**

Transection of the fiber tracts from the thalamus to the cerebral cortex, which blocks thalamic activation of the cortex and thereby eliminates the alpha waves, nevertheless does not block delta waves in the cortex. This indicates that some synchronizing mechanism can occur in the cortical neuronal system by itself—mainly independent of lower structures in the in the brain—to cause the delta waves. Delta waves also occur during deep slow-wave sleep; this suggests that the cortex then is mainly released from the activating influences of the thalamus and other lower centers.

3.7 Changes in the EG at Different Stages of Wakefulness and Sleep

Alert wakefulness is characterized by high-frequency beta waves, whereas quiet wakefulness is usually associated with alpha waves. Slow-wave sleep is divided into four stages. In the first stage, a stage of very light sleep, the voltage of the EEG waves becomes very low; this is broken by “sleep spindles,” that is, short spindle-shaped bursts of alpha waves that occur periodically. In stages 2, 3, and 4 of slow-wave sleep, the frequency of the EEG becomes progressively slower until it reaches a frequency of only 1 to 3 waves per second in stage 4; these are delta waves. It is often difficult to tell the difference between this brain wave pattern and that of an awake, active person. The waves are irregular and high-frequency, which are normally suggestive of desynchronized nervous activity as found in the awake state. Therefore, REM sleep is frequently called desynchronizedsleep because there is lack of synchrony in the firing of the neurons, despite significant brain activity

4.0 SUMMARY

In this unit, you have learnt:

- definition of sleep
- Stages of sleep and theories of sleep
- Causes of REM sleep
- Cycle between wakefulness and sleep and physiologic effect of sleep
- Brain waves origin and changes in EEG.

5.0 TUTOR-MARKED ASSIGNMENT

What is the quality of your sleep? Interact with 5 patients and determine the quality of their sleep.

SELF-ASSESSMENT EXERCISE

i. define and describe the stages of sleep
ii. describe the theories of sleep
iii. discuss possible cause of rem sleep.
iv. describe cycle between wakefulness and sleep and physiologic effect of sleep.
v. describe brain waves origin and changes in the electroencephalography, different stages of wakefulness and sleep.

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UNIT 8 SKIN CARE AND WOUND CARE

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CONTENTS

1.0 INTRODUCTION

The human skin is very delicate and covers all parts of the human body. It is vital for you to have adequate knowledge as regards skin care and wound care, in order to care for your patients in the hospital

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- discuss the skin integrity
- discuss the types of wound
- discuss factors influencing wound healing
- discuss how to care for the skin and wound.

3.0 MAIN CONTENT

3.1 Skin

The skin is the largest organ in the body and serves a variety of important functions in maintaining health and protecting the individual from injury. Important nursing functions are maintaining skin integrity and promoting wound healing. Impaired skin integrity is not a frequent problem for most healthy people but is a threat to older adults; to clients with restricted mobility, chronic illnesses, or trauma; and to those undergoing invasive health care procedures. To protect the skin and manage wounds effectively, the nurse must understand the factors affecting skin integrity, the physiology of wound healing, and specific measures that promote optimal skin conditions.

3.2 Skin Integrity

Intact skin refers to the presence of normal skin and skin layers uninterrupted by wounds. The appearance of the skin and skin integrity are influenced by internal factors such as genetics, age, and the underlying health of the individual as well as external factors such as activity. Genetics and heredity determine many aspects of a person's skin, including skin color, sensitivity to sunlight, and allergies. Age influences skin integrity in that the skin of both the very young and the very old is more fragile and susceptible to injury than that of most adults. Wounds tend to heal more rapidly in infants and children, however. Many chronic illnesses and their treatments affect skin integrity. People with impaired peripheral arterial circulation may have skin on the legs that damages easily. Some medications, corticosteroids for example, cause thinning of the skin and allow it to be much more readily harmed. Many medications increase sensitivity to sunlight and can predispose one to severe sunburns. Some of the most common medications that cause this damage are certain antibiotics (e.g., tetracycline and doxycycline), chemotherapy drugs for cancer (e.g., methotrexate), and some psychotherapeutic drugs (e.g., tricyclic antidepressants). Poor nutrition alone can interfere with the appearance and function of normal skin.

3.3 Types of wound

Body wounds are either intentional or unintentional. Intentional trauma occurs during therapy. Examples are operations or venipunctures. Although removing a tumor, for example, is therapeutic, the surgeon must cut into body tissues, thus traumatizing them. Unintentional wounds are accidental; for example, a person may fracture an arm in an automobile collision. If the tissues are traumatized without a break in the skin, the wound is closed. The wound is open when the skin or mucous membrane surface is broken. Wounds may be described according to how they are acquired. They also can be described according to the likelihood and degree of wound contamination:

i. Clean wounds; are uninfected wounds in which there is minimal inflammation and the respiratory, gastrointestinal, genital, and urinary tracts are not entered. Clean wounds are primarily closed wounds.
ii. Clean-contaminated wounds are surgical wounds in which the respiratory, gastrointestinal, genital, or urinary tract has been entered. Such wounds show no evidence of infection.
iii. Contaminated wounds include open, fresh, accidental wounds and surgical wounds involving a major break in sterile technique or a large amount of spillage from the gastrointestinal tract. Contaminated wounds show evidence of inflammation.
iv. Dirty or infected wounds include wounds containing dead tissue and wounds with evidence of a clinical infection, such as purulent drainage. Wounds, excluding pressure ulcers and burns, are classified by depth, that is, the tissue layers involved in the wound.

3.4 Factors Affecting Wound Healing

Characteristics of the individual such as age, nutritional status, lifestyle, and medications influence the speed of wound healing. Developmental Considerations Healthy children and adults often heal more quickly than older adults, who are more likely to have chronic diseases that hinder healing.

i. Nutrition

Wound healing places additional demands on the body. Clients require a diet rich in protein, carbohydrates, lipids, vitamins A and C, and minerals, such as iron, zinc, and copper. Malnourished clients may require time to improve their nutritional status before surgery, if this is possible. Obese clients are at increased risk of wound infection and slower healing because adipose tissue usually has a minimal blood supply

ii. Lifestyle

People who exercise regularly tend to have good circulation and because blood brings oxygen and nourishment to the wound, they are more likely to heal quickly. Smoking reduces the amount of functional hemoglobin in the blood, thus limiting the oxygen carrying capacity of the blood ,and constricts arterioles.

iii. Medications

Anti-inflammatory drugs (e.g., steroids and aspirin) and antineoplastic agents interfere with healing. Prolonged use of antibiotics may make a person susceptible to wound infection by resistant organisms.

3.5 Assessment of Skin Integrity

The nurse conducts an examination of the integument as part of a routine assessment and during regular care. Removing barriers to assessment is very important. Antiembolic stockings, braces, or devices must be removed to assess the skin condition underneath.

Nursing History and Physical Assessment

During the review of systems as part of the nursing history, information regarding skin diseases, previous bruising, general skin condition, skin lesions, and usual healing of sores is elicited. Inspection and palpation of the skin focus on determination of skin color distribution, skin turgor, presence of edema, and characteristics of any lesions that are present. Particular attention is paid to skin condition in areas most likely to break down: in skin folds such as under the breasts, in areas that are frequently moist such as the perineum, and in areas that receive extensive pressure such as the bony prominences.

3.6 Assessment of Wounds

Nurses commonly assess both untreated and treated wounds

i. Untreated Wounds

Untreated wounds usually are seen shortly after an injury (e.g., at the scene of an accident or in an emergency center). Assessment for these wounds is shown in the accompanying Practice Guidelines. Principles of care include: Control severe bleeding by (a) applying direct pressure over the wound and (b) elevating the involved extremity. Prevent infection by (a) cleaning or flushing abrasions or lacerations with normal saline and (b) covering the wound with a clean dressing, if possible (a sterile dressing is preferred). When applying a dressing, wrap the wound tightly enough to apply pressure and approximate the wound edges, if you are able. If the first layer of dressing becomes saturated with blood, apply a second layer. Do so without removing the first layer of dressing, because blood clots might be disturbed, resulting in more bleeding.

Control swelling and pain by applying ice over the wound and surrounding tissues. If bleeding is severe or if internal bleeding is suspected, and if emergency equipment is available, assess the client for signs of shock (rapid thready pulse, cold clammy skin, pallor, lowered blood pressure).

ii. Treated Wounds

Treated wounds, or sutured wounds, are usually assessed to determine the progress of healing. These wounds may be inspected during changing of a dressing. If the wound itself cannot be directly inspected, the dressing is inspected and other data regarding the wound (e.g., the presence of pain) are assessed. Assessment of a treated wound involves observation of its appearance, size, drainage, and the presence of swelling, pain, and status of drains or tubes. In some long-term facilities, home care situations, and outpatient clinics, photographs are taken weekly for a visual record of the progress of pressure ulcers and wounds. Other assessments are documented and dated along with the photograph.

3.7 How to care for the skin

i. Cleansing: Essential to the health of one's skin is appropriate and thorough cleansing. There are a number of products available to care for the wide variety of skin types e.g. dry or oily.

ii Moisturizing: The skin can become dry due to moisture loss through the use of inappropriate cleansing agents, illness, trauma or exposure to sun.

iii. Avoiding exposure to ultraviolet radiation: people are becoming increasingly aware of the dangers associated with exposing the skin to sun and other sources of ultraviolet radiation i.e. tanning. The use of protectives such as sun glasses and clothening are encouraged.

iv. Providing adequate nutrition: Because an inadequate intake of calories, protein, vitamins, and iron is believed to be a risk factor for pressure ulcer development, nutritional supplements should be considered for nutritionally compromised clients. The diet should be similar to that which supports wound healing, as discussed earlier. Monitor weight regularly to help assess nutritional status. Pertinent lab work should also be monitored including lymphocyte count, protein (especially albumin), and hemoglobin.

v. Maintaining Skin Hygiene: Obtain baseline data using the established tool and then reassess the skin at least daily in the hospital and weekly at home. When bathing the client, the nurse should minimize the force and friction applied to the skin, using mild cleansing agents that minimize irritation and dryness and that do not disrupt the skin's "natural barriers." Also, avoid using hot water, which increases skin dryness and irritation. Nurses can minimize dryness by avoiding exposure to cold and low humidity. Dry skin is best treated with moisturizing lotions applied while the skin is moist after bathing. The client's skin should be kept clean and dry and free of irritation and maceration by urine, feces, sweat, or incomplete drying after a bath. Apply skin protection if indicated. Dimethicone-based creams or alcohol-free barrier films are available in liquid, spray, and moist wipe format and are very effective in preventing moisture or drainage from collecting on the skin. In most cases, the nurse can apply these without a primary care provider's order.

vi. Avoiding Skin Trauma: Providing the client with a smooth, firm, and wrinkle-free foundation on which to sit or lie helps prevent skin trauma. To prevent injury due to friction and shearing forces, clients must be positioned, transferred, and turned correctly. For bedridden clients, shearing force can be reduced by elevating the head of the bed to no more than 30 degrees, if this position is not contraindicated by the client's condition. (For example, clients with respiratory disorders may find it easier to breathe in Fowler's position.) When the head of the bed is raised, the skin and superficial fascia stick to the bed linen while the deep fascia and skeleton slide down toward the bottom of the bed. As a result, blood vessels in the sacral area become twisted, and the tissues in the area can become ischemic and necrotic. Baby powder and cornstarch are never used as friction or moisture prevention. These powders create harmful abrasive grit that is damaging to tissues and they are considered a respiratory hazard when airborne. Instead, use moisturizing creams and protective films, such as transparent dressings and alcohol-free barrier films. Frequent shifts in position, even if only slight, effectively change pressure points. The client should shift weight 10 to 15 degrees every 15 to 30 minutes and, whenever possible, exercise or ambulate to stimulate blood circulation. When lifting a client to change position, nurses should use a lifting device such as a trapeze rather than dragging the client across or up in bed. The friction that results from dragging the skin against a sheet can cause blisters and abrasions, which may contribute to more extensive tissue damage. Therefore, using devices or a lift team to lift the client's weight off the bed surface is the method of choice.

vii. Providing Supportive Devices: In order for circulation to remain uncompromised, pressure on the bony prominences should remain below capillary pressure for as much time as possible through a combination of turning, positioning, and use of pressure-relieving surfaces. The nurse should review the manufacturer's product descriptions that report the amount of time that the pressure between the surface and the bony prominence is above or below specified levels and determine if this is adequate to protect a particular client. For clients confined to bed, three types of support surfaces can be used to relieve pressure. The overlay mattress is applied on top of the standard bed mattress. A replacement mattress is used instead of the standard mattress; most are made of foam and gel combinations. Specialty beds replace hospital beds. They provide pressure relief, eliminate shearing and friction, and decrease moisture. Examples are high-air-loss beds, low air-loss beds, and beds that provide kinetic therapy. Kinetic beds provide continuous passive motion or oscillation therapy, which is intended to counteract the effects of a client's immobility. Table 36–4lists selected mechanical devices for reducing pressure on body parts. When a client is confined to bed or to a chair, pressure-reducing devices, such as pillows made of foam, gel, air, or a combination of these, can be used. When the client is sitting, weight should be distributed over the entire seating surface so that pressure does not center on just one area. To protect a client's heels in bed, supports such as wedges or pillows can be used to raise the heels completely off the bed. Doughnut-type devices should not be used since they limit blood flow and can cause tissue damage to the areas in direct contact with the device.

Wound care

- Wash hands for 20 seconds with warm water and antibacterial soap. Rinse well. Apply gloves if necessary.
- Gather wound supplies and small garbage or plastic bag.
- Remove old dressing. Discard in garbage or plastic bag. Double bag the old dressing if infection is suspected.
- Wash hands as indicated above. Apply gloves if necessary.
- Cleanse wound as instructed by your physician. For example, use normal saline or soap and water. Rinse well.
- Observe wound for signs and symptoms of infection: Redness around the wound ,Warm skin around the wound ,Increased clear, bloody or pus-like drainage, increased pain when performing wound care and **f**oul odor from the wound.
- Apply wound dressing as instructed by your physician. You may use sterile cotton swabs to apply any ointments.
- Cover the wound dressing with appropriate cover dressing and adhere with tape or other means to secure dressing.
- Remove gloves if used and dispose in garbage or plastic bag.

- Place another garbage or plastic bag over bag containing soiled dressing. Dispose in lined outdoor trash receptacle.
- Wash hands as indicated above.

4.0 SUMMARY

In this unit you have learnt
i. skin integrity
ii. types of wound
iii. factors influencing wound healing
iv. assessment of skin integrity and wounds
v. how to care for the skin and wound.

5.0 TUTOR-MARKED ASSIGNMENT

Conduct skin and wound assessment for five patients where you work and report your findings.

SELF-ASSESSMENT EXERCISE

i. discuss the skin integrity
ii. discuss the types of wound
iii. discuss factors influencing wound healing
iv. discuss how to care for the skin and wound.

6.0 REFERENCES/FURTHER READING

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www.google.com

This module therefore gives a brief overview of some important foundational concepts in Medical-Surgical Nursing. A sound understanding of these concepts will be needed for application as you proceed in this course. Welcome to the field of adult care nursing.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- discuss basic principles, concepts and theories that shape the context of nursing care
- explain the changing context of nursing care
- describe the continuum and settings of care
- explain the various models of nursing care
- discuss nursing process as a framework for nursing practice
- apply the concept of critical thinking to nursing practice.
- define nursing
- discuss the patient as the recipient of nursing care services
- discuss patient's needs using the Maslow's hierarchy of needs
- discuss the concept of health
- discuss the concept of illness
- define a theory
- discuss some of the theories of nursing practice.

3.0 MAIN CONTENTS

3.1 Definition of Nursing

In the early days of nursing, Florence Nightingale in 1858 asserted that the goal of nursing was "to put the patient in the best condition for nature to act upon him". Nursing has been described as both an art and a science and the definition of nursing has evolved over time based on advanced nursing education and development of nursing knowledge base. Recently, The American Nurses Association (ANA), in its Social Policy Statement (ANA, 1995), defined nursing as "the diagnosis and treatment of human responses to health and illness". This is a reflection of autonomy of nursing as a profession. In the same document, ANA provided the following illustrative list of phenomena that are the focus for nursing care and research:

- Self-care processes
- Physiologic and pathophysiologic processes in areas such as rest, sleep, respiration, circulation, reproduction, activity, nutrition, elimination, skin, sexuality, and communication

- Comfort, pain and discomfort
- Emotions related to experiences of health and illness
- Personalized meanings of health and illnesses
- Decision making and ability to make choices
- Perceptual orientations such as self-image and control over one's body and environments
- Transitions across life span, such as birth, growth, development and death
- Affiliative relationships, including freedom from oppression and abuse
- Environmental systems

3.1.2 The Patient/Client - the Recepient of Nursing Care

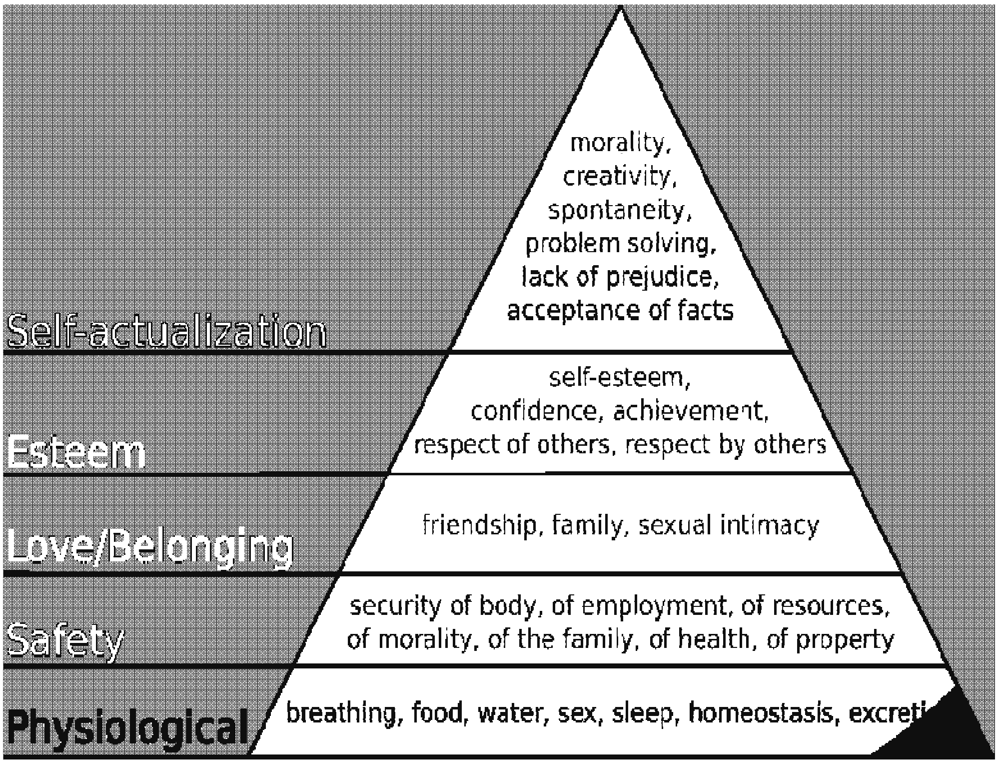
The patient is the central figure in health care services and constitutes the core of health care context. The term *patient* was derived from a Latin verb that has been literarily translated to mean, "to suffer," It has over the years been used traditionally to describe the recipients of care and thus has been translated to mean a completely dependent one. This has been considered derogatory and inhumane. However, in order to protect the human dignity of recipient of health care, the word *client has* been preferred recently. The word client was derived from a Latin verb which means "to lean," thus connoting alliance and interdependence.

The Patient's Needs
The core of the nurse-patient interaction is founded on Patients' needs. This varies depending on their problems, associated circumstances, and past experiences. Identifying patient's immediate needs and taking measures to address them thus form the core of nursing care. These needs are often regarded as priority needs and are fundamental to human functioning. However, some needs are more vital to life than others, hence, the need for their prioritization. This is illustrated by Maslow's model of human needs, described below.

Maslow's Hierarchy of needs
Maslow ranked human needs as follows, based on its vitality to life:

- Physiologic needs: air, clean water, nutrition, sex,
- Psychological needs: Safety and security needs
- Sociocultural needs: need for belonging and affection
- Intellectual needs: Esteem and self-respect need and
- Spiritual needs: Self-actualization (includes self-fulfillment)

Lower-level physiological needs are basic and fundamental to sustaining life and physical health while higher-level needs indicate psychological health and well-being. Maslow"s hierarchy of needs is useful for the assessment of a patient's strength, limitations and need for nursing interventions.



Maslow's hierarchy of needs

3.2 The Concept of Health

This is a concept that has been described extensively in literatures. Its definition varies based on human experiences and cultural inclinations.

The WHO Model of Health

According to World Health Organization (WHO), health has been defined as "a state of complete physical, mental and social well-being and not merely the absence of disease and infirmity. This definition underscores that human being is a sum total of complex biopsychosocial entity that operates as one in the physical, psychological and social domains of existence and cannot be understood in parts. However, such definition of health does not give room for any variation in degrees of wellness or illness i.e it describes health as an absolute state and illness as deviation from the absolute state. According to WHO, a physically sound but mentally unfit individual is not healthy. In reality, health appears unattainable, hence the need for a more flexible approach to its conceptualization. This has thus given birth to the concept of health-illness continuum.

The Health-Illness Continuum Model

The health-illness continuum model allows for a greater range in describing a person's health status. This model views health and illness on a continuum, with health and illness on opposite extremes. In this way, a person's state of health is ever-changing and has the potential to range from high-level of wellness to extremely poor health and imminent death. This model thus views a person as simultaneously possessing degrees of both health and illness.

3.3 The Concept of Wellness

Wellness has been defined as being equivalent to health. It describes a conscious and deliberate act to attain an advanced state of physical, psychological and spiritual health. It is a dynamic and fluctuating state of being which indicates the capacity of a person to function and adapt to hostile situations to the best of his or her ability. It is a subjective reported feeling of well-being. The goal of health care providers is to promote positive changes that are directed toward health and well-being. The subjective nature of wellbeing emphasizes the importance of recognizing and responding to patient individuality and diversity in health care and nursing.

3.4 The Concept of Health Promotion

Health promotion seems to be the focus of recent health care services because health is seen as resulting from a lifestyle that is oriented toward wellness. It discourages behaviours that are inimical to health such as improper diet, lack of exercise, smoking, drugs, high-risk behaviors (including risky sexual practices) and poor hygiene and encourages behaviours that promote health. The goal of health promotion is to motivate people to make improvements in the way they live, to modify risky behaviours and adopt healthy ones.

Organized self-care education programs emphasize

- Health promotion
- Disease prevention
- Management of illness
- Self-medication/ management of chronic illnesses and interaction with self-help groups
- Judicious use of the professional health care system.

Health promotion strategies include:

- Multiphasic screening
- Genetic testing
- Lifetime health monitoring programs

- Environmental and mental health programs
- Risk reduction and
- Nutrition and health education.

This concept aims to equip Individuals with knowledge about their health and encourage them to take more interest in and responsibility for their health and well-being.

3.5 The Concept of Illness

Illness means different things to different people. Examination of WHO definition of health points to the fact that, the presence of illness goes beyond the existence of physical signs and symptoms. Illness can result due to a disease (either physiological or psychological) or injury that affects functioning. It may also point to a situation where there is an inability to meet one's needs.
There are two major classifications of illness:

i. acute
ii. chronic.

An acute illness is a disruption in functional ability usually characterized by a rapid onset, intense manifestations, and a relatively short duration of signs and symptoms. Acute illnesses are usually reversible e.g. malaria fever.

Achronic illness is usually characterized by a gradual, insidious onset with lifelong changes that are usually irreversible and may last a long time, frequently throughout the individual's life e.g. diabetes mellitus, depressive illness.
It should also be noted that, an acute episode may occur over an established chronic illness i.e. superimposition of an acute illness in an individual with chronic illness e.g. acute pneumonia in a patient with latent pulmonary tuberculosis. Another pattern is acute exacerbation of a chronic disease e.g. acute episode of bronchial asthma in a patient with a known chronic obstructive pulmonary

Chronic illness affects individuals across the lifespan and may hamper their normal development especially those illnesses that starts from childhood e.g. sickle cell disorder. It is important to remember that chronicity is *not* an experience unique to the elderly alone. However, as life expectancy continues to increase, the number of people living with chronic illnesses also increases.

Changes Influencing Health Care Delivery

In recent times, health care delivery system has undergone an obvious change in terms of the population and its health care needs and expectations. The factors that have brought about these changes include:

- **The changing demographics of the population:** within the Nigerian setting, these include;
  - Increase in total population
  - Changing composition of the population i.e. more dependent than the independent population
  - Increase in birth rate
  - Decline in life expectancy attributed to worsened socioeconomic situations
  - Rural-to-urban migration with urban congestion
  - Steady increase in the number of homeless people, including entire families
  - A more culturally diverse population

All these population changes have affected the need for health care for the entire population

- **The increase in chronic illnesses and disability associated with acute infection becoming chronic:** this is due to increasing number of infectious agents and emergence of antibiotic resistant strains as a result of widespread inappropriate use of antibiotics and inadequate immunization coverage. All have promoted the lifelong disabling complications of these infectious diseases.
- **The greater emphasis on economics:** this revolves around the issue of the increasing cost of health care services and who pays for what service. The consumers are now result oriented and now demands on outcome as well as more affordable health care services. This has changed completely, the landscape of the health care delivery system globally. Part of the changes witnessed is the establishment of the health insurance scheme which has developed some structural approaches such as creation of the health maintenance organizations, case management and preferred provider's organizations. All efforts are towards making the best healthcare services available to all individuals at more affordable rates.
- **Technological advances.**

Theories of Nursing Practice

What is a Concept?

A concept is the basic building block of a theory. It is a complex mental formulation of our perceptions of the world." A concept labels or names a phenomenon, an observable fact that can be perceived through the senses and explained.

What is a Proposition?

A proposition(another structural element of a theory) is a statement that proposes a relationship between concepts.

What is a Theory?

A theory is a set of concepts and propositions that provide an orderly way to view a phenomena. Theory guides research by validating the existing knowledge or generating new knowledge. A theory helps us to organize our thoughts and ideas, and also direct our actions.

Classifications of nursing theories

- **Agrand theory** explains a more global and complex concepts. It is the broadest in scope, represents the most abstract level of development and addresses the broad phenomena of concern within the discipline.
- **Middle-Range Theory:** explains a more concrete and more narrowly defined phenomena than a grand theory. An example of a middle-range theory is Peplau’s Theory of Interpersonal Relations.
- **A micro-range theory** is the most concrete and narrow in scope. It explains a specific phenomenon of concern to the discipline, such as the effect of social supports on grieving and would establish nursing care guidelines to address the problem.

Selected Nursing Theories

Florence Nightingale

Nightingale provided the philosophical basis from which other theories have emerged and developed. She posited that a person’s health was the direct result of environmental influences, specifically cleanliness, light, pure air, pure water, and efficient drainage. Through manipulating the environment, nursing aims to discover the laws of nature that would assist in putting the patient in the best possible condition so that nature can effect a cure

Hildegard Peplau

Hildegard Peplau developed the theory of psychodynamic nursing, published in 1952. He defined the concepts and stages involved in the development of the nurse-client relationship and from that relationship, identified the roles of the nurse as stranger, resource person, teacher, leader, surrogate, and counselor.

Virginia Henderson

Her main contribution was the definition of nursing in 1955. According to Henderson, “the unique function of the nurse is to assist the individual, sick or well, in the performance of those activities contributing to health or its recovery (or to a peaceful death) that he would perform unaided if he has the necessary strength, will, or knowledge, and to do this in such a way as to help him gain independence as rapidly as possible”. She also identified those basic human needs viewed as the basis of nursing care. These needs include the need to maintain physiologic balance, to adjust to the environment, to communicate and participate in social interaction, and to worship according to one’s faith.

She identified 14 components that encompassed basic nursing care:

1. breathe normally
2. eat and drink adequately
3. eliminate body wastes
4. move and maintain desirable postures
5. sleep and rest
6. select suitable clothes—dress and undress
7. maintain body temperature within normal range by adjusting clothing and modifying the environment
8. keep the body clean and well groomed and protect the integument
9. avoid dangers in the environment and avoid injuring others
10. communicate with others in expressing emotions, needs, fears, or opinions
11. worship according to one’s faith
12. work in such a way that there is a sense of accomplishment
13. play or participate in various forms of recreation
14. learn, discover, or satisfy the curiosity that leads to normal development and health and use the available health facilities.

Faye Abdellah

Faye Abdellah identified 21 problems that she believed would serve as a knowledge base for nursing, which were primer to the development of what we now know as nursing diagnoses.

Myra Levine
Myra Levine posited the Conservation Theory. According to Levine, the four principles of conservation are:

1. *Conservation of Energy:* "The individual requires a balance of energy and a constant renewal of energy to maintain life activities".
2. *Conservation of Structural Integrity:* "Structural integrity is concerned with the processes of healing to restore wholeness and continuity after injury or illness".
3. *Conservation of Personal Integrity:* "Everyone seeks to defend his or her identity as a self, in both that hidden, intensely private person that dwells within and in the public faces assumed as individuals move through their relationships with others".
4. *Conservation of Social Integrity:* "No diagnosis should be made that does not include the other persons whose lives are entwined with that of the individual"

Dorothea Orem
Theory of Self-Care: According to this theory, self-care is a learned behavior and a deliberate action in response to a need. Orem identified three categories of self-care requisites:

1. Universal self-care requisites
2. Developmental self-care requisites and
3. Health-deviation self-care requisites.

Theory of Self-Care Deficit: This theory purports that nursing care is needed when people are affected by limitations that do not allow them to meet their self-care needs. The relationship between the nurse and the client is established when a self-care deficit is present. Self-care deficits, not medical diagnosis, determine the need for nursing care. According to Orem, the only legitimate need for nursing care is when a self-care deficit exists.

Theory of Nursing Systems: This is the unifying theory that subsumes the theory of self-care deficit which subsumes the theory of self-care. The Theory attempts to answer the question "What do nurses do?"
Orem identified three types of nursing systems:

1. wholly compensatory
2. partly compensatory and
3. supportive-educative

Sister Callista Roy
She developed the Roy Adaptation Model. Roy defines a person as "an adaptive system, a whole comprised of parts that function as a unity for some purpose". The person is a biopsychosocial being in constant

interaction with a changing internal and external environment. Nursing attempts to alter the environment when the person is not adapting well nor has ineffective coping responses. The world around and within (the person as an adaptive system) is called the environment and includes all conditions, circumstances, and influences that surround and affect the development and behavior of the person. These environmental stimuli can be classified as either focal, residual, or contextual. According to the Roy Adaptation Model, the person has coping mechanisms that are broadly categorized in either the regulator or cognator subsystem. Roy categorized these responses into four adaptive modes: physiologic, self-concept, role function, and interdependence. Adaptation is accomplished through these coping mechanisms that are innate, genetically determined and automatic processes. The purposes of adaptation are survival, growth, reproduction and mastery. Adaptive responses contribute to these goals, whereas ineffective responses may threaten the person's survival, growth, reproduction, or mastery

Jean Watson

In the 1980s, Jean Watson developed the Theory of Human Caring which focuses on the art and science of human caring. She believed caring is the essence of nursing and the most central and unifying focus of nursing practice. This theory conceptualized human-to-human transactions that occur daily in nursing practice.

Watson's theory is composed of 10 carative factors, which are classified as nursing actions or caring processes. Watson's carative factors are:

1. Formation of a humanistic-altruistic system of values
2. Nurturing of faith-hope
3. Cultivation of sensitivity to one's self and to others
4. Developing a helping-trusting, human caring relationship
5. Promotion and acceptance of the expression of positive and negative feelings
6. Use of creative problem-solving method processes
7. Promotion of transpersonal teaching and learning
8. Provision for a supportive, protective, or corrective mental, physical, sociocultural, and spiritual environment
9. Assistance with gratification of human needs
10. Allowance for existential-phenomenological forces

Martha Rogers

Martha Rogers pioneered the development of the Science of Unitary Human Beings. Her ideas regarded the person and the environment as energy fields. According to her, nursing is the study of unitary, irreducible human beings and their respective environments and the uniqueness of nursing is identified in the phenomena of concern. Unitary person is an irreducible pandimensional energy field characterized by pattern and expressing qualities that are unique to the whole and cannot be foreseen from knowledge of the parts.

Environment is defined as an irreducible pandimensional energy field identified by pattern and integral with a given human field. The whole of the person's energy field interacts with the whole of the environmental energy field, which results in the process of life. There is a constant exchange of matter and energy between the person-environment units, yet the uniqueness of each person is maintained through rhythmical patterns and relationships. Nursing identifies the patterns and organization of the person-environment unit and aims to re-pattern the rhythm and organization of these energy fields so that the person's integrity is heightened.

4.0 SUMMARY

At this juncture, you should be able to;

- define nursing
- discuss the patient as the recipient of nursing care services
- discuss patients needs using the Maslow's hierarchy of needs
- discuss the concept of health
- discuss the concept of illness
- define a theory
- discuss some of the theories of nursing practice.

5.0 TUTOR-MARKED ASSIGNMENT

With your experience as a nurse, conceptualize your own definition of nursing. Share this in the discussion forum with other colleagues and carefully consider and critique the definitions of your colleagues.

SELF-ASSESSMENT EXERCISE

i. What is nursing? (L.O. (i)
ii. Using Maslow's Hierarchy of needs, explain the needs of the patients that must be met through nursing services. L.O. (i&ii)
iii. Consider the WHO definition of health carefully and critique the absoluteness of health using the health-illness continuum (L.O. iv)
iv. Discuss the concept of illness (L.O. (v)
v. Discuss any two nursing practice theories. (L.O. vii)

Compare your answers to the contents under this unit.

For Further reading:

Your Facilitator for this session will provide this.

UNIT 2 MODELS OF NURSING CARE DELIVERY

CONTENTS

1.0 INTRODUCTION

Nursing practice has evolved over time and is still evolving in response to societal needs. The essence of nursing is to render cost effective care to patients and such must be the one that will promote continuity of care. Probably you are working in a setting where you are responsible for caring for a certain number of clients 24 hours a day, 7 days a week while your other colleague is working in another setting where she only cares for group of clients for 8 or 12 hours shift, you may be bothered about the difference in schedule of care. The focus of this unit is to answer your quest and also broaden your knowledge on other form of care models that are in practice globally. You will be able to understand the most cost effective and efficient model that will promote continuity of care

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- discuss the types of models of nursing care delivery
- differentiate between various types of nursing care delivery models
- identify the type of nursing care model that your institution adopted.

3.0 MAIN CONTENTS

3.1 Functional Nursing method

The focus of this approach is on completion of the task and it uses various levels of personnel depending on the complexity of the assignment. This task oriented approach utilizes personnel with less educational qualifications than professional nurses to perform less complex care requirements. Each member of staff performs his or her assigned task for each client. This approach is based on production and efficiency model that gives authority and responsibility to the head nurse assigning the work. For example, one nurse may assess each client and document findings and another may give all medications and treatments. Another nurse may be assigned to complete client teaching or discharge planning(process that enables the client to resume self-care activities before leaving the health care environment). One nursing assistant might serve all trays and collect intake and output records for each client while another is responsible for giving baths or making beds.

The advantage of this system is that a large number of clients can be cared for by a relatively small number of personnel. In addition, it allows the use of less skilled (and less expensive) personnel for some tasks and allows personnel to be used in areas for which they have special knowledge or skill. However, this system can also result in fragmented and depersonalized care and may invite omissions in care because no oneperson is responsible for the total care of the client. Another disadvantage is that client's emotional needs may be overlooked.

3.2 Team Nursing

This is a model of nursing care that focuses on the delivery of an individualized care to clients by a team of various personnel (professional, technical, and unlicensed assistants). The team is responsible for providing comprehensive and coordinated nursing care to a group of clients. The registered nurse is usually theleader of the team and is responsible for supervision ofthe team, as well as planning and evaluating the resultsof care giving activities. This management system usesprofessional nurses for skilled observations and interventionsand provision of direct care to acutely ill clients, while licensed practical nurses care for lessacutely ill clients, and nursing assistants are responsiblefor serving trays, making beds, and assisting the nurses with other tasks. This method is frequently used because it is cost-effective, increases the efficiency of registered nurses and also provides more individualized care than the functional approach. The major disadvantage of this approach is that some believe that in-patients high acuity of illness leaves little to be delegated.

3.3 Primary Nursing

It is a system in which one professional nurse is responsible for overseeing the total care of a number of clients 24 hours a day, 7 days a week, even if he or she does not deliver all the care personally. The care may be delegated to nurse associates for shifts when the primarynurse is not in attendance but the primary nurse still maintains the responsibility for total client care 24 hours a day. It is a method of providing comprehensive, individualized and consistent care. It uses the nurse's technical knowledge and management skills.

The primary nurse assesses and prioritizes each client's needs, identifies nursing diagnoses, set the goals, develops a plan of care and evaluates the effectiveness of care. The primary nursing encompasses all aspect of the professional role, including teaching, advocacy, decision making and continuity of care. The principal advantage of this approach is the continuity of care, accountabilities and responsibilities that are inherent in the system. Primary nursing is most effective with a total staff of registered nurses, which makes this system expensive to maintain.

3.4 Patient- Centered Nursing

The central figure in health care services is, of course, the patient and the focus of this model is to bring all services and care providers to the clients. The belief is that if all activities like physical therapy, ECG test, phlebotomy etc that are usually provided by auxiliary personnel are moved closer to the client, it will reduce the number of steps involved to get the work done. This will reduce stress on the part of the patient compared to when patient is being moved to various units for all these services. This model promotes cross-training and the development of multi-skilled workers who can function in more than one discipline.

Case Method

This nursing care delivery model is one of the earliest nursing models and it is otherwise called total care. In this method, one nurse is assigned to and is responsible for the comprehensive care of a group of clients during 8-12 hours shift. The nurse assesses the needs of each client and makes nursing plan, formulates diagnoses, implements care, and evaluates the effectiveness of the care on individual basis. The difference between this method and primary nursing is that here, the nurse will not be with the clients throughout the day and week. This method has been considered as the precursor of primary nursing.

Differentiated Practice Model

It is a type of nursing care model in which nursing personnel are used based on their educational preparation and skills e.g. roles of those with diploma training is different from that of Bachelor degree while that of Masters degree is different from those with PhD qualification. The model consists of specific job descriptions for nurses according to their training. The model delineates the roles between the licensed nursing personnel and unlicensed nursing personnel. This model promotes quality care at an affordable cost.

Total Client Care and Modular Nursing

Total client care and modular nursing are variations of primary nursing. Although these systems imply that one nurse is responsible for all the care administered to a client, responsibility for the client actually changes from shift to shift with the assigned caregiver. This system uses both registered nurses and licensed practical nurses with the registered nurses assigned to more complex client situations. A unit manager or charge nurse typically coordinates activities on the unit. Modular nursing attempts to assign caregivers to a small segment or “module” of a nursing unit, ensuring that clients are cared for by the same personnel on a regular basis.

4.0 SUMMARY

Evolvement of different models of nursing care delivery system was as a result of need to decrease health care cost and to improve utilization of limited human and physical resources. This unit has been able to broaden your understanding as regards to the most commonly used nursing care models in the health care system**.**

5.0 TUTOR-MAKED ASSIGNMENT

Visit two health care institutions nearest to you (one public and one private), identify the type of nursing care model(s) they are using, list the characteristics of the model(s) and state the appropriateness of such model to that setting.

SELF-ASSESSMENT EXERCISE

i. Explain the various types of models of nursing care delivery?
ii. State the differences between various types of nursing care delivery models.
iii. Identify the type of nursing care model that your institution is using?

UNIT 3 NURSING PROCESS

CONTENTS

1.0 INTRODUCTION

I believe the nursing process is not a new concept to you because in one way or the other you would have received lessons on this concept at different levels of nursing education. Some of the nurses' seminars or conferences also focus on nursing process and some hospitals have nursing process booklet attached to each in-patient case file. But as popular as this concept is, have you been able to apply it properly when you cared for patients? Before you answer this question, study the information provided in this unit (Nursing process).

2.0 OBJECTIVES

At the end of this unit, you will be able to:

- describe the phases of the nursing process
- differentiate subjective and objective data
- explain the purposes of nursing diagnoses
- describe four elements of the planning component.

3.0 MAIN CONTENT

3.1 Definition of nursing process

Nursing process is a systematic, rational method of planning and providing individualized nursing care. Its purpose is to identify a client's health status and actual or potential health care problems or needs, to establish plans to meet the identified needs and to deliver specific nursing interventions to meet those needs. The client may be an individual, a family, a community, or a group. Hall originated the term nursing process in1955. Johnson (1959), Orlando (1961) and Wiedenbach (1963) were among the first to use it to refer to a series of phases describing the practice of nursing. Since then, various nurses have described the process of nursing and organized the phases in different ways.

3.2 Characteristics of the Nursing Process

The nursing process has distinctive characteristics that enable the nurse to respond to the changing health status of the client. These characteristics include its cyclic and dynamic nature, client centered, focus on problem solving and decision making, interpersonal and collaborative style, universal applicability and use of critical thinking.

a. Data from each phase provide input into the next phase. Findings from the evaluation phase feed back into assessment. Hence, the nursing process is a regularly repeated event or sequence of events (a cycle) that is continuously changing (dynamic) rather than staying the same (static).
b. The nursing process is client centred. The nurse organizes the plan of care according to client problems rather than nursing goals. In the assessment phase, the nurse collects data to determine the client's habits, routines, and needs, enabling the nurse to incorporate client routines into the care plan as much as possible.
c. The nursing process is an adaptation of problem solving). It can be viewed as parallel to but separate from the process used by physicians (the medical model).
d. Decision making is involved in every phase of the nursing process. Nurses can be highly creative in determining when and how to use data to make decisions. They are not bound by standard responses and may apply their repertoire of skills and knowledge to assist clients. This facilitates the individualization of the nurse's plan of care.
e. The nursing process is interpersonal and collaborative. It requires the nurse to communicate directly and consistently with clients and families to meet their needs. It also requires that nurses collaborate, as members of the health care team, in a joint effort to provide quality client care.
f. The universally applicable characteristic of the nursing process means that it is used as a framework for nursing care in all types of health care settings, with clients of all age groups.

3.3 Phases of the Nursing Process

The Standards of Practice within the most current Scope and Standards of Nursing Practice include six phases of the nursing process: assessment, diagnosis, outcomes identification, planning, implementation and evaluation (ANA, 2010). The national licensure examination for registered nurses (NCLEX) uses five phases: assessment, analysis, planning, implementation, and evaluation and most others, use five phases: assessing, diagnosing (which includes outcomes identification and analysis), planning, implementing and evaluating. Although, nurses may use different terms to describe the phases (or steps) of the nursing process, the activities of the nurse using the process are similar. For example, implementing may be called implementation, intervention or intervening. The phases of the nursing process are not separate entities but overlapping, continuing sub processes. For example, assessing, which may be considered the first phase of the nursing process is also carried out during the implementing and evaluating phases. For instance, while actually administering medications (implementing), the nurse continuously notes the client's skin color, level of consciousness, and so on. Each phase of the nursing process affects the others; they are closely interrelated. For example, if inadequate data are obtained during assessing, the nursing diagnoses will be incomplete or incorrect; inaccuracy will also be reflected in the planning, implementing, and evaluating phases.

Assessment

Assessment is the systematic and continuous collection, organization, validation, and documentation of data (information). In effect, assessing is a continuous process carried out during all phases of the nursing process. For example, in the evaluation phase, assessment is done to determine the outcomes of the nursing strategies and to evaluate goal achievement. All phases of the nursing process depend on the accurate and complete collection of data. There are four different types of assessments:

a. initial nursing assessment
b. problem focused assessment
c. emergency assessment
d. time-lapsed reassessment.

Assessments vary according to their purpose, timing, time available and client status. Nursing assessments focus on a client's responses to a health problem. A nursing assessment should include the client's perceived needs, health problems, related experience, health practices, values and lifestyles. To be most useful, the data collected should be relevant to a particular health problem. Therefore, nurses should think critically about what to assess.

The purpose of assessment is to establish a database concerning a client's physical, psychosocial and emotional health in order to identify health-promoting behaviors as well as actual and potential health problems. Through assessment, the nurse determines the client's functional abilities and the absence or presence of dysfunction. The client's normal routine for activities of daily living and lifestyle patterns are also assessed. Identification of the client's strengths provides the nurse and other members of the treatment team with information about the skills, abilities, and behaviors the client has available to promote the treatment and recovery process. Some examples of client strengths are family support, intelligence, spiritual beliefs, and coping skills (how previous problems have been solved). The assessment phase also offers an opportunity for the nurse to form a therapeutic interpersonal relationship with the client. During assessment, the client is provided an opportunity to discuss health care concerns and goals with the nurse.

The essential elements of the assessment process are:
(a) Data collection
(b) Data verification
(c) Data organization
(d) Data interpretation
(e) Data documentation.

Nursing diagnosis

The nursing diagnosis is the second step in the nursing process and includes clinical judgments made about wellness states, illness states and syndromes, and the readiness to enhance current states of wellness experienced by individuals, families, and aggregate populations (communities). Diagnosing is based on a critical analysis of the assessment data. The purpose of a nursing diagnosis is to effectively communicate client needs among members of the healthcare team. Society tends to interpret nursing using nursing language. When a nursing diagnosis is a part of the client's plan of care, the nurse is able to communicate the client's needs to other professionals involved in that care. These needs encompass physiologic, role function, self-concept, interdependence and spiritual dimensions. To determine individualized therapeutic nursing interventions, the nurse must develop appropriate nursing diagnoses that are based on organized assessment data.

The term nursing diagnosis has been in the literature since the early 1950s. Fry (1953) identified that nursing diagnosis is integral to the plan of nursing care and is an important tool for individualizing client care. However, these ideas were slow to gain momentum despite the interests of several nurse theorists and the focus on client-centered problems in the 1960s and the 1970s. In 1973, the First National Conference for the Classification of Nursing Diagnoses met to identify, develop and classify nursing diagnoses. In 1982, at the fifth national conference, the organization was renamed the North American Nursing Diagnosis Association (NANDA).

Purposes of Nursing Diagnoses

Nursing diagnosis is unique in that it focuses on a client's response to a health problem, rather than on the problem itself, and it provides the structure through which nursing care can be delivered. Although these characteristics have always been in existence within nursing, they were unidentified prior to the mid-twentieth century.

Professionalism: One of the requisites of a profession is a unique body of knowledge. Clearer conceptualization of knowledge unique to nursing increases both professional accountability and autonomy. Therefore, nursing diagnosis contributes to the professional status of the discipline.

Communication: Nursing diagnosis also provides a means for effective communication. It is generally agreed among nurses, prescribing practitioners, and other health care professionals that there is need for a common language within the health care sector. A mutual vocabulary that can be used for describing practice, research, and education benefits both the profession and the consumer. In addition, communication about nursing diagnoses is possible through computer-based searches.

Holistic, individualized care Holistic client care is facilitated with the use of nursing diagnosis. The list of NANDA-I– approved nursing diagnoses (NANDA-I, 2009) for clinical use provides assistance for the nurse in individualizing care and developing comprehensive therapeutic nursing interventions.

Components of a Nursing Diagnosis

There are five components of a nursing diagnosis that should be understood by the student and practicing clinician alike. The diagnostic label (or concept) consists of one or more nouns (and may also include an adjective) that name the diagnosis and can be a word or a phrase that describes the pattern of related cues. The definition provides a clear description and differentiates one diagnosis from other similar diagnoses. The defining characteristics are observable manifestations of a specific diagnosis (NANDA-I, 2009). Risk factors are those elements that increase the chances of an individual, family, or community being susceptible to a disease state or life event that will have an impact on health. Finally, related factors can precede, be associated with, contribute to, or be related to nursing diagnoses in some type of patterned relationship (NANDA-I, 2009). Several formats have been used to structure nursing diagnosis statements. Two formats that are frequently seen in the nursing literature are the two- and three-part statements. The two-part statement is NANDA-approved and is used by most nurses, in large part because of its brief and precise format. The three-part statement is preferred by those nurses desiring to strengthen the diagnostic statement by including specific manifestations, an attribute that is not possible through the use of the two-part format.

The Two-Part Statement

The components of a nursing diagnosis typically consist of two parts. The first component is a problem statement or diagnostic label that describes the client's response to an actual, a possible, a risk for a health problem, or a wellness condition. The second component of a two-part nursing diagnosis is the etiology. The etiology is the related contributing factor of the problem. The diagnostic label and etiology are linked by the term related to (RT). Examples of nursing diagnoses are disturbed body image RT loss of left lower extremity and activity intolerance RT decreased oxygen-carrying capacity of cells. Descriptive words or modifiers may be added to clarify specific nursing diagnoses. These modifiers, which limit or specify the meaning of a nursing diagnosis, are called judgments. NANDA-I (2009) recognizes the following: anticipatory, compromised, decreased, defensive, deficient, delayed, disabled, disorganized, disproportionate, disturbed, dysfunctional, effective, enhanced, excessive, imbalanced, impaired, ineffective, interrupted, low, organized, perceived, readiness for, and situational. These terms are placed before the problem statement. The population for which a diagnosis is being used can also be named. The populations identified by NANDA-I (2009) include individual, family, group, and community. If a population is not specified within the diagnostic label, such as with readiness for enhanced family processes, it becomes the individual by default.

The Three-Part Statement

The nursing diagnosis can also be expressed as a three-part statement. As in the two-part statement, the first two components are the diagnostic label and the etiology. The third component consists of defining characteristics (collected data that are also known as signs and symptoms, subjective and objective data, or clinical manifestations). In the three part nursing diagnosis format, the third part is joined to the first two components with the connecting phrase ''as evidenced by''(AEB). Defining characteristics list the relevant clinical manifestations, such as signs or symptoms for the identified client problem and the related etiology. Defining characteristics are identified for each NANDA-approved diagnosis.These characteristics continue to evolve as they are reviewed and updated. Defining characteristics may assist the nurse in identifying client goals, measurable client outcome criteria and relevant nursing interventions. Some nurses believe that the three-part statement strengthens the diagnostic process. However, other nurses prefer the two-part statement and refer to the defining characteristics as part of the original database.

Categories of Nursing Diagnoses

Nursing diagnoses may be classified into four categories of health status:

a. Actual: Actual diagnoses are those problems that are already in existence. Examples of actual diagnoses include excess fluid volume RT intravenous infusion therapy overload and anxiety RT unknown results of breast biopsy.
b. Risk: Risk diagnoses are identified when there is a recognized vulnerability for the client to exhibit a problem, but that response has not yet manifested itself. Examples of risk diagnoses include risk for poisoning RT increased mobility of infant and failure to have house child proofed and risk for deficient fluid volume RT excessive number of stools.
c. Health promotion: Health promotion diagnoses identify behaviors that indicate a desire to increase well-being.
d. Wellness: Wellness diagnoses identify the client condition or state of being healthy that may be enhanced by deliberate health promoting activities. These consist of a one-part statement (no ‘‘related to ’’phrase) that uses the label ‘‘readiness for enhanced’’ followed by the state to be enhanced. Examples of wellness diagnoses include readiness for enhanced community coping and readiness for enhanced spiritual well-being.

Planning and outcome identification

Planning, the third step of the nursing process, includes the formulation of guidelines used to establish the client’s plan of care. Preceding this step is the collection of assessment data and the formulation of nursing diagnoses. After a nurse thoroughly assesses a client and determines the client’s unique nursing diagnoses (or problems), a plan of action is developed with specific goals to resolve the nursing diagnoses or health problems. Following the planning component, the nursing process continues with implementation of nursing interventions and evaluation of the client’s response to the plan of care.

Purposes of Planning and Outcome Identification

The American Nurses Association (2004) identifies outcome identification and planning as essential principles for ensuring the delivery of competent nursing care and outlines these components in terms of their significance within the nursing process. Although the overall purpose of a client’s plan of care should be to maintain or improve health at an optimal level, planning is a framework on which to base scientific nursing practice. Therefore, planning is done in order to provide quality nursing care. Planning also improves staff communication and provides continuity in the delivery of individualized, quality nursing care to all clients. The four critical elements of planning include:

- Establishing priorities
- Setting goals and developing expected outcomes (outcome identification)
- Planning nursing interventions (with collaboration and consultation as needed)
- Documenting nursing

Establishing priorities

The establishment of priorities is the first element of planning. When establishing priorities, the nurse examines the client's nursing diagnoses and ranks them in order of physiological or psychological importance. This method organizes a client's nursing diagnoses into a systematic framework for the planning of nursing care. The diagnoses should be mutually ranked by the nurse and client. Involving the client in shared decision-making power helps motivate the client and gives the client a feeling of control, which inspires successful achievement of each goal.

Establishing goals and expected outcomes

After assessing the client, formulating nursing diagnoses, and establishing priorities, the nurse sets goals and identifies and establishes expected outcomes for each nursing diagnosis. The purposes of setting goals and expected outcomes are to provide guidelines for individualized nursing interventions and to establish evaluation criteria for measuring the effectiveness of the nursing care plan.

Goal

Goal is an aim, an intent, or an end. A goal is a broad or globally written statement describing the intended or desired change in the client's behavior, response, or outcome. An expected outcome is a detailed, specific statement that describes the method through which the goal will be achieved. Expected outcomes are addressed through direct nursing care activities, such as client teaching. Goals should be established to meet the immediate, as well as long-term prevention and rehabilitation, needs of the client. A short-term goal is a statement written in objective format demonstrating an expectation to be achieved in resolution of the nursing diagnosis in a short period of time, usually in a few hours or days. A long-term goal is a statement written in objective format demonstrating an expectation to be achieved in resolution of the nursing diagnosis over a longer period of time, usually over weeks or months.

Another consideration is the accuracy in identifying the etiology of the problem. If the etiology of the problem is incorrectly identified, the client may meet the short-term

Expected Outcomes
After the goal is established, the expected outcomes can be identified based on the goal. Given the client's unique situation and resources, expected outcomes are constructed to be:

- Realistic
- Mutually desired by the client and nurse
- Attainable within a defined time period

Planning nursing interventions
Once the goals have been mutually agreed on by the nurse and client, the nurse should use a decision-making process to select appropriate nursing interventions. A nursing intervention is an action performed by a nurse that helps the client to achieve the results specified in the goals and expected outcomes. These actions are based on scientific principles and knowledge from nursing, behavioral and physical sciences. Usually, several nursing interventions are developed for each of the goals identified for the client. It is important to identify as many nursing interventions as possible so that if one proves to be unsuitable, others are readily available. The interventions are prioritized according to the order in which they will be implemented.

The delivery of quality, individualized nursing care is greatly enhanced by combining critical thinking and the scientific problem-solving approach. Through critical thinking, sound conclusions are reached in the selection of nursing interventions to prevent, reduce, or eliminate the nursing diagnoses or problems. Several factors can assist the nurse in selecting nursing interventions. Just as the client's goals can be derived from the nursing diagnosis, the nursing interventions can be developed from the etiology of each nursing diagnosis. The effective nurse plans interventions that are directed toward the causative factors of the client's nursing diagnosis or problem. For example, for a client with angina whom has the nursing diagnosis of pain related to myocardial ischemia, an appropriate nursing intervention would be to help the client conserve energy (i.e, bed-rest).

Implementation
Implementation, the fourth step in the nursing process, involves the execution of the nursing plan of care that was developed during the planning phase. It involves completion of nursing activities to accomplish predetermined goals and to make progress toward achievement of specific outcomes. The implementation phase of the

nursing process, as with the other phases of the process, requires a broad base of clinical knowledge, careful planning, critical thinking and analysis, and judgment on the part of the nurse.

Requirements for effective implementation

The implementation phase of the nursing process requires cognitive (intellectual), psychomotor (technical) and interpersonal communication skills. These skills serve as vehicles with which effective nursing care can be delivered and are used either in conjunction with each other or individually as required by the client and the specific needs of the situation.

Cognitive skills

Cognitive skills enable nurses to make appropriate observations, understand the rationale for the activities performed and appreciate how differences among individuals influence nursing care. Critical thinking is an important element within the cognitive domain because it helps nurses to analyze data, organize observations and apply prior knowledge and experiences to current client situations.

Psychomotor skills

Proficiency with psychomotor skills is necessary to safely and effectively perform nursing activities. Nurses must be able to handle medical equipment with a high degree of competency and to perform skills such as administering medications and assisting clients with mobility needs (e.g., positioning and ambulating).

Interpersonal skills

The use of interpersonal skills involves communication with clients and families as well as with other health care professionals. The nurse-client relationship is established through the use of therapeutic communication that helps ensure a beneficial outcome for the client's health status. Interaction between members of the health care team promotes collaboration and enhances holistic care of the client. Communication is also the mechanism by which nurses teach clients, families, and other community groups.

Evaluation

Evaluation is the fifth step in the nursing process and involves determining whether the client goals have been met, have been partially met, or have not been met. Even though it is the final phase of the nursing process, evaluation is an ongoing part of daily nursing activities. The major purpose of evaluation is to determine the effectiveness of those activities in helping clients achieve expected outcomes. Evaluation is not only a part of the nursing process but also an integral process in determining the quality of health care delivered. The purposes of evaluation include:

- to determine the client's progress or lack of progress toward achievement of expected outcomes.
- to determine the effectiveness of nursing care in helping clients achieve the expected outcomes
- to determine the overall quality of care provided
- to promote nursing accountability

Evaluation is done primarily to determine whether a client is progressing-that is, experiencing an improvement in health status. Evaluation is not an end to the nursing process, but rather an ongoing mechanism that ensures quality interventions. Effective evaluation is done periodically, not just prior to termination of care. Evaluation is closely related to each of the other stages of the nursing process. The plan of care may be modified during any phase of the nursing process when the need to do so is determined through evaluation. Client goals and expected outcomes provide the criteria for evaluation of care. The Nursing Interventions Classification (NIC) and Nursing Outcomes Classification (NOC) taxonomies are methods useful in evaluating clients' achievement of outcomes and the efficacy of nursing interventions.

Components of Evaluation

Evaluation is a fluid process that depends on all the other components of the nursing process. Evaluation affects, and is affected by, assessment, diagnosis, outcome identification and planning, and implementation of nursing care. Ongoing evaluation is essential if the nursing process is to be implemented appropriately.

TECHNIQUES Effective evaluation results primarily from the nurse's accurate use of communication and observation skills. Both verbal and nonverbal communication between the nurse and the client can yield important information about the accuracy of the goals, expected planned outcomes, and nursing interventions that have been executed for resolution of the client's problems. The nurse needs to be sensitive to clients' willingness or hesitation to discuss their responses to nursing actions and must use therapeutic communication techniques to collect all necessary data. Effective nurses are aware of changes in the client's physiological condition, emotional status, and behavior. Because these changes are often subtle, they require astute observational skills on the part of the nurse. Observation occurs through use of the senses. In other words, what the nurse sees, hears, smells, and feels when touching the client all provide clues to the client's current health status.

4.0 SUMMARY

In this unit you have learnt that,

- The nursing process is a systematic, rational method of planning and providing individualized nursing care
- Phases of nursing process comprises assessing, diagnosing (which includes outcomes identification and analysis), planning, implementing, and evaluating.
- Nursing diagnoses may be classified into four categories of health status which are: actual, risk, health promotion and wellness.

5.0 TUTOR-MARKED ASSIGNMENT

1. Read more about essential elements of assessment process. Work with your preceptor, choose a patient in the health facility where you work and use essential elements of assessment process as a guide to your data collection and utilize Nursing Process to develop the care plan and manage him or her. Submit your report to your preceptor. Share your experiences using the Nursing Process with your colleagues on the discussion forum.

   Note: protect patient's privacy.

2. What are the priority nursing diagnoses that you made and why do you consider them priority?

SELF-ASSESSMENT EXERCISE

Scenario: Mr. Magee was admitted yesterday with right-sided weakness. His medical diagnosis is cerebrovascular accident (CVA). He is 68 years old and lives alone in the house on his farm where he and his wife lived for 40years. She died last year. He reports that he is right-handed and has difficulty holding a fork.

ASSESSMENT

- ''I can't handle this milk carton with only one hand.''
- ''I do not like to use that walker. It gets in my way.''
- Gait unsteady and shuffling.
- Asymmetrical strength in arms and legs.
- Unable to hold fork in right hand.

Identify 2 nursing diagnoses and draw a care plan with him.

UNIT 5 CRITICAL THINKING IN NURSING PRACTICE

CONTENTS

1.0 INTRODUCTION

Critical thinking skills have been used in nursing education and practice in the past decade. In general, nurses use critical thinking when taking care of their patients, and specifically when they are providing patient education.

Have you ever had cause to make complex decisions that required thinking deeply or critically? A nurse is faced with increasingly complex issues nowadays due to advanced technology, patients knowing and claiming their rights, complexity of disease processes, as well as cultural and ethical factors. Nursing involves being able to reason, having adequate knowledge, and using available information and ideas to analyze issues in order to make informed decision.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- explain the term 'Critical Thinking'
- differentiate between critical thinking and non critical thinking in nursing practice
- describe the process of critical thinking
- describe the components of critical thinking

- explain the factors that can influence the critical thinking process in nursing care plan
- develop a plan of nursing care for a patient using strategies of critical thinking

3.0 MAIN CONTENT

3.1 Definition of Term

Critical thinking is defined as "a systematic way to form and shape one's thinking. It functions purposefully and exactingly. It is thought that is disciplined, comprehensive, based on intellectual standards, and, as a result, well-reasoned''
Critical thinking is a multidimensional skill, a cognitive or mental process or set of procedures.

3.2 Differences Between Critical and Non-Critical Thinking in Nursing Practice

CRITICAL THINKING IS	CRITICAL THINKING IS NOT
Organized and clearly explained with the use of words examples audio/visual materials	Disorganized and vague
Aimed at positive health outcomes, new ideas, and doing things in the best interest of the .patients	Focused on limiting new ideas and suggestions, or alternatives
Inquisitive about intents ,facts and reasons behind an idea or action, it is knowledge – based	Unconcerned about motives, facts and reasons behind an idea or action, task oriented rather than thought – oriented
Sensitive to the powerful influence of emotion, but focused on making decision based on what is moral and ethical.	Emotionally driven.
Communicative and collaborative with the nurse and all members of the health care team as they adapt to complex patient issues	Isolated, competitive or unable to communicate with others when dealing with complex issues

Adapted from Alfaro – LeFevre, R. (2009). Critical thinking and clinical judgment: a practical approach to outcome focused thinking. (4th ed) St Louis: W.B. Saunders

3.3 Critical Thinking Process

Critical thinking is systematic and organized. The skills involved in critical thinking are developed over time through effort, practice, and experience. Skills needed in critical thinking include interpretation, analysis, evaluation, inference, explanation and self regulation. Critical thinking requires background knowledge and knowledge of key concepts as well as standards of good thinking. The critical thinker uses reality-based deliberation to validate the accuracy of data and reliability of sources, being mindful of and questioning inconsistencies. Interpretation is used to determine the significance of data that are gathered, and analysis is used to identify patient problems indicated by the data. The nurse uses inferences to draw conclusions. Evaluation is the process of determining whether outcomes have been or are being met, and self-regulation is the process of examining the care provided and adjusting the interventions as needed.

Critical thinking is also reflective, involving metacognition, active evaluation, and refinement of the thinking process. The critical thinker considers the possibility of personal bias when interpreting data and determining appropriate actions. The critical thinker must be insightful and have a sense of fairness and integrity, the courage to question personal ethics, and the perseverance to strive continuously to minimize the effects of egocentricity, ethnocentricity, and other biases on the decision-making process.

3.4 Components of Critical Thinking

Certain cognitive or mental activities can be identified as key components of critical thinking. When thinking critically, a person will do the following:

- Ask questions to determine the reason why certain developments have occurred and to see whether more information is needed to understand the situation accurately.
- Gather as much relevant information as possible to consider as many factors as possible.
- Validate the information presented to make sure that it is accurate, that it makes sense, and that it is based on fact and evidence.
- Analyze the information to determine what it means and to see whether it forms clusters or patterns that point to certain conclusions.

- Draw on past clinical experience and knowledge to experience to explain what is happening and to anticipate what happens next, acknowledging personal bias and cultural influences.
- Maintain a flexible attitude that allows the facts to guide thinking and takes into account all possibilities.
- Consider available options and examine each in terms of its advantages and disadvantages.
- Formulate decisions that reflect creativity and independent decision making.

3.5 Factors that can influence the Critical thinking process in Nursing care plan

Using critical thinking to develop a plan of nursing care requires considering the human factors that might influence the plan. The nurse interacts with the patient, family, and other health care providers in the process of providing appropriate, individualized nursing care.
The culture, attitude and thought processes of the nurse, the patient, and others will affect the critical thinking process from the data-gathering stage through the decision-making stage; therefore, aspects of the nurse-patient interaction must be considered.

Nurses must use critical thinking in all practice settings-hospital, home and community. However, regardless of the setting, each patient situation is viewed as unique and dynamic. The unique factors that the patient and nurse bring to the health care situation are considered, studied, analyzed, and interpreted. Interpretation of the information presented then allows the nurse to focus on those factors that are most relevant and most significant to the clinical situation. Decisions about what to do and how to do it are then developed into a plan of action.

3.6 Fonteyn [1998], identified 12 predominant thinking strategies used by nurses, regardless of their area of clinical practice

- Recognizing a pattern
- Setting priorities
- Searching for information
- Generating hypotheses
- Making predictions
- Forming relationships
- Stating a proposition[“if-then”]
- Asserting a practice rule
- Making choices[alternative actions]
- Judging the value

- Drawing conclusions
- Providing explanations

4.0 SUMMARY

This unit talks about the definition of critical thinking, differences between critical and non-critical thinking, process of critical thinking, components of critical thinking, factors that can influence the process of critical thinking in nursing care plan and strategies that could be used to plan patient's nursing care.

5.0 TUTOR-MARKED ASSIGNMENT

You are on morning duty in the accident and emergency unit with a full bed complement, you have just been informed that a strike action is to commence immediately. How will you use critical thinking approach to address this issue? Write down your submission and submit to your course facilitator.

SELF-ASSESSMENT EXERCISE

A severely anemic patient tells you she is not ready to be transfused, which critical thinking strategies wouldyou use to address the issue. Give reasons for your response (LO6).

6.0 REFERENCES/FURTHER READING

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