"Child health Nursing".

In Section 1 of this course you will cover these topics:

- Nurses Role In The Care Of The Child: Hospital, Community Settings, And Home.
- Family-Centered Care: Theory And Applications
- Cultural Influences
- Genetic And Hereditary Influences
- Concepts Of Growth And Development
- Child And Family Communication
- Social And Environmental Influences On The Child
- Pediatric And Newborn Assessment

Topic : Nurses Role In The Care Of The Child: Hospital, Community Settings, And Home.

Topic Objective:

At the end of the topic student will be able to understand:

- Death rates from unintentional and intentional injuries
- Child Mortality
- Nurses Play Vital Role in Development of Child Healthcare

Definition/Overview:

Ranking of infant mortality rates in 2001 among world nations. Note the ranking of the United States, far behind Canada, European nations, and many Asian nations. What could account for the poorer ranking? Note: From UNICEF. Official summary: The state of the worlds children 2003 (pp. 1418). New York: United Nations Publications.

Key Points:

1. Nurses Play Vital Role in Development of Child Healthcare

Leading causes of death in the United Statesin the neonatal period (in infants up to 28 days of age) in 1989 and 2001. Why do you think the neonatal mortality rate associated with short gestation and low birth weight was higher in 2000 than in 1989? What could account for the dramatic reduction in mortality due to respiratory distress syndrome? Consider the impact of advances in healthcare technology on the changes in mortality

rates during the decade illustrated. The neonatal intensive care nurseries have collaborated in multicenter research trials to identify the medical interventions associated with the best outcomes for low-birth-weight infants and those with respiratory distress syndrome. New technology and new knowledge have improved survival of infants with respiratory distress syndrome, but there are increasing numbers of very-low birth-weight infants alive at birth who die in the first days of life. Note: From National Centerfor Health Statistics. In 1989, the mortality rate for sudden infant death syndrome was 129.6 per 100,000 live births in contrast to 2001 when the mortality rate was 50.8 per 100,000 live births. The change in recommended sleep position for newborns and infants from the stomach to the back has been credited with much of this decreased rate of SIDS.

2. Child Mortality

Child mortality refers to the death of infants and children under the age of five. About 25,000 young children die every day, mainly from preventable causes. In 2007, 9.2 million children under five died, down from 9.7 million in 2006, and 12.7 million in 1990. About half of child deaths occur in Africa. Approximately 60 countries make up 94% of under five child deaths.

3. Death rates from unintentional and intentional injuries

Death rates from unintentional and intentional injuries per 100,000 children ages 1 to 4

years in the United States in 1988 and 2001. Interventions such as car safety seats, enforcement of fences around swimming pools, and working smoke detectors in homes all contributed to reductions in unintentional injury deaths. Which types of injuries are unintentional (unplanned or accidental) and intentional (violence or homicide related)?

Death rates from unintentional and intentional injuries per 100,000 children ages 5 to 14 years in the United Statesin 1988 and 2001. Intensive focus on infant and child passenger safety in motor vehicles has contributed to the reduction in motor vehiclerelated deaths. What could be causing the increased rate of deaths due to firearms noted in 2001? Death rates from all injuries per 100,000 adolescents 15 to 19 years in the United Statesin 1988 and 2000. While the rate of motor vehiclerelated deaths has decreased, a greater

proportion of injury deaths is now due to firearms. How can you use these data with patients and families during patient teaching and when providing care?

Topic : Family-Centered Care: Theory And Applications

Topic Objective:

At the end of the topic student will be able to understand:

- Family-Centered Care
- Why Do We Need Family-Centered Care?
- The Three Possible Driving Force of Service Delivery
- Elements of Family-Centered Care
- Focus of Old System-Centered Care
- Focus of New Family-Centered Care
- Recognizing the Driving Forces of Services

Definition/Overview:

Families are big, small, extended, nuclear, multi-generational, with one parent, two parents, and grandparents. We live under one roof or many. A family can be as temporary as a few weeks, as permanent as forever. We become part of a family by birth, adoption, marriage, or from a desire for mutual support... A family is a culture unto itself with different values and unique ways of realizing its dreams. Together, our families become the source of our rich cultural heritage and spiritual diversity. Our families create neighborhoods, communities, states, and nations.

Key Points:

1. Family-Centered Care

Family-Centered care was first defined in 1987 as part of former Surgeon General Koops initiative for family-centered, community-based, coordinated care for children with special health care needs and their families. The Key Elements of Family-Centered Care (listed below) were further refined in 1994 by the ACCH (Association for the Care of Childrens Health). These key elements are widely accepted by families and professionals alike as they embody both the spirit and heart of Family-Centered Care.

At the very heart of family-centered care is the recognition that the family is the constant in a childs life. For this reason, family-centered care is built on partnerships between families and professionals. Although family-centered care was first intended for children with special needs, it can also be relevant in all settings and can be applied to persons of all ages. Family-Centered Care is neither a destination nor something that one instantly becomes. It is a continual pursuit of being responsive to the priorities and choices of families. There is no single approach that is right for all families. Family-centered professionals acknowledge and respect family diversity.

2. Why Do We Need Family-Centered Care?

Because Family-Centered Care improves and enhances clinical outcomes for children with special needs and provides more support for their families as they deal with the challenges and joys of raising a child with special needs. Because the family-centered approach enhances success and satisfaction in the work of medical professionals. It places a new emphasis on the art of medicine, recognizing that the way care is provided is important, if not more important, than the actual provision of care. It leads to better health outcomes and wiser allocation of resources.

Family-centered care requires that we recognize the driving forces behind our programs and services. We need to recognize when our services are not family-centered and strive to make them as family-centered as possible.

3. The Three Possible Driving Force of Service Delivery

- **System-Centered:** The needs of, or benefit to, the system drive the delivery of services.
- **Child-Centered:** The strengths and needs of the child drive the delivery of services.
- **Family-Centered:** The priorities and choices of the family drive the delivery of services.

To illustrate these three forces, consider that a child requires a special diet.

In a System-Centered facility, test results must be sent ahead before a visit can be scheduled with a nutritionist. This rule reflects a requirement of the system or perhaps a job function within that system. In a Child-Centered facility, the nutritionist assesses the child, designs a meal plan, and gives it to the parents. Although this approach addresses the childs clinical needs as identified by the nutritionist, the familys dietary preferences,

cultural practices, and resources have not been considered. In a Family Centered facility, the nutritionist asks to meet with the parents to jointly design a meal plan in line with the familys resources and preferences. This addresses the priorities and choices of the family and also affords the best clinical outcome.

4. Elements of Family-Centered Care

- Recognize that the family is the constant in the child's life, while the service systems and personnel within those systems fluctuate.
- Share complete and unbiased information with parents about their child's condition on an ongoing basis. Do so in an appropriate and supportive manner.
- Recognize family strengths and individuality. Respect different methods of coping.
- Encourage and make referrals to parent-to-parent support.
- Facilitate parent/professional collaboration at all levels of health care -- care of an individual child, program development, implementation, and evaluation policy formation.
- Assure that the design of health care delivery systems is flexible, accessible and responsive to families.
- Implement appropriate policies and programs that provide emotional and financial support to families.
- Understand and incorporate the developmental needs of children and families into health care delivery systems.

5. Focus of Old System-Centered Care

- Family discrepancy
- Has a restrictive definition of the family
- Disempowers patients and their families
- Relies heavily on technology and biomedical science and undervalues the importance of human interactions in health care experiences.
- Is driven by the system

6. Focus of New Family-Centered Care

- Respect
- Strengths

- Choice
- Flexibility
- Information
- Support
- Collaboration
- Empowerment

7. Recognizing the Driving Forces of Services

Once we can begin to recognize the forces that drive our services, it will be easier to visualize new possibilities for Family-Centered Care. In this exercise, there can be more than one answer depending on how these examples are justified. The important thing about this exercise is to begin thinking about what drives our services rather than getting the right answer.

Topic : Cultural Influences

Topic Objective:

At the end of the topic student will be able to understand:

- Concept
- The All-Pervading Influence of Culture

Definition/Overview:

In the twentieth century, "culture" emerged as a concept central to anthropology, encompassing all human phenomena that are not purely results of human genetics. Specifically, the term "culture" in American anthropology had two meanings: (1) the evolved human capacity to classify and represent experiences with symbols, and to act imaginatively and creatively; and (2) the distinct ways that people living in different parts of the world classified and represented their experiences, and acted creatively. Following World War II, the term became important, albeit with different meanings, in other disciplines such as sociology, cultural studies, organizational psychology and management studies.

Key Points:

1. **The All-Pervading Influence of Culture**: **Culture As A Mindset**

Its a given that culture powerfully influences thoughts, emotions and behaviors. In fact, culture operates at primary cognitive, perceptual and motivational levels. Culture is an important part of our blueprint for operation within our physical and social worlds. We are an insecure species and culture offers us a reduction of anxiety through its standard rules of thought, emotion and behavior. Culture offers predictability in an often unpredictable world. We see things through a cultural lens that tints, magnifies, shrinks and otherwise shapes our perceptions. Our culture is a mindset that we developed during childhood socialization. The structural integrity, coherency and stability of our personalities are rooted in our culture. It is for these and other reasons that intercultural interactions can cause anxiety and arouse emotions. When people of different cultures meet there can be uncertainty and confusion about the rules of interaction. Many of our basic assumptions do not work. Our normally successful thoughts, emotions and behaviors do not get the verification and feedback we are accustomed to. Some of our expectancies regarding the outcome and meaning of social interactions are disconfirmed. When we are in a social interaction situation in another culture we may think, feel or behave in the manner we are normally accustomed to in such a situation and then find that it just didnt work. We expected to be understood and we expected a certain response from other people, but we either got no response at all or a response that was completely different from what we expected. We might have been so misunderstood that we caused hurt feelings, anger or resentment or felt these ourselves. And even if we dont experience these stronger emotions, we most definitely feel confusion.

2. Concept

The concepts of low-context and high-context are useful analytical tools here. Context refers to the amount of meaning which the social situation has on the rules of discourse for an interaction, in other words, the way in which the social situation influences the structure and content of the interaction. America is a low-context culture (more informal) and Pacific island cultures are high-context (more formal). As an American from a low-context, individualistic culture, when I meet someone for the first time my inclination is to be informal and also to tell them a lot about myself and ask them a lot of questions

about themselves in order to get a maximum amount of information in a minimum amount of time. To a Pacific islander, who comes from a high-context collectivist culture, I may appear pushy by moving too fast, self-centered and egotistical by telling them so many things about myself, and lastly I may appear rude and prying by asking them so many questions about themselves and putting them on the spot.

Culture also influences how we learn and how we teach. Teaching within ones own culture is an activity where social and cultural context and the existence of different thinking, learning and instructional styles interact in a very complex fashion. The classroom is a complex sociocultural environment even when working within our own culture. The age, sex, gender role expectations, appearance and dress expectations, numerous other role expectations, socioeconomic status and many other characteristics of both students and teachers are all variables affecting the interactions, the effectiveness of instruction and the amount of learning which takes place in the classroom. The situation becomes even more complex when students and instructors are from different cultures. Culture and sub-culture affects the attitudes, assumptions, expectations, style and performance of both instructors and students. Consider America where there are differences between rural and urban subcultures as well as differences within and between European, African-American, Hispanic and Asian subcultures. In the Pacific we also encounter cultural and subcultural differences within and between indigenous people and immigrant populations; and even among indigenous people there are ethnic and cultural subdivisions such as main islanders and outer islanders with implications for interaction. Culture influences norms of verbal and non-verbal interaction within the classroom. Even within the United States, subcultural and socioeconomic differences can create vastly different classroom interaction patterns. A society educational processes normally display a vast array of thinking styles, learning styles, teaching styles and styles of learning environment. Culture can contribute to making certain styles more prominent than others.

Topic : Genetic And Hereditary Influences

Topic Objective:

At the end of the topic student will be able to understand:

- DNA and chromosomes

- Reproduction
- Recombination and linkage

Definition/Overview:

Genetics (from Ancient Greekγενετικός genetikos, genitive and that from γένεσις genesis, origin), a discipline of biology, is the science of heredity and variation in living organisms. The fact that living things inherit traits from their parents has been used since prehistoric times to improve crop plants and animals through selective breeding. However, the modern science of genetics, which seeks to understand the process of inheritance, only began with the work of Gregor Mendel in the mid-nineteenth century. Although he did not know the physical basis for heredity, Mendel observed that organisms inherit traits in a discrete mannerthese basic units of inheritance are now called genes. Genes correspond to regions within DNA, a molecule composed of a chain of four different types of nucleotidesthe sequence of these nucleotides is the genetic information organisms inherit. DNA naturally occurs in a double stranded form, with nucleotides on each strand complementary to each other. Each strand can act as a template for creating a new partner strandthis is the physical method for making copies of genes that can be inherited.

Key Points:

1. DNA and chromosomes

The molecular structure of DNA. Bases pair through the arrangement of hydrogen bonding between the strands.

The molecular basis for genes is deoxyribonucleic acid (DNA). DNA is composed of a chain of nucleotides, of which there are four types: adenine (A), cytosine (C), guanine (G), and thymine (T). Genetic information exists in the sequence of these nucleotides, and genes exist as stretches of sequence along the DNA chain. Viruses are the only exception to this rulesometimes viruses use the very similar molecule RNA instead of DNA as their genetic material. DNA normally exists as a double-stranded molecule, coiled into the shape of a double-helix. Each nucleotide in DNA preferentially pairs with its partner nucleotide on the opposite strand: A pairs with T, and C pairs with G. Thus, in its two-stranded form, each strand effectively contains all necessary information, redundant with its partner strand. This

structure of DNA is the physical basis for inheritance: DNA replication duplicates the genetic information by splitting the strands and using each strand as a template for synthesis of a new partner strand.

Genes are arranged linearly along long chains of DNA sequence, called chromosomes. In bacteria, each cell has a single circular chromosome, while eukaryotic organisms (which includes plants and animals) have their DNA arranged in multiple linear chromosomes. These DNA strands are often extremely long; the largest human chromosome, for example, is about 247 million base pairs in length. The DNA of a chromosome is associated with structural proteins that organize, compact, and control access to the DNA, forming a material called chromatin; in eukaryotes, chromatin is usually composed of nucleosomes, repeating units of DNA wound around a core of histone proteins. The full set of hereditary material in an organism (usually the combined DNA sequences of all chromosomes) is called the genome.

While haploid organisms have only one copy of each chromosome, most animals and many plants are diploid, containing two of each chromosome and thus two copies of every gene. The two alleles for a gene are located on identical loci of sister chromatids, each allele inherited from a different parent.

Walther Flemming's 1882 diagram of eukaryotic cell division. Chromosomes are copied, condensed, and organized. Then, as the cell divides, chromosome copies separate into the daughter cells. An exception exists in the sex chromosomes, specialized chromosomes many animals have evolved that play a role in determining the sex of an organism. In humans and other mammals, the Y chromosome has very few genes and triggers the development of male sexual characteristics, while the X chromosome is similar to the other chromosomes and contains many genes unrelated to sex determination. Females have two copies of the X chromosome, but males have one Y and only one X chromosome - this difference in X chromosome copy numbers leads to the unusual inheritance patterns of sex-linked disorders.

2. Reproduction

When cells divide, their full genome is copied and each daughter cell inherits one copy. This process, called mitosis, is the simplest form of reproduction and is the basis for asexual reproduction. Asexual reproduction can also occur in multicellular organisms, producing

offspring that inherit their genome from a single parent. Offspring that are genetically identical to their parents are called clones.

Eukaryotic organisms often use sexual reproduction to generate offspring that contain a mixture of genetic material inherited from two different parents. The process of sexual reproduction alternates between forms that contain single copies of the genome (haploid) and double copies (diploid). Haploid cells fuse and combine genetic material to create a diploid cell with paired chromosomes. Diploid organisms form haploids by dividing, without replicating their DNA, to create daughter cells that randomly inherit one of each pair of chromosomes. Most animals and many plants are diploid for most of their lifespan, with the haploid form reduced to single cell gametes.

Although they do not use the haploid/diploid method of sexual reproduction, bacteria have many methods of acquiring new genetic information. Some bacteria can undergo conjugation, transferring a small circular piece of DNA to another bacterium. Bacteria can also take up raw DNA fragments found in the environment and integrate them into their genome, a phenomenon known as transformation. These processes result in horizontal gene transfer, transmitting fragments of genetic information between organisms that would be otherwise unrelated.

3. Recombination and linkage

Thomas Hunt Morgan's 1916 illustration of a double crossover between chromosomes

The diploid nature of chromosomes allows for genes on different chromosomes to assort independently during sexual reproduction, recombining to form new combinations of genes. Genes on the same chromosome would theoretically never recombine, however, were it not for the process of chromosomal crossover. During crossover, chromosomes exchange stretches of DNA, effectively shuffling the gene alleles between the chromosomes. This process of chromosomal crossover generally occurs during meiosis, a series of cell divisions that creates haploid cells.

The probability of chromosomal crossover occurring between two given points on the chromosome is related to the distance between the points. For an arbitrarily long distance, the

probability of crossover is high enough that the inheritance of the genes is effectively uncorrelated. For genes that are closer together, however, the lower probability of crossover means that the genes demonstrate genetic linkage - alleles for the two genes tend to be inherited together. The amounts of linkage between a series of genes can be combined to form a linear linkage map that roughly describes the arrangement of the genes along the chromosome.

Topic : Concepts Of Growth And Development

Topic Objective:

At the end of the topic student will be able to understand:

- Normal Cephalocaudal Growth
- Major Theories of Personality Development
- Personality Development
- Five Dimensions
- Psychosocial Development During Toddlerhood

Definition/Overview:

Adolescence is a time of many transitions for both teens and their families. To ensure that teens and adults navigate these transitions successfully, it is important for both to understand what is happening to the teen physically, cognitively, and socially; how these transitions affect teens; what adults can do; and what support resources are available. As you read the following information, keep in mind that while all teens develop, they dont all follow the same timeline.

Key Points:

1. Normal Cephalocaudal Growth

In normal cephalocaudal growth, the child gains control of the head and neck before the trunk and limbs. In normal proximodistal growth, the child controls arm movements before hand movements. For example, the child reaches for objects before being able to

grasp them. Children gain control of their hands before their fingers; that is, they can hold things with the entire hand before they can pick something up with just their fingers.

2. Major Theories of Personality Development

- Developmental stages
- Freud psychosexual focus to personality development
- Erikson developmental challenges throughout life

3. Personality Development

The progress in and insistence on quality of education coupled with rapid strides in spread of knowledge calls for equally developed and able recipients. Thus, a definite need is felt for well-developed personality and character in our life. The vedantic concept of personality development is based on the concept of perfection of each soul and self-confidence for realization and manifestation of this inner knowledge.

4. **Five Dimensions**

Five dimensions are involved in forming the human personality. These are:1) physical self, 2) energy self, 3) intellectual self, 4) mental self, and 5) blissful self.
Well-integrated personality is the sum total of harmonious expression of these five dimensions.Physical self relates to our senses. Proper nourishment and growth of physical faculties is essential by way of balanced diet, recreation, music, and care and concern from near and dear ones. A simple pat on the back for any achievement in life goes a long way to build up confidence. However, discretion and discrimination are the key words in this regard. Otherwise, there is every chance that senses would create havoc by way of infatuation and attachment to the sense objects. Energy self is somewhat subtler than the first. It relates to metabolism and the gross manifestations of energy (Prana), for insatnce the act of breathing. The control of Prana is achieved by control of anger, anxiety, and restlessness. Intellectual self concerns with discriminative power and knowledge, what we call "buddhi". In addition to sincere and formal studies, reading other books like biographies of great and noble persons and invigorating literature helps us develop this faculty. Mental self is related to stress and psychology. Here selflessness, control, concentration, and calmness of mind plays essential role.

Anandamaya Kosha or blissful self is the function of state of being. It calls for remaining calm and unaffected, nay to remain happy, in all the frivolities of world, in neck break competition and struggle, in calamities and disasters, in suffering and loss, in failure and success. The five fold method to attain to such state of heightened perfection and purity are a) self-effort, b) self-control, c) self-reliance, d) self-sacrifice, and e) self-knowledge. Next, a practical program is needed to make this 'intellectual gymnastic' real in our lives. The simple action plan, to start with, consists of daily physical exercise for ten minutes, reading good literature for half an hour, sincere prayers for two to five minutes, and meditation and yoga for about ten minutes.

5. Psychosocial Development During Toddlerhood

A, Two children are displaying typical parallel play since they enjoy playing near other children, but are not engaging in social interactions with each other. Which cognitive and motor skills are these children developing? B, Imitative play such as pushing and pulling a vacuum allows this toddler to develop gross and fine motor skills.

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Preschoolers have well-developed language, motor, and social skills, and they can work creatively together on an art project, as this group is doing at an in-home childcare center.

A, School-age children may take part in activities that require practice. This is a consideration when children are hospitalized and unable to practice or perform. Why? B, School-age children enjoy spending time with others the same age on projects and discussing the activities of the day. This is an important consideration when they are in an acute-care setting. When you are in the clinical setting, look for examples of this type of interaction taking place.

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Topic : Child And Family Communication

Topic Objective:

At the end of the topic student will be able to understand:

- Physical inactivity
- Family and peer patterns
- Child and Family Communication

Definition/Overview:

Family Communication offers a thorough and up-to-date presentation of scientific research in family communication for students and teachers of family communication, as well as professionals who work with families. Undergraduate readers will find the text to be accessible, engaging andeasy to understand while graduate students and professionals will utilize the work as a comprehensive reference to classic and contemporary research on family communication and relationships.

Key Points:

1. Child and Family Communication

The special relationship between a father about to be deployed in the military and his young daughter is clear. This father has two other children and is spending time with each of them, as well as with the family together, before leaving. The cycle of leaving and returning home can be stressful for families. Nurses can assist military families in making plans for healthcare, finances, and communication while gone and providing resources for emotional support for the entire family. The special relationship between a father about to be deployed in the military and his young daughter is clear. This father has two other children and is spending time with each of them, as well as with the family together,

before leaving. The cycle of leaving and returning home can be stressful for families. Nurses can assist military families in making plans for healthcare, finances, and communication while gone and providing resources for emotional support for the entire family. This father is bringing his two daughters to a mobile van parked near a school to receive healthcare. Children may receive some of their healthcare from school-based services including school nurses, clinics, or mobile vans.

2. Family and peer patterns

A, Methamphetamine is a popular drug because it can be manufactured with items that are available to the lay public such as those shown in the picture on the left. Manufacture of the substance in homes has become a concern of health departments and communities at large. Children can be harmed by the chemicals produced, and may experience neglect and abuse. They may suffer even after the home is found and adults are apprehended as they must be placed in foster homes. B, Homes must be decontaminated in a lengthy and costly manner before future use after methamphetamine production.

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3. Physical inactivity

Physical inactivity is a growing problem among children, and can contribute to poor health. It is important to balance sedentary activities, such as playing computer games, with physical and social activities. Sports are an excellent way for children to develop their psychosocial, cognitive, and motor skills. Soccer photo courtesy of Rebecca Scheirer, Kensington, Maryland. Physical inactivity is a growing problem among children, and can contribute to poor health. It is important to balance sedentary activities, such as playing computer games, with physical and social activities. Sports are an

excellent way for children to develop their psychosocial, cognitive, and motor skills. Soccer photo courtesy of Rebecca Scheirer, Kensington, Maryland.

Topic : Social And Environmental Influences On The Child

Topic Objective:

At the end of the topic student will be able to understand:

- Normal development of posture
- Chest
- Ears
- Canal and tympanic membrane
- Eyes
- Testing skin turgor
- Measuring infant weight
- Measuring infant length

Definition/Overview:

Pediatrics differs from adult medicine in many respects. The obvious body size differences are paralleled by maturational changes. The smaller body of an infant or neonate is substantially different physiologically from that of an adult. Congenital defects, genetic variance, and developmental issues are of greater concern to pediatricians than they often are to adult physicians. Childhood is the period of greatest growth, development and maturation of the various organ systems in the body. Years of training and experience (above and beyond basic medical training) goes into recognizing the difference between normal variants and what is actually pathological.

Key Points:

1. Measuring infant length

Have an assistant hold the infants head in the midline while you gently push down on the knees until the legs are straight. Position the heels of the feet on the footboard and record the length to the nearest 0.5 cm or 1/4 inch.

Standing height measurements are taken routinely at each well child visit to assess the childs rate of growth. Position the head in an erect and midline position while the shoulders, buttocks, and heels touch the wall. Move the head piece down to touch the crown. Measure the height reading to the nearest 0.5 cm or 1/4 inch.

2. Measuring infant weight

Place a hand close to the chest without touching the infant to be able to prevent the infant from falling. Record the weight in the nearest 10 g or 1/2 oz.

Measuring head circumference. Wrap the tape around the head at the supraorbital prominence, above the ears, and around the occipital prominence, the point of largest circumference of the head.

3. Testing skin turgor

Tenting of the skin is associated with poor skin turgor. Pinch a small amount of skin on the abdomen between the thumb and forefinger. Release the skin, and watch the speed of recoil. Skin with normal turgor will quickly return to a flat position.

Head and Face

- Shape of head and face
- Symmetry
- Skull sutures
- Fontanels

Draw an imaginary line down the middle of the face over the nose and compare the features on each side. Significant asymmetry may be caused by paralysis of cranial nerve V or VII, in utero positioning, or swelling from infection, allergy, or trauma.

The sutures are separations between the bones of the skull that have not yet joined. The fontanels are formed at the intersection of these sutures where bone has not yet formed. Fontanels are covered by tough membranous tissue that protects the brain. The posterior fontanel closes between 2 and 3 months. The anterior fontanel and sutures are palpable up

to the age of 18 months. The suture lines of the skull are seldom palpated after 2 years of age. After that time, the sutures rarely separate.

4. Eyes

Draw an imaginary line across the medial canthi and extend it to each side of the face to identify the slant of the palpebral fissures. When the line crosses the lateral canthi, the palpebral fissures are horizontal and no slant is present. When the lateral canthi fall above the imaginary line, the eyes have an upward or Mongolian slant. A downward or anti-Mongolian slant is present when the lateral canthi fall below the imaginary line. Epicanthal folds are present when an extra fold of skin partially or completely covers the caruncles in the medial canthi. What type of slant does this child have? Are epicanthal folds present? Inspection of the extraocular movements. Have the child sit at your eye level. Hold a toy or penlight about 30 cm (12 in.) from the childs eyes and move it in all six directions indicated. Both eyes should move together, tracking the object.

Coveruncover test. With the child at your eye level, ask the child to look at a picture on the wall. A, As you cover one eye with an index card or paper cup, observe for any movement of the uncovered eye. If it jumps to fixate on the picture, the uncovered eye has a muscle weakness. B, As you remove the cover from the eye, observe the covered eye for any movement to fixate on the picture. If the eye has a muscle weakness, it will drift to a relaxed position once covered.

5. Canal and tympanic membrane

To detect the correct placement of the external ears, draw an imaginary line through the medial and lateral canthi of the eye toward the ear. This line normally passes through the upper portion of the pinna. The pinna is considered low set when the top lies completely below the imaginary line. Low-set ears are often associated with renal disorders. Is this a normal ear placement?

6. Ears

A, To restrain an uncooperative infant, place the infant supine on the examining table. Have an assistant hold the childs arms next to the head to restrain the childs head movements. Restrain the childs body movements by lying across the childs body. Keep

your hands free to hold the otoscope and position the external ear. B, Place the uncooperative toddler on the parents lap with legs held between the parents legs. One of the parents arms hold the childs head to the chest and the other arm holds the childs arms and upper torso against the chest. A, To restrain an uncooperative infant, place the infant supine on the examining table. Have an assistant hold the childs arms next to the head to restrain the childs head movements. Restrain the childs body movements by lying across the childs body. Keep your hands free to hold the otoscope and position the external ear. B, Place the uncooperative toddler on the parents lap with legs held between the parents legs. One of the parents arms hold the childs head to the chest and the other arm holds the childs arms and upper torso against the chest. To straighten the auditory canal: pull the pinna back and up for children over 3 years of age; pull the pinna down and back for children under 3 years of age. Cross section of the ear. The tympanic membrane normally has a triangular light reflex with the base on the nasal side pointing toward the center. The bony landmarks, the umbo and handle of malleus, are seen through the tympanic membrane. A, Weber test. Place vibrating tuning fork on midline of the childs head. B, Rinne test, step 1. Place vibrating tuning fork on mastoid process. C, Rinne test, step 2. Reposition still vibrating tines between 2.5 and 5 cm (1 and 2 in.) from ear. A, Weber test. Place vibrating tuning fork on midline of the childs head. B, Rinne test, step 1. Place vibrating tuning fork on mastoid process. C, Rinne test, step 2. Reposition still vibrating tines between 2.5 and 5 cm (1 and 2 in.) from ear. A, Weber test. Place vibrating tuning fork on midline of the childs head. B, Rinne test, step 1. Place vibrating tuning fork on mastoid process. C, Rinne test, step 2. Reposition still vibrating tines between 2.5 and 5 cm (1 and 2 in.) from ear.

7. Chest

Intercostal spaces and ribs are numbered to describe the location of findings. A, To determine the rib number on the anterior chest, palpate down from the top of the sternum until a horizontal ridge, the angle of Louis, is felt. Directly to the right and left of that ridge is the second rib. The second intercostal space is immediately below the second rib. Ribs 312 and the corresponding intercostal spaces can be counted as the fingers move toward the abdomen. B, To determine the rib number on the posterior chest, find the protruding spinal process of the seventh cervical vertebra at the shoulder level. The next spinal process belongs to the first thoracic vertebra, which attaches to the first rib.

8. Normal development of posture

Normal development of posture and spinal curves. A, Infant 23 monthsHolds head erect when held upright; thoracic kyphosis when sitting. B, 68 monthsSits without support; spine is straight. C, 1015 months Walks independently; straight spine. D, ToddlerProtuding abdomen; lumbar lordosis. E, School-age childHeight of shoulders and hips is level; balanced thoracic convex and lumbar concave curves.

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Topic : Pediatric And Newborn Assessment

Topic Objective:

At the end of the topic student will be able to understand:

- School-Age Children
- Breastfeeding Infants Age Newborn to 6 Months
- Nutrition Facts

Definition/Overview:

Pediatrics differs from adult medicine in many respects. The obvious body size differences are paralleled by maturational changes. The smaller body of an infant or neonate is substantially different physiologically from that of an adult. Congenital defects, genetic variance, and developmental issues are of greater concern to pediatricians than they often are to adult physicians. Childhood is the period of greatest growth, development and maturation of the various organ systems in the body. Years of training and experience (above and beyond basic medical training) goes into recognizing the difference between normal variants and what is actually pathological.

Key Points:

1. Nutrition Facts

The nutrition facts label of food is based on a typical serving and contains information about fat, cholesterol, sodium, carbohydrate, protein, and selected vitamins. However, the daily value information is based on a 20002500 calorie diet. What adjustments should be made if the diet has lower calories, such as with young children?

2. Breastfeeding Infants Age Newborn to 6 Months

- Exclusive feeding for 6 months
- Continue through 12 months
- Advantages

Breastfeeding offers many physical and emotional benefits for the infant. This new mother is learning to breastfeed her baby. How can nurses encourage mothers to have positive breastfeeding experiences? Preschoolers learn food habits by eating with others. Engaging them in food preparation enhances knowledge of food and promotes intake at meals. Preschoolers learn food habits by eating with others. Engaging them in food preparation enhances knowledge of food and promotes intake at meals.

3. School-Age Children

- Appropriate food choices
- School involvement
- Growth spurts
- Dental care

The nurse accurately measures the child and then places height and weight on appropriate growth grids for the childs age and gender. Growth chart with first few entries in same channel and then a change indicated. The growth for the child indicated on this chart remained steady and in the same channel (75th percentile) for some months. Then the weight measurement decreased to another channel. What kind of dietary assessment will you complete with the parents? What could be the possible causes?

In Section 2 of this course you will cover these topics:

- Infant, Child, And Adolescent Nutrition
- Concepts Of Health Promotion And Health Maintenance
- Health Promotion And Health Maintenance Of The Newborn
- Health Promotion And Health Maintenance Of The Infant
- Health Promotion And Maintenance Of The Toddler And Preschooler
- Health Promotion And Maintenance Of The School-Age Child
- Health Promotion And Maintenance Of The Adolescent

Topic : Infant, Child, And Adolescent Nutrition

Topic Objective:

At the end of the topic student will be able to understand:

- Failure to Thrive
- Health Promotion - Community Resources for Food
- Analysis of growth plots, proportionality, and patterns
- Nutrition Facts

Definition/Overview:

Adolescence there a high incidence of nutritional deficiencies and poor eating habits. This may lead to consequences in later years including osteoporosis, obesity, hyperlipedemia, sexual maturation delays, and final adult height. In addition, the development of eating disorders is very prominent during this period. Nutritional surveys have incicated that the highest prevalence of nutritional deficiencies occur during adolescence.

Key Points:

1. Nutrition Facts

The nutrition facts label of food is based on a typical serving and contains information about fat, cholesterol, sodium, carbohydrate, protein, and selected vitamins. However, the daily value information is based on a 20002500 calorie diet. Breastfeeding offers many physical and emotional benefits for the infant. This new mother is learning to breastfeed her baby. Preschoolers learn food habits by eating with others. Engaging them in food preparation enhances knowledge of food and promotes intake at meals. Preschoolers learn food habits by eating with others. Engaging them in food preparation enhances knowledge of food and promotes intake at meals.

2. Analysis of growth plots, proportionality, and patterns

The nurse accurately measures the child and then places height and weight on appropriate growth grids for the childs age and gender. Growth chart with first few entries in same channel and then a change indicated. The growth for the child indicated on this chart

remained steady and in the same channel (75th percentile) for some months. Then the weight measurement decreased to another channel. What kind of dietary assessment will you complete with the parents? What could be the possible causes?

3. Health Promotion - Community Resources for Food

Most Head Start centers participate in screening programs to identify children at risk for anemia. The child is comfortable sitting on the mothers lap while the nurse does a fingerstick to measure hematocrit. Infants with failure to thrive may not look severely malnourished, but they fall well below the expected weight and height norms for their age. This infant, who appears to be about 4 months old, is actually 8 months old. He has been hospitalized for feeding disorder of infancy.

4. Failure to Thrive

The school nurse is providing instruction for a mother and teacher about the use of the Epipen which may be needed for treatment of a child with food allergy. They have both received prior instruction and practice but need to review techniques before a field trip.

Topic : Concepts Of Health Promotion And Health Maintenance

Topic Objective:

At the end of the topic student will be able to understand:

- Physical health
- Mental health
- Determinants of health
- Health maintenance
- Nutrition
- Sports nutrition
- Exercise
- Hygiene
- Stress management
- Health care
- Workplace wellness programs

- Public health
- Role of science in health
- Where health knowledge comes from
- Putting health knowledge to use

Definition/Overview:

The World Health Organisation(WHO) defined health as a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity. In 1986 the World Health Organization in the Ottawa Charter for Health Promotion said health is a resource for everyday life, not the objective of living. Health is a positive concept emphasizing social and personal resources, as well as physical capacities. Classification systems such as the WHO Family of International Classifications (WHO-FIC) (composed of the International Classification of Functioning, Disability, and Health (ICF) and the International Classification of Diseases (ICD)) also define health.

Key Points:

1. Physical health

Physical fitness is good body health, and is the result of regular exercise, proper diet and nutrition, and proper rest for physical recovery.

A strong indicator of the health of localized population is their height|weight, which generally increases with improved nutrition and health care. This is also influenced by the standard of living and quality of life. Genetics also plays a major role in people's height. The study of human growth, its regulators, and implications is known as Auxology.

2. Mental health

Mental health refers to an individual's emotional and psychological well-being. "A state of emotional and psychological well-being in which an individual is able to use his or her cognitive and emotional capabilities, function in society, and meet the ordinary demands of everyday life."

One way to think about mental health is by looking at how effectively and successfully a person functions. Feeling capable and competent; being able to handle normal levels of stress, maintain satisfying relationships, and lead an independent life; and being able to "bounce back," or recover from difficult situations, are all signs of mental health.

A combination of physical, emotional, social and most importantly mental well-being is vital to achieve overall health.

3. Determinants of health

The LaLonde report suggested that there are four general determinants of health including human biology, environment, lifestyle, and healthcare services. Thus, health is maintained and improved not only through the advancement and application of health science, but also through the efforts and intelligent lifestyle choices of the individual and society. A major environmental factor is water quality, especially for the health of infants and children in developing countries.

Studies show that in developed countries, the lack of neighborhood recreational space that includes the natural environment leads to lower levels of neighborhood satisfaction and higher levels of obesity; therefore, lower overall well being. Therefore, the positive psychological benefits of natural space in urban neighborhoods should be taken into account in public policy and land use.

4. Health maintenance

Achieving health and remaining healthy is an active process. Effective strategies for staying healthy and improving one's health include the following elements:

5. Nutrition

Personal health depends partially on the social structure of ones life. The maintenance of strong social relationships is linked to good health conditions, longevity, productivity, and a positive attitude. This is due to the fact that positive social interaction as viewed by the participant increases many chemical levels in the brain which are linked to personality and intelligence traits.

6. Sports nutrition

Sports nutrition focuses the link between dietary supplements and athletic performance. One goal of sports nutrition is to maintain glycogen levels and prevent glycogen depletion. Another is to optimize energy levels and muscle tone. An athlete's strategy for winning an event may include a schedule for the entire season of what to eat, when to eat it, and in what precise quantities (before, during, after, and between workouts and events).

7. Exercise

Exercise is the performance of movements in order to develop or maintain physical fitness and overall health. It is often directed toward also honing athletic ability or skill. Frequent and regular physical exercise is an important component to prevention of some of the diseases of affluence such as cancer, heart disease, cardiovascular disease, Type 2 diabetes, obesity and back pain.

Exercises are generally grouped into three types depending on the overall effect they have on the human body:

- Flexibility exercises such as stretching improve the range of motion of muscles and joints.
- Aerobic exercises such as walking and running focus on increasing cardiovascular endurance and muscle density.
- Anaerobic exercises such as weight training or sprinting increase muscle mass and strength.

Physical exercise is considered important for maintaining physical fitness including healthy weight; building and maintaining healthy bones, muscles, and joints; promoting physiological well-being; reducing surgical risks; and strengthening the immune system.

Proper nutrition is just as, if not more, important to health as exercise. When exercising it becomes even more important to have good diet to ensure the body has the correct ratio of macronutrients whilst providing ample micronutrients; this is to aid the body with the recovery process following strenuous exercise. When the body falls short of proper nutrition, it gets into starvation mode developed through evolution and depends onto fat content for survival.

8. Hygiene

Hygiene is the practice of keeping the body clean to prevent infection and illness, and the avoidance of contact with infectious agents. Hygiene practices include bathing, brushing and flossing teeth, washing hands especially before eating, washing food before it is eaten, cleaning food preparation utensils and surfaces before and after preparing meals, and many others. This may help prevent infection and illness. By cleaning the body, dead skin cells are washed away with the germs, reducing their chance of entering the body.

9. Stress management

Prolonged psychological stress may negatively impact health, such as by weakening the immune system. Stress management is the application of methods to either reduce stress or increase tolerance to stress. Relaxation techniques are physical methods used to relieve stress. Psychological methods include cognitive therapy, meditation, and positive thinking which work by reducing response to stress. Improving relevant skills and abilities builds confidence, which also reduces the stress reaction to situations where those skills are applicable. Reducing uncertainty, by increasing knowledge and experience related to stress-causing situations, has the same effect. Learning to cope with problems better, such as improving problem solving and time management skills, may also reduce stressful reaction to problems. Repeatedly facing an object of one's fears may also desensitize the fight-or-flight response with respect to that stimulus -- e.g., facing bullies may reduce fear of bullies.

10. Health care

Health care is the prevention, treatment, and management of illness and the preservation of mental and physical well being through the services offered by the medical, nursing, and allied health professions.

11. Workplace wellness programs

Workplace wellness programs are recognized by an increasingly large number of companies for their value in improving the health and well-being of their employees, and for increasing morale, loyalty, and productivity. Workplace wellness programs can include things like onsite fitness centers, health presentations, wellness newsletters,

access to health coaching, tobacco cessation programs and training related to nutrition, weight and stress management. Other programs may include health risk assessments, health screenings and body mass index monitoring.

12. **Public health**

Public health is "the science and art of preventing disease, prolonging life and promoting health through the organised efforts and informed choices of society, organizations, public and private, communities and individuals." It is concerned with threats to the overall health of a community based on population health analysis. The population in question can be as small as a handful of people or as large as all the inhabitants of several continents (for instance, in the case of a pandemic). Public health has many sub-fields, but is typically divided into the categories of epidemiology, biostatistics and health services. Environmental, social and behavioral health, and occupational health, are also important fields in public health.

The focus of public health intervention is to prevent rather than treat a disease through surveillance of cases and the promotion of healthy behaviors. In addition to these activities, in many cases treating a disease can be vital to preventing it in others, such as during an outbreak of an infectious disease. Vaccination programs and distribution of condoms are examples of public health measures.

13. Role of science in health

Health science is the branch of science focused on health, and it includes many subdisciplines. There are two approaches to health science: the study and research of the human body and health-related issues to understand how humans (and animals) function, and the application of that knowledge to improve health and to prevent and cure diseases.

14. Where health knowledge comes from

Health research builds primarily on the basic sciences of biology, chemistry, and physics as well as a variety of multidisciplinary fields (for example medical sociology). Some of the other primarily research-oriented fields that make exceptionally significant contributions to health science are biochemistry, epidemiology, and genetics.

15. Putting health knowledge to use

Applied health sciences also endeavor to better understand health, but in addition they try to directly improve it. Some of these are: biomedical engineering, biotechnology, nursing, nutrition, pharmacology, pharmacy, public health (see above), psychology, physical therapy, and medicine. The provision of services to maintain or improve people's health is referred to as health care.

Topic : Health Promotion And Health Maintenance Of The Newborn

Topic Objective:

At the end of the topic student will be able to understand:

- Newborns Act influence health care benefits
- Status of the attending provider
- 48-hour (or 96-hour) period start, according to the Newborns Act
- Newborns Act require my plan to offer maternity benefits
- Acts apply to my health coverage

Definition/Overview:

Know your rights. If your plan provides maternity benefits, you should be entitled to a minimum hospital stay of 48 hours following a vaginal delivery and 96 hours following a cesarean delivery. You cannot be required to get a preauthorization from your plan in order for the minimum hospital stay to be covered. Your plan must provide you with a notice regarding your rights relating to a hospital stay following childbirth. If your plan is insured, the notice must describe your protections under state law. Contact your health plan or your spouses health plan as soon as possible to find out how to enroll your new baby in group health plan coverage.

Key Points:

1. **Newborns Act influence health care benefits**

This Act influences the amount of time you and your baby receive. Coverage included during the hospital stay and after the childbirth. Insurance companies and Health

Maintenance organizations that are subject to the Newborns Act can not restrict benefits for a hospital stay to less than 48 hours, following the birth of a child, or 96 hours after the birth by cesarean section. After consulting with you, the attending provider may decide whether to discharge you and your child earlier. However, he doesnt have rights to discharge you and your child earlier than 48 or 96 hours.

2. **Status of the attending provider**

It is a state law, a licensed entity, which is responsible for providing pediatric or maternity care to a mother and her newborn child. For example, an insurance plan, hospital, or HMO would be called an attending provider, although a nurse or physician assistant can be an attending provider, if she or he has a license, received from the state, to provide maternity and pediatric care after the childbirth.

3. **48-hour (or 96-hour) period start, according to the Newborns Act**

This period starts right after the delivery. For example, if a woman comes into the hospital at 6 p.m. on July 10, but gives birth at 7p.m. July 13, then the 48-hour period starts at 7 p.m. on July 13. There are situations when birth occurs outside the hospital and only after that the woman is admitted to the hospital. In such cases the period begins right after the admission.

4. **Newborns Act require my plan to offer maternity benefits**

The Newborns Act doesnt require insurance companies, plans or different insurance providing organizations (HMO) to provide coverage for hospital stays, caused by childbirth. However, other legal document, for example the Title VII of the Civil Rights Act of 1964, may require such kind of coverage.

5. **Acts apply to my health coverage**

it depends whether your plan offers any benefits for hospital stays that deal with childbirth. If it does, then the Newborns Act can apply to certain coverage. It can also depend on the insurance provider. Is your coverage insured by the insurance company or is it self-insured? Self-insured coverage is a subject to the Newborns Act. However, if you have coverage, provided by the insurance company or HMO, and your state has a law that regulates coverage for newborns and young mothers, then you will be more dependent on the state law, rather than on the Newborns Act.

Topic : Health Promotion And Health Maintenance Of The Infant

Topic Objective:

At the end of the topic student will be able to understand:

- Health Maintenance of the Infant
- Infant Healthcare Providers
- Choosing an Infant Healthcare Provider
- Well-Baby Care

Definition/Overview:

During the first year of life nutritional intake patterns reflect the developmental progression of the infant. The baby first receives all nutrition from milk and closely bonds with the parent during feeding. As the baby becomes able to take in and metabolize other foods, parents begin to feed soft foods. When the infant can sit, reach for objects, and place them in the mouth, finger foods are introduced. The baby in this picture has developed the pincer grasp and is able to feed foods to self using this ability. Choices should include nutritionally sound food that helps to meet the babys recommended allowances. By the first birthday, the child has developed the social and motor ability to eat most of the food commonly consumed in the family. Eating has been a mirror of social, metabolic, and developmental progression throughout the first year.

Key Points:

1. Health Maintenance of the Infant

One of the most important decisions you'll make about your baby's health is selecting his or her doctor. It's important to find a doctor you feel comfortable with -- someone whom you can talk to and who is willing to answer your questions. After all, you will turn to this doctor for help often, and even when your baby is healthy you'll be making regular visits. In the following pages you'll learn who the different doctors are, how they care for your baby, and how to pick the one that's right for you.

2. **Infant Healthcare Providers**

There are two main types of doctors who specialize in infant care: pediatricians and family practitioners. In addition to choosing between them, you'll also be choosing from among different settings for your child's health care. Find out how these two types differ from each other and from other healthcare professionals.

3. **Choosing an Infant Healthcare Provider**

Before you settle on a doctor, you'll want to know about his or her style, if he or she can work on your schedule, and who serves as backup if the doctor can't be reached, among other things. This page gives you many good questions to ask during your interviews with potential doctors for your baby.

4. **Well-Baby Care**

Once you've chosen the right person, he or she will want to see your baby often. During the first couple years of life, even visits for regular checkups are frequent. The doctor will want to check your baby's eyes, ears, nose, vital organs, arms and legs, and other things for normal development. On this page, you'll learn how often you can expect to see the doctor, and what to expect at these visits.

Topic : Health Promotion And Maintenance Of The Toddler And Preschooler

Topic Objective:

At the end of the topic student will be able to understand:

- Toddlers
- Preschoolers

Definition/Overview:

The Early Language Milestone (ELM) Scale is one method of evaluating speech in young children. It differentiates receptive from expressive speech, recognizing that children may understand some language even though they do not speak to their level of understanding. Examine this tool to see what receptive and expressive language you would expect to see in

15-month-old Clarence in the opening scenario. Used with permission. The Early Language Milestone (ELM) Scale is one method of evaluating speech in young children. It differentiates receptive from expressive speech, recognizing that children may understand some language even though they do not speak to their level of understanding. Examine this tool to see what receptive and expressive language you would expect to see in 15-month-old Clarence in the opening scenario. Used with permission.

Stuttering .

Key Points:

1. Toddlers

Toddlers are young children between 14 and 36 months. Toddlerhood is the time parents seem to find their children the most challenging, as their babies struggle between complete dependence and separation. Curiosity, energy, and speed increase during the toddler years; hence, limits need to be established. By the age of 2, several abilities in children improve. Coloring, building blocks, and scribbling are activities that interest children at this particular stage. They have gone from fun babbling to building a vocabulary of about 40 words, still learning to use the words in combination. Children have gone from needing help while taking steps to running, jumping, and climbing. At this age, children are able to refer to themselves by name, and in many cases, they have a hard time sharing. By three years of age, children are usually able to dress and undress themselves, to some extent. Their language skills develop rather quickly during this stage. They begin to speak a little more clearly, making themselves understood, and they are able to comprehend more than one command at a time. Children are usually ready to be potty trained at this time.

2. Preschoolers

Preschoolersthese are the 3 to 5-year-olds. At this stage, children begin riding tricycles, dressing and undressing themselves with help, and showing awareness of gender identity. These are childrens curious years. Your child will ask you about any and everything. Three to five-year-old children are eager to learn. They are also very imaginative, making

it hard for some to distinguish between reality and their fantasy worlds. Children often claim to have (imaginary) friends that only they can see around this age.

At this stage, preschoolers walk on their tip toes, stand and hop on one foot, skip, dress themselves, etc. Certain fears are sometimes associated with pre-schoolers, for instance, fear of separation, baths, dogs, the dark, etc. During this time, it is important for parents to exhibit the behavior they are expecting from their children. Children are very impressionable during these early years, and they tend to follow the example of their parents. Its at this age they test their parents by trying out the profane words they have heard from older siblings, neighbors, other adults, or their parents.

Topic : Health Promotion And Maintenance Of The School-Age Child

Topic Objective:

At the end of the topic student will be able to understand:

- School Age Health
- School Age Health Activities
- Collaborative Planning Efforts
- School Health Nursing
- Regional Diabetes Resource Nurse
- Promoting Healthy Physical Activity and Nutrition for School Age Children and Families
- The vision for Colorado Connections for Health Schools:
- Mission to achieve this vision:
- Colorado Physical Activity and Nutrition Program (COPAN)

Definition/Overview:

Children generally interact readily with healthcare providers and appear at ease when welcomed and engaged in interactions. Notice the pleasant setting with child art posted on the wall.

Key Points:

1. School Age Health

The goal of the school age child health activities is to positively impact the health and well-being of school age children in Colorado by improving and supporting state and local child health infrastructure. The school age child health activities focus on children from kindergarten through 12th grade and include:

2. School Age Health Activities

3. Collaborative Planning Efforts

Promoting collaboration between public health agencies and local school districts to plan for and develop strategies to improve physical activity and nutrition in the school age child and youth population

4. School Health Nursing

The Child and Adolescent Health Program provides technical support to districts and school health personnel, in concert with Colorado Department of Education.

5. Regional Diabetes Resource Nurse

The incidence of diabetes in school age children has dramatically increased over the past several decades. The care of these children is complex and must be attended to in every aspect of their lives including while in attendance at school. School staff must be knowledgeable about diabetes care in order for children with diabetes to be safe in school and to benefit optimally from their educational programs. A Diabetes Resource Nurse program will connect expert school nurses and public health nurses with districts throughout Colorado for the purpose of:

- Consulting with school nurses, administrators, & other staff about diabetes related issues to insure optimal care for students with diabetes.
- Assisting with development of health care & 504 plans.
- Providing resources & in-service education to district staff.

- Helping to trouble shooting individual problems (but not providing care to individual students).
- Providing standardization of health services for children with diabetes, with a goal toward healthier students who will be more capable of achieving optimally in their education programs.

6. Promoting Healthy Physical Activity and Nutrition for School Age Children and Families

The Child, Adolescent and School Health Section works closely with both state and local partners including the Colorado Physical Activity and Nutrition Program to plan for develop strategies and promote healthy behaviors that can reduce and prevent overweight problems in children and youth. The Colorado Department of Public Health and Environment and the Colorado Department of Education have joined forces to coordinate the Colorado Connections for Healthy Schools to implement the eight components model of coordinated school health.

7. The vision for Colorado Connections for Health Schools:

All school-aged children and youth in Colorado will be healthy and learn at their full potential.

8. Mission to achieve this vision:

To Build Colorado's state education and health agency partnership and capacity to implement and coordinate school health programs, assisting schools to improve the well-being and academic achievement of school-age youth. To achieve an optimal learning environment, schools will integrate comprehensive school health education, physical education, school health services, nutrition services, counseling, psychological and social services, a health school environment, school site health promotion for staff and family and community involvement in order to:

- Reduce tobacco use and addiction
- Improve eating patterns
- Increase vigorous daily physical activity
- Reduce obesity

- Reduce skin cancer due to sun damage

9. Colorado Physical Activity and Nutrition Program (COPAN)

Colorado Physical Activity and Nutrition Programs (COPAN) mission is to prevent obesity and related chronic diseases, and to promote healthy lifestyles for all Coloradans. COPAN and its partners have developed and are implementing the Colorado Physical Activity and Nutrition State Plan 2010that promotes healthy eating and physical activity in order to successfully prevent and reduce overweight, obesity, and related chronic diseases.

Topic : Health Promotion And Maintenance Of The Adolescent

Topic Objective:

At the end of the topic student will be able to understand:

- Health Promotion and Maintenance of the Adolescent

Definition/Overview:

Parents often accompany teens with a healthcare problem in for the examination. Provide an opportunity to see both the teen and parent privately and integrate general health promotion and health maintenance into the visit.

Key Points:

Health Promotion and Maintenance of the Adolescent

Generally, the adolescent years (ie, between ages 11 to 21 years1) are a time of good health for most of this population in the United States. In turn, adolescent patients may not present to their health care providers offices for routine health maintenance visits. In some cases, however, adolescents do not have access to appropriate or affordable health care. Adolescents with chronic diseases who are underinsured often do not have case managers or access to the medications and medical equipment required for them to be able to achieve their maximal potential in daily life or at school. In addition, recent surveys of school-based health clinics have shown that teenagers are frequently in need of timely access to mental health services.2

A number of health-related problems place adolescents at increased risk of morbidity and mortality. The leading causes of death in the adolescent age-group are unintentional injury, homicide, and suicide, all of which may be affected by anticipatory guidance and intervention from the health care system. Activities such as smoking, drug use, unprotected sex, and alcohol use often begin during the teenage years and can start an adolescent on an unhealthy route toward adulthood. Approximately $33.4 billion (ie, $855 per adolescent) are spent annually in the United States on adolescent morbidities.3 The 1997 Youth Risk Behavior Surveillance4 examined 16,262 United States high school students in grades nine through 12. The study revealed that 49% of the adolescent boys and 48% of the adolescent girls had had sexual intercourse; only 62.5% of boys and 50.8% of girls reported using a condom at last intercourse.4 More than 28% of the girls and 37.3% of the boys reported having five or more drinks in a row on one or more occasions in 30 days prior to the survey.4 Among 12th graders, 19% of girls and 20% of boys were current cigarette smokers.4 Fifteen percent of boys and 27% of girls considered suicide in the 12 months prior to the survey, and 4.5% of boys and 11.6% of girls attempted suicide. The 60% of girls and 23% of boys who reported that they were trying to lose weight are a concern because disordered eating patterns may arise. The adolescent patient, entangled in a time of major physical, emotional, social, and cognitive growth and development, poses a unique challenge to the practicing clinician. Often providers feel overwhelmed by or uncomfortable with counseling teenage patients about sensitive areas such as sexuality or drug and alcohol use. A 1989 position paper of the American College of Physicians5 stated that internists need better training and more involvement in the care of adolescents; 25% of internists surveyed felt that they had insufficient training in many areas of adolescent health care.5

In Section 3 of this course you will cover these topics:

- Nursing Care For The Child In The Community
- Nursing Care For The Hospitalized Child
- Pain Assessment And Management
- Infectious And Communicable Diseases
- Nursing Care For The Child With A Chronic Condition
- The Child And Life-Threatening Illness Or Injury
- End Of Life Care And Bereavement

Topic : Nursing Care For The Child In The Community

Topic Objective:

At the end of the topic student will be able to understand:

- Nursing Care for the Child in the Community
- Differences between adult and pediatric medicine
- History of pediatrics
- Training of pediatricians
- "Pediatrician" versus "Paediatrician"
- Subspecialists in pediatrics
- Pediatric organizations
- Social role of pediatric specialists

Definition/Overview:

Nurses carefully assess children in the office setting who present with an acute care illness. It is important to identify how serious the childs illness is and to monitor the child for progression of symptoms during the visit. This is also a time to gather information about the childs illness and to identify health information that will be needed for the family to care for the child at home. Nurses provide patient education to help families learn to recognize the early stages of an asthma attack by using a peak flow meter. The child learns the proper method for taking a deep breath and blowing into the peak flow meter so the best reading is obtained.

Key Points:

1. Nursing Care for the Child in the Community

The school nurse treats this child with a nebulizer to determine if the asthma attack can be controlled before calling the parent to come and pick up the child and seek care from the primary care provider. Because some children need medications or other therapies during school hours, the parents and child, school nurse, teacher, and school administrators develop a plan to manage the childs condition during school hours. This document is the childs individual health plan. Nurses provide both short-term and long-term services to

families in the home setting. In some cases, families need support for a short time after the child is discharged from the hospital following an acute illness. In other cases, families need assistance with complex nursing care for the child dependent on technology for survival.

2. Differences between adult and pediatric medicine

Pediatrics differs from adult medicine in many respects. The obvious body size differences are paralleled by maturational changes. The smaller body of an infant or neonate is substantially different physiologically from that of an adult. Congenital defects, genetic variance, and developmental issues are of greater concern to pediatricians than they often are to adult physicians. Childhood is the period of greatest growth, development and maturation of the various organ systems in the body. Years of training and experience (above and beyond basic medical training) goes into recognizing the difference between normal variants and what is actually pathological.

Pediatrics is that branch/speciality of medicine which deals with the study and practice of diseases and their management in children.

Treating a child is not like treating a miniature adult. A major difference between pediatrics and adult medicine is that children are minors and, in most jurisdictions, cannot make decisions for themselves. The issues of guardianship, privacy, legal responsibility and informed consent must always be considered in every pediatric procedure. In a sense, pediatricians often have to treat the parents and sometimes, the family, rather than just the child. Adolescents are in their own legal class, having rights to their own health care decisions in certain circumstances only.

3. History of pediatrics

In the 9th century, the famous Persian physician Rhazes (Muhammad ibn Zakarīya Rāzi) wrote The Diseases of Children, the first book to deal with pediatrics as an independent field of medicine. For this reason, some medical historians consider him the father of pediatrics. His teacher Ali ibn Sahl Rabban al-Tabari was also a pioneer in the field of child development, which he earlier discussed in his Firdous al-Hikmah. The first work

on pediatrics in the Western world was the Book of Children, written circa 1530 by Thomas Phaer, who was inspired by the works of Rhazes and Avicenna.

Pediatrics as a separate area of medical practice in the Western world largely began in the nineteenth century. The Hospital for Sick Children, Great Ormond Street (London) was founded in 1852, and is probably the oldest such children's hospital in the English-speaking world. Great Ormond Street is adjacent to Coram's Fields, the site of the much earlier Foundling Hospital. The emigrant German physician, Abraham Jacobi, worked in the same period and is often considered the father of pediatrics.

4. Training of pediatricians

The training of pediatricians varies considerably across the world.

Like other medical practitioners, pediatricians begin their training with an entry-level medical education: a tertiary-level course, undertaken at a medical school attached to a university. Such a course leads to a medical degree.

Depending on jurisdiction and university, a medical degree course may be either undergraduate-entry or graduate-entry. The former commonly takes five or six years, and has been usual in the Commonwealth. Entrants to graduate-entry courses (as in the USA), usually lasting four or five years, have previously completed a three- or four-year university degree, commonly but by no means always in sciences. Medical graduates hold a degree specific to the country and university in and from which they graduated. This degree qualifies that medical practitioner to become licensed or registered under the laws of that particular country, and sometimes of several countries, subject to requirements for "internship" or "conditional registration".

Within the United States, the term physician also describes holders of the Doctor of Osteopathic medicine (D.O.) degree. For further information on osteopathic medicine, see the entry on the comparison of MD and DO in the US.

Pediatricians must undertake further training in their chosen field. This may take from three to six or more years, depending on jurisdiction and the degree of specialization. The post-graduate training for a primary care physician, including primary care pediatricians, is generally not as lengthy as for a hospital-based medical specialist.

In most jurisdictions, entry-level degrees are common to all branches of the medical profession, but in some jurisdictions, specialization in pediatrics may begin before completion of this degree. In some jurisdictions, pediatric training is begun immediately following completion of entry-level training. In other jurisdictions, junior medical doctors must undertake generalist (unstreamed) training for a number of years before commencing pediatric (or any other) specialization. Specialist training is often largely under the control of **pediatric organizations** (see below) rather than universities, with varying degrees of government input, depending on jurisdiction.

5. "Pediatrician" versus "Paediatrician"

A slight semantic difference has developed in association with the difference in spelling. In the USA, a pediatrician (US spelling) is a specialist physician who generally functions in a primary care setting for children. Like all physicians, they first receive a general medical degree (from a US medical school, typically MD or DO). Next, such pediatricians (US spelling) complete an internship in pediatrics and then 2 additional years of residency in pediatrics. A similar situation exists in Germany: a Kinderarzt is commonly a primary care pediatrician. In the UK and many other parts of the world, a paediatrician is also a specialist physician for children, but generally not in primary care. He or she sees children who are either urgently taken to a hospital or who are referred by general practitioners; the latter see the bulk of child patients in primary care. Such paediatricians (British spelling) generally first receive a general medical degree, typically MB BS, MB BChir etc, and then complete at least 2 years' general clinical training ("foundation training"), followed by 6 or more years' additional training in paediatrics or its subspecialties.

6. Subspecialists in pediatrics

Specialist pediatricians may undergo further training in sub-specialties. Practicing a subspecialty in pediatrics is similar in some respects to practising the relevant adult specialty, but a major difference is in the pattern of disease. Typically, diseases commonly seen in children are rare in adults (e.g. bronchiolitis, rotavirus infection), and those seen in adults are rare in children (e.g. coronary artery disease, deep vein thrombosis). Hence, pediatric cardiologists deal with the heart conditions of children, particularly congenital heart defects, and pediatric oncologists most often treat types of

cancer that are relatively common in children (e.g. certain leukemias, lymphomas and sarcomas), but which are rarely seen in adults. Every subspecialty of adult medicine exists in pediatrics (with the obvious exception of geriatrics).

Adolescent medicine is a growing sub-specialty. The pattern of diseases in adolescents in part resembles that seen in older adults, and specialists or sub-specialists in adolescent medicine are also drawn from practitioners of internal medicine or family medicine. Another major sub-specialty, which is unique to pediatrics, is neonatology: the medical care of newborn babies.

7. Pediatric organizations

Most pediatricians are members of a national body. Examples are the American Academy of Pediatrics, the Canadian Paediatric Society, the Royal College Of Paediatrics and Child Health, Norsk barnelegeforening (The Norwegian society of pediatricians) or the Indian Academy of Pediatrics. In Australia and New Zealand, paediatricians are fellows of the Royal Australasian College of Physicians, which covers both nations and which has adult & paediatric sections. This was the situation in the UK until the late 1990s, where specialist pediatricians were Members Fellows of either the Royal College of Physicians or of the fraternal colleges in Scotland. In 1996, British paediatricians were granted a royal charter to form their own college, the Royal College of Paediatrics and Child Health.

8. Social role of pediatric specialists

Like other medical practitioners, pediatricians are traditionally considered to be members of a learned profession, because of the extensive training requirements, and also because of the occupation's special ethical and legal duties.

Pediatricians commonly enjoy high social status, often combined with expectations of a high and stable income and job security. However, medical practitioners in general often work long and inflexible hours, with shifts at unsociable times, and may earn less than other professionals whose education is of comparable length. Neonatologists or general pediatricians in hospital practice are often on call at unsociable times for perinatal problems in particular such as for Cesarean section or other high risk births, and for the

care of ill newborn infants. In August 2000, during a "name and shame" campaign by Rupert Murdoch's News of the World, a paediatrician in Wales had her home and car vandalised by "vigilantes", who believed "paediatrician" meant "paedophile".

Topic : Nursing Care For The Hospitalized Child

Topic Objective:

At the end of the topic student will be able to understand:

- Major Stressors & Reactions To Them
- Children 3 years of age and younger
- Children 3 - 6 years old
- Children 7- 12 years old
- Adolescents 12 and up
- Reaction To Bodily Injury & Pain
- Reaction To Stressors
- Care Of Hospitalized Child

Definition/Overview:

Separation anxiety Protest Cry, scream, run Despair Withdrawal, depressed, non-communicative, regression Detachment Superficial adjustment/ relationships Loss of control Additional stimuli, inconsistency, unfamiliarity of env./ daily rituals, rigid schedules, lack of privacy Bodily injury & pain

Key Points:

1. Children 3 years of age and younger

Children 3 years of age and younger Lack understanding about their illness Confused about the new change in their familiar environment Concerned with being away from family and home. Toddlers - Difficulty coping with the change in routines (especially - eating, sleeping and toileting). Help Allow parents/ friends/ anyone known to child to be with the child Maintain close and continual parental contact during hospitalization

2. **Children 3 - 6 years old**

Children 3 - 6 years old Usually view the hospital and procedures as punishment. Wants to be near the family Views hospital stay or procedure as punishment for something. Loss of control and fear of the unknown Help - Honest, simple, age-appropriate conversations can help your child feel more secure. Remember, young children learn best through play. - Reassure child that he/she hasn't done anything wrong. - Allow to bring a favorite toy; blanket or clothes from home - Encourage walking around or playing outside of his/her room.

3. **Children 7- 12 years old**

Children 7- 12 years old Worried about painful procedures Believe that hospitalization and procedures are a form of punishment Experience a loss of control and independence Older children worry about painful procedures and changes to their body Help - Providing information is key at this age..very important - Inform in advance about procedures, changes in the environment etc.. - Do not mislead by saying something won't hurt if it will - Instead, talk about how to cope with possible pain and confusion. - give choices when they exist

4. **Adolescents 12 and up**

Adolescents 12 and up Concern about loss of control; separation from friends Very self-conscious. Lots of questions about specific procedures. Help - Encourage to talk to doctors and nurses involved in care - allow to be part of discussions & decision making (this will give some degree of control) - Support social interactions with friends via phone, email and visits

Reaction To Bodily Injury & Pain

0 6 months Cry, bodily movements 6/12 1 year Resistance, uncooperative 1 3 years Aggressive behaviour 3- 5 years Fear of punishment/ mutilation/ death; verbal abuse 512 years Fear of disability, concern for privacy, words to describe pain > 12 years Effect on body image, questioning, privacy

5. **Reaction To Stressors**

Depends upon Developmental age Previous experience with illness Separation Coping skills (innate/ acquired) Seriousness of illness Support systems

6. **Care Of Hospitalized Child**

Prepare for hospitalization Prevent/ minimize separation Minimize loss of control Prevent minimize bodily injury Allow for regression Provide pain management (= Atraumatic care) Provide for developmentally appropriate play activities Provide opportunities for play/ expressive activities Maximize potential benefit of hospitalization Focus on developmental age rather than chronological age.

Topic : Pain Assessment And Management

Topic Objective:

At the end of the topic student will be able to understand:

- Gellert Index of Body Knowledge
- Childs Physical Care
- Nursing Considerations

Definition/Overview:

Nursing Care of the Hospitalized Child

Key Points:

1. Nursing Considerations

Nursing Considerations in Preparing Parents and Child for Planned Short-Stay Admission Allowing the child to dress up as a doctor or a nurse helps prepare the child for the hospitalization experience. This helps the child adjust to treatment, care, and the recovery process. Why? What might the childs concerns be? Can you think of any concerns that

might be related to cultural background? The childs anxiety and fear often will be reduced if the nurse explains what is going to happen and demonstrates how the procedure will be done by using a doll. Based on your experience, can you list five actions you can take to prepare a school-age child for hospitalization? Jasmines parents are taking the time to prepare her for hospitalization by reading a book recommended by the nurse. Such material should be appropriate to the childs age and culture. Why do you think that having the parents read this material is valuable? Sample Teaching Materials for Children Regarding Hospitalization and Healthcare.

2. Childs Physical Care

This child has just undergone surgery and is in the post anesthesia care unit (PACU). Although the childs physical care is immediate and important, remember that both the child and the family have strong psychosocial needs that must be addressed concurrently. It is important to reunite the family as soon as possible after surgery. This boy was formerly afraid of blood draws but with the aid of health professionals has overcome his fear and can now have the procedure done calmly. He shows his mastery over the situation. What can you do to help children afraid of procedures to develop coping mechanisms to assist them? The nurse can use a simple gender-specific outline drawing of a childs body to encourage children to draw what they think about their medical problem. Such drawings reveal a childs interpretation, which the nurse can work with to provide enhanced teaching.

3. Gellert Index of Body Knowledge

Nursing Strategies to Improve the Illness/Hospitalization Experience of Parents/Children Shriners Hospital in Spokane, Washington, has a special classroom and teacher for children undergoing a lengthy hospital stay, enabling them to remain current with their school work. The child who falls behind other students might not fit in when he or she returns to school or might be required to repeat a grade. What are the potential consequences of these situations?

Topic : Infectious And Communicable Diseases

Topic Objective:

At the end of the topic student will be able to understand:

- Nociceptors transmit pain
- Classification
- Transmission
- Preventing transmission
- Diagnosis and therapy
- Methods of diagnosis
- Microbial culture
- Microscopy
- Biochemical tests
- Molecular diagnostics
- Clearance and immunity

Definition/Overview:

An infectious disease is a clinically evident disease resulting from the presence of pathogenic microbial agents, including pathogenic viruses, pathogenic bacteria, fungi, protozoa, multicellular parasites, and aberrant proteins known as prions. These pathogens are able to cause disease in animals and/or plants. Infectious pathologies are usually qualified as contagious diseases (also called communicable diseases) due to their potentiality of transmission from one person or species to another. Transmission of an infectious disease may occur through one or more of diverse pathways including physical contact with infected individuals. These infecting agents may also be transmitted through liquids, food, body fluids, contaminated objects, airborne inhalation, or through vector-borne spread. The term infectivity describes the ability of an organism to enter, survive and multiply in the host, while the infectiousness of a disease indicates the comparative ease with which the disease is transmitted to other hosts. An infection however, is not synonymous with an infectious disease, as an infection may not cause important clinical symptoms or impair host function.

Key Points:

1. Nociceptors transmit pain

Nociceptors transmit pain impulses along A-delta and C fibers to the dorsal horn of the spinal cord. After the sensory information reaches the dorsal horn of the spinal cord, the pain signal may be modified depending on the presence of other stimuli, from either the brain or the periphery. Along the nerve conduction pathways between the periphery, spinal cord, and the brain are gates that control the number of impulses sent to the brain. Nonpain impulses can compete with pain impulses for transmission along the spinal tracts to the brain. Once the impulse reaches the brain, the pain is perceived.

2. Classification

Among the almost infinite varieties of microorganisms, relatively few cause disease in otherwise healthy individuals. Infectious disease results from the interplay between those few pathogens and the defenses of the hosts they infect. The appearance and severity of disease resulting from any pathogen depends upon the ability of that pathogen to damage the host as well as the ability of the host to resist the pathogen. Infectious microorganisms, or microbes, are therefore classified as either primary pathogens or as opportunistic pathogens according to the status of host defenses.

Primary pathogens cause disease as a result of their presence or activity within the normal, healthy host, and their intrinsic virulence (the severity of the disease they cause) is, in part, a necessary consequence of their need to reproduce and spread. Many of the most common primary pathogens of humans only infect humans, however many serious diseases are caused by organisms acquired from the environment or which infect non-human hosts.

Organisms which cause an infectious disease in a host with depressed resistance are classified as opportunistic pathogens. Opportunistic disease may be caused by microbes that are ordinarily in contact with the host, such as pathogenic bacteria or fungi in the gastrointestinal or the upper respiratory tract, and they may also result from (otherwise innocuous) microbes acquired from other hosts (as in Clostridium difficile colitis) or from the environment as a result of traumatic introduction (as in surgical wound infections or

compound fractures). An opportunistic disease requires impairment of host defenses, which may occur as a result of genetic defects (such as Chronic granulomatous disease), exposure to antimicrobial drugs or immunosuppressive chemicals (as might occur following poisoning or cancer chemotherapy), exposure to ionizing radiation, or as a result of an infectious disease with immunosuppressive activity (such as with measles, malaria or HIV disease). Primary pathogens may also cause more severe disease in a host with depressed resistance than would normally occur in an immunosufficient host.

One way of proving that a given disease is "infectious", is to satisfy Koch's postulates (first proposed by Robert Koch), which demands that the infectious agent be identified only in patients and not in healthy controls, and that patients who contract the agent also develop the disease. These postulates were first used in the discovery that Mycobacteria species cause tuberculosis. Koch's postulates cannot be met ethically for many human diseases because they require experimental infection of a healthy individual with a pathogen produced as a pure culture. Often, even diseases that are quite clearly infectious do not meet the infectious criteria. For example, Treponema pallidum, the causative spirochete of syphilis, cannot be cultured in vitro - however the organism can be cultured in rabbit testes. It is less clear that a pure culture comes from an animal source serving as host than it is when derived from microbes derived from plate culture. Epidemiology is another important tool used to study disease in a population. For infectious diseases it helps to determine if a disease outbreak is sporadic (occasional occurrence), endemic (regular cases often occurring in a region), epidemic (an unusually high number of cases in a region), or pandemic (a global epidemic).

3. Transmission

Washing one's hands, a form of hygiene, is the number one way to prevent the spread of infectious disease.

An infectious disease is transmitted from some source. Defining the means of transmission plays an important part in understanding the biology of an infectious agent, and in addressing the disease it causes. Transmission may occur through several different mechanisms. Respiratory diseases and meningitis are commonly acquired by contact with aerosolized droplets, spread by sneezing, coughing, talking, kissing or even singing. Gastrointestinal diseases are often acquired by ingesting

contaminated food and water. Sexually transmitted diseases are acquired through contact with bodily fluids, generally as a result of sexual activity. Some infectious agents may be spread as a result of contact with a contaminated, inanimate object (known as a fomite), such as a coin passed from one person to another, while other diseases penetrate the skin directly.

Transmission of infectious diseases may also involve a "vector". Vectors may be mechanical or biological. A mechanical vector picks up an infectious agent on the outside of its body and transmits it in a passive manner. An example of a mechanical vector is a housefly, which lands on cow dung, contaminating its appendages with bacteria from the feces, and then lands on food prior to consumption. The pathogen never enters the body of the fly.

In contrast, biological vectors harbor pathogens within their bodies and deliver pathogens to new hosts in an active manner, usually a bite. Biological vectors are often responsible for serious blood-borne diseases, such as malaria, viral encephalitis, Chagas disease, Lyme disease and African sleeping sickness. Biological vectors are usually, though not exclusively, arthropods, such as mosquitoes, ticks, fleas and lice. Vectors are often required in the life cycle of a pathogen. A common strategy used to control vector borne infectious diseases is to interrupt the life cycle of a pathogen by killing the vector.

The relationship between virulence and transmission is complex, and has important consequences for the long term evolution of a pathogen. Since it takes many generations for a microbe and a new host species to co-evolve, an emerging pathogen may hit its earliest victims especially hard. It is usually in the first wave of a new disease that death rates are highest. If a disease is rapidly fatal, the host may die before the microbe can get passed along to another host. However, this cost may be overwhelmed by the short term benefit of higher infectiousness if transmission is linked to virulence, as it is for instance in the case of cholera (the explosive diarrhea aids the bacterium in finding new hosts) or many respiratory infections (sneezing and coughing create infectious aerosols).

4. Preventing transmission

A simplified model of how disease transmission in small-world networks can be prevented. Major focus should be on preventing jumps between hubs (green cross out) in addition to prevention within infected hubs (red cross outs).

One of the ways to prevent or slow down the transmission of infectious diseases is to recognize the different characteristics of various diseases. Some critical disease characteristics that should be evaluated include virulence, distance traveled by victims, and level of contagiousness. The human strains of Ebola virus, for example, incapacitate its victims extremely quickly and kills them soon after. As a result, the victims of this disease do not have the opportunity to travel very far from the initial infection zone. Also, this virus must spread through skin lesions or permeable membranes such as the eye. Thus, the initial stage of Ebola is not very contagious since its victims experience only internal hemorrhaging. As a result of the above features, the spread of Ebola is very rapid and usually stays within a relatively confined geographical area. In contrast, Human Immunodeficiency Virus (HIV) kills its victims very slowly by attacking their immune system. As a result, a lot of its victims transmit the virus to many others before even realizing that they are carrying the disease. Also, the relatively low virulence allows its victims to travel long distances, increasing the likelihood of an epidemic.

Another effective way to decrease the transmission rate of infectious diseases is to recognize the effects of small-world networks. In epidemics, there are often extensive interactions within hubs or groups of infected individuals and other interactions within discrete hubs of susceptible individuals. Despite the low interaction between discrete hubs, the disease can jump to and spread in a susceptible hub via a single or few interactions with an infected hub. Thus, infection rates in small-world networks can be reduced somewhat if interactions between individuals within infected hubs are eliminated (Figure 1). However, infection rates can be drastically reduced if the main focus is on the prevention of transmission jumps between hubs. The use of needle exchange programs in areas with a high density of drug users with HIV is an example of the successful implementation of this treatment method. Another example is the use of ring culling or vaccination of potentially susceptible livestock in adjacent farms to prevent the spread of

the foot-and-mouth virus in 2001. General methods to prevent transmission of pathogens may include disinfection and pest control.

5. Diagnosis and therapy

Diagnosis of infectious disease sometimes involves identifying an infectious agent either directly or indirectly. In practice most minor infectious diseases such as warts, cutaneous abscesses, respiratory system infections and diarrheal diseases are diagnosed by their clinical presentation. Conclusions about the cause of the disease are based upon the likelihood that a patient came in contact with a particular agent, the presence of a microbe in a community, and other epidemiological considerations. Given sufficient effort, all known infectious agents can be specifically identified. The benefits of identification, however, are often greatly outweighed by the cost, as often there is no specific treatment, the cause is obvious, or the outcome of an infection is benign.

Specific identification of an infectious agent is usually only determined when such identification can aid in the treatment or prevention of the disease, or to advance knowledge of the course of an illness prior to the development of effective therapeutic or preventative measures. For example, in the early 1980s, prior to the appearance of AZT for the treatment of AIDS, the course of the disease was closely followed by monitoring the composition of patient blood samples, even though the outcome would not offer the patient any further treatment options. In part, these studies on the appearance of HIV in specific communities permitted the advancement of hypotheses as to the route of transmission of the virus. By understanding how the disease was transmitted, resources could be targeted to the communities at greatest risk in campaigns aimed at reducing the number of new infections. The specific serological diagnostic identification, and later genotypic or molecular identification, of HIV also enabled the development of hypotheses as to the temporal and geographical origins of the virus, as well as a myriad of other hypothesis. The development of molecular diagnostic tools have enabled physicians and researchers to monitor the efficacy of treatment with anti-retroviral drugs. Molecular diagnostics are now commonly used to identify HIV in healthy people long before the onset of illness and have been used to demonstrate the existence of people who are genetically resistant to HIV infection. Thus, while there still is no cure for AIDS, there is great therapeutic and predictive benefit to identifying the virus and monitoring the virus

levels within the blood of infected individuals, both for the patient and for the community at large.

6. Methods of diagnosis

Diagnosis of infectious disease is nearly always initiated by medical history and physical examination. More detailed identification techniques involve the culture of infectious agents isolated from a patient. Culture allows identification of infectious organisms by examining their microscopic features, by detecting the presence of substances produced by pathogens, and by directly identifying an organism by its genotype. Other techniques (such as X-rays, CAT scans, PET scans or NMR) are used to produce images of internal abnormalities resulting from the growth of an infectious agent. The images are useful in detection of, for example, a bone abscess or a spongiform encephalopathy produced by a prion.

7. Microbial culture

Four nutrient agar plates growing colonies of common Gram negative bacteria.

Microbiological culture is a principal tool used to diagnose infectious disease. In a microbial culture, a growth medium is provided for a specific agent. A sample taken from potentially diseased tissue or fluid is then tested for the presence of an infectious agent able to grow within that medium. Most pathogenic bacteria are easily grown on nutrient agar, a form of solid medium that supplies carbohydrates and proteins necessary for growth of a bacterium, along with copious amounts of water. A single bacterium will grow into a visible mound on the surface of the plate called a colony, which may be separated from other colonies or melded together into a "lawn". The size, color, shape and form of a colony is characteristic of the bacterial species, its specific genetic makeup (its strain), and the environment which supports its growth. Other ingredients are often added to the plate to aid in identification. Plates may contain substances that permit the growth of some bacteria and not others, or that change color in response to certain bacteria and not others. Bacteriological plates such as these are commonly used in the clinical identification of infectious bacteria. Microbial culture may also be used in the identification of viruses: the medium in this case being cells grown in culture that the virus can infect, and then alter or kill. In the

case of viral identification, a region of dead cells results from viral growth, and is called a "plaque". Eukaryotic parasites may also be grown in culture as a means of identifying a particular agent.

In the absence of suitable plate culture techniques, some microbes require culture within live animals. Bacteria such as Mycobacterium leprae and T. pallidum can be grown in animals, although serological and microscopic techniques make the use of live animals unnecessary. Viruses are also usually identified using alternatives to growth in culture or animals. Some viruses may be grown in embryonated eggs. Another useful identification method is Xenodiagnosis, or the use of a vector to support the growth of an infectious agent. Chaga's disease is the most significant example, because it is difficult to directly demonstrate the presence of the causative agent, Trypanosoma cruzi in a patient, which therefore makes it difficult to definitively make a diagnosis. In this case, xenodiagnosis involves the use of the vector of the Chaga's agent T. cruzi, an uninfected triatomine bug (subfamily Triatominae), which takes a blood meal from a person suspected of having been infected. The bug is later inspected for growth of T. cruzi within its gut.

8. Microscopy

Another principal tool in the diagnosis of infectious disease is microscopy. Virtually all of the culture techniques discussed above rely, at some point, on microscopic examination for definitive identification of the infectious agent. Microscopy may be carried out with simple instruments, such as the compound light microscope, or with instruments as complex as an electron microscope. Samples obtained from patients may be viewed directly under the light microscope, and can often rapidly lead to identification. Microscopy is often also used in conjunction with biochemical staining techniques, and can be made exquisitely specific when used in combination with antibody based techniques. For example, the use of antibodies made artificially fluorescent (fluorescently labeled antibodies) can be directed to bind to and identify a specific antigens present on a pathogen. A fluorescence microscope is then used to detect fluorescently labeled antibodies bound to internalized antigens within clinical samples or cultured cells. This technique is especially useful in the diagnosis of viral diseases, where the light microscope is incapable of identifying a virus directly.

Other microscopic procedures may also aid in identifying infectious agents. Almost all cells readily stain with a number of basic dyes due to the electrostatic attraction between negatively charged cellular molecules and the positive charge on the dye. A cell is normally transparent under a microscope, and using a stain increases the contrast of a cell with its background. Staining a cell with a dye such as Giemsa stain or crystal violet allows a microscopist to describe its size, shape, internal and external components and its associations with other cells. The response of bacteria to different staining procedures is used in the taxonomic classification of microbes as well. Two methods, the Gram stain and the acid-fast stain, are the standard approaches used to classify bacteria and to diagnosis of disease. The Gram stain identifies the bacterial groups Firmicutes and Actinobacteria, both of which contain many significant human pathogens. The acid-fast staining procedure identifies the Actinobacterial genera Mycobacterium and Nocardia.

9. Biochemical tests

Biochemical tests used in the identification of infectious agents include the detection of metabolic or enzymatic products characteristic of a particular infectious agent. Since bacteria ferment carbohydrates in patterns characteristic of their genus and species, the detection of fermentation products is commonly used in bacterial identification. Acids, alcohols and gases are usually detected in these tests when bacteria are grown in selective liquid or solid media.

The isolation of enzymes from infected tissue can also provide the basis of a biochemical diagnosis of an infectious disease. For example, humans can make neither RNA replicases nor reverse transcriptase, and the presence of these enzymes are characteristic of specific types of viral infections. The ability of the viral protein hemagglutinin to bind red blood cells together into a detectable matrix may also be characterized as a biochemical test for viral infection, although strictly speaking hemagglutinin is not an enzyme and has no metabolic function.

Serological methods are highly sensitive, specific and often extremely rapid tests used to identify microorganisms. These tests are based upon the ability of an antibody to bind specifically to an antigen. The antigen, usually a protein or carbohydrate made by an infectious agent, is bound by the antibody. This binding then sets off a chain of events that can be visibly obvious in various ways, dependent upon the test. For example, "Strep

throat" is often diagnosed within minutes, and is based on the appearance of antigens made by the causative agent, S. pyogenes, that is retrieved from a patients throat with a cotton swab. Serological tests, if available, are usually the preferred route of identification, however the tests are costly to develop and the reagents used in the test often require refrigeration. Some serological methods are extremely costly, although when commonly used, such as with the "strep test", they can be inexpensive.

10. Molecular diagnostics

Technologies based upon the polymerase chain reaction (PCR) method will become nearly ubiquitous gold standards of diagnostics of the near future, for several reasons. First, the catalog of infectious agents has grown to the point that virtually all of the significant infectious agents of the human population have been identified. Second, an infectious agent must grow within the human body to cause disease; essentially it must amplify its own nucleic acids in order to cause a disease. This amplification of nucleic acid in infected tissue offers an opportunity to detect the infectious agent by using PCR. Third, the essential tools for directing PCR, primers, are derived from the genomes of infectious agents, and with time those genomes will be known, if they are not already.

Thus, the technological ability to detect any infectious agent rapidly and specifically are currently available. The only remaining blockades to the use of PCR as a standard tool of diagnosis are in its cost and application, neither of which is insurmountable. The diagnosis of a few diseases will not benefit from the development of PCR methods, such as some of the clostridial diseases (tetanus and botulism). These diseases are fundamentally biological poisonings by relatively small numbers of infectious bacteria that produce extremely potent neurotoxins. A significant proliferation of the infectious agent does not occur, this limits the ability of PCR to detect the presence of any bacteria.

11. Clearance and immunity

Mary Mallon (a.k.a Typhoid Mary) was an asymptomatic carrier of typhoid fever. Over the course of her career as a cook, she infected 53 people, three of whom died.

Infection with most pathogens does not result in death of the host and the offending organism is ultimately cleared after the symptoms of the disease have waned. This

process requires immune mechanisms to kill or inactivate the inoculum of the pathogen. Specific acquired immunity against infectious diseases may be mediated by antibodies and/or T lymphocytes. Immunity mediated by these two factors may be manifested by:

- a direct effect upon a pathogen, such as antibody-initiated complement-dependent bacteriolysis, opsonoization, phagocytosis and killing, as occurs for some bacteria,
- neutralization of viruses so that these organisms cannot enter cells,
- or by T lymphocytes which will kill a cell parasitized by a microorganism.

The immune response to a microorganism often causes symptoms such as a high fever and inflammation, and has the potential to be more devastating than direct damage caused by a microbe. Resistance to infection (immunity) may be acquired following a disease, by asymptomatic carriage of the pathogen, by harboring an organism with a similar structure (crossreacting), or by vaccination. Knowledge of the protective antigens and specific acquired host immune factors is more complete for primary pathogens than for opportunistic pathogens. Immune resistance to an infectious disease requires a critical level of either antigen-specific antibodies and/or T cells when the host encounters the pathogen. Some individuals develop natural serum antibodies to the surface polysaccharides of some agents although they have had little or no contact with the agent, these natural antibodies confer specific protection to adults and are passively transmitted to newborns.

Topic : Nursing Care For The Child With A Chronic Condition

Topic Objective:

At the end of the topic student will be able to understand:

- Prevalence
- Chronic Conditions
- Understand that you're not alone
- Become the Captain Of Your Medical Team

Definition/Overview:

In medicine, a chronic disease is a disease that is long-lasting or recurrent. The term chronic describes the course of the disease, or its rate of onset and development. A chronic course is distinguished from a recurrent course; recurrent diseases relapse repeatedly, with periods of remission in between. As an adjective, chronic can refer to a persistent and lasting medical condition. Chronicity is usually applied to a condition that lasts more than three months.

Key Points:

1. Prevalence

Nearly one in two Americans (133 million) has a chronic medical condition of one kind or another. However, most of these people are not actually disabled, as their medical conditions do not impair normal activities. According to this report, the most common chronic conditions are high blood pressure, arthritis, respiratory diseases like emphysema, and high cholesterol. That number is projected to increase by more than one percent per year by 2030, resulting in an estimated chronically ill population of 171 million. 60% are between the ages of 18 and 64. 90% of seniors have at least one chronic disease, and 77% of them have two or more chronic diseases.

2. Chronic Conditions

Bad news: You have high blood pressure, or diabetes, or asthma, or heart disease, or any one of dozens of chronic diseases. Your doctor said your condition "can't be cured," but can be "managed," a process you'll need to deal with "for the rest of your life."

If you're newly diagnosed, chances are you feel a little frantic: What's to become of me? If you've had a chronic condition for a while, chances are you feel victimized, perhaps depressed, and no doubt hassled by the medication you have to take and the adjustments you've had to make. Having a chronic disease is certainly no fun. It's perfectly reasonable to feel shocked, anxious, and saddened when diagnosed, and depressed and irritated as you cope with your condition over time. Allow yourself to feel those feelings. Don't deny them. Then, when you're ready, move emotionally past them. The fact is, the vast majority of chronic illnesses are NOT the end of the world. You CAN learn to live with this. And strange as this may sound, in the not-too-distant-future, you might even come to

feel that in some ways, your condition has improved your life. Every chronic condition is different. But the approaches to coping with them are more or less the same:

3. Understand that you're not alone

Having a chronic illness is often isolating. You might think you're the only person in the world who has to spend time and energy hassling with what you have to do to take care of yourself. Not true. The fact is that almost half of Americans of all ages have some chronic medical condition, and among seniors, the proportion is more than half: Arthritis affects 32 million. High blood pressure is a problem for 22.5 million. Allergies affect 20 million. Some 16 million have diabetes. Heart disease afflicts 14 million. More than 5 million have asthma. You may feel isolated. But you're not. You're a member of a very large club. There's a lot more to this than: Misery loves company. The prevalence of chronic conditions means that help abounds: specialists, resources, books, counseling, support groups (for example, SeniorNet's "Health Matters" RoundTables)--you name it.

4. Become the Captain Of Your Medical Team

A chronic condition usually means ongoing contact with one or more medical specialists. For people who are used to having just one family doctor, this can be disconcerting. It takes time to make the rounds of all your doctors. And sometimes they may make conflicting recommendations, leaving you feeling anxious and confused.

Think of your doctors as a team and yourself as the captain. Don't abandon your family doctor. That physician knows you best and can provide valuable perspective on what the specialists say. But don't limit yourself to your family doctor, either. To get the best care, ask for referrals to one or more specialists who focus on your condition. Don't worry that asking for referrals will offend your family doctor. Family doctors make referrals to specialists all the time--and consult them whey they feel the need. When you see a specialist, ask that doctor to send a report back to your family doctor. That way your family doctor, the physician you know best and are probably most comfortable with, can help you interpret the specialists' findings and recommendations. If you must see several specialists, which often happens when dealing with cancer, encourage your various doctors--pathologist, surgeon, medical oncologist, radiation oncologist--to talk with each other and come to a consensus on what's best for you. This may take some assertiveness

on your part. Here's a tip: Obtain all your doctors' e-mail addresses and forward each one's recommendations to the others. Your physicians may disagree at first. That's not unusual. Medicine is as much an art as a science. That's why it's a good idea to share all your doctors' recommendations with all your other doctors. Then they can discuss your situation, and come to a consensus on treatment recommendations. Frequently, a doctor urges you to begin some type of treatment "right away." When faced with many chronic conditions, prompt treatment is a good idea. But it may not mean you have to begin treatment immediately. It's also important to feel comfortable with your treatment plan, and to check in with your family doctor, or other doctors if you feel the need to do so. Email allows you to check in with your doctors usually in 24 hours. If a specialist seems eager to begin treatment and you'd like a day or so to consider it and check in with your family doctor, say so. Then negotiate. Except in the case of surgery, once you begin a treatment program, you're rarely locked into it. Medications can be changed. Treating a chronic condition is a process, not a single event. Try to take a long-term perspective.

Topic : The Child And Life-Threatening Illness Or Injury

Topic Objective:

At the end of the topic student will be able to understand:

- Structured Settlements in Personal Injury Cases
- Personal injury
- Legal issues
- Types of injury

Definition/Overview:

Injury or bodily injury is damage or harm caused to the structure or function of the body caused by an outside agent or force, which may be physical or chemical. Personal Injury also refers to damage caused to the reputation of another rather than physical harm to the body. A severe and life-threatening injury is referred to as a physical trauma.

Key Points:

1. Types of injury

- Bruise is a hemorrhage under the skin caused by contusion.
- Wound: cuts and grazes are injuries to or through the skin, that cause bleeding (i.e., a laceration).
- Burns are injuries caused by excess heat, chemical exposure, or sometimes cold (frostbite).
- Fractures are injuries to bones.
- Joint dislocation is a displacement of a bone from its normal joint, such as a dislocated shoulder or finger.
- Concussion is mild traumatic brain injury caused by a blow, without any penetration into the skull or brain.
- Sprain is an injury which occurs to ligaments caused by a sudden over stretching; a strain injures muscles.
- Shock is a serious medical condition where the tissues cannot obtain sufficient oxygen and nutrients.
- Amputation is the removal of a body extremity by trauma or surgery.
- Munchausen Syndrome is a psychiatric disorder where a person inflicts an injury upon themselves for the purpose of receiving medical attention.
- Serious bodily injury is any injury or injuries to the body that substantially risks death of the victim.

2. Legal issues

Various legal remedies may be available for personal injury (eg. under the law negligence) or for injury to the reputation of another (eg. see damages and restitution) for slander or libel. In the United States, the legal definition of malicious injury is any injury committed with malice, hatred or one committed spitefully or wantonly. Such an action must be willfully committed with the knowledge that it is liable to cause injury. Injury involving element of fraud, violence, wantonness, willfulness, or criminality.

3. Personal injury

A personal injury occurs when a person has suffered some form of injury, either physical or psychological, as the result of an accident or medical malpractice.

The most common type of personal injury claims are road traffic accidents, accidents at work, tripping accidents, assault claims, accidents in the home, defective product accidents and holiday accidents. Indeed, there are a multitude of types of accident and the term personal injury also incorporates medical and dental accidents (which lead to numerous medical and dental negligence claims every year) and conditions which are often classified as industrial disease cases. Industrial disease type cases include asbestosis and mesothelioma, chest diseases (e.g. emphysema, pneumoconiosis, silicosis, chronic bronchitis, asthma, chronic obstructive pulmonary disease, and chronic obstructive airways disease), vibration white finger, occupational deafness, occupational stress, contact dermititus, and repetitive strain injury cases.

Where the accident was the fault of someone else, the injured party may be entitled to monetary compensation from the person whose negligent conduct caused the injury. At least in the United States this system is complex and controversial with critics calling for various forms of tort reform. Attorneys often represent clients on a "contigency basis," in which the attorney does not charge for services until the case is resolved.

In England and Wales, under the limitation rules, where an individual is bringing a claim for compensation, court proceedings must be commenced within 3 years of the date of the accident, failing which the claimant will lose the right to bring their claim. However, if the injured party was under the age of 18 at the time of the accident, then they have up until the day prior to their 21st birthday to commence proceedings. A court has the discretion to extend or waive the limitation period if it is considered equitable to do so. Legal Aid for personal injury cases was largely abolished in the late 1990s and replaced with "no win, no fee" arrangements.

4. **Structured Settlements in Personal Injury Cases**

Often, the use of a structured settlement is desired by the injury victim to help protect them financially after an injury settlement. Structured settlements provide injury victims with tax benefits and enable proper financial planning for future needs of the injury victim as a result of the injury.

Topic : End Of Life Care And Bereavement

Topic Objective:

At the end of the topic student will be able to understand:

- Risks
- Types and duration
- Types of bereavement
- Childhood bereavement
- Death of a child
- Death of a spouse
- Death of a parent
- Death of a sibling
- Other losses

Definition/Overview:

Grief is a multi-faceted response to loss. Although conventionally focused on the emotional response to loss, it also has physical, cognitive, behavioral, social, and philosophical dimensions. Common to human experience is the death of a loved one, whether it be a friend, family, or other companion, and in fact the word "grief" comes from the same root as "grave." While the terms are often used interchangeably, bereavement often refers to the state of loss, and grief to the reaction to loss. Losses can range from loss of employment, pets, status, a sense of safety, order, or possessions, to the loss of loved ones. Our response to loss is varied and researchers have moved away from conventional views of grief (that is, that people move through an orderly and predictable series of responses to loss) to one that considers the wide variety of responses that are influenced by personality, family, culture, and spiritual and religious beliefs and practices.

Bereavement, while a normal part of life for us all, carries a degree of risk when limited support is available. Severe reactions to loss may carry over into familial relations and cause trauma for children, spouses and any other family members: there is an increased risk of marital breakup following the death of a child, for example. Issues of personal faith and

beliefs may also face challenge, as bereaved persons reassess personal definitions in the face of great pain. While many who grieve are able to work through their loss independently, accessing additional support from bereavement professionals may promote the process of healing. Grief counseling, professional support groups or educational classes, and peer-led support groups are primary resources available to the bereaved. In the United States, local hospice agencies may be an important first contact for those seeking bereavement support.

Key Points:

1. Risks

Many studies have looked at the bereaved in terms of increased risks for stress-related illnesses. Colin Murray Parkes in the 1960s and 1970s in England noted increased doctor visits, with symptoms such as abdominal pain, breathing difficulties, and so forth in the first six months following a death. Others have noted increased mortality rates and Bunch et al found a five times greater risk of suicide in teens following the death of a parent. Grief puts a great stress on the physical body as well as on the psyche, resulting in wear and tear beyond what is normal.

2. Types and duration

Complicated grief, now also commonly referred to as Prolonged Grief, can be differentiated from normal grief. Normal grief typically involves a range of transient behavioural and emotional responses to loss. While the experience of grief is a very individual process depending on many factors, certain commonalities are often reported. Nightmares, appetite problems, dryness of mouth, shortness of breath, sleep disorders, and repetitive motions to avoid pain are often reported by people experiencing normal grief. Even hallucinatory experiences may be normal early in grief.

Examples of complicated grief can often be found in those who have survived a suicide attempt. Complicated grief responses almost always are a function of intensity and timing: a grief that after a year or two begins to worsen, accompanied by unusual behaviors, is a warning sign. Complicated grief is usually grief where the story of the loss is in some ways difficult to tell.[citation needed]Deaths such as suicides, murders, accidents, and other sudden and unexpected deaths can result in complicated grief due to the sudden

shock. The surprise makes it difficult to integrate the "story" of the loss, so the person struggles with an initial task of simply believing that the loss has occurred. Variables surrounding the death such as expectedness, naturalness, presence of violence, ambivalence, degree of attachment, and others play into the presence of complicated grief. All too often complicated grief can last for years and most people (friends of the mourner) will recoil when hearing that this sort of grief may still be present after several years. There is a clinical problem of becoming "identified" with the grief. In this situation, mourners are reluctant to release the grief because grieving has been integrated as part of their identity. Reporting in the journal NeuroImage, scientists suggest that complicated grief activates neurons in the reward centers of the brain, possibly giving these memories addiction-like properties. The authors found activity in the nucleus accumbens, a region of the brain most commonly associated with reward and one that has also been shown to play a role in social attachment, such as sibling and maternal affiliation.

3. Types of bereavement

Differing bereavements along the life cycle may have different manifestations and problems which are age related, mostly because of cognitive and emotional skills along the way. Children will exhibit their mourning very differently in reaction to the loss of a parent than a widow would to the loss of a spouse. Reactions in one type of bereavement may be perfectly normal, but in another the same reaction could be problematic. The kind of loss must be taken under consideration when determining how to help.

4. Childhood bereavement

When a parent or caregiver dies or leaves, children may have symptoms of psychopathology, but they are less severe than in children with major depression. The loss of a parent, grandparent or sibling can be very troubling in childhood, but even in childhood there are age differences in relation to the loss. A very young child, under one or two, may be felt to have no reaction if a carer dies, but this is far from the truth. At a time when trust and dependency are formed, a break even of no more than separation can cause problems in wellbeing; this is especially true if the loss is around critical periods such as 8-12 months, when attachment and separation are at their height in formation, and

even a brief separation from a parent or other person who cares for the child can cause distress.

Even as a child grows older, death is still difficult to assimilate and this affects the way a child responds. For example, younger children will find the 'fact' of death a changeable thing: one child believed her deceased mother could be restored with 'band-aids', and children often see death as curable or reversible, more as a separation. Reactions here may manifest themselves in 'acting out' behaviors: a return to earlier behaviors such as sucking thumbs, clinging to a toy or angry behavior: they do not have the maturity to mourn as an adult, but the intensity is there. As children enter pre-teen and teen years, there is a more mature understanding. Adolescents may respond by delinquency, or oppositely become 'over-achievers': repetitive actions are not uncommon such as washing a car repeatedly or taking up repetitive tasks such as sewing, computer games, etc. It is an effort to stay 'above' the grief. Childhood loss as mentioned before can predispose a child not only to physical illness but to emotional problems and an increased risk for suicide, especially in the adolescent period.

5. Death of a child

Death of a child can take the form of a loss in infancy such as abortion, miscarriage, stillbirth or neonatal death, SIDS, or the death of an older child. In all cases, parents find the grief almost unbearably devastating, and while persons may rate the death of a spouse as first in traumatic life events, the death of a child is still perhaps one of the most intense forms of grief, holding greater risk factors. This loss also bears a lifelong process: one does not get 'over' the loss but instead must assimilate and live with the death. Intervention and comforting support can make all the difference to the survival of a parent in this type of grief but the risk factors are great and may include family breakup or suicide. Because of the intensity of grief emotions, irrational decisions are often made. In the event of a miscarriage or abortion, it is important for friends and family members to acknowledge the loss of the pregnancy, and not to attempt to minimalize the significance of a pregnancy that did not come to term. Feelings of guilt, whether legitimate or not, are pervasive, and the dependent nature of the relationship disposes parents to a variety of problems as they seek to cope with this great loss. Parents that suffer miscarriage or abortion may experience resentment towards others who experience successful pregnancies.

6. Death of a spouse

Although the death of a spouse may be an expected change, particularly as we age, it is a particularly powerful loss of a loved-one. A spouse often becomes part of the other in a unique way: many widows and widowers describe losing 'half' of themselves, and after a long marriage, at older ages, the elderly may find it a very difficult assimilation to begin anew. Furthermore, most couples have a division of 'tasks' or 'labor', e.g. the husband mows the yard, the wife pays the bills, etc. which in addition to dealing with great grief and life changes means added responsibilities for the bereaved. Social isolation may also become imminent as many groups composed of couples find it difficult to adjust to the new identity of the bereaved. When queried about what in life is most traumatic, most rate death of a spouse first, although the death of a child presents more risk factors.

7. Death of a parent

As a child, the death of a parent, without support to manage the effect of the grief, may result in long term psychological harm. Therefore, it is important that the emotions the child feels are worked through completely and discussed openly. An adult may be expected to cope with the death of a parent in a less emotional way, however it can still invoke extremely powerful emotions. This is especially true when the death occurs at an important or difficult period of life, such as when becoming a parent themselves, graduation or other times of emotional stress. It is important to recognize the effects that the loss of a parent can cause and address these. As an adult, the willingness to be open to grief is often diminished and a failure to accept and deal with loss will only result in further pain and suffering.

8. Death of a sibling

The loss of a sibling is a devastating event and sibling grief is often a disenfranchised type of grief (especially with regard to adult siblings) in that it is overlooked by society as a whole and people in general, thus negating the depth of love that exists between siblings. Siblings who have been part of each other's lives since birth help form and sustain each other's identities; with the death of one sibling comes the loss of that part of the survivor's identity. The sibling relationship is a unique one as they share a special bond and a common history from birth, have a certain role and place in the family, often

complement each other, and share genetic traits; siblings who enjoy a close relationship participate in each other's daily lives and special events, confide in each other, share joys, spend leisure time together (whether they are children or adults), and have a relationship that not only exists in the present but often looks toward a future together (even into retirement).

Siblings who play a major part in each other lives are essential to each other; the sibling relationship can be the longest significant relationship of the lifespan and this loss intensifes their grief. Adult siblings eventually expect the loss of aging parents, the only other people who have been an integral part of their lives since birth, but they don't expect to lose their siblings first; as a result, when a sibling dies, the surviving sibling may experience a longer period of shock and disbelief. Overall, with the loss of a sibling, a substantial part of the surviving sibling's past, present, and future is also lost. It should also be noted that if siblings were not on good terms or close with each other, then intense feelings of guilt may ensue on the part of the surviving sibling (guilt may also ensue for: having survived, not being able to prevent the death, having argued with their sibling, etc.). (For further elaboration and information on the preceding information, see "Understanding Sibling Loss" CIGNA, "Sibling Grief" P. Gill White, Ph.D. and "Surviving the Death of a Sibling" T.J. Wray).

9. Other losses

Parents may grieve due to permanent loss of children through means other than death. This loss differs from the death of a child in that the grief process is prolonged or denied because of hope that the relationship will be restored. In this sense, children may be lost due to many different causes, including loss of custody in divorce proceedings; legal termination of parental rights by the government, such as in cases of child abuse; through kidnapping; because the child voluntarily left home (either as a runaway or, for children over 18, by leaving home legally); or because an adult child refuses to have contact with the parent and withdraws from all social and family contact (a symptom of various depression or anxiety disorders).

Many other losses predispose persons to these same experiences, although often not as severely. Loss reactions may occur after the loss of a romantic relationship (i.e. divorce or break up), a vocation, a pet (animal loss), a home, children leaving home (empty nest

syndrome), a friend, a favored appointment or desire, a faith in one's religion, etc. A person who strongly identifies with their occupation may feel a sense of grief if they have to stop their job due to retirement, being laid off, injury, or loss of certification. While the reaction may not be as intense, experiences of loss may still show in these forms of bereavement. Those who have experienced a loss of trust, will also experience some form of grief. For example, people that have been physically or sexually abused as a child may have issues around trust as an adult.

In Section 4 of this course you will cover these topics:

- Alterations In Fluid, Electrolyte, And Acid-Base Balance
- Alterations In Eye, Ear, Nose, And Throat Function
- Alterations In Respiratory Function
- Alterations In Cardiovascular Function
- Alterations In Immune Function
- Alterations In Hematologic Function
- Alterations In Cellular Growth

Topic : Alterations In Fluid, Electrolyte, And Acid-Base Balance

Topic Objective:

At the end of the topic student will be able to understand:

- Electrolyte abnormalities and ECG changes
- General Function
- Nomenclature
- Fluid, Electrolyte, and Acid-Base Balance

Definition/Overview:

Electrolytes play a vital role in maintaining homeostasis within the body. They help to regulate myocardial and neurological function, fluid balance, oxygen delivery, acid-base balance and much more. Electrolyte imbalances can develop by the following mechanisms: excessive ingestion; diminished elimination of an electrolyte; diminished ingestion or

excessive elimination of an electrolyte. The most common cause of electrolyte disturbances is renal failure.

Key Points:

1. Fluid, Electrolyte, and Acid-Base Balance

The most serious electrolyte disturbances involve abnormalities in the levels of sodium, potassium, and/or calcium. Other electrolyte imbalances are less common, and often occur in conjunction with major electrolyte changes. Chronic laxative abuse or severe diarrhea or vomiting can lead to electrolyte disturbances along with dehydration. People suffering from bulimia or anorexia are at especially high risk for an electrolyte imbalance.

2. Nomenclature

There is a standard nomenclature for electrolyte disorders:

- The name starts with a prefix denoting whether the electrolyte is abnormally elevated ("hyper-") or depleted ("hypo-").
- The word stem then gives the name of the electrolyte in Latin. If no Latin equivalent exists, then the corresponding term in English is used.
- The name ends with the suffix "-emia," meaning "in the blood." (Note, this doesn't mean that the disturbance is only in the blood; usually, electrolyte disturbance is systemic. However, since the disturbance is usually detected from blood testing, the convention has developed.)

For instance, elevated potassium in the blood is called "hyperkalemia" from the Latin term for potassium, "kalium".

3. General Function

Electrolytes are important because they are what cells (especially nerve, heart, muscle) use to maintain voltages across their cell membranes and to carry electrical impulses (nerve impulses, muscle contractions) across themselves and to other cells. Kidneys work to keep the electrolyte concentrations in blood constant despite changes in your body. For example, during heavy exercise, electrolytes are lost in sweat, particularly sodium and

potassium. These electrolytes must be replaced to keep the electrolyte concentrations of the body fluids constant.

4. Electrolyte abnormalities and ECG changes

The most notable feature of hyperkalemia is the "tent shaped" or "peaked" T wave. Delayed ventricular depolarization leads to a widened QRS complex and the P wave becomes wider and flatter. When hyperkalemia becomes severe, the ECG resembles a sine wave as the P wave disappears from view. In contrast, hypokalemia is associated with flattening of the T wave and the appearance of a U wave. When untreated, hypokalemia may lead to severe arrhythmias.

The fast ventricular depolarization and repolarization associated with hypercalcemia lead to a characteristic shortening of the QT interval. Hypocalcemia has the opposite effect, lengthening the QT interval.

Topic : Alterations In Eye, Ear, Nose, And Throat Function

Topic Objective:

At the end of the topic student will be able to understand:

- Throat
- Introduction to ears and hearing
- Types of eye
- Overview
- Eye

Definition/Overview:

The ear is the sense organ that detects sounds. The vertebrate ear shows a common biology from fish to humans, with variations in structure according to order and species. It not only acts as a receiver for sound, but plays a major role in the sense of balance and body position. The ear is part of the auditory system.

Anatomically, a **nose** is a protuberance in vertebrates that houses the nostrils, or nares, which admit and expel air for respiration in conjunction with the mouth. and behind the nose is the

olfactory mucosa and the sinuses. Behind the nasal cavity, air next passes through the pharynx, shared with the digestive system, and then into the rest of the respiratory system. In humans, the nose is located centrally on the face; on most other mammals, it is on the upper tip of the snout.

Key Points:

1. Eye

Eyes are organs that detect light, and send signals along the optic nerve to the visual and other areas of the brain. Complex optical systems with resolving power have come in ten fundamentally different forms, and 96% of animal species possess a complex optical system. Image-resolving eyes are present in cnidaria, mollusks, chordates, annelids and arthropods.

The simplest "eyes", in even unicellular organisms, do nothing but detect whether the surroundings are light or dark, which is sufficient for the entrainment of circadian rhythms. From more complex eyes, retinal photosensitive ganglion cells send signals along the retinohypothalamic tract to the suprachiasmatic nuclei to effect circadian adjustment.

2. Overview

Complex eyes can distinguish shapes and colors. The visual fields of many organisms, especially predators, involve large areas of binocular vision to improve depth perception; in other organisms, eyes are located so as to maximise the field of view, such as in rabbits and horses. The first proto-eyes evolved among animals 540 million years ago, about the time of the so-called Cambrian explosion The last common ancestor of animals possessed the biochemical toolkit necessary for vision, and more advanced eyes have evolved in 96% of animal species in 6 of the thirty-something[note 1] main phyla. In most vertebrates and some mollusks, the eye works by allowing light to enter it and project onto a light-sensitive panel of cells, known as the retina, at the rear of the eye. The cone cells (for color) and the rod cells (for low-light contrasts) in the retina detect and convert light into neural signals for vision. The visual signals are then transmitted to the brain via the optic nerve. Such eyes are typically roughly spherical, filled with a transparent gel-like

substance called the vitreous humour, with a focusing lens and often an iris; the relaxing or tightening of the muscles around the iris change the size of the pupil, thereby regulating the amount of light that enters the eye, and reducing aberrations when there is enough light. The eyes of cephalopods, fish, amphibians and snakes usually have fixed lens shapes, and focusing vision is achieved by telescoping the lens similar to how a camera focuses.

Compound eyes are found among the arthropods and are composed of many simple facets which, depending on the details of anatomy, may give either a single pixelated image or multiple images, per eye. Each sensor has its own lens and photosensitive cell(s). Some eyes have up to 28,000 such sensors, which are arranged hexagonally, and which can give a full 360-degree field of vision. Compound eyes are very sensitive to motion. Some arthropods, including many Strepsiptera, have compound eyes of only a few facets, each with a retina capable of creating an image, creating vision. With each eye viewing a different thing, a fused image from all the eyes is produced in the brain, providing very different, high-resolution images.

Possessing detailed hyperspectral color vision, the Mantis shrimp has been reported to have the world's most complex color vision system. Trilobites, which are now extinct, had unique compound eyes. They used clear calcite crystals to form the lenses of their eyes. In this, they differ from most other arthropods, which have soft eyes. The number of lenses in such an eye varied, however: some trilobites had only one, and some had thousands of lenses in one eye. In contrast to compound eyes, simple eyes are those that have a single lens. For example, jumping spiders have a large pair of simple eyes with a narrow field of view, supported by an array of other, smaller eyes for peripheral vision. Some insect larvae, like caterpillars, have a different type of simple eye (stemmata) which gives a rough image. Some of the simplest eyes, called ocelli, can be found in animals like some of the snails, which cannot actually "see" in the normal sense. They do have photosensitive cells, but no lens and no other means of projecting an image onto these cells. They can distinguish between light and dark, but no more. This enables snails to keep out of direct sunlight. In organisms dwelling near deep-sea vents, compound eyes have been secondarily simplified and adapted to spot the infra-red light produced by the hot vents - in this way the bearers can spot hot springs and avoid being boiled alive.

3. Types of eye

Nature has produced ten different eye layouts indeed every way of capturing an image has evolved at least once in nature, with the exception of zoom and Fresnel lenses. Eye types can be categorized into "simple eyes", with one concave chamber, and "compound eyes", which comprise a number of individual lenses laid out on a convex surface. Note that "simple" does not imply a reduced level of complexity or acuity. Indeed, any eye type can be adapted for almost any behaviour or environment. The only limitations specific to eye types are that of resolution the physics of compound eyes prevents them from achieving a resolution better than 1. Also, superposition eyes can achieve greater sensitivity than apposition eyes, so are better suited to dark-dwelling creatures. Eyes also fall into two groups on the basis of their photoreceptor's cellular construction, with the photoreceptor cells either being cilliated (as in the vertebrates) or rhabdomic. These two groups are not monophyletic; the cnidaira also possess cilliated cells, and some annelids possess both.

4. Introduction to ears and hearing

Audition is the scientific name for the perception of sound. Sound is a form of energy that moves through air, water, and other matter, in waves of pressure. Sound is the means of auditory communication, including frog calls, bird songs and spoken language. Although the ear is the vertebrate sense organ that recognizes sound, it is the brain and central nervous system that "hears". Sound waves are perceived by the brain through the firing of nerve cells in the auditory portion of the central nervous system. The ear changes sound pressure waves from the outside world into a signal of nerve impulses sent to the brain.

The outer part of the ear collects sound. That sound pressure is amplified through the middle portion of the ear and, in land animals, passed from the medium of air into a liquid medium. The change from air to liquid occurs because air surrounds the head and is contained in the ear canal and middle ear, but not in the inner ear. The inner ear is hollow, embedded in the temporal bone, the densest bone of the body. The hollow channels of the inner ear are filled with liquid, and contain a sensory epithelium that is studded with hair cells. The microscopic "hairs" of these cells are structural protein filaments that project out into the fluid. The hair cells are mechanoreceptors that release a chemical neurotransmitter when stimulated. Sound waves moving through fluid push the filaments; if the filaments bend over enough it causes the hair cells to fire. In this way sound waves

are transformed into nerve impulses. In vision, the rods and cones of the retina play a similar role with light as the hair cells do with sound. The nerve impulses travel from the left and right ears through the eighth cranial nerve to both sides of the brain stem and up to the portion of the cerebral cortex dedicated to sound. This auditory part of the cerebral cortex is in the temporal lobe. The part of the ear that is dedicated to sensing balance and position also sends impulses through the eighth cranial nerve, the VIIIth nerve's Vestibular Portion. Those impulses are sent to the vestibular portion of the central nervous system. The human ear can generally hear sounds with frequencies between 20 Hz and 20 kHz (the audio range). Although the sensation of hearing requires an intact and functioning auditory portion of the central nervous system as well as a working ear, human deafness (extreme insensitivity to sound) most commonly occurs because of abnormalities of the inner ear, rather than the nerves or tracts of the central auditory system.

5. Throat

Deep Throat was the pseudonym given to the Federal Bureau of Investigation Deputy Director William Mark Felt, Sr. who, as a secret source, provided information to The Washington Post about the involvement of United States President Richard Nixon's administration in what came to be known as the Watergate scandal.

Deep Throat was first introduced to the public in the 1974 book All the President's Men by Washington Post reporters Bob Woodward and Carl Bernstein, which was adapted into an Academy Award-winning film two years later. In the book and movie, the two used Deep Throat's information to write a series of articles on a scandal which played a leading role in introducing the misdeeds of the Nixon administration to the general public. The scandal would eventually lead to the resignation of President Nixon as well as prison terms for White House Chief of Staff H. R. Haldeman, G. Gordon Liddy, Egil Krogh, White House Counsel Charles Colson and John Dean, and presidential adviser John Ehrlichman.

Howard Simons, the managing editor of the Post during Watergate, dubbed the secret informant "Deep Throat" as an allusion to the notorious pornographic movie which was a mainstream cause clbre at the time. The name was also a play on the journalism term

"deep background," referring to information provided by a secret source that, by agreement, will not be reported directly.

For more than 30 years, the identity of Deep Throat was one of the biggest mysteries of American politics and journalism and the source of much public curiosity and speculation. Woodward and Bernstein insisted they would not reveal his identity until he died or consented to have his identity revealed.

Topic : Alterations In Respiratory Function

Topic Objective:

At the end of the topic student will be able to understand:

- Physiology Variances from the Adult
- Pediatric Respiratory System

Definition/Overview:

It is easy to see that a childs airway is smaller and less developed than an adults airway, but why is this important? The infant and child are more vulnerable to the consequences of an upper respiratory tract infection, enlarged tonsils and adenoids, an allergic reaction, positioning of the head and neck during sleep, and small objects that can be aspirated. All can cause an airway obstruction that results in respiratory distress.

Key Points:

1. Pediatric Respiratory System

The diameter of an infants airway is approximately 4 mm, in contrast to an adults airway diameter of 20 mm. An inflammatory process in the airway causes swelling that narrows the airway, and airway resistance increases. Note that swelling of 1 mm reduces the infants airway diameter to 2 mm, but the adults airway diameter is only narrowed to 18 mm. Air must move more quickly in the infants narrowed airway to get the same amount of air to the lungs. The friction of the quickly moving air against the side of the airway increases airway resistance. The infant must use more effort to breathe and breathe faster to get adequate oxygen. In children, the trachea is shorter and the angle of the right

bronchus at bifurcation is more acute than in the adult. Where is an aspirated foreign body likely to land? When you are resuscitating or suctioning, you must allow for the differences in the length of the trachea as it is easier to slip into the right bronchus with an endotracheal tube or suction catheter.

2. Physiology Variances from the Adult

The chest wall is flexible in infants and young children because the chest muscles are immature and the ribs are cartilaginous. With respiratory distress, the negative pressure created by the downward movement of the diaphragm to draw in air is increased, and the chest wall is pulled inward causing retractions. Intercostal retractions are seen in mild respiratory distress. As the severity of respiratory distress increases, retractions can be seen in the substernal and subcostal areas. In cases of severe distress, accessory muscles (sternocleidomastoid and trapezius muscles) are used, and retractions are seen in the supraclavicular and suprasternal areas.

Topic : Alterations In Cardiovascular Function

Topic Objective:

At the end of the topic student will be able to understand:

- Components
- Pulmonary circulation
- Coronary circulation
- Heart
- Closed cardiovascular system
- Other vertebrates
- Open circulatory system
- Circulatory system

Definition/Overview:

The **circulatory system**is an organ system that moves nutrients, gases, and wastes to and from cells to help fight diseases and help stabilize body temperature and pH to maintain homeostasis. This system may be seen strictly as a blood distribution network, but some consider the circulatory system as composed of the **cardiovascular system**, which distributes blood, and the **lymphatic system**, which distributes lymph. While humans, as well as other vertebrates, have a closed cardiovascular system (meaning that the blood never leaves the network of arteries, veins and capillaries), some invertebrate groups have an open cardiovascular system. The most primitive animal phyla lack circulatory systems. The lymphatic system, on the other hand, is an open system.

Key Points:

1. Components

The main components of the human circulatory system are the heart, the blood, and the blood vessels. The circulatory system includes: the pulmonary circulation, a "loop" through the lungs where blood is oxygenated; and the systemic circulation, a "loop" through the rest of the body to provide oxygenated blood. An average adult contains five to six quarts (roughly 4.7 to 5.7 liters) of blood, which consists of plasma, red blood cells, white blood cells, and platelets. Also, the digestive system works with the circulatory system to provide the nutrients the system needs to keep the heart pumping. Two types of fluids move through the circulatory system: blood and lymph. The blood, heart, and blood vessels form the cardiovascular system. The lymph, lymph nodes, and lymph vessels form the lymphatic system. The cardiovascular system and the lymphatic system collectively make up the circulatory system.

2. Pulmonary circulation

Pulmonary circulation is the portion of the cardiovascular system which transports oxygen-depleted blood away from the heart, to the lungs, and returns oxygenated blood back to the heart.

De-oxygenated blood enters the right atrium of the heart and flows into the right ventricle where it is pumped through the pulmonary arteries to the lungs. Pulmonary veins return

the now oxygen-rich blood to the heart, where it enters the left atrium before flowing into the left ventricle. Also, from the left ventricle the oxygen-rich blood is pumped out via the aorta, and on to the rest of the body.

3. Coronary circulation

The coronary circulatory system provides a blood supply to the heart. As it provides oxygenated blood to the heart, it is by definition a part of the systemic circulatory system.

4. Heart

The heart pumps oxygenated blood to the body and deoxygenated blood to the lungs. In the human heart there is one atrium and one ventricle for each circulation, and with both a systemic and a pulmonary circulation there are four chambers in total: left atrium, left ventricle, right atrium and right ventricle. The right Atrium, which is the upper chamber of the right side of the heart, receives blood from the upper body through the Superior Vena Cava, and from the lower body through the Inferior Vena Cava. The blood that is returned to the right atrium is oxygen-poor and passed into the right ventricle to be pumped through the pulmonary artery to the lungs to be re-oxygenated. The left atrium receives newly oxygenated blood from the lungs which is passed into the strong left ventricle to be pumped through the aorta to the tissues of the body.

5. Closed cardiovascular system

The cardiovascular systems of humans are closed, meaning that the blood never leaves the network of blood vessels. In contrast, oxygen and nutrients diffuse across the blood vessel layers and enters interstitial fluid, which carries oxygen and nutrients to the target cells, and carbon dioxide and wastes in the opposite direction. The other component of the circulatory system, the lymphatic system, is not closed.

6. Other vertebrates

The circulatory systems of all vertebrates, as well as of annelids (for example, earthworms) and cephalopods (squid and octopus) are closed, just as in humans. Still, the systems of fish, amphibians, reptiles, and birds show various stages of the evolution of the circulatory system.

In fish, the system has only one circuit, with the blood being pumped through the capillaries of the gills and on to the capillaries of the body tissues. This is known as single cycle circulation. The heart of fish is therefore only a single pump (consisting of two chambers). In amphibians and most reptiles, a double circulatory system is used, but the heart is not always completely separated into two pumps. Amphibians have a three-chambered heart.

In reptiles, the ventricular septum of the heart is incomplete and the pulmonary artery is equipped with a sphincter muscle. This allows a second possible route of blood flow. Instead of blood flowing through the pulmonary artery to the lungs, the sphincter may be contracted to divert this blood flow through the incomplete ventricular septum into the left ventricle and out through the aorta. This means the blood flows from the capillaries to the heart and back to the capillaries instead of to the lungs. This process is useful to ectothermic (cold-blooded) animals in the regulation of their body temperature.

Birds and mammals show complete separation of the heart into two pumps, for a total of four heart chambers; it is thought that the four-chambered heart of birds evolved independently from that of mammals.

7. Open circulatory system

The Open Circulatory System is a system in which fluid (called hemolymph) in a cavity called the hemocoel bathes the organs directly with oxygen and nutrients and there is no distinction between blood and interstitial fluid; this combined fluid is called hemolymph or haemolymph. Muscular movements by the animal during locomotion can facilitate hemolymph movement, but diverting flow from one area to another is limited. When the heart relaxes, blood is drawn back toward the heart through open-ended pores (ostia).

Hemolymph fills all of the interior hemocoel of the body and surrounds all cells. Hemolymph is composed of water, inorganic salts (mostly Na^+, Cl^-, K^+, Mg^{2+}, and Ca^{2+}), and organic compounds (mostly carbohydrates, proteins, and lipids). The primary oxygen transporter molecule is hemocyanin.

There are free-floating cells, the hemocytes, within the hemolymph. They play a role in the arthropod immune system.

8. Circulatory system

Circulatory systems are absent in some animals, including flatworms (phylum Platyhelminthes). Their body cavity has no lining or enclosed fluid. Instead a muscular pharynx leads to an extensively branched digestive system that facilitates direct diffusion of nutrients to all cells. The flatworm's dorso-ventrally flattened body shape also restricts the distance of any cell from the digestive system or the exterior of the organism. Oxygen can diffuse from the surrounding water into the cells, and carbon dioxide can diffuse out. Consequently every cell is able to obtain nutrients, water and oxygen without the need of a transport system.

Topic : Alterations In Immune Function

Topic Objective:

At the end of the topic student will be able to understand:

- Disorders in the immune system
- Immune System

Definition/Overview:

An **immune system** is a collection of biological processes within an organism that protects against disease by identifying and killing pathogens and tumour cells. It detects a wide variety of agents, from viruses to parasitic worms, and needs to distinguish them from the organism's own healthy cells and tissues in order to function properly. Detection is complicated as pathogens can evolve rapidly, producing adaptations that avoid the immune system and allow the pathogens to successfully infect their hosts.

Key Points:

1. Immune System

To survive this challenge, multiple mechanisms evolved that recognize and neutralize pathogens. Even simple unicellular organisms such as bacteria possess enzyme systems that protect against viral infections. Other basic immune mechanisms evolved in ancient eukaryotes and remain in their modern descendants, such as plants, fish, reptiles, and

insects. These mechanisms include antimicrobial peptides called defensins, phagocytosis, and the complement system. Vertebrates such as humans have even more sophisticated defense mechanisms. The immune systems of vertebrates consist of many types of proteins, cells, organs, and tissues, which interact in an elaborate and dynamic network. As part of this more complex immune response, the human immune system adapts over time to recognise specific pathogens more efficiently. This adaptation process is referred to as "adaptive immunity" or "acquired immunity" and creates immunological memory. Immunological memory created from a primary response to a specific pathogen, provides an enhanced response to secondary encounters with that same, specific pathogen. This process of acquired immunity is the basis of vaccination.

2. Disorders in the immune system

Disorders in the immune system can result in disease. Immunodeficiency diseases occur when the immune system is less active than normal, resulting in recurring and life-threatening infections. Immunodeficiency can either be the result of a genetic disease, such as severe combined immunodeficiency, or be produced by pharmaceuticals or an infection, such as the acquired immune deficiency syndrome (AIDS) that is caused by the retrovirus HIV. In contrast, autoimmune diseases result from a hyperactive immune system attacking normal tissues as if they were foreign organisms. Common autoimmune diseases include rheumatoid arthritis, diabetes mellitus type 1 and lupus erythematosus. Immunology covers the study of all aspects of the immune system which has significant relevance to human health and diseases. Further investigation in this field is expected to play a serious role in promotion of health and treatment of diseases.

Topic : Alterations In Hematologic Function

Topic Objective:

At the end of the topic student will be able to understand:

- Types
- Etymology
- White Blood Cells
- Functions besides oxygen transport

- Nucleus
- Vertebrate erythrocytes

Definition/Overview:

Red blood cells are the most common type of blood cell and the vertebrate body's principal means of delivering oxygen to the body tissues via the blood. The cells are filled with hemoglobin, a biomolecule that can bind to oxygen. They take up oxygen in the lungs or gills and release it while squeezing through the body's capillaries. The blood's red color is due to the color of hemoglobin. In humans, red blood cells develop in the bone marrow, take the form of flexible biconcave disks, lack a cell nucleus, subcellular organelles and the ability to synthesize protein, and live for about 120 days.

Key Points:

1. Vertebrate erythrocytes

Erythrocytes consist mainly of hemoglobin, a complex metalloprotein containing heme groups whose iron atoms temporarily link to oxygen molecules (O_2) in the lungs or gills and release them throughout the body. Oxygen can easily diffuse through the red blood cell's cell membrane. Hemoglobin in the erythrocytes also carries some of the waste product carbon dioxide back from the tissues; most of the carbon dioxide is however transported as bicarbonate dissolved in the blood plasma. Myoglobin, a compound related to hemoglobin, acts to store oxygen in muscle cells.

The color of erythrocytes is due to the heme group of hemoglobin. The blood plasma alone is straw-colored, but the red blood cells change color depending on the state of the hemoglobin: when combined with oxygen the resulting oxyhemoglobin is scarlet, and when oxygen has been released the resulting deoxyhemoglobin is darker, appearing bluish through the vessel wall and skin. Pulse oximetry takes advantage of this color change to directly measure the arterial blood oxygen saturation using colorimetric techniques.

The sequestration of oxygen carrying proteins inside specialized cells (rather than having them dissolved in body fluid) was an important step in the evolution of vertebrates; it allows for less viscous blood, higher concentrations of oxygen, and

better diffusion of oxygen from the blood to the tissues. The size of erythrocytes varies widely among vertebrate species; erythrocyte width is on average about 25% larger than capillary diameter and it has been hypothesized that this improves the oxygen transfer from erythrocytes to tissues.

The only known vertebrates without erythrocytes are the crocodile icefishes (family Channichthyidae); they live in very oxygen rich cold water and transport oxygen freely dissolved in their blood. While they don't use hemoglobin anymore, remnants of hemoglobin genes can be found in their genome.

2. Nucleus

Erythrocytes in mammals are anucleate when mature, meaning that they lack a cell nucleus. In comparison, the erythrocytes of nearly all other vertebrates have nuclei; the only known exception being salamanders of the Batrachoseps genus.

3. Functions besides oxygen transport

When erythrocytes undergo shear stress in constricted vessels, they release ATP which causes the vessel walls to relax and dilate. When their hemoglobin molecules are deoxygenated, erythrocytes release S-nitrosothiols which also acts to dilate vessels, thus directing more blood to areas of the body depleted of oxygen. Erythrocytes also play a part in the body's immune response: when lysed by pathogens such as bacteria, their hemoglobin releases free radicals that break down the pathogen's cell wall and membrane, killing it.[

4. White Blood Cells

White blood cells, or **leukocytes** (also spelled "leucocytes"), are cells of the immune system defending the body against both infectious disease and foreign materials. Five different and diverse types of leukocytes exist, but they are all produced and derived from a multipotent cell in the bone marrow known as a hematopoietic stem cell. Leukocytes are found throughout the body, including the blood and lymphatic system. The number of leukocytes in the blood is often an indicator of disease. There are normally between $4 10^9$ and $11 10^9$ white blood cells in a litre of blood, making up approximately 1% of blood in a healthy adult. In conditions such as leukemia, the number of leukocytes is higher than

normal, and in leukopenia, this number is much lower. The physical properties of leukocytes, such as volume, conductivity, and granularity, may change due to activation, the presence of immature cells, or the presence of malignant leukocytes in leukemia.

5. Etymology

The name "white blood cell" derives from the fact that after centrifugation of a blood sample, the white cells are found in the buffy coat, a thin layer of nucleated cells between the sedimented red blood cells and the blood plasma, which is typically white. The scientific term leukocyte directly reflects this description, derived from Greek leukos - white, and kytos - cell. Blood plasma may sometimes be green if there are large amounts of neutrophils in the sample, due to the heme-containing enzyme myeloperoxidase that they produce.

6. Types

There are several different types of white blood cells. They all have many things in common, but are all different. A major distinguishing feature of some leukocytes is the presence of granules; white blood cells are often characterized as granulocytes or agranulocytes:

- Granulocytes (polymorphonuclear leukocytes): leukocytes characterised by the presence of differently staining granules in their cytoplasm when viewed under light microscopy. These granules are membrane-bound enzymes which primarily act in the digestion of endocytosed particles. There are three types of granulocytes: neutrophils, basophils, and eosinophils, which are named according to their staining properties.
- Agranulocytes (mononuclear leucocytes): leukocytes characterized by the apparent absence of granules in their cytoplasm. Although the name implies a lack of granules these cells do contain non-specific azurophilic granules, which are lysosomes. The cells include lymphocytes, monocytes, and macrophages.

Topic : Alterations In Cellular Growth

Topic Objective:

At the end of the topic student will be able to understand:

- Cell populations
- Cell size
- Yeast cell size regulation
- Cell size regulation in mammals
- Cell reproduction
- Comparison of the three types of cell reproduction
- Chromosomes

Definition/Overview:

The term **cell growth** is used in the contexts of cell development and cell division (reproduction). When used in the context of cell division, it refers to growth of cell populations, where one cell (the "mother cell") grows and divides to produce two "daughter cells". Percentage of primary tumors by site of origin for different age groups. Notice that in the early years of life, in addition to leukemia, cancers that derive from embryonic cells such as sympathetic nervous system (neuroblastoma) and eye (retinoblastoma) are common. A protooncogene normally regulates cellular growth and development. When altered by a virus or other external cause, it can change to an oncogene, which allows unregulated genetic activity and tumor growth. Tumor-suppressor genes regulate the effects of oncogenes to decrease wildly proliferating cellular growth.

Key Points:

1. Cell populations

Cell populations go through a type of exponential growth called doubling. Thus, each generation of cells should be twice as numerous as the previous generation. However, the number of generations only gives a maximum figure as not all cells survive in each generation.

2. Cell size

3. Yeast cell size regulation

The relationship between cell size and cell division has been extensively studied in yeast. For some cells, there is a mechanism by which cell division is not initiated until a cell has

reached a certain size. If the nutrient supply is restricted (after time t = 2 in the diagram, below) and the rate of increase in cell size is slowed, the time period between cell divisions is increased. Yeast cell size mutants were isolated that begin cell division before reaching the normal size (wee mutants). The Wee1 protein is a tyrosine kinase. It normally phosphorylates the Cdc2 cell cycle regulatory protein (cyclin-dependent kinase-1, CDK1) on a tyrosine residue. This covalent modification of the molecular structure of Cdc2 inhibits the enzymatic activity of Cdc2 and prevents cell division. In Wee1 mutants, there is less Wee1 activity and Cdc2 becomes active in smaller cells, causing cell division before the yeast cells reach their normal size. Cell division may be regulated in part by dilution of Wee1 protein in cells as they grow larger.

4. Cell size regulation in mammals

Many of the signal molecules that convey information to cells during the control of cellular differentiation or growth are called growth factors. The protein mTOR is a serine/threonine kinase that regulates translation and cell division. Nutrient availability influences mTOR so that when cells are not able to grow to normal size they will not undergo cell division. The details of the molecular mechanisms of mammalian cell size control are currently being investigated. The size of post-mitotic neurons depends on the size of the cell body, axon and dendrites. In vertebrates, neuron size is often a reflection of the number of synaptic contacts onto the neuron or from a neuron onto other cells. For example, the size of motoneurons usually reflects the size of the motor unit that is controlled by the motoneuron. Invertebrates often have giant neurons and axons that provide special functions such as rapid action potential propagation. Mammals also use this trick for increasing the speed of signals in the nervous system, but they can also use myelin to accomplish this, so most human neurons are relatively small cells.

4.1 Other experimental systems for the study of cell size regulation

One common means to produce very large cells is by cell fusion to form syncytia. For example, very long (several inches) skeletal muscle cells are formed by fusion of thousands of myocytes. Genetic studies of the fruit fly Drosophila have revealed several genes that are required for the formation of multinucleated muscle cells by fusion of [[myoblast]s. Some of the key proteins are important for cell adhesion between myocytes and some are

involved in adhesion-dependent cell-to-cell signal transduction that allows for a cascade of cell fusion events.

Oocytes can be unusually large cells in species for which embryonic development takes place away from the mother's body. Their large size can be achieved either by pumping in cytosolic components from adjacent cells through cytoplasmic bridges (Drosophila) or by internalization of nutrient storage granules (yolk granules) by endocytosis (frogs).

Increases in the size of plant cells is complicated by the fact that almost all plant cells are inside of a solid cell wall. Under the influence of certain plant hormones the cell wall can be remodeled, allowing for increases in cell size that are important for the growth of some plant tissues. Most unicellular organisms are microscopic in size, but there are some giant bacteria and protozoa that are visible to the naked eye. See: Table of cell sizes - Dense populations of a giant sulfur bacterium in Namibian shelf sediments - Large protists of the genus Chaos, closely related to the genus Amoeba

5. Cell reproduction

Cell reproduction is asexual. For most of the constituents of the cell, growth is a steady, continuous process, interrupted only briefly at M phase when the nucleus and then the cell divide in two.

The process of cell reproduction has three major parts. The first part of cell reproduction involves the replication of the parental cell's DNA. The second major issue is the separation of the duplicated DNA into two equally sized groups of chromosomes. The third major aspect of cell reproduction is the physical division of entire cells, usually called cytokinesis.

Cell reproduction is more complex in eukaryotes than in other organisms. Prokaryotic cells such as bacterial cells reproduce by binary fission, a process that includes DNA replication, chromosome segregation, and cytokinesis. Eukaryotic cell reproduction either involves mitosis or a more complex process called meiosis. Mitosis and meiosis are sometimes called the two "nuclear division" processes. Binary fission is similar to

eukaryotic cell reproduction that involves mitosis. Both lead to the production of two daughter cells with the same number of chromosomes as the parental cell. Meiosis is used for a special cell reproduction process of diploid organisms. It produces four special daughter cells (gametes) which have half the normal cellular amount of DNA. A male and a female gamete can then combine to produce a zygote, a cell which again has the normal amount of chromosomes. The rest of this article is a comparison of the main features of the three types of cell

reproduction that either involve binary fission, mitosis, or meiosis. The diagram below depicts the similarities and differences of these three types of cell reproduction.

6. Comparison of the three types of cell reproduction

The DNA content of a cell is duplicated at the start of the cell reproduction process. Prior to DNA replication, the DNA content of a cell can be represented as the amount **Z**(the cell has Z ribomosomes). After the DNA replication process, the amount of DNA in the cell is **2Z** (multiplication: 2 x Z = 2Z). During Binary fission and mitosis the duplicated DNA content of the reproducing parental cell is separated into two equal halves that are destined to end up in the two daughter cells. The final part of the cell reproduction process is cell division, when daughter cells physically split apart from a parental cell. During meiosis, there are two cell division steps that together produce the four daughter cells.

After the completion of binary fission or cell reproduction involving mitosis, each daughter cell has the same amount of DNA (**Z**) as what the parental cell had before it replicated its DNA. These two types of cell reproduction produced two daughter cells that have the same number of chromosomes as the parental cell. After meiotic cell reproduction the four daughter cells have half the number of chromosomes that the parental cell originally had. This is the haploid amount of DNA, often symbolized as **N**. Meiosis is used by diploid organisms to produce haploid gametes. In a diploid organism such as the human organism, most cells of the body have the diploid amount of DNA, **2N**. Using this notation for counting chromosomes we say that human somatic cells have 46 chromosomes (2N = 46) while human sperm and eggs have 23 chromosomes (N = 23). Humans have 23 distinct types of chromosomes, the 22 autosomes and the special category of sex chromosomes. There are two distinct sex chromosomes, the X chromosome and the Y chromosome. A diploid human cell has 23 chromosomes from

that person's father and 23 from the mother. That is, your body has two copies of human chromosome number 2, one from each of your parents.

7. Chromosomes

Immediately after DNA replication a human cell will have 46 "double chromosomes". In each double chromosome there are two copies of that chromosome's DNA molecule. During mitosis the double chromosomes are split to produce 92 "single chromosomes", half of which go into each daughter cell. During meiosis, there are two chromosome separation steps which assure that each of the four daughter cells gets one copy of each of the 23 types of chromosome.

In Section 5 of this course you will cover these topics:

- Alterations In Gastrointestinal Function
- Alterations In Genitourinary Function
- Alterations In Endocrine And Metabolic Function
- Alterations In Neurologic Function
- Alterations In Cognition And Mental Health
- Alterations In Musculoskeletal Function
- Alterations In Skin Integrity

Topic : Alterations In Gastrointestinal Function

Topic Objective:

At the end of the topic student will be able to understand:

- Upper gastrointestinal tract
- Lower gastrointestinal tract
- Accessory organs
- Embryology

Definition/Overview:

The digestive tract (also known as the alimentary canal) is the system of organs within multicellular animals that takes in food, digests it to extract energy and nutrients, and expels the remaining waste. The major functions of the GI tract are ingestion, digestion, absorption, and defecation. The GI tract differs substantially from animal to animal. Some animals have multi-chambered stomachs, while some animals' stomachs contain a single chamber. In a normal human adult male, the GI tract is approximately 6.5 meters (20 feet) long and consists of the upper and lower GI tracts. The tract may also be divided into foregut, midgut, and hindgut, reflecting the embryological origin of each segment of the tract

Key Points:

1. Upper gastrointestinal tract

The upper GI tract consists of the mouth, pharynx, esophagus, and stomach.

- The mouth contains the buccal mucosa, which contains the openings of the salivary glands; the tongue; and the teeth.
- Behind the mouth lies the pharynx, which leads to a hollow muscular tube, the esophagus.
- Peristalsis takes place, which is the contraction of muscles to propel the food down the esophagus which extends through the chest and pierces the diaphragm to reach the stomach..

2. Lower gastrointestinal tract

The lower GI tract comprises the intestines and anus.

- Bowel or intestine
- Small intestine, which has three parts:
- Duodenum
- Jejunum
- Ileum
- Large intestine, which has three parts:
- Cecum (the vermiform appendix is attached to the cecum).
- Colon (ascending colon, transverse colon, descending colon and sigmoid flexure)
- Rectum

- Anus

3. Accessory organs

Accessory organs to the alimentary canal include the liver, gallbladder, and pancreas. The liver secretes bile into the small intestine via the biliary system, employing the gallbladder as a reservoir. Apart from storing and concentrating bile, the gallbladder has no other specific function. The pancreas secretes an isosmotic fluid containing bicarbonate and several enzymes, including trypsin, chymotrypsin, lipase, and pancreatic amylase, as well as nucleolytic enzymes (deoxyribonuclease and ribonuclease), into the small intestine. Both of these secretory organs aid in digestion.

4. Embryology

The gut is an endoderm-derived structure. At approximately the 16th day of human development, the embryo begins to fold ventrally (with the embryo's ventral surface becoming concave) in two directions: the sides of the embryo fold in on each other and the head and tail fold towards one another. The result is that a piece of the yolk sac, an endoderm-lined structure in contact with the ventral aspect of the embryo, begins to be pinched off to become the primitive gut. The yolk sac remains connected to the gut tube via the vitelline duct. Usually this structure regresses during development; in cases where it does not, it is known as Meckel's diverticulum.

During fetal life, the primitive gut can be divided into three segments: foregut, midgut, and hindgut. Although these terms are often used in reference to segments of the primitive gut, they are nevertheless used regularly to describe components of the definitive gut as well. Each segment of the primitive gut gives rise to specific gut and gut-related structures in the adult. Components derived from the gut proper, including the stomach and colon, develop as swellings or dilatations of the primitive gut. In contrast, gut-related derivativesthat is, those structures that derive from the primitive gut but are not part of the gut properin general develop as outpouchings of the primitive gut. The blood vessels supplying these structures remain constant throughout development.[2

Topic : Alterations In Genitourinary Function

Topic Objective:

At the end of the topic student will be able to understand:

- Urogenital System
- Development

Definition/Overview:

In anatomy, the genitourinary system or urogenital system is the organ system of the reproductive organs and the urinary system. These are grouped together because of their proximity to each other, their common embryological origin and the use of common pathways, like the male urethra.

Key Points:

1. Development

The urinary and reproductive organs are developed from the intermediate mesoderm. The permanent organs of the adult are preceded by a set of structures which are purely embryonic, and which with the exception of the ducts disappear almost entirely before the end of fetal life. These embryonic structures are on either side; the pronephros, the mesonephros and the metanephros of the kidney, and the Wolffian and Mllerian ducts of the sex organ. The pronephros disappears very early; the structural elements of the mesonephros mostly degenerate, but the gonad is developed in their place, with which the Wolffian duct remains as the duct in males, and the Mllerian as that of the female. Some of the tubules of the mesonephros form part of the permanent kidney.

2. Urogenital System

Urogenital system stands for urinary plus genital systems. They are interrelated because the male genital ducts arise from the mesonephric kidney and ducts and the exit of both kinds of ducts occurs at the UG-sinus. The kidneys and ducts arise from the intermediate mesoderm. The nephrotome is separated into three areas which give rise to different structures: anterior part giving rise to the pronephric regions which in mammals are very

minimal, but which give rise to the pronephric duct. It is induced by the mesenchyme of the nephrotome to form branches as it grows back along the rest of the mesenchyme of the nephrotome and these branches induce the mesonephric kidney nephrons, forming a separate organ. This functions in fetal pigs because they have very non-intimate placentas so the fetal pig makes its own urinary products to concentrate and store in the allantois. When the pronephric duct reaches the cloaca, it opens up in the UG sinus region. The pronephric kidney deteriorates rapidly early and the duct becomes the mesonephric duct as the induced mesonephric nephron tubules fuse with it. Look at 10-20 mm pig cross sections, see the diagrams which follow, and label the numbered structures of UG system and skeleton. You will also be able to see the mesonephros organ in the littlest whole pigs which you make a sagital section of and dissect. The metanephric kidney will be induced as a separate organ which will become the adult kidney by the ureteric buds which grow out of the base of the mesonephric duct in response to the metanephric mesenchyme induction at the posterior end of the nephrotome. Nephrons will develop at the cortex of the metanephros and will fuse with collecting ducts induced as branches from the ureteric bud at the pelvis of the kidney. The branching and formations of neprhons may result from NGF stimulus on receptors of kidney cells. Look at the metanephros and mesonephros in 10-20 mm pigs and their sections, look for gonads in all the little pigs.

The ureter will move from opening into the UG sinus to opening into the base of the allantois which becomes the bladder. That allows the mesonephric duct to open esparately into the UG sinus for males where sprem will not be forced into the bladder, but will go directly to the urethra.

The UG system is also related to the gut because the allantois base has grown out from the hindgut. The prostate and bulbourethral glands will develop at the juncture by outgrowth of branches from the endodermally lined urethra into the splanchnic mesoderm, to secrete lubricating seminal fluids and to close off the urethra from the bladder during erection. Find where the hindgut and UG ducts come together and where the allantois is given off. The base of the allantois will become the bladder.

The testes will descend from their position in the dorsal body wall into the scrotum via a shortening of the gubernaculum and descend through the inguinal canal.

In the male, the same duct (the urethra will release urinary and genital products. The old mesonephric duct becomes the Wolffian duct or vas deferens and where the connection is made to the old kidney nephrons, it becomes elongated and coiled to become the epididymus. The converted mesonephric tubules become the vasa efferentia connecting the testis seminiferous tubules and epididymus. Male sex hormones are necessary as well as hormone receptors on the somatic cells to make the male structures (mesonephric ducts and tubules) remain. They die in female embryos. Male hormones in males also kill off the female reproductive ducts which developed earlier, even in males (Mullerian or oviducts.)

In the female: genital products (eggs and embryos) are delivered out through the oviducts, uterus, vagina whereas urinary products go out the urethra. There is a complex development of cloaca and then separation into two parts- hindgut and UG sinus, then urethra (the connection between the allantois and the UG sinus) and vagina form separately from an opening-up of the base of the UG sinus so that now both open independently to the outside. The oviduct bases fuse with the uterus and cervex and that fuses with the vagina which forms partly by an evagination from the UG sinus and has a dual endodermal and mesodermal origin.

The external genitalia are in an indifferent stage at first with genital tubercle and UG sinus; then if there is no male hormone the default condition is the female pattern of development.The cloacal folds around the cloaca help separate it into anus and UG sinus with the genital tubercle at the front of it. The urethral folds separate the UG sinus into vagina and urethra behind the clittoris which develops from the tubercle. In the male, the urethral folds extend along the entire length of the growing penis and fuse along it, carrying the opening of the urethra to the tip of the penis. The UG folds also fuse, and instead of forming labia as in the female, they form scrotal sacs which close over the rest of the UG sinus opening

Topic : Alterations In Endocrine And Metabolic Function

Topic Objective:

At the end of the topic student will be able to understand:

- Metabolism
- Amino acids and proteins
- Lipids
- Carbohydrates
- Nucleotides
- Coenzymes
- Minerals and cofactors

Definition/Overview:

Metabolism is the set of chemical reactions that occur in living organisms in order to maintain life. These processes allow organisms to grow and reproduce, maintain their structures, and respond to their environments. Metabolism is usually divided into two categories. Catabolism breaks down organic matter, for example to harvest energy in cellular respiration. Anabolism, on the other hand, uses energy to construct components of cells such as proteins and nucleic acids.

Key Points:

1. Metabolism

The chemical reactions of metabolism are organized into metabolic pathways, in which one chemical is transformed into another by a sequence of enzymes. Enzymes are crucial to metabolism because they allow organisms to drive desirable but thermodynamically unfavorable reactions by coupling them to favorable ones, and because they act as catalysts to allow these reactions to proceed quickly and efficiently. Enzymes also allow the regulation of metabolic pathways in response to changes in the cell's environment or signals from other cells. The metabolism of an organism determines which substances it will find nutritious and which it will find poisonous. For example, some prokaryotes use

hydrogen sulfide as a nutrient, yet this gas is poisonous to animals. The speed of metabolism, the metabolic rate, also influences how much food an organism will require.

A striking feature of metabolism is the similarity of the basic metabolic pathways between even vastly different species. For example, the set of carboxylic acids that are best known as the intermediates in the citric acid cycle are present in all organisms, being found in species as diverse as the unicellular bacteria Escherichia coli and huge multicellular organisms like elephants. These striking similarities in metabolism are most likely the result of the high efficiency of these pathways, and of their early appearance in evolutionary history.

2. Amino acids and proteins

Proteins are made of amino acids arranged in a linear chain and joined together by peptide bonds. Many proteins are the enzymes that catalyze the chemical reactions in metabolism. Other proteins have structural or mechanical functions, such as the proteins that form the cytoskeleton, a system of scaffolding that maintains the cell shape. Proteins are also important in cell signaling, immune responses, cell adhesion, active transport across membranes and the cell cycle.

3. Lipids

Lipids are the most diverse group of biochemicals. Their main structural uses are as part of biological membranes such as the cell membrane, or as a source of energy. Lipids are usually defined as hydrophobic or amphipathic biological molecules that will dissolve in organic solvents such as benzene or chloroform. The fats are a large group of compounds that contain fatty acids and glycerol; a glycerol molecule attached to three fatty acid esters is a triacylglyceride. Several variations on this basic structure exist, including alternate backbones such as sphingosine in the sphingolipids, and hydrophilic groups such as phosphate in phospholipids. Steroids such as cholesterol are another major class of lipids that are made in cells.

4. Carbohydrates

Carbohydrates are straight-chain aldehydes or ketones with many hydroxyl groups that can exist as straight chains or rings. Carbohydrates are the most abundant biological

molecules, and fill numerous roles, such as the storage and transport of energy (starch, glycogen) and structural components (cellulose in plants, chitin in animals). The basic carbohydrate units are called monosaccharides and include galactose, fructose, and most importantly glucose. Monosaccharides can be linked together to form polysaccharides in almost limitless ways.

5. Nucleotides

The polymers DNA and RNA are long chains of nucleotides. These molecules are critical for the storage and use of genetic information, through the processes of transcription and protein biosynthesis. This information is protected by DNA repair mechanisms and propagated through DNA replication. A few viruses have an RNA genome, for example HIV, which uses reverse transcription to create a DNA template from its viral RNA genome. RNA in ribozymes such as spliceosomes and ribosomes is similar to enzymes as it can catalyze chemical reactions. Individual nucleosides are made by attaching a nucleobase to a ribose sugar. These bases are heterocyclic rings containing nitrogen, classified as purines or pyrimidines. Nucleotides also act as coenzymes in metabolic group transfer reactions.

6. Coenzymes

Structure of the coenzyme acetyl-CoA.The transferable acetyl group is bonded to the sulfur atom at the extreme left. Metabolism involves a vast array of chemical reactions, but most fall under a few basic types of reactions that involve the transfer of functional groups. This common chemistry allows cells to use a small set of metabolic intermediates to carry chemical groups between different reactions. These group-transfer intermediates are called coenzymes. Each class of group-transfer reaction is carried out by a particular coenzyme, which is the substrate for a set of enzymes that produce it, and a set of enzymes that consume it. These coenzymes are therefore continuously being made, consumed and then recycled.

One central coenzyme is adenosine triphosphate (ATP), the universal energy currency of cells. This nucleotide is used to transfer chemical energy between different chemical reactions. There is only a small amount of ATP in cells, but as it is continuously regenerated, the human body can use about its own weight in ATP per day. ATP acts as a

bridge between catabolism and anabolism, with catabolic reactions generating ATP and anabolic reactions consuming it. It also serves as a carrier of phosphate groups in phosphorylation reactions.

A vitamin is an organic compound needed in small quantities that cannot be made in the cells. In human nutrition, most vitamins function as coenzymes after modification; for example, all water-soluble vitamins are phosphorylated or are coupled to nucleotides when they are used in cells. Nicotinamide adenine dinucleotide (NADH), a derivative of vitamin B_3 (niacin), is an important coenzyme that acts as a hydrogen acceptor. Hundreds of separate types of dehydrogenases remove electrons from their substrates and reduce NAD^+into NADH. This reduced form of the coenzyme is then a substrate for any of the reductases in the cell that need to reduce their substrates. Nicotinamide adenine dinucleotide exists in two related forms in the cell, NADH and NADPH. The NAD^+/NADH form is more important in catabolic reactions, while $NADP^+$/NADPH is used in anabolic reactions.

7. Minerals and cofactors

Inorganic elements play critical roles in metabolism; some are abundant (e.g. sodium and potassium) while others function at minute concentrations. About 99% of mammals' mass are the elements carbon, nitrogen, calcium, sodium, chlorine, potassium, hydrogen, phosphorus, oxygen and sulfur. The organic compounds (proteins, lipids and carbohydrates) contain the majority of the carbon and nitrogen and most of the oxygen and hydrogen is present as water.

The abundant inorganic elements act as ionic electrolytes. The most important ions are sodium, potassium, calcium, magnesium, chloride, phosphate, and the organic ion bicarbonate. The maintenance of precise gradients across cell membranes maintains osmotic pressure and pH. Ions are also critical for nerves and muscles, as action potentials in these tissues are produced by the exchange of electrolytes between the extracellular fluid and the cytosol. Electrolytes enter and leave cells through proteins in the cell membrane called ion channels. For example, muscle contraction depends upon the movement of calcium, sodium and potassium through ion channels in the cell membrane and T-tubules. The transition metals are usually present as trace elements in organisms, with zinc and iron being most abundant. These metals are used in some proteins as

cofactors and are essential for the activity of enzymes such as catalase and oxygen-carrier proteins such as hemoglobin. These cofactors are bound tightly to a specific protein; although enzyme cofactors can be modified during catalysis, cofactors always return to their original state after catalysis has taken place. The metal micronutrients are taken up into organisms by specific transporters and bound to storage proteins such as ferritin or metallothionein when not being used.

Topic : Alterations In Neurologic Function

Topic Objective:

At the end of the topic student will be able to understand:

- Educational requirements
- Testing examinations
- Clinical tasks
- General caseload
- Overlapping areas
- Relationship to clinical neurophysiology
- Overlap with psychiatry

Definition/Overview:

Neurology is a medical specialty dealing with disorders of the nervous system. Specifically, it deals with the diagnosis and treatment of all categories of disease involving the central, peripheral, and autonomic nervous systems, including their coverings, blood vessels, and all effector tissue, such as muscle. Physicians who specialize in neurology are called neurologists, and are trained to investigate, or diagnose and treat, neurological disorders. Pediatric neurologists treat neurological disease in children. Neurologists may also be involved in clinical research, clinical trials, as well as basic research and translational research. In the United Kingdom, contributions to the field of neurology stem from various professions; saliently, several biomedical research scientists are choosing to specialize in the technical/laboratory aspects of one of neurology's subdisciplines.

Key Points:

1. Educational requirements

A neurologist's educational background and medical training varies with the country of training. In the United States and Canada, neurologists are physicians who have completed postgraduate training in neurology after graduation from medical school.

Neurologists complete, on average, at least 12 years of college education and clinical training. This training includes obtaining a four-year undergraduate degree, a medical degree, which is an additional four years, and then completing a four-year residency in neurology. The four-year residency consists of one year of internal medicine training followed by three years of training in neurology. One and two year fellowships are available following completion of the neurology residency if desired.

Many neurologists also have additional subspecialty training (fellowships) after completing their residency in one area of neurology such as stroke or vascular neurology, interventional neurology, epilepsy, neuromuscular, neurorehabilitation, behavioral neurology, sleep medicine, pain management, neuroimmunology, clinical neurophysiology, or movement disorders. In the United Kingdom and Ireland, neurology is a subspecialty of general (internal) medicine. After five to nine years of medical school and a year as a pre-registration house officer (or two years on the Foundation Programme) a neurologist must pass the examination for Membership of the Royal College of Physicians (or the Irish equivalent) before entering specialist training in neurology. A generation ago some neurologists would also spend a couple of years working in psychiatric units and obtain a Diploma in Psychological Medicine, but that became uncommon and now that a basic psychiatric qualification takes three years to obtain it is no longer practical. A period of research is essential, and obtaining a higher degree aids career progression: many found it was eased after an attachment to the Institute of Neurology at Queen Square in London. Some neurologists enter the field of rehabilitation medicine (known as physiatry in the US) to specialise in neurological rehabilitation, which may include stroke medicine as well as brain injuries.

2. Testing examinations

During a neurological examination, the neurologist reviews the patient's health history with special attention to the current condition. The patient then takes a neurological exam. Typically, the exam tests mental status, function of the cranial nerves (including vision), strength, coordination, reflexes and sensation. This information helps the neurologist determine if the problem exists in the nervous system and the clinical localization. Localization of the pathology is the key process by which neurologists develop their differential diagnosis. Further tests may be needed to confirm a diagnosis and ultimately guide therapy and appropriate management.

3. Clinical tasks

4. General caseload

Neurologists are responsible for the diagnosis, treatment, and management of all the above conditions. When surgical intervention is required, the neurologist may refer the patient to a neurosurgeon. In some countries, additional legal responsibilities of a neurologist may include making a finding of brain death when it is suspected that a patient is deceased. Neurologists frequently care for people with hereditary (genetic) diseases when the major manifestations are neurological, as is frequently the case. Lumbar punctures are frequently performed by neurologists. Some neurologists may develop an interest in particular subfields, such as dementia, movement disorders, headaches, epilepsy, sleep disorders, chronic pain management, multiple sclerosis or neuromuscular diseases.

5. Overlapping areas

There is some overlap with other specialties, varying from country to country and even within a local geographic area. Acute head trauma is most often treated by neurosurgeons, whereas sequelae of head trauma may be treated by neurologists or specialists in rehabilitation medicine. Although stroke cases have been traditionally managed by internal medicine or hospitalists, the emergence of vascular neurology and interventional neurologists has created a demand for stroke specialists. The establishment of JCAHO certified stroke centers has increased the role of neurologists in stroke care in many

primary as well as tertiary hospitals. Some cases of nervous system infectious diseases are treated by infectious disease specialists. Most cases of headache are diagnosed and treated primarily by general practitioners, at least the less severe cases. Similarly, most cases of sciatica and other mechanical radiculopathies are treated by general practitioners, though they may be referred to neurologists or a surgeon (neurosurgeons or orthopedic surgeons). Sleep disorders are also treated by pulmonologists. Cerebral palsy is initially treated by pediatricians, but care may be transferred to an adult neurologist after the patient reaches a certain age. In the United Kingdom and other countries, many of the conditions encountered by older patients such as movement disorders including Parkinson's Disease, stroke, dementia or gait disorders are managed predominantly by specialists in geriatric medicine.

Clinical neuropsychologists are often called upon to evaluate brain-behavior relationships for the purpose of assisting with differential diagnosis, planning rehabilitation strategies, documenting cognitive strengths and weaknesses, and measuring change over time (e.g., for identifying abnormal aging or tracking the progression of a dementia).

6. Relationship to clinical neurophysiology

In some countries, e.g. USA and Germany, neurologists may specialize in clinical neurophysiology, the field responsible for EEG, nerve conduction studies, EMG and evoked potentials. In other countries, this is an autonomous specialty (e.g. United Kingdom, Sweden).

7. Overlap with psychiatry

There are strong indications that neurochemical mechanisms play an important role in the development of, for instance, bipolar disorder and schizophrenia. Also, "neurological" diseases often have "psychiatric" manifestations, such as post-stroke depression, depression and dementia associated with Parkinson's disease, mood and cognitive dysfunctions in Alzheimer's disease, to name a few. Hence, there is no sharp distinction between neurology and psychiatry on a biological basis this distinction has mainly practical reasoning and strong historical roots (such as the dominance of Freud's psychoanalytic theory in the first three quarters of the 20th century which has since then

been largely replaced by the focus on neurosciences aided by the tremendous advances in genetics and neuroimaging.)

In Germany, a compulsory year of psychiatry must be done to complete a residency of neurology.

Topic : Alterations In Cognition And Mental Health

Topic Objective:

At the end of the topic student will be able to understand:

- History
- Mental wellbeing
- Lack of a mental disorder
- Cultural and religious considerations
- Mental health profession

Definition/Overview:

Mental health is a term used to describe either a level of cognitive or emotional well-being or an absence of a mental disorder. From perspectives of the discipline of positive psychology or holism mental health may include an individual's ability to enjoy life and procure a balance between life activities and efforts to achieve psychological resilience.

Key Points:

1. History

The treatment of mental disorders dates back to ancient civilisations, including Ancient Egypt, India, Greece and Rome. Medieval physicians in the Muslim world from the 8th to 15th centuries were concerned with mental health.

In the mid-19th century, William Sweetzer was the first to clearly define the term "mental hygiene". Isaac Ray, one of thirteen founders of the American Psychiatric Association, further defined mental hygiene as an art to preserve the mind against incidents and influences which would inhibit or destroy its energy, quality or development.

At the beginning of the 20th century, Clifford Whittingham Beers founded the National Committee for Mental Hygiene and opened the first outpatient mental health clinic in the United States

2. Mental wellbeing

Mental health can be seen as a continuum, where an individual's mental health may have many different possible values. Mental wellness is generally viewed as a positive attribute, such that a person can reach enhanced levels of mental health, even if they do not have any diagnosable mental health condition. This definition of mental health highlights emotional well-being, the capacity to live a full and creative life, and the flexibility to deal with life's inevitable challenges. Many therapeutic systems and self-help books offer methods and philosophies espousing strategies and techniques vaunted as effective for further improving the mental wellness of otherwise healthy people. Positive psychology is increasingly prominent in mental health.

A holistic model of mental health generally includes concepts based upon anthropological, educational, psychological, religious and sociological perspectives, as well as theoretical perspectives from personality, social, clinical, health and developmental psychology. An example of a wellness model includes one developed by Myers, Sweeny and Witmer. It includes five life tasks essence or spirituality, work and leisure, friendship, love and self-directionand twelve sub taskssense of worth, sense of control, realistic beliefs, emotional awareness and coping, problem solving and creativity, sense of humor, nutrition, exercise, self care, stress management, gender identity, and cultural identityare identified as characteristics of healthy functioning and a major component of wellness. The components provide a means of responding to the circumstances of life in a manner that promotes healthy functioning. Most of the US Population is not educated on Mental Health.

3. Lack of a mental disorder

Mental health can also be defined as an absence of a major mental health condition though recent evidence stemming from positive psychology (see above) suggests mental health is more than the mere absence of a mental disorder or illness. Therefore the impact of social, cultural, physical and education can all affect someone's mental health.

4. Cultural and religious considerations

Mental health can be socially constructed and socially defined; that is, different professions, communities, societies and cultures have very different ways of conceptualizing its nature and causes, determining what is mentally healthy, and deciding what interventions are appropriate. Thus, different professionals will have different cultural and religious backgrounds and experiences, which may impact the methodology applied during treatment.

Many mental health professionals are beginning to, or already understand, the importance of competency in religious diversity and spirituality. The American Psychological Association explicitly states that religion must be respected. Education in spiritual and religious matters is also required by the American Psychiatric Association.

5. Mental health profession

A number of professions have developed specializing in mental disorders, including the medical speciality of psychiatry, divisions of psychology known as clinical psychology, abnormal psychology, positive psychology, applied behavior analysis, behavior therapy, clinical or mental health social work, mental health counselors, marriage and family therapists, psychotherapists, counselors and public Health professionals. Different clinical and academic professions tend to favor differing models, explanations and goals.

Topic : Alterations In Musculoskeletal Function

Topic Objective:

At the end of the topic student will be able to understand:

- Musculoskeletal Function
- Skeletal
- Function
- Muscular
- Contraction initiation
- Joints
- Tendons

- Bursa
- Nervous

Definition/Overview:

The musculoskeletal system (also known as the locomotor system) is an organ system that gives animals the ability to move using the muscular and skeletal systems. The musculoskeletal system provides form, stability, and movement to the human body.

Key Points:

1. Musculoskeletal Function

It is made up of the body's bones (the skeleton), muscles, cartilage, tendons, ligaments, joints, and other connective tissue (the tissue that supports and binds tissues and organs together). The musculoskeletal system's primary functions include supporting the body, allowing motion, and protecting vital organs. The skeletal portion of the system serves as the main storage system for calcium and phosphorus and contains critical components of the hematopoietic system.

There are, however, diseases and disorders that may render the function and overall effectiveness of the system. These diseases can be difficult to diagnose due to the close relation of the musculoskeletal system to other internal systems. The musculoskeletal system refers to the system having its muscles attached to an internal skeletal system and is necessary for humans to move to a more favorable position.

2. Skeletal

The Skeletal System serves many important functions; it provides the shape and form for our bodies in addition to supporting, protecting, allowing bodily movement, producing blood for the body, and storing minerals. The number of bones in the human skeletal system is a controversial topic. Humans are born with about 300 to 350 bones, however, many bones fuse together between birth and maturity. As a result an average adult skeleton consists of 208 bones. The number of bones varies according to the method used to derive the count. While some consider certain structures to be a single bone with multiple parts, others may see it as a single part with multiple bones. There are five

general classifications of bones. These are Long bones, Short bones, Flat bones, Irregular bones, and Sesamoid bones. The human skeleton is composed of both fused and individual bones supported by ligaments, tendons, muscles and cartilage. It is a complex structure with two distinct divisions. These are the axial skeleton and the appendicular skeleton.

3. Function

The Skeletal System serves as a framework for tissues and organs to attach themselves to. This system acts as a protective structure for vital organs. Major examples of this are the brain being protected by the skull and the lungs being protected by the rib cage.

Located in long bones are two distinctions of bone marrow (yellow and red). The yellow marrow has fatty connective tissue and is found in the marrow cavity. During starvation, the body uses the fat in yellow marrow for energy. The red marrow of some bones is an important site for blood cell production, approximately 2.6 million red blood cells per second in order to replace existing cells that have been destroyed by the liver. Here all erythrocytes, platelets, and most leukocytes form in adults. From the red marrow, erythrocytes, platelets, and leukocytes migrate to the blood to do their special tasks.

Another function of bones is the storage of certain minerals. Calcium and phosphorus are among the main minerals being stored. The importance of this storage "device" helps to regulate mineral balance in the bloodstream. When the fluctuation of minerals is high, these minerals are stored in bone; when it is low it will be withdrawn from the bone.

4. Muscular

There are three types of muscles - cardiac, skeletal, and smooth. Smooth muscles are used to control the flow of substances within the lumens of hollow organs, and are not consciously controlled. Skeletal and cardiac muscles have striations that are visible under a microscope due to the components within their cells. Only skeletal and smooth muscles are part of the musculoskeletal system and only the skeletal muscles can move the body. Cardiac muscles are found in the heart and are used only to circulate blood; like the smooth muscles, these muscles are not under conscious control. Skeletal muscles are attached to bones and arranged in opposing groups around joints. Muscles are innervated,

to communicate nervous energy to, by nerves, which conduct electrical currents from the central nervous system and cause the muscles to contract.

5. Contraction initiation

In mammals, when a muscle contracts, a series of reactions occur. Muscle contraction is stimulated by the motor neuron sending a message to the muscles from the somatic nervous system. Depolarization of the motor neuron results in neurotransmitters being released from the nerve terminal. The space between the nerve terminal and the muscle cell is called the neuromuscular junction. These neurotransmitters diffuse across the synapse and bind to specific receptor sites on the cell membrane of the muscle fiber. When enough receptors are stimulated, an action potential is generated and the permeability of the sarcolemma is altered. This process is known as initiation.

6. Nervous

Nervous tissue is made of two general cell types. Neurons, the conducting cell type, transmit nerve messages and Glial cells, the non-conducting cell type, serve as support cells and help to protect the neurons. The neuron is the cell that receives and sends the messages received from chemical reactions. Humans have approximately 100 billion neurons in their brain alone. All neurons have three parts. Dendrites receive information from another cell and trasnport the message to the cell body. The cell body, or soma contains the organelles typical of eukaryotic cells and the axon conducts messages away from the cell body, acting as a transport for the message.

7. Joints

Joints are structures that connect individual bones and may allow bones to move against each other to cause movement. There are two divisions of joints, diarthroses which allow extensive mobility between two or more articular heads, and false joints or synarthroses, joints that are immovable, that allow little or no movement and are predominantly fibrous. Synovial joints, joints that are not directly joined, are lubricated by a solution called synovia that is produced by the synovial membranes. This fluid lowers the friction between the articular surfaces and is kept within an articular capsule, binding the joint with its taut tissue.

8. Tendons

A tendon is a tough, flexible band of fibrous connective tissue that connects muscles to bones. Muscles gradually become tendon as the cells become closer to the origins and insertions on bones, eventually becoming solid bands of tendon that merge into the periosteum of individual bones. As muscles contract, tendons transmit the forces to the rigid bones, pulling on them and causing movement.

9. Ligaments

A ligament is a small band of dense, white, fibrous elastic tissue. Ligaments connect the ends of bones together in order to form a joint. Most ligaments limit dislocation, or prevent certain movements that may cause breaks. Since they are only elastic they increasingly lengthen when under pressure. When this occurs the ligament may be susceptible to break resulting in an unstable joint.

10. Bursa

A bursa is a small fluid-filled sac made of white fibrous tissue and lined with synovial membrane. Bursa may also be formed by a synovial membrane that extends outside of the join capsule. It provides a cushion between bones and tendons and/or muscles around a joint; bursa are filled with synovial fluid and are found around almost every major joint of the body.

Topic : Alterations In Skin Integrity

Topic Objective:

At the end of the topic student will be able to understand:

- Skin components
- Functions
- Hygiene and skin care

Definition/Overview:

The skin is the outer covering of the body, also known as the epidermis. It is the largest organ of the integumentary system made up of multiple layers of epithelial tissues, and guards the underlying muscles, bones, ligaments and internal organs. The adjective cutaneous literally means "of the skin" (from Latin cutis, skin).

Key Points:

1. Skin components

Skin has pigmentation, or melanin, provided by melanocytes, which absorb some of the potentially dangerous ultraviolet radiation (UV) in sunlight. It also contains DNA-repair enzymes that help reverse UV damage, and people who lack the genes for these enzymes suffer high rates of skin cancer. One form predominantly produced by UV light, malignant melanoma, is particularly invasive, causing it to spread quickly, and can often be deadly. Human skin pigmentation varies among populations in a striking manner. This has led to the classification of people(s) on the basis of skin color.

Mammalian skin often contains hairs, which in sufficient density is called fur. The hair mainly serves to augment the insulation the skin provides, but can also serve as a secondary sexual characteristic or as camouflage. On some animals, the skin is very hard and thick, and can be processed to create leather. Reptiles and fish have hard protective scales on their skin for protection, and birds have hard feathers, all made of tough β-keratins. Amphibian skin is not a strong barrier to passage of chemicals and is often subject to osmosis. A frog sitting in an anesthetic solution could quickly go to sleep.

The skin is often known as the largest organ of the human body. This applies to exterior surface, as it covers the body, appearing to have the largest surface area of all the organs. For the average adult human, the skin has a surface area of between 1.5-2.0 square meters (16.1-21.5 sq ft.), most of it is between 2-3 mm (0.10 inch) thick. The average square inch (6.5 cm) of skin holds 650 sweat glands, 20 blood vessels, 60,000 melanocytes, and more than a thousand nerve endings.

2. Functions

Skin performs the following functions:

- Protection: an anatomical barrier from pathogens and damage between the internal and external environment in bodily defense; Langerhans cells in the skin are part of the adaptive immune system.
- Sensation: contains a variety of nerve endings that react to heat and cold, touch, pressure, vibration, and tissue injury; see somatosensory system and haptics.
- Heat regulation: the skin contains a blood supply far greater than its requirements which allows precise control of energy loss by radiation, convection and conduction. Dilated blood vessels increase perfusion and heat loss while constricted vessels greatly reduce cutaneous blood flow and conserve heat. Erector pili muscles are significant in animals.
- Control of evaporation: the skin provides a relatively dry and impermeable barrier to fluid loss. Loss of this function contributes to the massive fluid loss in burns.
- Aesthetics and communication: others see our skin and can assess our mood, physical state and attractiveness.
- Storage and synthesis: acts as a storage center for lipids and water, as well as a means of synthesis of vitamin D by action of UV on certain parts of the skin.
- Excretion: sweat contains urea, however its concentration is 1/130th that of urine, hence excretion by sweating is at most a secondary function to temperature regulation.
- Absorption: Oxygen, nitrogen and carbon dioxide can diffuse into the epidermis in small amounts, some animals using their skin for their sole respiration organ. In addition, medicine can be administered through the skin, by ointments or by means of adhesive patch, such as the nicotine patch or iontophoresis. The skin is an important site of transport in many other organisms.
- Water resistance: The skin acts as a water resistant barrier so essential nutrients aren't washed out of the body.

3. Hygiene and skin care

The skin supports its own ecosystems of microorganisms, including yeasts and bacteria, which cannot be removed by any amount of cleaning. Estimates place the number of individual bacteria on the surface of one square inch (6.5 square cm) of human skin at 50 million though this figure varies greatly over the average 20 square feet (1.9 m^2) of

human skin. Oily surfaces, such as the face, may contain over 500 million bacteria per square inch (6.5 cm). Despite these vast quantities, all of the bacteria found on the skin's surface would fit into a volume the size of a pea. In general, the microorganisms keep one another in check and are part of a healthy skin. When the balance is disturbed, there may be an overgrowth and infection, such as when antibiotics kill microbes, resulting in an overgrowth of yeast. The skin is continuous with the inner epithelial lining of the body at the orifices, each of which supports its own complement of microbes.

Proper skin hygiene is important because unclean skin favors the development of pathogenic organisms. The dead cells that continually slough off the epidermis mix with the secretions of the sweat and sebaceous glands and the dust found on the skin form a filthy layer on its surface. If not washed away, the slurry of sweat and sebaceous secretions mixed with dirt and dead skin is decomposed by bacterial flora, producing a foul smell. Functions of the skin are disturbed when it is excessively dirty; it becomes more easily damaged, the release of antibacterial compounds decreases, and dirty skin is more prone to develop infections.

Cosmetics should be used carefully on the skin because these may cause allergic reactions. Each season requires suitable clothing in order to facilitate the evaporation of the sweat. Sunlight, water and air play an important role in keeping the skin healthy.

Oily skin is caused by over-active sebaceous glands, that produce a substance called sebum, a naturally healthy skin lubricant. When the skin produces excessive sebum, it becomes heavy and thick in texture. Oily skin is typified by shininess, blemishes and pimples. The oily-skin type is not necessarily bad, since such skin is less prone to wrinkling, or other signs of aging, because the oil helps to keep needed moisture locked into the epidermis (outermost layer of skin).

The negative aspect of the oily-skin type is that oily complexions are especially susceptible to clogged pores, blackheads, and buildup of dead skin cells on the surface of the skin. Oily skin can be sallow and rough in texture and tends to have large, clearly visible pores everywhere, except around the eyes and neck.

The goal of treating oily skin is to remove excess surface sebum without complete removal of skin lipids. Severe degreasing treatment can foster an actual worsening of

sebum secretion, which defeats the aim of the cleansing. A method of cleansing oily skin is to cleanse with a natural face cleanser formulated especially for oily skin. The cleansers pH should be 4.5 - 5.5. Gel cleansers work best on oily skin. (see: surfactant) Oily skin products should contain very little natural oils. They should not contain waxes or other synthetic lipid agents that could aggravate the oily condition of the skin. A toning lotion should also be natural and have a pH of 4.5-5.5 and formulated especially to help balance and hydrate oily skin. Some cleansing products have lower concentrations of hydroxy acids, which remove dead cells from the upper levels of the stratum corneum. Those products should be used on a regular basis to work adequately. A light moisturizer may be included in a hydoxy acid product to counteract any drying effects of the cleanser. People with oily skin should use a moisturizer with humectants and a clay masques containing bentonite clay twice a week.