

**BHARTIYA SKILL DEVELOPMENT UNIVERSITY**

School of Health Care and Paramedics Skills

Session: 2019-20 Summer

B. Voc. Program, 2nd Semester2nd In-Sem. Examination

Course Code: SHP1304

Time: 1 Hour

Course Name: Nutrition & Elimination II

Max. Marks: 20

Instructions:

1. **SECTION-A:** 05 objective type questions, each question carries 01 mark
2. **SECTION-B:** 03 short answer type questions, each question carries 02 marks
3. **SECTION-C:** 03 essay type questions, each question carries 03 marks.

SECTION-A**[5x1=Marks]**

1. One gram of fat how much calories provides?
 - a. Four calories
 - b. Six calories
 - c. Eight calories
 - d. Nine calories
2. Carbohydrate is stored in the body as...
 - a. Glucose
 - b. Amino acids
 - c. Fatty acid
 - d. Glycogen
3. When cleaning the skin around the stoma you should use what kind of soap?
 - a. Dove
 - b. Ivory
 - c. Baby wash
 - d. Antibacterial
4. Ascorbic acid is a...
 - a. Protein
 - b. Vitamin
 - c. Enzyme
 - d. Lipid
5. Vitamin B₃ is called as...
 - a. Riboflavin
 - b. Pantothenic acid
 - c. Niacin
 - d. Pyridoxine

SECTION-B**[3x2=6 Marks]**

- 1) Define nutrition. Write down the nutrition for pre-school child.

Nutrition is a vital component to overall wellness & health. Diet affects energy well being & may disease states. There is a connection between lifetime nutritional habits and the risks of many chronic diseases such as cardio vascular diseases, diabetes, cancer. A well balanced diet can prevent such conditions and improve energy level and over all health & wellness. The basis of nutrition is food. "Nutrition is the intake of food, considered in relation to the body's dietary needs." WHO further describes this relationship as "Good nutrition – an adequate, well balanced diet combined with regular physical activity – is the cornerstone of good health. Poor nutrition can lead to reduced immunity, increased

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susceptibility to disease, impaired physical and mental development and reduced productivity." Good nutrition promotes good health and counteracts certain disease such as diabetes, heart conditions, high blood pressure, osteoporosis, strokes, cancer, abnormal childhood growth, obesity, and malnutrition diseases.

Nutrition for pre-school child

During the preschool years, your child should be eating the same foods as the rest of the family, with an emphasis on those with nutritional value. This includes fresh vegetables and fruits, non-fat or low-fat dairy products (milk, yogurt, cheeses), lean meats (chicken, turkey, fish, lean hamburger), and whole grain cereals and bread. At the same time, limit or eliminate the junk food in your child's diet, and get rid of sugared beverages as well. Energy requirements for pre-school children increase as the child grows older:

- A one-year-old girl requires 1,165 kcal/day
- A one-year boy needs 1,230 kcal/day
- A four-year-old girl requires 1,545 kcal/day
- A four year a boy needs 1,715 kcal/day

2) Define parenteral nutrition. Write down the four side effect of parenteral nutrition.

Parenteral nutrition (PN) is intravenous administration of nutrition, which may include protein, carbohydrate, fat, minerals and electrolytes, vitamins and other trace elements for patients who cannot eat or absorb enough food through tube feeding formula or by mouth to maintain good nutrition status. Achieving the right nutritional intake in a timely manner can help combat complications and be an important part of a patient's recovery. Parenteral nutrition is sometimes called Total Parenteral Nutrition (TPN).

Side effect and Risks of Parenteral Nutrition include

- infection
- hypoglycaemia (low blood sugar)
- hyperglycaemia (high blood sugar)
- fluid overload
- blood clotting
- air embolism
- inflammation of the gallbladder (cholecystitis)
- collapsed lung (parenteral nutrition pneumothorax)
- bone disease (osteoporosis)
- parenteral nutrition-induced liver disease or liver failure

weakening of gastrointestinal cells (gastrointestinal atrophy)

3) What do you mean food poisoning? Write down the four prevention of food poisoning.

Food poisoning, also called foodborne illness, is illness caused by eating contaminated food. Infectious organisms — including bacteria, viruses and parasites — or their toxins are the most common causes of food poisoning. Infectious organisms or their toxins can contaminate food at any point of processing or production. Contamination can also occur at home if food is incorrectly handled or cooked.



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Prevention

To prevent food poisoning at home:

Wash your hands, utensils and food surfaces often

Wash your hands well with warm, soapy water before and after handling or preparing food. Use hot, soapy water to wash utensils, cutting boards and other surfaces you use.

Keep raw foods separate from ready-to-eat foods

When shopping, preparing food or storing food, keep raw meat, poultry, fish and shellfish away from other foods. This prevents cross-contamination.

Cook foods to a safe temperature

The best way to tell if foods are cooked to a safe temperature is to use a food thermometer. You can kill harmful organisms in most foods by cooking them to the right temperature. Cook ground beef to 160 F (71.1 C); steaks, roasts and chops, such as lamb, pork and veal, to at least 145 F (62.8 C). Cook chicken and turkey to 165 F (73.9 C). Make sure fish and shellfish are cooked thoroughly.

Refrigerate or freeze perishable foods promptly

Within two hours of purchasing or preparing them. If the room temperature is above 90 F (32.2 C), refrigerate perishable foods within one hour.

Defrost food safely

Don't thaw food at room temperature. The safest way to thaw food is to defrost it in the refrigerator. If you microwave frozen food using the "defrost" or "50 percent power" setting, be sure to cook it immediately.

Throw it out when in doubt

If you aren't sure if a food has been prepared, served or stored safely, discard it. Food left at room temperature too long may contain bacteria or toxins that can't be destroyed by cooking. Don't taste food that you're unsure about — just throw it out. Even if it looks and smells fine, it may not be safe to eat.

SECTION-C

[3x3= 9 Marks]

1) Define vitamin. Explain the fat soluble vitamin.

They help your body grow and work the way it should. There are 13 vitamins—vitamins A, C, D, E, K, and the B vitamins (thiamine, riboflavin, niacin, pantothenic acid, biotin, B6, B12, and folate). Vitamins have different jobs—helping you resist infections, keeping your nerves healthy, and helping your body get energy from food or your blood to clot properly.



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Fat-soluble vitamins are stored in the fatty tissues of the body and the liver. Vitamins A, D, E, and K are fat-soluble. These are easier to store than water-soluble vitamins, and they can stay in the body as reserves for days, and sometimes months. Fat-soluble vitamins are absorbed through the intestinal tract with the help of fats, or lipids.

Vitamin A	Chemical names: Retinol, retinal, and four carotenoids, including beta carotene. <ul style="list-style-type: none">• It is fat soluble.• Deficiency may cause night-blindness and keratomalacia, an eye disorder that results in a dry cornea.• Good sources include: Liver, cod liver oil, carrots, broccoli, sweet potato, butter, kale, spinach, pumpkin, collard greens, some cheeses, egg, apricot, cantaloupe melon, and milk.
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Vitamin D	Chemical names: Ergocalciferol, cholecalciferol. <ul style="list-style-type: none">• It is fat soluble.• Deficiency may cause rickets and osteomalacia, or softening of the bones.• Good sources: Exposure to ultraviolet B (UVB) through sunlight or other sources causes vitamin D to be produced in the skin. Also found in fatty fish, eggs, beef liver, and mushrooms.
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Vitamin E	Chemical names: Tocopherols, tocotrienols <ul style="list-style-type: none">• It is fat soluble.• Deficiency is uncommon, but it may cause hemolytic anemia in newborns. This is a condition where blood cells are destroyed and removed from the blood too early.• Good sources include: Kiwi fruit, almonds, avocado, eggs, milk, nuts, leafy green vegetables, unheated vegetable oils, wheat germ, and whole-grains.
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Vitamin K	Chemical names: Phylloquinone, menaquinones <ul style="list-style-type: none">• It is fat soluble.• Deficiency may cause bleeding diathesis, an unusual susceptibility to bleeding.
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2) What do you mean eating disorder? Describe the prevention of eating disorder.

health, your emotions and your ability to function in important areas of life. The most common eating disorders are anorexia nervosa, bulimia nervosa and binge-eating disorder. Most eating disorders involve focusing too much on your weight, body shape and food, leading to dangerous eating behaviors. These behaviors can significantly impact your body's ability to get appropriate nutrition. Eating disorders can harm the heart, digestive system, bones, and teeth and mouth, and lead to other diseases. Eating disorders often develop in the teen and young adult years, although



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they can develop at other ages. With treatment, you can return to healthier eating habits and sometimes reverse serious complications caused by the eating disorder.

Prevention

Although there's no sure way to prevent eating disorders, here are some strategies to help your child develop healthy-eating behaviors:

Avoid dieting around your child	Family dining habits may influence the relationships children develop with food. Eating meals together gives you an opportunity to teach your child about the pitfalls of dieting and encourages eating a balanced diet in reasonable portions.
Talk to your child	For example, there are numerous websites that promote dangerous ideas, such as viewing anorexia as a lifestyle choice rather than an eating disorder. It's crucial to correct any misperceptions like this and to talk to your child about the risks of unhealthy eating choices.
Cultivate and reinforce a healthy body image	in your child, whatever his or her shape or size. Talk to your child about selfimage and offer reassurance that body shapes can vary. Avoid criticizing your own body in front of your child. Messages of acceptance and respect can help build healthy self-esteem and resilience that will carry children through the rocky periods of the teen years.
Enlist the help of your child's doctor	At well-child visits, doctors may be able to identify early indicators of an eating disorder. They can ask children questions about their eating habits and satisfaction with their appearance during routine medical appointments, for instance. These visits should include checks of height and weight percentiles and body mass index, which can alert you and your child's doctor to any significant changes.

3) Define Colostomy. Describe the types of colostomy.

A colostomy is an opening (stoma) in the large intestine (colon), or the surgical procedure that creates one. The opening is formed by drawing the healthy end of the colon through an incision in the anterior abdominal wall and suturing it into place. This opening, often in conjunction with an attached stoma appliance, provides an alternative channel for Faeces to leave the body. Thus if the natural anus is not available for that job (for example, in cases where it has been removed in the fight against colorectal cancer or ulcerative colitis), an artificial anus takes over. It may be reversible or irreversible, depending on the circumstances.

Types of Colostomy

Each type is named for the section of the colon in which it is needed.

Sigmoid colostomy	This is the most common type. It is located in the bottom part of the large intestine. The sigmoid colon moves waste to the rectum. Sigmoid colostomies produce stool that is more solid and regular than other colostomies.
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Transverse colostomy	<p>The transverse colon crosses the top of the abdomen. Stool in this area is usually soft. This is because only a small portion of the colon has absorbed water from the indigestible material. This common type of colostomy has 3 versions:</p> <ul style="list-style-type: none">• A loop colostomy. This colostomy creates a stoma through which stool exits. In this type, the colon stays connected to the rectum. As a result, people will sometimes pass stool or gas through the rectum.• A single-barrel colostomy. This surgery removes the colon below the colostomy, including the rectum and anal opening. This type of colostomy is permanent.• A double-barrel colostomy. This divides the colon into 2 ends that form separate stomas. Stool exits from 1 of the stomas. Mucus made by the colon exits from the other. This type of transverse colostomy is the least common.
Descending colostomy	<p>The descending colon takes waste down the left side of the abdomen. The stool there is usually firm because it has moved through the working parts of the colon.</p>
Ascending colostomy	<p>The ascending colon runs from the beginning of the large intestine to the right side of the abdomen. In this procedure, only part of the colon still works. As a result, little water is absorbed from the waste. This means the stool is usually liquid. This type of colostomy is rare. An ileostomy is more appropriate for this portion of the colon.</p>

**BHARTIYA SKILL DEVELOPMENT UNIVERSITY****School of Health Care and Paramedics Skills****Session: 2019-20 Summer****B. Voc. Program, 2nd Semester****2nd In-Sem. Examination****Course Code: SHP1305****Time: 1 Hour****Course Name: Mobilization & Movement****Max. Marks: 20****Instructions:**

1. **SECTION-A:** 05 objective type questions, each question carries 01 mark
2. **SECTION-B:** 03 short answer type questions, each question carries 02 marks
3. **SECTION-C:** 03 essay type questions, each question carries 03 marks.

SECTION-A**[5x1=Marks]**

1. **Most common cause of contracture is...**
 - a. Burn
 - b. Cerebral palsy
 - c. Stroke
 - d. Muscular dystrophies
2. **A contracture is a deformity which prevents the movement of a joint through its normal range.**
 - a. True
 - b. False
3. **A contracture can be treated with the following**
 - a. Use active and passive movements
 - b. Apply skin or skeletal traction
 - c. Apply serial corrective casts
 - d. Release soft tissues surgically
4. **Which of the following is a risk factor for falls in the elderly?**
 - a. Visual impairment
 - b. Decrease bone mineral density
 - c. Poor dental care
 - d. Both a and b
5. **What are the most serious consequences of a fall?**
 - a. Hip fracture
 - b. Head injuries
 - c. Pressure sores
 - d. All of above

SECTION-B**[3x2=6 Marks]**

- 1) Write down the two difference between the incomplete and complete fracture.
- 2) Draw the chart of more fall scale.
- 3) Write down the four function of bone.

SECTION-C**[3x3= 9 Marks]**

- 1) Define contracture. How to avoided contractures.
- 2) Define fall. Describe the intrinsic factors of fall.
- 3) Define fracture. Write down the four causes, symptom and prevention of fracture.

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Time: 1 Hour

Course Name: Mobilization & Movement

Max. Marks: 20

Instructions:

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SECTION-B**[3x2=6 Marks]**

- 1) **Write down the two difference between the incomplete and complete fracture.**

Incomplete fracture – In an complete.your bone dosent break completely. In other words, it cracks without breaking all the way through.

Types- Hairline fracture

Greenstick fracture

Buckle or torus fracture

Complete fracture- In a complete fracture, your bone breaks completely.its snapped or crushed into two or more pieces.



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Types- Single fracture

- Comminuted fracture
- Compression fracture
- Non displaced fracture
- Displaced fracture
- Segmental fracture
- Incomplete fractures

2) Draw the chart of more fall scale.

Morse Fall Scale

The Morse Fall Scale (MFS) is a rapid and simple method of assessing a patient's likelihood of falling. A large majority of nurses (82.9%) rate the scale as "quick and easy to use," and 54% estimated that it took less than 3 minutes to rate a patient. It consists of six variables that are quick and easy to score, and it has been shown to have predictive validity and interrater reliability. The MFS is used widely in acute care settings, both in the hospital and long term care inpatient settings.

Item	Scale	Scoring
1. History of falling; immediate or within 3 months	No 0 Yes 25	
2. Secondary diagnosis	No 0 Yes 15	
3. Ambulatory aid <input type="checkbox"/> Bed rest/nurse assist Crutches/cane/walker Furniture	0 15 30	
4. IV/Heparin Lock	No 0 Yes 20	
5. Gait/Transferring Normal/bedrest/immobile Weak <input type="checkbox"/> Impaired	0 10 20	
6. Mental status <input type="checkbox"/> Oriented to own ability Forgets limitations	0 15	

3) Write down the four function of bone.

Functions of Bone

- **Support**—bones form the framework of the body and contribute to the shape, alignment, and positioning of the body parts
- **Protection**—bony "boxes" protect the delicate structures they enclose
- **Movement**—bones with their joints constitute levers that move as muscles contract
- **Mineral storage**—bones are the major reservoir for calcium, phosphorus, and other minerals
- **Hematopoiesis**—blood cell formation is carried out by myeloid tissue

SECTION-C

[3x3= 9 Marks]

1) **Define contracture. How to avoided contractures.**

Contracture (lat. Contrahere = contracting) becomes a persistent joint stiffness or one more or less strong marked loss of physiological mobility of a joint. It should not be confused with the term "contraction" (physiological contraction of a muscle).

Most contracture are the results of bed rest. The venecular says. Who rest, who rusts. All joint that are not regularly used will quickly become stiff.therefore, it is important that the patient stays at least once a day outside the bed.if possible, the patient should take a few steps on foot, such as using a walker.

2) **Define fall. Describe the intrinsic factors of fall.**

A fall is an event where the person inadvertently lands on the ground or at another lower level" (WHO, 2007).

Intrinsic factors (internal causes)

With the intrinsic factors a subdivision into unpredictable (no presence of risk factors) and expected (characteristics and diagnoses that can be measured) factors possible. Internal factors include illness or age-related changes and conditions that, either individually or in combination, contribute to a change in mobility (= disorder of the brain) and thus to a fall.



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Age-related changes

Age physiological deviations, such as changes in balance, vision, gait, musculoskeletal and cardiovascular systems as well as degenerative changes form a wide range of causes for falls. In children, it is not fully developed anatomical structures and physiological conditions that lead to falls. The younger the child, the greater the physiological restraints. A reduced performance, orientation, coordination and communication ability as well as reaction time, such as age, e.g. In children, can also be causes of falls.

Disease-related changes

In the case of stress, depression, anxiety or dementia and other changes in the psyche and the cognitive-affective area, there is a risk of being able to perceive the environment in a changed way or to be unable to assess risks. A worsened sensory perception (e.g. cataract) reduces z. For example, the visual perception. Arrhythmias or bronchial asthma compromise the cardiovascular-respiratory system: impaired performance may result in a fall. The same applies to multimorbidity, underweight, fever and a generally poor state of health. Causal connections are also associated with changes in the metabolism (e.g., hypoglycaemia) and the musculoskeletal system (eg, osteoarthritis, myopathies, contractures, or hallux valgus).

Neurological changes

Fall causes can also neurological changes such. As ischemic syncope, apoplexy, Parkinson's disease be because they are often associated with balance disorders or misinterpretation of environmental conditions.

3) Define fracture. Write down the four causes, symptom and prevention of fracture.

A fracture is a broken bone. It can range from a thin crack to a complete break.

Causes- Falls

Direct strikes to your body

Traumatic events, such as car accidents or gun shot wounds

Injuries from sports

Symptoms- Pain

Swelling

Bruising

Discolored skin around the affected area

The patient is unable to put weight on the injured area

The affected bone or joint may have a grating sensation

Prevention – A nutritious diet

Vitamin D and calcium rich diet

Shoes should not be slippery

Loose carpet or irregular floors should be repaired

Do not smoke

Avoid excess alcohol intake

Increase weight bearing exercise.

**BHARTIYA SKILL DEVELOPMENT UNIVERSITY****School of Health Care and Paramedics Skills****Session: 2019-20 Summer****B. Voc. Program, 2nd Semester****2nd In-Sem. Examination****Course Code: SHP1307****Time: 1 Hour****Course Name: Respiratory Care****Max. Marks: 20****Instructions:**

1. **SECTION-A:** 05 objective type questions, each question carries 01 mark
2. **SECTION-B:** 03 short answer type questions, each question carries 02 marks
3. **SECTION-C:** 03 essay type questions, each question carries 03 marks.

SECTION-A**[5x1=Marks]**

1. **COPD most common caused by...**
 - a. Smoking
 - b. Pollution
 - c. Dust
 - d. Exposure to asbestos
2. **What should the tracheostomy stoma site be cleaned with?**
 - a. Povidone iodine
 - b. Chlorhexidine gluconate
 - c. 0.9% sterile saline solution
 - d. Antimicrobial hand wash
3. **Larynx are located is...**
 - a. C₄-C₆ Cervical vertebra
 - b. C₇-C₈ Cervical vertebra
 - c. C₄-T₅ Cervical vertebra
 - d. C₁-C₃ Cervical vertebra
4. **Total lung capacity is...**
 - a. 4000 ml
 - b. 6000 ml
 - c. 6200 ml
 - d. 3300ml
5. **External respiration means...**
 - a. Air transport lungs to blood
 - b. Air transport blood to tissue
 - c. Air transport lungs to tissue
 - d. None of above

SECTION-B**[3x2=6 Marks]**

- 1) Define breathing. Write the name of lower respiratory system organ.
- 2) Define atelectasis. Write down the four symptom and prevention of atelectasis.
- 3) Explain the four risk factor of emphysema.

SECTION-C**[3x3= 9 Marks]**

- 1) What do you mean by tracheostomy? Write down the indication and types of tracheostomy.
- 2) Define pneumonia. Write down the four causes, symptom and prevention of pneumonia.
- 3) Describe the inhalation system.

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**BHARTIYA SKILL DEVELOPMENT UNIVERSITY****School of Health Care and Paramedics Skills****Session: 2019-20 Summer****B. Voc. Program, 2nd Semester****2nd In-Sem. Examination****Course Code: SHP1307****Time: 1 Hour****Course Name: Respiratory Care****Max. Marks: 20****Instructions:**

1. **SECTION-A:** 05 objective type questions, each question carries 01 mark
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SECTION-A**[5x1=Marks]**

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SECTION-B**[3x2=6 Marks]**

- 1) Define breathing. Write the name of lower respiratory system organ.

Breathing**Inspiration**

During inspiration, the dome-shaped muscle of the diaphragm flattens, and the inter-costal muscles pull the rib cage upwards and outwards. This increases the volume of the chest cavity and air is drawn into the lungs.



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- The patient is unable to independently maintain their airway, i.e. those with reduced consciousness levels may be unable to maintain a patent airway or protect from aspiration. □
- The patient's bronchial secretions cannot be cleared due to poor cough effort and the patient is therefore at risk of aspiration. □
- The patient is undergoing upper airway surgery. □

The patient has undergone a laryngectomy – the stoma will be □ permanent.

Types of Tracheostomy

A temporary tracheostomy usually refers to a stoma formed as an elective procedure at the time of major surgery (such as a total glossectomy), although percutaneous techniques, performed by the bedside in intensive care units, are becoming commonplace. □

A permanent tracheostomy is the creation of a tracheostomy usually following a total laryngectomy. The larynx is removed and the trachea is sutured in position to form a permanent stoma, known as a laryngectomy stoma. The patient will breathe through this stoma for the remainder of their life. As a result, there is no connection between the nasal passages and the trachea.

Percutaneous tracheostomy

The percutaneous method most commonly used is known as percutaneous dilational tracheostomy (PDT), enabling the pretracheal tissues to be incised under local anaesthesia. A sheath is inserted into the trachea between the cricoid and the first tracheal ring or between the first and second rings. The trachea is progressively dilated with a series of conical dilators, which are slipped over a guidewire, ready for a tracheostomy tube to be inserted. Now frequently performed in the critical care setting as an early intervention post initiation of mechanical ventilation, the procedure takes less time and requires fewer resources, such as theatres and surgeons, resulting in fewer costs, than a surgical tracheostomy. Another potential benefit of percutaneous tracheostomy is more rapid stomal closure and smaller scar formation once the tracheostomy tube has been removed.

Surgical tracheostomy

Elective surgical tracheostomy is ideally performed in the operating theatre under general anaesthetic, although it can be performed under local anaesthetic. A horizontal incision is made halfway between the sternal notch and the cricoid cartilage. The strap muscles are divided and the thyroid isthmus is retracted/divided, enabling the trachea to be exposed and the tracheal cartilages to be counted. The tracheostomy should be sited over the second and third or third and fourth tracheal cartilages

2) Define pneumonia. Write down the four causes, symptom and prevention of pneumonia.

Pneumonia is a bacterial or viral infection of the lungs. Symptoms can include fever, chills, shortness of breath, coughing that produces phlegm, and chest pain.



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Causes

- Pneumonia is an infection of the air sacs in the lungs and is caused by bacteria Streptococcus pneumonia (pneumococcal disease) but viral pneumonia is more common in children.
- viruses
- fungi.
- Most cases of pneumonia are caused by bacteria, usually
- The lungs are made up of separate lobes – three in the right lung and two in the left lung. Pneumonia may affect only one lobe or be widespread in the lungs.

Signs and symptoms

- Fever
- Chills
- Shortness of breath
- Rapid breathing
- A worsening cough that may produce yellow/green or bloody mucus (phlegm)
- Chest pain when breathing or coughing – caused by inflammation of the membrane that lines the lungs.

Prevention

- Breastfeeding your baby (preferably beyond four months) – to help boost their immune system
- Quit smoking and ensure a smoke-free household
- Keeping your home warm and well-ventilated
- Vaccination, in particular against pneumococcal disease, whooping cough, Hib (Haemophilus influenza type b), and influenza
- Regular and thorough hand-washing
- Avoiding contact with people who have colds, the flu, or other infections.
- Vaccines against pneumococcal disease may not always prevent pneumonia but they may prevent serious complications of pneumonia should infection occur.

3) Describe the inhalation system.

Dosage forms introduced into the body via the lungs in an aerosol form to achieve local effects such as to improve bronchodilation or to improve clearance of pulmonary secretions. Systemic effects can also be achieved through the pulmonary route, for example volatile anaesthetics. Some are inhaled via the mouth, some via the nose and some via nose and mouth.

In order for drugs to reach the lungs, they must be delivered in an aerosol form. The aerosol penetrates the lung airways and the deeper passages of the respiratory tract provide a large surface area for drug absorption and the alveolar-capillary network absorbs medication



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rapidly. There are three ways in which this aerosol can be produced: by nebulizer, by pressurized metered dose inhalers and by drug powder inhalers.

Nebulization

Nebulization involves the passage of air or oxygen driven through a solution of a drug. The resulting fine mist is then inhaled via a facemask. Some antibiotics and bronchodilators may be given in this way. The advantage of nebulizers is that they can deliver more drug to the lungs than standard inhalers because of the smaller particles that are generated. They also do not require any co-ordination in order to deliver the drug to the lungs. The disadvantages are that they are expensive, they are not easily portable and the delivery of drug can be difficult to control, for example due to loss in the tubing and mouthpiece.

Metered dose inhalers (MDI)

Metered dose inhalers (MDI) involve a drug being suspended in a propellant in a small hand-held aerosol can in the form of a spray, mist or fine powder. Metered doses can then be delivered from the aerosol by the use of a metering valve within the device which is designed to release a fixed volume, for example Ventolin. Steroid medications are often administered by MDI to treat long-term reactive airway disease.

The advantages of MDIs are that they are convenient, can deliver a fixed dose and are inexpensive. The disadvantage can be the coordination needed to use one. In order to be effective, the patient needs to trigger the MDI during a deep slow inhalation and then hold their breath for around 10 seconds. This need for co-ordination between actuation of the dose and inhalation can be removed by using a spacer device. The spacer device reduces the speed with which the dose is delivered and the resultant 'cold freon' effect that can occur, which can prevent a patient from continuing to inhale after actuation of the MDI. Spacers are also useful for patients on high-dose inhaled steroids in order to prevent oral candidiasis, for children and patients requiring higher doses, and can improve dose delivery to 15%. Spacer devices are designed to be compatible with specific inhalers and therefore care should be taken to ensure the correct spacer device is used. Medication in MDIs is under pressure and so they should not be punctured or stored near heat or in hot conditions (e.g. patients must be informed not to leave their MDI in a hot car).

Dry powder inhalers (DPI)

Dry powder inhalers (DPI) involve a powder being delivered to the lung via a breath-actuated device. Examples of inhalers in this group are the Accuhaler and the Turbohaler. Dry powder inhalers are also useful when there are problems with co-ordination. However, they can initiate a cough reflex and patients need to have sufficient breath inhalation to activate the device. It is also important to remember that because these medications are absorbed rapidly through the pulmonary circulation, most create systemic side-effects