University of the Philippines Manila
The Health Sciences Center
COLLEGE OF NURSING
WHO Collaborating Centre for Leadership in Nursing Development
Commission on Higher Education Center of Excellence
Sotejo Hall, Pedro Gil St., Ermita, Manila
Tel.: (632)523-1472 / Telefax: (632)523-1485

STUDY GUIDE FOR VITAMINS AND SUPPLEMENTS

Introduction

Dear Students,

How did you start your day? What is something that you are grateful for today? I hope that you are maintaining good energy to surpass all your scholastic requirements. Do you feel tired and exhausted already? You might be missing something, your food, your drink, or your vitamins and supplements. Take a break for a while.
Vitamins and supplements help us keep going as they say. These nutrients help us to effectively do our functions and activities, and become productive. These nutrients also help us to maintain our wellness and health. For this study guide, you will recall what you have learned about vitamins and supplements from your Nutrition Course. In this way, learning the topics in this study guide will be easier.

Learning outcomes

After going through this topic, you will be able to:

1. Describe the importance of vitamins and minerals
2. Differentiate water- and fat-soluble vitamins and their functions and recommended dietary allowance;
3. Differentiate micro- and macrominerals and their functions and recommended dietary allowance;
4. Identify nursing considerations for patients receiving vitamins and supplements
5. Determine conditions requiring specific type of vitamin and mineral supplementation; and
6. Determine application of nursing process in patients receiving vitamins and supplements.

A. Vitamins and Minerals

Vitamins and minerals are needed in correct portions for normal body function. Overuse of vitamins and minerals particularly fat-soluble vitamins and iron, may lead to vitamin or iron toxicity. Vitamins are organic chemicals that are necessary for normal metabolic functions and tissue growth and healing.

Definition of Terms

1. Adequate intake is the amount determined to be sufficient in the absence of scientific information
2. Estimated average requirement (EAR) is the amount thought to provide a sufficient intake in one half of healthy persons in a defined group
3. Recommended dietary allowance (RDA) is the amount thought to provide the needs of 98% of well children and adults of specific age group and gender. RDAs were developed to prevent deficiencies and may not be reflective of all groups, such as older adults.
4. Tolerable upper intake level (UL) is the maximum amount considered not likely to be a risk for healthy persons in a specified group. This is not a recommended level to take.

Table 1. Reasons for giving vitamin supplementation

Categories	Deficiencies
1. Malabsorption, diarrhea, infectious and inflammatory diseases (e.g., Crohn's disease, celiac disease)	
2. Inability to use vitamins	1. Liver diseases, renal disease, certain hereditary deficiencies
3. Increased vitamin losses	2. Fever from infectious process, hyperthyroidism, hemodialysis, cancer, starvation, crash diets
4. Increased vitamin requirements	3. Early childhood, pregnancy, debilitating disease (cancer, alcoholism), gastrointestinal surgery, special diets

B. Fat Soluble Vitamins

The fat-soluble vitamins are A, D, E, and K. They are metabolized slowly, can be stored in fatty tissue, liver, and muscle in significant amounts, and are excreted in the urine at slow rate.

Table 2. Fat-soluble vitamins

Vitamins	Function	Deficiency Conditions	RDA	
			Men	Women

A (retinol)	Required for development and maintenance of healthy eyes, gums, teeth, skin, hair, and selected glands. Needed for fat metabolism	Dry skin, poor tooth development, night blindness	1000 mg retinoid equivalents	800 mg retinoid equivalents
D (calciferol)	Promotes use of phosphorus and calcium. Important for strong teeth and bones.	Rickets in children; osteomalacia in adults	5-10 mg	5-10 mg
E (alpha-tocopherol)	Protects fatty acids and promotes formation and functioning of red blood cells, muscle, and other tissues.	Breakdown of red blood cells	10 alpha-tocopherol equivalents	8 alpha-tocopherol equivalents
K	Essential for blood clotting	Increased clotting time, leading to increased bleeding and hemorrhage	65-80 mcg	55-65 mcg

C. Water-Soluble Vitamins

Water-soluble vitamins are the B-complex vitamins and vitamin C. This group of vitamins is not usually toxic unless taken in extremely excessive amounts. Water-soluble vitamins are not stored by the body, so consistent, steady supplementation is required.

Table 3. Water-soluble vitamins

Vitamins	Function	Deficiency Conditions	RDA	
			Men	Women
B1 (thiamine)	Promotes use of sugars (energy). Required for good function of nervous system and heart	Sensory disturbances, retarded growth, fatigue, anorexia	1.2 – 1.5 mg	1.0 – 1.1 mg
B2 (riboflavin)	Promotes body's use of carbohydrates, proteins, and fats by releasing energy to	Visual defects such as blurred vision and photophobia; cheilosis; rash on nose; numbness of extremities	1.4 – 1.8 mg	1.2 – 1.3 mg

	cells. Required for tissue integrity.			
B6 (pyridoxine)	Important in metabolism, protein synthesis, and formation of red blood cells.	Neuritis, convulsions, dermatitis, anemia, lymphopenia	2 mg	1.5–1.6mg
B12 (cobalamin)	Functions as a building block of nucleic acids and to form red blood cells. Facilitates functioning of nervous system	Gastrointestinal disorders, poor growth, anemias	2 mcg	2 mcg
Folic acid (folvite)	Helps in formation of genetic materials and proteins for the cell nucleus. Assists with intestinal functioning. Prevents selected anemias.	Decreased white blood cell count and clotting factors, anemias, intestinal disturbances, depression	200 mcg	160–180 mcg
Pantothenic acid	Promotes body's use of carbohydrates, fats, and proteins. Essential for formation of specific hormones and nerve-regulating substances.	Natural deficiency unknown in humans	5 mg	5 mg
Biotin	Synthesis of fatty acids and energy production from glucose. Required by body chemical systems	Natural deficiency unknown in humans	30 mcg	30 mcg
C (ascorbic acid)	Helps tissue repair and growth. Required in formation of collagen	Poor wound healing, bleeding gums, scurvy, predisposition to infection	60 mg	60 mg

D. Minerals

Table 4. Minerals		
Macrominerals are inorganic substances that must be consumed daily in amounts of 100 mg or higher		
Minerals	**Purpose**	**RDA**
1. Calcium	Forms bony matrix; regulates nerve conduction and muscle contraction	800–1,200 mg
2. Chloride	Major anion in body fluids; part of gastric acid (HCl)	750 mg
3. Magnesium	Cofactor for many enzymes; necessary for normal nerve conduction and muscle contraction	Men: 350–400 mg Women: 280–300 mg
4. Phosphorus	Forms bony matrix; part of ATP and nucleic acids	700 mg
5. Potassium	Necessary for normal nerve conduction and muscle contraction; principal cation in intracellular fluid; essential for acid–base and electrolyte balance	2.0 g
6. Sodium	Necessary for normal nerve conduction and muscle contraction; principal cation in extracellular fluid; essential for acid–base and electrolyte balance	500 mg
7. Sulfur	Component of proteins, B vitamins, and other critical molecules	Not established
Microminerals are required daily in amounts of 20 mg or less		
1. Chromium	Potentiates insulin and is necessary for proper glucose metabolism	0.05–2 mg
2. Cobalt	Cofactor for vitamin B12 and several oxidative enzymes	0.1 mcg
3. Copper	Cofactor for hemoglobin synthesis	1.5–3 mg
4. Fluorine	Influences tooth structure and possibly affects growth	1.5–4 mg
5. Iodine	Component of thyroid hormone	150 mcg
6. Iron	Component of hemoglobin and some enzymes of oxidative phosphorylation	Men: 10–12 mg Women: 10–15 mg
7. Manganese	Cofactor in some enzymes of lipid, carbohydrate, and protein metabolism	2–5 mg
8. Molybdenum	Cofactor for certain enzymes	75–250 mg
9. Selenium	Antioxidant cofactor for certain enzymes	Men: 50–70 mcg

		Women: 50–55 mcg
10. Zinc	Cofactor for certain enzymes, including carbonic anhydrase; needed for proper protein structure, normal growth, and wound healing	12-15 mg

E. Supplementation of vitamins and minerals in different conditions

- **Vitamin B1 (Thiamine)** given during alcohol intoxication.
- **Vitamin B6 supplementation** is necessary in some patients for the prevention of peripheral neuropathy in the case of those taking antimycobacterial. It is also recommended for treating nausea and vomiting in pregnancy.
- **Vitamin K** is the antidote for Warfarin toxicity.
- **Vitamin D supplementation and calcium** may be required for those taking glucocorticoids and bisphosphonates (alendronate).
- **Calcium and vitamin D** are advised to be given for post-menopausal women
- **Folic acid supplementation** during pregnancy to prevent major birth defects of the child's brain (anencephaly) and spine (spina bifida)
- **Iron** for iron-deficiency anemia. It can be given via oral or intramuscular route (Z-track injection)
    a. Watch the video on how to perform Z-track injection using this link: https://www.youtube.com/watch?v=dd8iIa2Xt04

F. Nursing Care for Patients Receiving Vitamin and Mineral Pharmacotherapy

1. Assessment
    a. Perform baseline assessment before administration
    b. Monitoring of patient throughout the administration
2. Diagnosis
    a. Imbalanced Nutrition: Less than body requirements
    b. Impaired Health Maintenance
    c. Readiness for Enhanced Therapeutic Management
    d. Deficient Knowledge
    e. Risk for Injury
3. Planning and Outcomes
    a. Achieve therapeutic effects
    b. Be free or experience minimal adverse effects
    c. Verbalize understanding of the drug's use, adverse effects, and required precautions.

    d. Demonstrate proper self-administration of the medication
4. Interventions
    a. Ensuring therapeutic effects
    b. Minimizing adverse effects
    c. Patient understanding of drug therapy
    d. Patient self-administration of drug therapy
5. Evaluation
    a. Evaluate the effectiveness of drug therapy in line with the achievement of patient goals and outcomes

G. Summary

In this study guide, you learn about the importance and functions of vitamins and minerals. You differentiate the actions, effects, and recommended dose of water-soluble and fat-soluble vitamins and micro- and macrominerals. This information helps you to identify nursing considerations in the care of patients receiving vitamins and supplements. You learn the different conditions that require specific vitamin and mineral supplementation to prevent unnecessary events from occurring. Lastly, you are able to learn the application of the nursing process for patients receiving vitamins and supplements.

References:

Adams, M.P., Holland, Jr, L.N., & Urban, C.Q. (2014). *Pharmacology for nurses: a pathophysiologic approach* (4th ed.). Pearson Education, Inc.
Kee, J.L., Hayes, E.R., & McCuistion, L.E. (2015). *Pharmacology: a patient-centered nursing approach*. Saunders.