

Biological science education in nursing at Seoul National University II

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Abstract

In the last few decades, the role of nursing has branched out into new dimensions of patient care, holding a unique and independent place in health care settings. Unfortunately, however, most nursing schools have not made corresponding revisions in nursing courses dealing with bioscientific aspects of nursing knowledge which will be the basis of their understanding of patients' physical problems and how they will implement the nursing process.

Our College of Nursing is very aware of the importance of biological science in nursing education, and reinforced its curriculum in a recent curriculum renovation, integrating and focusing on the courses related to bioscientific aspects of nursing.

In this article, a brief overview of courses including pathophysiology, pharmacology, nutrition and diet, and microbiology will be introduced.

Key words

nursing education, bioscientific aspect of nursing knowledge, curriculum renovation, pathophysiology, pharmacology, nutrition and diet, microbiology

1. Introduction

Over the last 20 years, nursing science has expanded its boundaries so that today it holds a unique and independent place in health care settings. Therefore, it seems extremely important that nurses have a strong and working bioscientific knowledge since this kind of knowledge will be the basis of their understanding of patients' physical problems and, just as importantly, how they will implement the nursing process. Not only does such knowledge provide nurses with rationale for nursing practices, it allows them the knowledge to exercise choices as to how those practices will be undertaken. For example, when nurses have adequate knowledge in bioscience they are able to make better patient observations and communicate these important observations to other medial staff. Moreover, they are able to make a decision to intervene themselves when it is appropriate. Clearly, adequate training in the biosciences must bring greater confidence and professionalism for nurses, better efficiency and quality in health team work and, ultimately, superior patient care.

Our College of Nursing is very aware of the importance

of biological science in nursing education, and reinforced its curriculum in a recent curriculum renovation by elaborating and focusing on certain issues in its courses work and renaming those course titles to reflect the changes. It is our intention to provide our students with a strong working background in competent nursing care in the acute and community health care system.

To best show the biological science courses in our curriculum, I am going to give you a brief overview of courses offered at Seoul National University. I will begin with the pathophysiology course and follow it with the courses of pharmacology, nutrition and diet, and the microbiology.

2. Pathophysiology (4 credit hours)

Pathophysiology is the study of the physiologic manifestations of disease. It encompasses an understanding of the adaptations that the body makes to the alterations produced by disease processes.

The organization of our course is intended to enhance the students' understanding of the effects of disease on the body and how the body is altered by or adapts to the changes.

Since normal structure and functions of human body have been already dealt with in a previous semester, we concentrate on the alterations of body function as well as the mechanism of production of the symptoms and signs of different disease syndromes. Rational therapeutic intervention of nursing are derived from our understanding of the mechanisms underlying diseases and their clinical manifestation. Clearly, nurses need to have that understanding.

We believe that beyond learning basic pathophysiological principles, case presentations and discussion of actual patient problems are critical to the learning of the concepts to the depth required. We therefore believe that the concepts of the course should be reinforced by viewing real-life examples.

To provide an integrating link between theory and practice, we are planning to utilize a pathophysiology casebook. We recognize the need for students to better understand the underlying disease processes and mechanisms present in the patients for whom they provide care. Understanding disease processes promotes better decision making in the nursing process. Assessment data take on greater meaning. Nursing diagnosis can be formulated more precisely. Interventions can be more carefully chosen and more effectively implemented when they are informed by knowledge of the course and processes of diseases.

Using case presentations and discussions, we wish to convey a sense of realism, immediacy, and excitement about the pathophysiology. We want the illustrative cases to reinforce principles, and engage the students in understanding what is going on at a basic level .

The course is divided into 2 units:

Unit I provides a basis for understanding cellular alterations in the organs and systems. A brief introduction of normal cellular structure and function is followed by a presentation on the alterations in cellular processes. Genetic disorders and concepts of neoplasia, since they may affect multiple organs and systems, are included. How infectious agents cause disease and the resulting inflammatory and immune system responses are detailed. Information on nutritional balances and imbalances complete this unit.

Unit II examines the pathophysiology of the major body systems. Beginning with the hematologic system, lectures proceed through circulation, pulmonary, urinary, digestion, fluid electrolyte imbalance, musculoskeletal and endocrine systems.

3. Pharmacology (2 credit hours)

In a study conducted last year, we found that nursing personnel themselves considered the need for nurses to have more information in bioscience courses, especially in pharmacology (Choe et al, 2000).

Students often state that the concepts of pharmacology are not hard to grasp, but that they are overwhelmed by the quantity of drugs they have to remember. They often spend hours, trying to identify subtle differences between drugs that have similar names, actions, pharmacokinetics and side effects.

In our new curriculum, key issues pertaining to therapeutic rationale based on physiology, basic pharmacologic principles and clinical use of the drugs, side effects as well as nursing interventions are emphasized. The essentials of basic pharmacology and clinical pharmacology are combined in the case study approach so that the transition from classroom to hospital is less abrupt. Also used are tables on an extensive list of drugs based on therapeutic mechanisms.

Explicit links between a disease and its pharmacological treatment are also forged in the case study approach. For example, the pathophysiology of a disease is introduced first in a pathophysiology course, and immediately followed up by a discussion of the drug used for that specific disease in a case study approach.

We also take special care to emphasize the side effects of each drug, its therapeutic mechanism, and its interactions with other drugs. We also stress knowledge of antihypertensive drugs, autonomic nervous system drugs, anticoagulants, information on patient tolerance for drugs as well as the addictive properties of certain drugs. Clinical nurses gave higher priority to their need for more information in these areas in earlier studies we conducted (Choe, 2000; Choi, 2001).

4. Nutrition and Diet (2 credit hours)

As the influence of nurses expands, their need to be well informed regarding nutrition is highlighted. After all, it is nurses who interact daily with patients about the issues of food and nutrition. Nutrition is increasingly recognized as an integral component of health maintenance and rehabilitation. We know that with a solid background in basic nutrition, our students will more fully understand the dietary modifications that are designed to maintain and restore health. With these ideas in mind along with frustration en-

countered by our students on biochemistry course, 'Biochemistry' course has been replaced by 'Nutrition and diet' course in our recent curriculum renovation. Nutrition and Diet course covers not only biochemical metabolism of nutrients but also diet therapy for certain diseases. Each topic in nutrition is discussed in terms of serving patients in various institutional and community settings. We are also very much aware of the fact that client as well as caregiver education is a fundamental responsibility of nursing. The overall goal of patient nutritional care is to empower patients to take responsibility for their own nutritional status. Patient education provides the lifestyle strategies that enable individuals to develop their own healthful dietary patterns. And most often, patient education comes from nursing staff. Certainly it is vital that, in addition to having dietary information, nurses are also comfortable in conveying that information to patients.

Part One presents the macronutrients, the building material needed in large quantities by the body for energy production. "Carbohydrates", "Lipids", and "Proteins" make up most of the units and discuss metabolic pathways, nutrient functions, distribution in the body, dietary sources, the way in which health is affected by deficiencies and excesses, including obesity and Diabetes Mellitus.

Part Two presents micronutrients, the vitamins and minerals.

Part Three presents "Overview of diet therapy" such as nutrition for disorders of the gastrointestinal tract, nutrition for disorders of the liver, gallbladder, and pancreas, nutrition for diabetes mellitus, nutrition for cardiovascular disease, nutrition for diseases of the kidneys, and nutrition in cancer, and other special problems.

5. Microbiology (2 credit hours)

Even though the study of microorganisms is a fascinating topic to those of us who feel its importance in and impact on our daily lives, the students often express frustration with this subject. Currently the microbiology class is offered by the faculty in the microbiology department of the School of Medicine. It is our understanding their lack of contact with the practical aspects of nursing and hospitals may help foster the frustration our students feel.

However, we still think it necessary to learn microbiological concepts and vocabulary in order to function well in clinical settings as well as in community. Because our sur-

veys of students and nurses demonstrated that clinical nurses had a strong interest in obtaining information on infection including hospital infections (Choe, 2000;Choi, 2001), we are trying to assist the students in becoming familiar with the principles of sterilization, infectious disease causation, and infectious disease prevention. We also provide a one week lab experience. Here, they grow various microorganisms and stain them by using a variety of methods in order to obtain a better view depending on the organisms. Our students found these experiments very useful.

These are some of the things we are doing to meet the requirements of today's nursing. We would be happy to have your reactions, either 'questions, critique or suggestions' to what we are doing and we would especially to share what your institution are currently doing. Thank you.

References

- Choi S, Song KJ, An GJ, Choe MA. (2001). The perceived impacts of undergraduate bioscience nursing knowledge on clinical practice among Korean RNs. *Journal of Nursing Education* (in press).
- Choe MA, Byun YS, Seo YS, Hwang AR, Kim HS, Hong HS, Park MJ, Choi-Kwon S, Lee KS, Seo WS, Shin GS. (2000). A study on the degree of need of the knowledge of pathophysiology, clinical microbiology and mechanisms and effects of drugs in clinical nurses. *The Journal of Korean Biological Nursing Society*, 2(1), 1-19.
- Pathophysiology
- Bullock BA & Henze RL. (1999). *Focus on Pathophysiology*. Lippincott.
- McPhee SJ, Lingappa VR, Ganong WF, Lange JD. (1997). *Pathophysiology of Disease*, 3rd edition, Lange Medical Books/McGraw-Hill.
- Schiffman FJ. (1998). *Lippincott's Pathophysiology Series*, Lippincott-Raven.
- Sims SL & Boland DL. (1990). *Pathophysiology Case Studies*, Mosby.
- Website
- <http://www-medlib.med.utah.edu/WebPath/webpath.html>

Pharmacology

Burton GRW & Engelkirk PG. Microbiology for the Health Sciences, 6th edition, Lippincott Williams & Wilkins.

Dudek, SG. (1997). Nutrition Handbook for Nursing Practice, JB Lippincott Company.

Microbiology

Eisenhauer LA, Nichols LW, Spencer RT, Bergan FW. (1998). Clinical Pharmacology and Nursing Management. 5th edition, Lippincott.

Grodner M, Anderson SL, DeYoung S. (1996). Foundations and Clinical Applications of Nutrition. A Nursing Approach., Mosby.

Gutierrez K & Mulhall M. (1999). Study Guide for Pharmacotherapeutics. Clinical decision-making in nursing, WB Saunders Company.

Katzung, BG. (1998). Basic and Clinical Pharmacology. 7th edition, Appleton & Lange.

Nutrition and Diet

Kee LJ & Hayes ER. (1997). Study Guide for Pharmacology. A Nursing Process Approach. Second Edition, WB Saunders Company.

Lilley LL & Aucker RS. (1999). Pharmacology and the Nursing Process. 2nd edition, Mosby.

Moore LA, Crosby LJ, Hamilton DB. (1998). Pharmacology for Nursing Care. 3rd edition, Saunders.

Neal MJ. (1997). Medical Pharmacology at a Glance, Third Edition, Blackwell Science.

Olson J. (1998). Clinical Pharmacology Made Ridiculously Simple, Ninth Printing, Medmaster, Inc., Miami, FL.

Williams SR. (1995). Basic Nutrition and Diet Therapy, 10th edition, Mosby.

(Appendix)

Pathophysiology (4 credit hours)

Course description

This course is designed to provide the student with a comprehensive theoretical foundation of the phenomena that produce alterations in human physiologic functions across the lifespan. Information gained in this course will prepare the student for subsequent courses related to the diagnosis and management of disease process.

Objectives

1. Relate the physiology and mechanism of normal body function.
2. Demonstrate knowledge of pathologic processes resulting in alteration of the structure and function of the body across the lifespan.

Teaching Strategies; Lecture, Case Study, Discussion

Textbook

In preparation

Evaluation

- | | |
|---------------|-----|
| 1. Attendance | 10% |
| 2. Exams (2) | 70% |
| 3. Case Study | 20% |

Lecture Schedule

Week 1 Cellular Injury and Adaptation

- 1) Process
- 2) Etiology or cause
- 3) Mechanism
- 4) The structural alterations induced by the hypoxia
- 5) Necrosis
- 6) Intracellular Accumulations
- 7) Cellular adaptations

Week 2 Inflammation

- 1) Mechanism
- 2) Acute Inflammation
- 3) Chronic Inflammation
- 4) Morphologic Patterns in Acute and Chronic Inflammation
- 5) Systemic Effects of Inflammation and Wound Healing

Week 3 Immunity

- 1) Natural Immune Reaction
- 2) Hypersensitivity Reaction
- 3) Transplant Rejection

4) Autoimmune Diseases: SLE, Rheumatoid Arthritis

5) Immunologic Deficiency Syndromes: AIDS

Week 4 Neoplasia

1) Pathology

2) Biology of Tumor Growth

3) Tumor and Host

4) Stomach cancer, Liver Cancer, Lung Cancer, Uterine Cancer

Week 5 Infectious Diseases

1) General Features

2) Viral Infectious Diseases: Hepatitis

3) Bacterial Infectious Diseases

4) Others

Week 6 Genetic Diseases

1) Normal chromosome

2) Chromosome disorder

3) Genetic Diseases

4) Disorders with Multifactorial Inheritance

Week 7 Nutritional Diseases and Cellular Injury

1) Kwashiokor

2) Marasmus

3) Vitamin Deficiency

4) Mineral Deficiency

5) Physical Injury

6) Chemical Injury

Week 8 Intermediate Exam

Week 9 Circulation

1) Swelling

2) Engorgement

3) Thrombosis

4) Embolus

5) Embolism

6) Bleeding

7) Shock

8) Congestive Heart Failure

Week 10 Blood Vessels

1) Anemia, Leukemia

2) Hyperlipidemia: Hypertension, Arteriosclerosis, Angina Pectoris, and Myocardial Infarction

Week 11 Altered Fluid and Electrolyte balance

1) Fluid Imbalance

2) Electrolyte Imbalance

3) Acid-base Imbalance

Week 12 Alterations in Respiratory Function

1) COPD

2) Bronchial asthma

Week 13 Alterations in Urinary Function

1) Renal Failure

2) Nephrotic syndrome

Week 14 Alterations in Digestive Function

1) Peptic Ulcer

2) Diabetes

3) Liver Cirrhosis

Week 15 Alterations in Endocrinary Function

1) Disorders associated with Pituitary Hormone

2) Disorders associated with Thyroid Hormone

3) Disorders associated with Parathyroid Hormone

4) Disorders associated with Adrenal Hormone

5) Disorders associated with Pancreas Hormone

Week 16 Final Exam

Pharmacology in Nursing (2 credit hours)

Course Description

This course will provide the theoretical basis for the physiologic action of the drugs, expected therapeutic effects, major side effects, and implications for clinical practice.

Objectives

1. Explain the physiologic actions of the major categories of pharmacologic agents used in clinical practice.
2. Identify expected therapeutic responses of the pharmacologic agents used in clinical practice.
3. Identify common side effects of the major categories of pharmacologic agents used in clinical practice.

Teaching Strategies : Lecture, Discussion, Case Studies

Textbook

M.W. Edmunds. (in Korean , 1998) Introduction to Clinical Pharmacology. 2nd Edition, Mosby.

Evaluation

Attendance	10%
Examinations (2)	70%
Case study report (2)	20%

Lecture Schedule

Week 1 Basic Principles of Drug Action (I)

- 1) Drug Absorption
- 2) Drug Distribution
- 3) Drug Excretion

Week 2 Basic Principles of Drug Action (II)

- 4) Drug Receptors
- 5) Competitive antagonist
- 6) Agonist
- 7) Partial agonist

Week 3 Calculation of Drug Dosages

- 1) Introduction
- 2) Calculations
- 3) Calculating Drug Dosage
- 4) Calculating Pediatric Dosages

Week 4 Drugs to Allergy and Respiratory Obstruction

- 1) Antihistamines
- 2) Drugs to treat coughs
- 3) Drugs to treat asthma
- 4) Bronchodilators
- 5) Decongestants
- 6) Expectorants
- 7) Nasal Steroids

Week 5 Antiinfective Agents (I)

- 1) Antibiotics
- 2) Antifungal Agents
- 3) Antiparasitics

Week 6 Antiinfective Agents (II)

- 4) Penicillins
- 5) Sulfonamide

Week 7 Chemotherapeutic Agents

- 1) Introduction
- 2) Mechanism of Action
- 3) Uses
- 4) Toxicity
- 5) Drug Interactions

Week 8 Intermediate Exam

Week 9 Drugs Affecting the Cardiovascular and Renal Systems

- 1) Vasodilators for Angina Pectoris and Peripheral Vascular Disease
- 2) Drugs to Control Cardiac Arrhythmias
- 3) Drugs to Lower Blood Lipid Levels
- 4) Antihypertensive Drugs and Diuretics
- 5) Cardiotonic Drugs

Week 10 Central Nervous System Stimulants

- 1) Opioids
- 2) Drugs to Control Pain
- 3) Anticonvulsants
- 4) Antiemetics
- 5) Drugs for Parkinsonism
- 6) Antipsychotic Drugs
- 7) Sedative- Hypotonic Agents

Week 11 Drugs Affecting the Gastrointestinal tract

- 1) Antacids and Antihistamines
- 2) Drugs to Control Activity of Intestine
- 3) Stool softeners
- 4) Others

Week 12 Agents Affecting Blood Coagulation

- 1) Introduction
- 2) Anticoagulants
- 3) Aminocaproic acid
- 4) Protamine Sulfate

Week 13 Hormones and endocrine agents

- 1) Drugs to treat Diabetes Mellitus
- 2) Drugs Acting on the Female Reproductive System
- 3) Drugs Affecting the Pituitary Gland and Adrenal Gland
- 4) Sex Hormone
- 5) Drugs Affecting the Thyroid Gland

Week 14 Immunomodulating Agents

- 1) Introduction
- 2) Mechanism of Action

Week 15 Centrally Acting Skeletal Muscle Relaxants and Drugs to treat Arthritis

- 1) Anti-inflammatory analgesics
- 2) Muscle Relaxants
- 3) Drugs to treat Arthritis
- 4) Drugs to treat Gout

Week 16 Final Exam

Nutrition and Diet (2 credit hours)

Week 1 Wellness, Nutrition, and the Nursing Role

Week 2 Carbohydrates

Week 3 Fats

Week 4 Protein

Week 5 Vitamins and Minerals

Week 6 Life Span Health Promotion: pregnancy, Lactation, and Infancy

Week 7 Life Span Health Promotion: Childhood, Adolescence, and Adulthood.

Week 8 Midterm Examination

Week 9 Enteral and Parenteral Nutrition

Week 10 Nutrition for Disorders of the Gastrointestinal Tract

Week 11 Nutrition for Burn and Operation Patients

Week 12 Nutrition for Disorders of the Liver, Gallbladder, and Pancreas

Week 13 Nutrition for Disorders of the Kidneys

Week 14 Nutrition for the Allergies and musculoskeletal patients

Week 15 Nutrition for Cancer patients

Week 16 Final Examination

Microbiology in Nursing (2 credit hours)

Course description

This course will provide the students with knowledge regarding pathogenic microorganisms. Emphasis is placed on the preparation of the student for understanding infectious mechanisms of microorganism, disinfection and sterilization.

Lecture Schedule

Week 1 Introduction & History of microbiology

Week 2 Morphology and structure of bacteria, Growth and culture of bacteria, Types of culture media

Week 3 Classification of bacteria, Normal Flora, Infection Source and Prevention of Infection

Week 4 Inhibition of Infectious Pathway, Sterilization

Week 5 Infection and Immunity, Anaphylaxis and Allergy

Week 6 Immune Therapy and Prevention of Infection, Treatment of Infection

Week 7 Cocci and Bacilli related to Respiratory tract

Week 8 Intermediate Exam

Week 9 Mycobacteria and Bacilli with spore

Week 10 Bacilli related to Intestinal tract, Pathogenic bacilli from Vibrio

Week 11 Spirochete, Mycoplasma, Rickettsia, Chlamydiae

Week 12 Laboratory (smear, bacterial culture & staining)

Week 13 DNA Virus

Week 14 RNA Virus I

Week 15 RNA Virus II

Week 16 Final Exam



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