

1963

Evaluation of an integrated pharmacology course

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**EVALUATION OF AN INTEGRATED
PHARMACOLOGY COURSE**

BY

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B.S., Boston College, 1958

**A field study submitted in partial fulfillment of the
requirements for the Degree of Master of Science
in the School of Nursing
Boston University
June, 1963**

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MS
1963
to
1964

251

This study was supported (in part) by a training grant,
Public Law 911, United States Public Health Service, NT 53-C
from the Division of Nursing Resources, Bureau of Medical Services,
United States Public Health Service.

TABLE OF CONTENTS

CHAPTER	PAGE
I. INTRODUCTION	1
Statement of the Problem	3
Justification of the Problem	3
Scope and Delimitation	6
Preview of Methodology	7
Sequence of Presentation	8
II. THEORETICAL FRAMEWORK	9
Review of Literature	9
Statement of Hypothesis	17
III. METHODOLOGY	18
Selection and Description of the Sample	18
Methods Used to Collect Data	20
IV. FINDINGS	25
V. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS	41
Summary	41
Conclusions	43
Recommendations	44
BIBLIOGRAPHY	46
APPENDIX	50

TABLES

TABLE	PAGE
1. Number of Different Drugs Administered to Two Hundred Patients	21
2. Patient Incidence of Drugs	22
3. Drug Classification Showing Drug Most Frequently and Least Frequently Given in Each Group	23
4. Number of Correct and Incorrect Responses to Eight Items Relating to Dosage	28
5. Number of Correct and Incorrect Responses to Eight Items Relating to Effect	30
6. Number of Correct and Incorrect Responses to Seven Items Relating to Toxicity	32
7. Number of Correct and Incorrect Responses to Seven Items Relating to Action	34
8. Number of Correct and Incorrect Responses to Thirty Items Showing Questions Dealing With Most and Least Frequently Given Drugs in Each Group	35
9. Per Cent of Correct Answers in Each Drug Group	37
10. Comparison of Percentile Ratings of Students On Thirty Item Test With N.L.N. Achievement Test in Pharmacology	39

FIGURES

FIGURE		PAGE
1.	Distribution of Scores on Thirty Item Test	26
2.	Distribution of Scores on Eight Items Relating to Dosage	27
3.	Distribution of Scores on Eight Items Relating to Effect	29
4.	Distribution of Scores on Seven Items Relating to Toxicity.	32
5.	Distribution of Scores on Seven Items Relating to Action	33

CHAPTER I

Introduction

A thorough knowledge of pharmacology is an essential requirement of the nurse practitioner. This knowledge is made necessary when one considers the ever increasing role of the professional nurse in the overall therapeutic plan. Indeed, it is this knowledge that in part separates the professional nurse from the growing number of ancillary nursing personnel, and further imparts unto her the ultimate responsibility for the proper and safe administration of medications. "This responsibility on the part of the nurse can be carried out intelligently only upon a firm foundation of knowledge of the actions and characteristics of drugs."¹

Krug and McGuigan state that "understanding of the actions of drugs is important to the nurse in order that she may function intelligently in her care of the ill and that she may cooperate efficiently with the physician. The practice of nursing more and more necessitates judgment based on knowledge."² In discussing the legal implications of this function, these authors further state "the time

¹Harold N. Wright and Mildred Montag, Pharmacology and Therapeutics (7th ed.; Philadelphia: W.B. Saunders Co., 1959), p. 1.

²Elsie E. Krug and Hugh Alister McGuigan, Pharmacology in Nursing (7th ed.; St. Louis: C.V. Mosby Co., 1955), p. 5.

has passed when professional nurses are expected only to carry out orders. Nurses who do carry out orders, without understanding the effects of what they do, from a legal standpoint can be considered negligent if injury to the patient occurs. Therefore, the nurse has both a professional and a legal responsibility to understand what she is doing when carrying out a doctor's order."³

It is clear to those familiar with current nursing practice that many practical considerations concerning the administration of drugs are made in the absence of direct and immediate consultation with the physician. The extent to which the nurse practitioner functions in an effective and independent manner rests heavily on her fundamental insight into the action of the therapeutic weapons against disease.

It is, therefore, incumbent upon the faculty of the school of nursing to provide a curriculum which includes, at least, the essential functional knowledge necessary to the safe and effective carrying out of this responsibility. Each year great numbers of new drugs are discovered, produced and marketed. Some of these fall quickly into disuse, while others become an integral part of the physician's armamentarium. This constant influx of new drugs and knowledge necessitates periodic evaluation of pharmacology in a nursing curriculum.

³Ibid.

Statement of the Problem

This study was undertaken to determine the knowledge of pharmacology gained by students who were taught pharmacology in an integrated Medical-surgical nursing course. Specifically, the study seeks to answer the following question:

Can a basic understanding of pharmacology be taught effectively as part of the initial course in medical-surgical nursing offered to freshmen students in a diploma school of nursing? This basic understanding encompasses four broad areas relating to selected drugs:

- a. action
- b. effect
- c. dosage
- d. toxicity

Justification of the Problem

"The teaching of pharmacology by the teacher and its learning by the student has always been one of the most difficult accomplishments in the nursing school curriculum."⁴ Today, this difficulty is compounded by the introduction of new drug preparations at a phenomenal rate. It has been estimated that greater than two thousand

⁴Mary W. Falconer and Mabelclaire Norman, The Drug, The Nurse, The Patient (Philadelphia: W.B. Saunders Co., 1958), p. vii.

drugs are in common use today.⁵ Added to this is the confusion created by trade names, with sometimes as many as three or four for the same drug.

The question is how to present this staggering amount of material in a way that is logical and meaningful to the student. Traditionally, pharmacology has been taught in schools of nursing as a separate course; sometimes without relationship to other courses. In other schools it has been correlated with medical-surgical nursing, but not a part of it. Only recently has it been taught as an integral part of another course.

Four years ago, at X School of Nursing, a change was made in the curriculum to integrate pharmacology into the basic medical-surgical nursing course. As a result of this change, the action, effect, dosage, toxicity, and special nursing measures relating to medications were discussed in the nursing classes as they related to specific nursing care. For example, digitalis and other cardiac glycosides were taught with, and as a part of, the nursing care of the patient with cardiac disease.

Brown states:

The important premises which contributed to such organization of learning experiences are:

1. A surgical patient is, first of all, a medical patient for whom certain technical procedures are prescribed.
2. Pharmacology is meaningful in direct proportion to its integration with related material in the clinical area.

⁵Wright and Montag, *Op. cit.*, p. 2.

3. Medical and surgical nursing, treatment by means of drugs, diet therapy, physical and occupational therapy, and the procedures pertinent to each of the important kinds of nursing problems are all so closely related that they may be taught and learned most effectively in a closely integrated course.⁶

It was the writer's belief that this integrated approach enables the nursing student to grasp more easily the fundamental principles of the action and administration of medications. The writer has found from her teaching experience that the student was better able to see the relationship between the patient's illness and the medications he was receiving, when all aspects of his care were presented to the student at the same time and in the same class.

This intermingling of the curriculum content posed a few special problems. For example, although a school may have combined instruction in pharmacology with instruction in medical-surgical nursing, it is important to ascertain whether the students are learning the principles of pharmacology or whether such principles have been lost in the process of integration. Only by testing the students' understanding of these principles can an evaluation of this type of teaching be made.

The findings of this study might aid the faculty in assessing the effects of the curriculum change and would assist in the future plans to integrate other courses, such as nutrition and diet therapy.

⁶Amy Frances Brown, "Medical Nursing in the Basic Curriculum," Nursing Outlook, VI (June, 1956), 347-349.

"Curriculum revision through self-study as compared with revision through adoption of a prefabricated plan of studies, has a sort of internal validity. It derives its sense from the concerns, aspirations, and skills of the people who teach it."⁷

Scope and Delimitation

This study was done in a three year diploma school of nursing conducted by a large community hospital in Southern New England. The school is fully accredited by the National League for Nursing. The hospital is part of a University Medical Center, the facilities of which are shared with a basic degree program in nursing, a master's degree program in nursing and a school for practical nursing. The hospital is a voluntary non-profit institution which has facilities for seven hundred and eight patients and one hundred and twelve bassinets. Of this number, five hundred and sixteen are available for the care of medical-surgical patients. The hospital is approved by the Joint Commission on Accreditation and is a member of the American Hospital Association.

All of the students in this study had completed the thirteen month freshman program, during which time they had been caring for adult medical and surgical patients as part of their nursing care

⁷ Fred Couey and Elisabeth D. Couey, Improving the Hospital School of Nursing (Atlanta: Georgia State College of Business Administration, 1957), p. 57.

practice. Classroom teaching of medications began in their third week in the program. The students practiced the administration of medications in the classroom and then began the actual administration of medications to patients sometime in their fourth month in the program.

This study, which was conducted in one diploma school of nursing, attempted to determine the understanding of basic knowledge of pharmacology of thirty nursing students. Two tools were used to ascertain this information. The first was a questionnaire constructed by the writer; the second was the basic achievement test in Pharmacology available through the Evaluation Service of the National League for Nursing.

No attempt was made to determine the students' skills or abilities in the actual administration of medications to patients.

Preview of Methodology

A questionnaire composed of thirty items was constructed by the writer and administered to six faculty members of X School of Nursing. Each question was labeled to show which area of pharmacology it was testing. These nurse faculty members were asked to evaluate each question for clarity and to determine if it in fact did test as it was labeled. As a result, some items were reworded and a number of questions deleted and replaced by an equal number of new questions. These new questions were reviewed and were included in the final questionnaire.

In addition to the questionnaire, the National League for Nursing test in Basic Pharmacology was administered to the same group of students. Thirty nursing students participated in the study. They were tested eleven weeks after the completion of the thirteen month Freshman Program. The writer administered both tests in two consecutive weeks, including an explanation of the nature of the study, its purpose and the students' role.

Because it was necessary for the student to sign her name to the National League for Nursing test, the same procedure was followed in administering the test constructed by the writer. It was emphasized that the students would not be identified as individuals in the study nor would the outcome of either test affect her grade in any way.

Sequence of Presentation

Chapter II presents the theoretical framework of the study, including a review of the related literature. Chapter III discusses in detailed form the methodology used. Chapter IV contains the data and their analysis. Chapter V offers a summary, conclusions and the recommendations of the study.

CHAPTER II

THEORETICAL FRAMEWORK

Review of Literature

A review of the literature pertinent to this study shows that nursing educators are becoming increasingly concerned with the preparation of the nursing student for her function of the administration of medications. Johnson, in a discussion of philosophy of nursing, points out that although the administration of medications is a dependent function of the nurse, there is within this function a large responsibility for independent judgment. She feels that one of nursing's most pressing tasks is to find the means to increase the ability of the practitioner to make valid judgments.⁸

"The responsible nurse", states Verschaeve, "must have knowledge of the drugs she administers."⁹ In her opinion, the responsibility for the teaching of this knowledge rests with the school of nursing. How can the schools best meet this responsibility? How can the

⁸Dorothy Johnson, "A Philosophy of Nursing," Nursing Outlook, VII (April, 1959), 198-200.

⁹Georgine Verschaeve, "Nursing and the New Drugs," International Nursing Review, VI (April, 1959), 67-72.

faculty devise a pharmacology course that assures the student an understanding of the basic principles necessary to administer medications? Squire contends that "pharmacology is not an easy subject for most nurses."¹⁰ This position is emphasized by a number of authors, especially of pharmacology textbooks for the student of nursing.^{11,12,13}

Hill and Ames state in their study, "clinical instructors reported that students had difficulty in converting dosages from one measuring system to another, in classifying drugs, and in recognizing normal and toxic reactions to specific drugs."¹⁴ In an effort to overcome this deficiency, a part of each class in Medical-surgical nursing was devoted to a review of related drugs and a re-emphasis of the concomitant nursing responsibilities. They reported that their greatest problem was the large numbers of new medications and the multitude of trade names. They tested the students' knowledge and

¹⁰ Jessie E. Squires, Basic Pharmacology for Nurses (St. Louis: C. V. Mosby Co., 1957), p. 5.

¹¹ Falconer and Norman, loc. cit.

¹² Stewart M. Brooks, "The Textbook-Big or Little", Nursing Outlook, VII (July, 1959), 406-407.

¹³ Stewart M. Brooks, Basic Facts of Pharmacology (Philadelphia: W. B. Saunders Co., 1957), p. v.

¹⁴ Richard J. Hill and Betty Gleen Ames, "Increasing Students' Knowledge of Pharmacology", Nursing Outlook, VII (April, 1959), 403-405.

application of pharmacology using two other hospital schools as controls. The outcome was a higher learning curve with the experimental group, which they attributed to simultaneous clinical practice coordinated with classes.¹⁵

This difficulty in mastering an understanding of pharmacology is not limited to the nursing student, but has been identified by the graduate nurse as well. Lester writes that in planning an inservice education program for nurses, the professional nursing staff indicated by means of a written questionnaire that their greatest need was for more and current information about drugs. Therefore, a program was designed to increase the knowledge, and thereby increase the skill of the professional nurse in the preparation and administration of drugs."¹⁶

Schools of nursing vary widely in their approach to the pharmacology portion of the curriculum. The average number of hours devoted to the teaching of this subject in the United States ranges from thirty two to forty.¹⁷

Flein and Flein made a study of one hundred and fifty seven schools of nursing: one hundred of which were diploma schools and

¹⁵Ibid.

¹⁶Madeline E. Lester, "A Fair Way to Learn About New Drugs," Nursing Outlook, IX (August, 1961), 484-485.

¹⁷Brooks, "The Textbook-Big or Little", Nursing Outlook, VII (July, 1959), 406-407.

fifty seven were basic collegiate schools. Forty five diploma schools and twenty six collegiate schools had no separate course for pharmacology. It was integrated with courses other than the course in Drugs and Solutions. Thirty five diploma and eighteen collegiate schools had a separate course in pharmacology. Two schools did not teach pharmacology at all and the remainder had a combined course in drugs and solutions and pharmacology. Sixty per cent of the diploma and twelve per cent of the collegiate schools taught it in the first year.¹⁸

This wide range of approaches points out that there is uncertainty about the best way to teach pharmacology. There is much experimentation and a search to evolve a curriculum pattern that gives the student a well grounded understanding of pharmacologic principles. These various approaches and this experimentation necessitates careful study of the curriculum. Fuller's study recommended that "studies should be done on medications that are commonly administered by nursing students."¹⁹ Her study showed that a group of senior students did not understand the pharmacodynamics of digitalis.

¹⁸Joy B. Plein and Elmer M. Plein, "The Scope of Pharmacology and Drugs and Solutions in Nursing Curricula and in Nursing Practice", Nursing Research, XI (Winter, 1962), 30-36.

¹⁹Alice P. Fuller, "A Study to Determine the Pharmacodynamics of Digitalis Which the Nursing Student Understands at the End of Thirty Months in a Three Year Diploma Program" (unpublished Master's thesis, Boston University School of Nursing, 1959), p. 44.

Brown's study tested the students' understanding of morphine sulfate and found, as did Fuller in the above cited study, that the students lacked some very basic knowledge relating to the action of this drug.²⁰ Too often, it is assumed that because certain material had been included in class, it has been learned by the student. Indeed, in a rapidly changing curriculum even some of the most basic principles can be neglected by the teacher.

Legally, the student is responsible for her actions, but some of this responsibility is carried as well by those persons who directly and indirectly supervise her and who assign her to specific duties. Thus, if an error is made and legal proceedings are instituted against a student; the clinical instructor, the head nurse and the supervisor may also be charged with partial responsibility for the error.

Byrne disclosed in her study that twenty eight per cent of medication errors in a particular hospital were made by first year students. The second year students accounted for thirty per cent and the third year students for thirty two per cent. The graduate nurses were responsible for only ten per cent.²¹ This two per cent increase each year might be due to the added responsibilities and the

²⁰Raella B. Brown, "A Study to Determine the Pharmacodynamics of Morphine Sulfate Which the Nursing Student Understands at the End of Thirty two Months in a Three Year Diploma Program" (unpublished Master's thesis, Boston University School of Nursing, 1961), p. 38.

²¹Anna K. Byrne, "Errors in Giving Medication," American Journal of Nursing, LIII (July, 1953), 829-831.

many demands placed on the student's time as she advances in the school.

Polley's study showed that the most frequent errors reported were medications given to the wrong patient and medications given at the wrong time, but there was no significant increase in errors from the first to second year, or from the second to the third year.²²

In studying the same problem, Corcoran concluded that more emphasis throughout the teaching program on the use and action of drugs and less on the mechanics of the procedure would probably result in the development of a patient centered procedure that would reduce errors. She also concluded that closer correlation between classroom teaching and clinical experience would result if clinical assignments provided definite opportunity for follow-up on action of drugs on individual patients and emphasis on the use of drugs in relation to the total program of patient care.²³

Kron feels that in addition to the nurse giving the "right drug, at the right time, in the right amount, in the right way, to the right patient"²⁴, the professional nurse must recognize the

²²Lois D. Polley, "An Analysis of Recorded and Unrecorded Errors in the Administration of Medicines" (unpublished Master's thesis, Boston University School of Nursing, 1960), p. 64.

²³Catherine I. Corcoran, "An Analysis of Recorded Errors in the Administration of Medications" (unpublished Master's thesis, Boston University School of Nursing, 1954), p. 57.

²⁴Thors Kron, "Stepping Beyond the Five Rights of Administering Drugs," American Journal of Nursing LXII (July, 1962), 62-63.

therapeutic, physical and emotional effects of medications. Furthermore, it is her responsibility to obtain the necessary information about the preparation, the reason it was prescribed and the expected results.²⁵

It has become apparent to the writer, during her teaching experiences, that the student more easily comprehends these various aspects of the nursing care of the patient when the material is presented in an integrated course. The student is less apt to compartmentalize material taught in an integrated course, than she is when that same material is taught in distinctly defined classes. Brown makes the following comment about integration. "While integration must actually take place within the student, it should also be recognized that it is possible, through a suitable organization of learning experiences of the student, to facilitate enormously the process of integration."²⁶

Heidgerken objects to the use of the term integrated when applied to a course consisting of what had previously been taught in medical and surgical nursing, pharmacology and diet therapy.

In the nursing literature such a course is termed an "integrated course in medical and surgical nursing."

²⁵Ibid.

²⁶Amy Frances Brown, Curriculum Development (Philadelphia: W. B. Saunders Co., 1960), p. 505.

There is much objection to this term by some nurse educators because it is the student who does the integrating, not the course. Perhaps it would be better to designate such a course a broad fields course, as is done in general curriculum practice.²⁷

She gives this formal definition of such a course. "The broad fields curriculum is a subject curriculum in which the content from several courses is selected and synthesized into one broad course."²⁸

The National League for Nursing Test Service explains that "both the external manipulation of the curriculum and the internal synthesis within the student are called integration, though one is cause and the other is effect."²⁹

Smith and Gips in writing about the Associate Degree Program of Rutgers University School of Nursing discuss the integration of all aspects of care in order to present the student with a related picture of the total nursing situation. Diet therapy, public health nursing, and pharmacology are taught as integral parts of the entire Medical-surgical nursing course. This method, they report, allows for continuity of course content.³⁰

²⁷Loretta E. Heidgerken, Teaching in Schools of Nursing (Philadelphia: J. B. Lippincott Co., 1953), p. 224.

²⁸Ibid., 221.

²⁹National League for Nursing Test Service, "The Effect of Curriculum Integration on Testing," Nursing Outlook, IX (January, 1961), p. 27.

³⁰Dorothy W. Smith and Claudia Gips, "Medical-surgical Nursing in an Associate Degree Program," Nursing Outlook, IV (June, 1956), 347-351.

Mayo, in her evaluation of a pharmacology study guide, concluded that it would be more valuable if it were employed as a planned part of a pharmacology course integrated with medical and surgical nursing.³¹ She also recommends that a patient-centered study guide be developed to include all aspects of patient care including the administration of drugs.³²

In discussing the methods of testing for basic principles taught in an integrated course, the National League for Nursing Test Service recommends that national standardized tests be given that will measure attainment in a subject such as pharmacology, rather than an integrated test giving only one score. In addition, they stress the importance of the teacher made test to find out if a subject has really been integrated.³³

Statement of Hypothesis

On the basis of the writer's past experience in teaching and the literature reviewed, it is the hypothesis of this study that a basic understanding of pharmacology can be taught effectively as part of the first course in Medical-surgical nursing offered to freshman students.

³¹Phyllis R. Mayo, "A Study to Determine the Effect of an Out-of-Class Assignment Study Guide on the Theoretical Grades in Pharmacology" (unpublished Master's thesis, Boston University School of Nursing, 1959), p. 42.

³²Ibid., 44.

³³National League for Nursing Test Service, loc. cit.

CHAPTER III

Methodology

This study was conducted at X School of Nursing located in Southern New England. The hospital operates as a voluntary general hospital, governed by a Board of Directors made up of citizens of the community. A total of seven hundred and eight beds and one hundred and twelve bassinets are available for the care of patients.

The School of Nursing has a thirty three month diploma program which is accredited by the State Board of Examiners for Nursing and by the National League for Nursing. The School has agency membership in the Council of Diploma and Associate Degree Programs, and has an enrollment of approximately one hundred and eighty five students.

"Nursing is the participation in the total care of the patient, including an understanding of and attention to his physical, emotional, mental and spiritual needs. It encompasses the maintenance of health and the prevention of disease in a society of steadily growing social and economic complexity."³⁴

Selection and Description of the Sample

Thirty nursing students who had completed sixteen months of the

³⁴Taken from X School of Nursing Philosophy as stated in the School Catalogue, p. 3.

school program participated in this study. This number represented approximately one half of the junior class. These students had completed the thirteen month freshman program and were about to finish the first quarter of the junior program. One half of the study group was assigned to Maternity Nursing and the other half to Nursing of Children. One quarter of the class was away from the school for Psychiatric Nursing experience and one quarter was currently receiving experience in Operating Room Nursing. Both groups who participated in the study were assigned to the same class day and often had joint classes. For this reason, this half of the class was selected for the study.

All of the students were taught pharmacology as part of an integrated course in Medical-surgical Nursing. This course was given during the first eleven months of the program. Classroom discussion of medications as a part of the nursing care of patients began as early as the third week. The students practiced the administration of medications in the nursing laboratory and then began the actual administration of medications to patients sometime in their fourth month in the program. Each student was supervised at least several times in the clinical area until both she and the instructor felt confident she could administer medications without supervision.

Once she had accomplished this, she was then responsible for the administration of medications to the patient or patients assigned to her for clinical experience. The clinical instructor was responsible for the assignment of patients for the students' clinical experience.

This was done in conjunction with the head nurse on the clinical unit.

Methods Used to Collect Data

Two tests were given to the sample group near the completion of the first twelve week rotation of the junior year. The first was a questionnaire devised by the writer based on the frequency of administration of drugs actually given to patients on the clinical divisions to which these students were assigned. Because of the difficulty of selecting specific medications for testing from such a large number of medications in use, two hundred charts of medical-surgical patients were reviewed to determine what medications were actually being given. All two hundred patients were admitted to services on which freshman students were currently obtaining clinical experience.

One hundred patients were admitted to medical services, and the other half to surgical services. One half of each group were patients of private physicians and one half were admitted to the University Service (ward patients). The medications were tabulated and classified into groups according to broad categories. A total of one hundred forty seven different drugs were administered to the two hundred patients. (See table 1).

TABLE 1
NUMBER OF DIFFERENT DRUGS ADMINISTERED TO
TWO HUNDRED PATIENTS

Antiinfectives and Antibiotics	20
Miscellaneous	19
Analgesics	17
Autonomic drugs	14
Insulin and Hormones	14
Sedatives and Tranquillizers	11
Cathartics	10
Cardiac drugs	10
Vitamins	9
Diuretics and Electrolyte replacement.	8
Hypnotics	5
Antacids	3
Emetics	3
Antihistamines	2
Anticoagulants	2
Total	147

Each medication was counted once if the patient actually received it. No attempt was made to determine the number of doses given to each patient nor were medications counted if they had been

ordered but not administered; for example, analgesics, sedatives and cathartics which were ordered to be given if necessary. Many patients received several drugs belonging to the same group (see table 2).

TABLE 2
PATIENT INCIDENCE OF DRUGS*

Analgesics	240
Cathartics	185
Hypnotics	185
Antinfectives and Antibiotics	120
Sedatives and Tranquillizers	92
Autonomic drugs	91
Miscellaneous	44
Cardiac drugs	36
Antihistamines	35
Vitamins	32
Insulin and Hormones	29
Antacids	26
Diuretics and Electrolyte replacement	23
Anticoagulants	13
Hematinics	12

*number of times a patient received a drug without regard to the number of times the drug was given to individual patients. This may include the same patient receiving more than one drug in the same category.

The drug groups were further analyzed to determine the most frequently and least frequently administered drug in each group (see table 3).

TABLE 3

DRUG CLASSIFICATION SHOWING DRUG MOST FREQUENTLY AND LEAST FREQUENTLY GIVEN IN EACH GROUP

Analgesics		Antihistamines	
Demerol	92	Phenergan	22
Percodan	1	Benedryl	12
Cathartics		Vitamins	
Milk of Magnesia	81	Maltivits	8
Magnesium sulfate	2	Theragran	1
Hypnotics		Insulin and Hormones	
Secnal	113	Insulin, regular	7
Paraldehyde	2	Prednisone	2
Antiinfectives & Antibiotics		Antacids	
Penicillin	26	Maalox	22
Aureomycin	1	Amphojel	1
Sedatives and Tranquillizers		Diuretics & Electrolyte replacement	
Phenobarbital	30	Mercuhydrin	7
Trancopal	2	Hydrodiuril	1
Autonomic drugs		Anticoagulants	
Atropine	54	Coumadin	7
Pilocarpine	1	Heparin	6
Miscellaneous		Hematinics	
Alevaire	6	Ferrous sulfate	10
Aminophyllin	1		
Cardiac drugs			
Digitoxin	15		
Nitroglycerin	1		

From this list of drugs, a thirty item questionnaire was produced based on the most frequently and least frequently administered

drug in each category (see Appendix). Four general areas of learning were tested; toxicity, action, dosage and effect. A multiple choice type of question was utilized and the students were allowed one hour to complete this test.

The second test used was the National League for Nursing Achievement Test in Basic Pharmacology. The students were allowed two hours to complete this test which was given six days after the thirty item questionnaire. The standard rules recommended by the Testing Service of the National League for Nursing were followed for the administration of this test.

CHAPTER IV

FINDINGS

Thirty students who had completed sixteen months in a three year diploma school of nursing were given two tests for the purpose of evaluating their understanding of basic pharmacology.

A questionnaire containing thirty items was constructed by the writer, utilizing content material from authorities such as Krug and McGuigan³⁵ and Wright and Montag.³⁶ A complete list of references used is found in the bibliography.

The scores on the thirty item questionnaire followed an essentially normal distribution and are graphically represented in Figure 1. As can be noted, the scores (expressed as the number correct) ranged from twelve to twenty two, with a median of sixteen and one half.

³⁵Elsie E. Krug and Hugh Alister McGuigan, Pharmacology in Nursing, (7th ed.; St. Louis: C. V. Mosby Co., 1955).

³⁶Harold N. Wright and Mildred Montag, Pharmacology and Therapeutics (7th ed.; Philadelphia: W. B. Saunders Co., 1959).

Number of
students

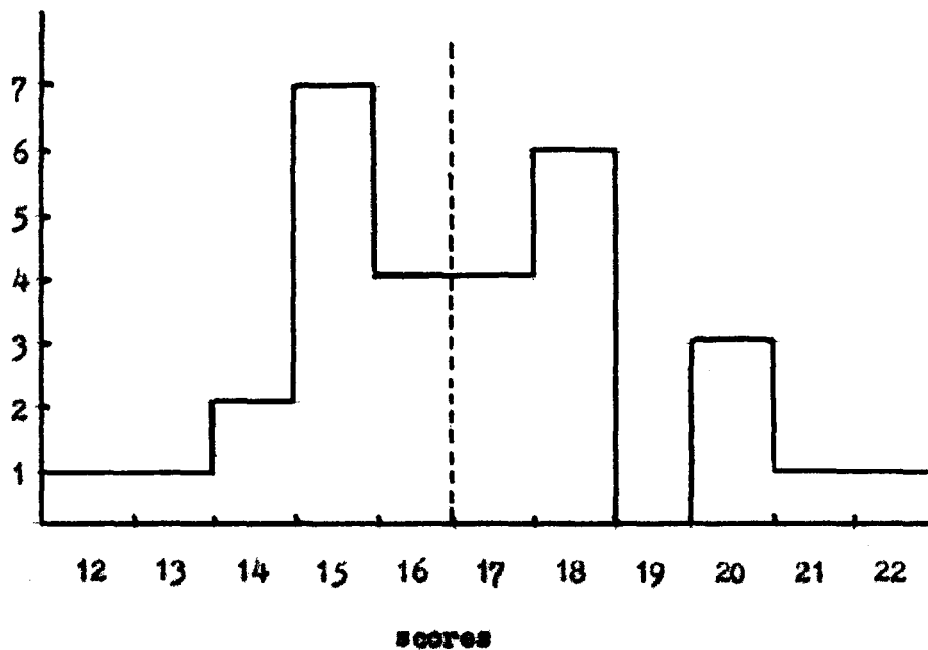


Figure 1. - Histogram showing distribution of scores on thirty item test. Dotted line is the median.

The distribution of scores on the eight items relating to dosage is revealed in Figure 2. There is a fairly normal distribution of scores ranging from two to seven correct answers, with a median of five. However, no student answered all eight items correctly.

Number of
students

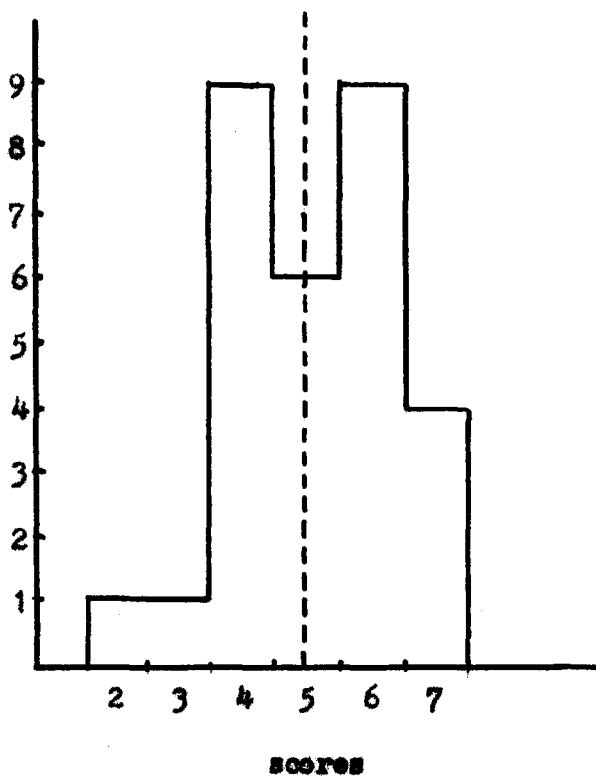


Figure 2. - Histogram showing distribution of scores on eight items relating to dosage. Dotted line is the median.

One could state that the students had a fair knowledge of the dosage of the drugs tested since there were one hundred and fifty three correct responses as compared with eighty seven incorrect responses to the items relating to dosage. The total number of responses is two hundred and forty as shown in Table 4.

TABLE 4

NUMBER OF CORRECT AND INCORRECT RESPONSES
TO EIGHT ITEMS RELATING TO DOSAGE

Question Number	Correct Answers	Incorrect Answers	Total
3	20	10	30
6	11	19	30
8	29	1	30
11	22	8	30
13	19	11	30
16	14	16	30
18	21	9	30
21	17	13	30
Total	153	87	240

Figure 3 illustrates the distribution of scores on the eight items relating to effect. The distribution is somewhat skewed with scores ranging from three to seven with a median of five. Once again, no student answered all eight items correctly.

Number of
students

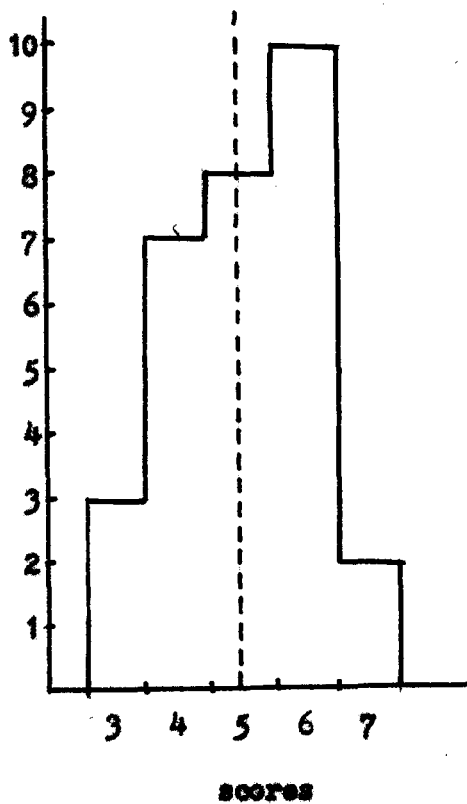


Figure 3. - Histogram showing distribution of scores on eight items relating to effect. Dotted line is the median.

An examination of the correct and incorrect responses to the items relating to effect reveals essentially the same pattern as the responses to the items relating to dosage. The students demonstrated a fair understanding, with one hundred and fifty one correct answers as compared to eighty nine incorrect responses, from a total of two hundred and forty as presented in Table 5.

TABLE 5

NUMBER OF CORRECT AND INCORRECT RESPONSES
TO EIGHT ITEMS RELATING TO EFFECT

Question Number	Correct Answers	Incorrect Answers	Total
9	12	18	30
17	26	4	30
19	8	22	30
22	21	9	30
23	23	7	30
25	19	11	30
26	14	16	30
28	28	2	30
Total	151	89	240

The distribution of scores on the seven items relating to toxicity is shown in Figure 4. The distribution follows an essentially normal curve with scores ranging from one to six, with a median of four. No student answered all items correctly.

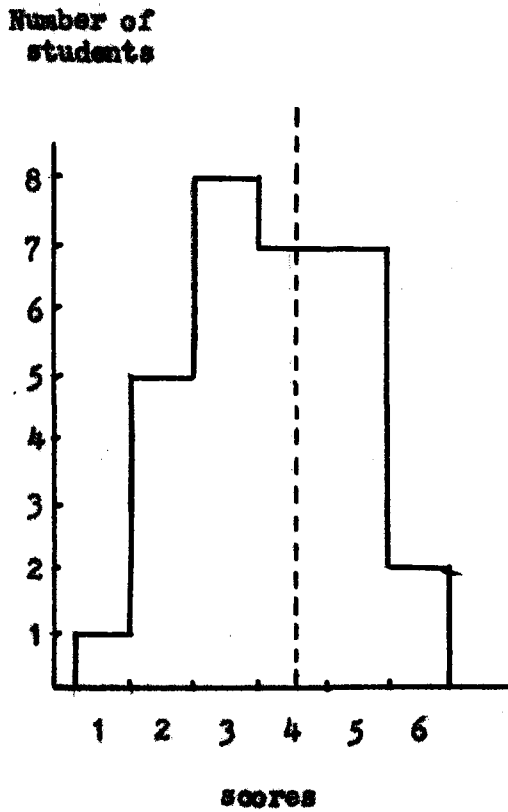


Figure 4. - Histogram showing distribution of scores on seven items relating to toxicity. Dotted line is the median.

In comparing the items pertaining to toxicity, it is apparent that the students displayed a limited knowledge in this area. Of the two hundred and ten responses, there were one hundred and nine correct answers, and one hundred and one incorrect. As is seen in Table 6, only a few more than half the total responses were correct.

TABLE 6

NUMBER OF CORRECT AND INCORRECT RESPONSES
TO SEVEN ITEMS RELATING TO TOXICITY

Question Number	Correct Answers	Incorrect Answers	Total
2	26	4	30
5	18	12	30
7	10	20	30
10	18	12	30
15	6	24	30
20	19	11	30
29	12	18	30
Total	109	101	210

As can be seen in Figure 5, the range of scores on the seven items relating to action is from one to five, with a median of three. This is the lowest median of the four areas tested and the distribution curve is skewed to the left.

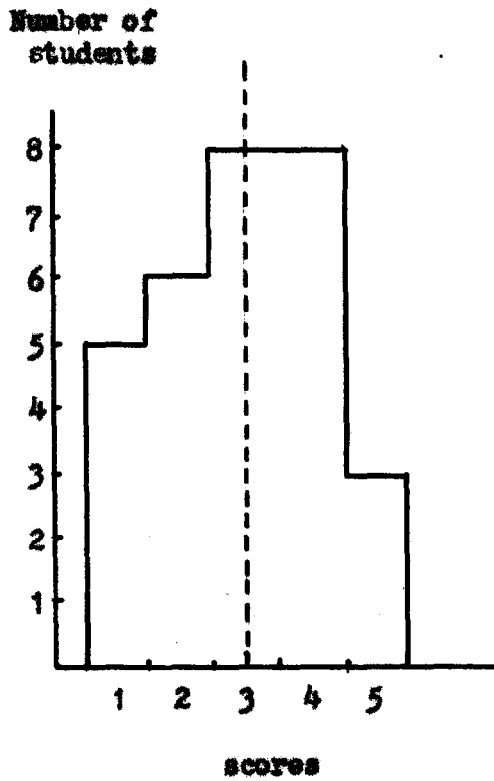


Figure 5. - Histogram showing distribution of scores on seven items relating to action. Dotted line is the median.

It is interesting to note that those questions dealing with the action of drugs received many more incorrect responses than correct ones. Table 7 shows that from a total of two hundred and ten responses, there were one hundred and twenty seven incorrect and only eighty three correct responses. It seems reasonable to say the students have a poor understanding of the action of the drugs tested.

TABLE 7

NUMBER OF CORRECT AND INCORRECT RESPONSES
TO SEVEN ITEMS RELATING TO ACTION

Question Number	Correct Answers	Incorrect Answers	Total
1	11	19	30
4	13	17	30
12	9	21	30
14	1	29	30
24	26	4	30
27	14	16	30
30	9	21	30
Total	83	127	210

The number of correct and incorrect responses to the thirty item questionnaire, arranged to show the questions dealing with the most

frequently and least frequently administered drugs in each group, is shown in Table 8. The table is arranged in descending order of frequency in each group.

TABLE 8

NUMBER OF CORRECT AND INCORRECT RESPONSES TO THIRTY ITEMS
SHOWING QUESTIONS DEALING WITH MOST AND LEAST
FREQUENTLY GIVEN DRUG IN EACH GROUP

Most Frequently Given			Least Frequently Given		
Question Number	Correct Answers	Incorrect Answers	Question Number	Correct Answers	Incorrect Answers
21	17	13	20	19	11
2	26	4	16	14	16
12	9	21	24	26	4
10	18	12	18	21	9
8	29	1	25	19	11
1	11	19	6	11	19
17	26	4	28	28	2
15	6	24	23	23	7
3	20	10	11	22	8
13	19	11	22	21	9
19	8	22	26	14	16
5	18	12	29	12	18
27	14	16	7	10	20
9	12	18	30	9	21
4	13	17	14	1	29
Total	246	204		250	200

Those drugs given most frequently received fewer correct responses than did those given least frequently. One would have expected just the opposite finding. Perhaps, because of the relatively limited clinical experience during the freshman year, the actual administration of medications does not add significantly to the students' basic knowledge of drugs. It would seem reasonable to conclude the major understanding which the student has at the end of the first year comes, for the greater part, from her classroom work.

A comparison of the number of correct responses, with the frequency of administration of drugs belonging to each group, shows there is no correlation between the frequency of drugs given and the students' knowledge of drugs belonging to that group. The per cent of correct answers in each drug group is shown in Table 9.

For example, only thirty three per cent correct answers were given in response to the questions about antibiotics, although this group of drugs was fourth in incidence of administration to the two hundred sample patients in this study. Conversely, sixty seven per cent correct answers were given in response to questions about hematinics, while this group of drugs was given to the fewest number of patients.

Again, one can question if classroom emphasis does not play the most important role in the students' understanding of medications. Also, without an adequate foundation of basic understanding, the student does not learn essential facts about a drug even though she is exposed to it in the clinical area.

TABLE 9

PER CENT OF CORRECT ANSWERS IN EACH DRUG GROUP

Drug Group	Patient Incidence of Drugs*	Per Cent Correct Answers
Analgesics	240	67
Cathartics	185	50
Hypnotics	185	47
Antiinfectives & Antibiotics	120	33
Sedatives & Tranquillizers	92	92
Autonomic drugs	91	32
Miscellaneous	44	58
Cardiac drugs	36	53
Antihistamines	35	75
Vitamins	32	52
Insulin & Hormones	29	62
Antacids	26	27
Diuretics & Electrolytes	23	70
Anticoagulants	13	43
Hematincs	12	67

* number of times a patient received a drug without regard to the number of times the drug was given to individual patients. This may include the same patient receiving more than one drug in the same category.

The second test administered to the same students was the National League for Nursing Achievement test in Pharmacology, the results of which are reported in percentiles. The norms on which this test is based are 1,491 students in forty schools of nursing in the year 1960. The scores of the thirty students ranged from the second percentile to the ninety eighth percentile, with a class mean of thirty four.

A comparison of the National League for Nursing Achievement test with the thirty item test is made in Table 10. For the purpose of comparison, the scores on the thirty item test were converted to percentiles. It must be kept in mind that these percentiles reflect the student's standing only in relation to her classmates, and are not based on established norms, as are the National League for Nursing percentiles.

Eleven students made scores above the seventy fifth percentile on the thirty item test. As can be noted, student number one achieved the highest score on both tests. However, only one additional student of the ten other students who scored above the seventy fifth percentile on the thirty item test, also achieved a score above this percentile on the achievement test. Seven students receiving a score above the seventy fifth percentile on the thirty item test, achieved below the fiftieth percentile on the achievement test; one student placed in the second percentile.

Only four students fall into the third quartile on the thirty item test. Two of these achieved above the fiftieth percentile and two

TABLE 10

COMPARISON OF PERCENTILE RATINGS OF STUDENTS
ON THIRTY ITEM TEST WITH N.L.N. ACHIEVEMENT
TEST IN PHARMACOLOGY

Student	Percentile	
	Thirty Item Test	N.L.N. Test
1	100	98
2	97	22
3	93	77
4	93	27
5	93	02
6	83	75
7	83	67
8	83	37
9	83	27
10	83	27
11	83	22
12	63	59
13	63	59
14	63	47
15	63	19
16	50	72
17	50	41
18	50	19
19	50	12
20	37	63
21	37	31
22	37	19
23	37	19
24	37	16
25	37	14
26	37	02
27	13	52
28	13	22
29	07	24
30	03	10

below this figure on the National League for Nursing test.

Eleven students comprise the second quartile on the thirty item test. Of this number, two made scores in the third quartile, two in the second quartile, and seven below the twenty fifth percentile on the National League for Nursing test.

Four students comprise the first quartile on the thirty item test. One of them attained the fifty second percentile and three fell below the twenty fifth percentile on the achievement test.

From these figures, it is fairly evident that the correlation between the two tests is poor. Some students made high scores on the thirty item test and low scores on the achievement test; while others did well on the achievement test and poorly on the thirty item test. Only six students received scores within ten percentile points on both tests. Nine students achieved scores in the same quartile on both tests.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

SUMMARY

The purpose of this study was to determine the knowledge of pharmacology gained by students who were taught pharmacology in an integrated medical-surgical nursing course. The study attempted to answer the following question:

Can a basic understanding of pharmacology be taught effectively as part of the initial course in Medical-surgical nursing offered to freshman students in a diploma school of nursing?

Two tools were utilized for obtaining data. The first was a test constructed by the writer, consisting of thirty items covering the areas of: (1) dosage, (2) effect, (3) toxicity, and (4) action in relation to selected drugs. These drugs were based on a survey of the drugs being administered to two hundred patients on the wards where the students were receiving clinical experience.

The second tool used was the National League for Nursing Achievement test in Pharmacology.

Thirty nursing students, who had completed sixteen months of educational experience in a three year hospital school of nursing, participated in this study.

The data were tabulated and analyzed. A summary of the findings is as follows:

1. The range of correct answers on the thirty item test was from twelve to twenty two, with a median of sixteen and one half.
2. The students answered correctly almost two thirds of the questions relating to dosage.
3. The students answered correctly almost two thirds of the questions relating to effect.
4. The students answered correctly slightly more than half the questions relating to toxicity.
5. The students answered correctly less than two fifths of the questions relating to action.
6. There was a negative correlation between the number of correct answers and the frequency of the administration of the drug.
7. There was a negative correlation between the number of correct answers to questions relating to specific drugs and the number of times a patient received a drug belonging to that group.
8. The scores on the National League for Nursing Achievement test ranged from the second percentile to the ninety eighth percentile, with a class mean of thirty four.

9. The correlation between the thirty item test scores and the achievement test scores was poor.
10. Only six students received scores within ten percentile points on both tests.
11. Only nine students received scores in the same quartile in both tests.

Conclusions

All of the data and findings were evaluated and the final conclusions are as follows:

1. Fourteen of the thirty items were answered incorrectly by more than half the students.
2. The students disclosed a fair knowledge in the areas of dosage and effect of those drugs tested.
3. The students were limited in their knowledge of the toxicity of drugs.
4. The students showed a low level of understanding in the area of the action of drugs.
5. Only nine students achieved a score above the fiftieth percentile on the National League for Nursing Achievement test.
6. The major understanding of pharmacology which the student has at the end of the first year comes from her classroom work.

Thus, the results of the data procured for this study do not support the hypothesis that a basic understanding of pharmacology can be taught effectively as part of the first course in medical-surgical nursing given to freshman students. This conclusion pertains only to the sample included in this study.

Recommendations

Based on the findings of this study, the following recommendations are made:

1. That the faculty of X School of Nursing reexamine the pharmacology content of the integrated medical-surgical nursing course.
2. That increased emphasis be placed on the teaching of the toxicity and action of drugs.
3. That the amount of time now used for classroom discussion of medications be increased.
4. That increased emphasis be placed on the discussion of medications during the weekly nursing care conferences.
5. That more testing of the students' understanding of drugs be done throughout the educational program, especially during the first year.
6. That a comparative study be done with the same group of students near the end of their senior year.

7. That the use of the National League for Nursing Achievement Test in Pharmacology be adopted to evaluate the students' understanding of pharmacology at the completion of the freshman year.

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APPENDIX

Name _____

Directions:

Write your name in the space provided above. Read each item carefully and decide which choice best completes the statement or answers the question. Indicate your answer by circling the letter or letters on the right hand side of the page.

1. Penicillin G (aqueous or regular), when injected intramuscularly, produces maximum blood concentrations in:

- | | |
|-----------------------|---|
| a. fifteen minutes | a |
| b. three hours | b |
| c. twelve hours | c |
| d. twenty four hours. | d |

2. The toxic effects of Demerol are:

- | | |
|---------------------------|-------------|
| a. nausea and vomiting | a and b |
| b. sweating | c and d |
| c. dizziness | a, b, and c |
| d. rise in blood pressure | all of them |

3. The usual maintenance dose of oral digitoxin is:

- | | |
|------------------|---|
| a. 0.1 milligram | a |
| b. 0.5 milligram | b |
| c. 1.0 milligram | c |
| d. 0.1 Gram | d |

4. Alevaire, when administered by nebulization:

- | | |
|-------------------------------|---|
| a. dilates the bronchi | a |
| b. acts as an expectorant | b |
| c. liquifies secretions | c |
| d. depresses the cough reflex | d |

5. An overdose of regular insulin produces:
- | | |
|---------------------------|-------------|
| a. warm dry skin | a and d |
| b. moist, clammy skin | b and c |
| c. nervousness | a, c, and d |
| d. rise in blood pressure | b, c, and d |
6. The usual dose of oral paraldehyde is:
- | | |
|-----------------------|---|
| a. 1 minim | a |
| b. 1 cubic centimeter | b |
| c. 1 dram | c |
| d. 1 ounce | d |
7. When Amphojel is taken every day it may cause:
- | | |
|--|---|
| a. an increase in blood levels of aluminum | a |
| b. systemic alkalosis | b |
| c. "acid rebound" | c |
| d. constipation | d |
8. A frequently prescribed oral dose of phenobarbital is:
- | | |
|-------------------|---|
| a. 3.0 milligrams | a |
| b. 30 milligrams | b |
| c. 5.0 grains | c |
| d. 0.5 grams | d |
9. Coumadin produces an anticoagulant effect that is:
- | | |
|-----------------|---------|
| a. immediate | a and c |
| b. delayed | a and d |
| c. short acting | b and c |
| d. long acting | b and d |
10. The symptoms of acute atropine overdose include:
- | | |
|----------------------------|-------------|
| a. markedly dilated pupils | a and b |
| b. rapid pulse | c and d |
| c. dryness of the mouth | a, b, and c |
| d. flushed skin | all of them |
11. The usual dose of aminophyllin by rectum is:
- | | |
|-------------------|---|
| a. 0.5 milligrams | a |
| b. 1.0 milligrams | b |
| c. 0.5 Gram | c |
| d. 5.0 Grams | d |

12. Milk of Magnesia produces its effect by:
- a. the absorption of water from the intestine. a
 - b. the absorption of magnesium from the intestine. b
 - c. the drawing of water into the intestine. c
 - d. the reduction of surface tension of the intestinal contents. d
13. The usual oral dose of ferrous sulfate is:
- a. 1.0 milligram three times per day. a
 - b. 5.0 milligrams three times per day. b
 - c. 0.3 Grams three times per day. c
 - d. 3.0 Grams three times per day. d
14. The action of pilocarpine on the eye:
- a. dilates the pupil. a only
 - b. constricts the pupil. b only
 - c. paralyzes the muscles of accommodation. a and c
 - d. stimulates the muscles of accommodation. b and d
15. The side effect associated with the administration of Maalox is:
- a. gastric hyperacidity a
 - b. indigestion b
 - c. diarrhea c
 - d. none of them d
16. A frequently ordered dose of heparin for deep subcutaneous administration is:
- a. 0.1 milligram a
 - b. 0.5 milligram b
 - c. 5.0 milligrams c
 - d. 50 milligrams d
17. The administration of phenergan with a narcotic:
- a. reduces its effectiveness as an analgesic a
 - b. decreases the danger of respiratory depression b
 - c. counteracts the hypnotic effect of the narcotic c
 - d. potentiates the action of the narcotic d

18. The usual dose of oral magnesium sulfate, given for its cathartic effect is:

- | | |
|--------------------------|---|
| a. 0.5 cubic centimeters | a |
| b. 2.0 cubic centimeters | b |
| c. 15 cubic centimeters | c |
| d. 250 cubic centimeters | d |

19. The use of Multivits in the post-operative period is thought to:

- | | |
|-----------------------------|-------------|
| a. promote tissue healing | a only |
| b. decrease incisional pain | c only |
| c. decrease nausea | a and d |
| d. combat fatigue | all of them |

20. The side effect associated with the administration of Benadryl is:

- | | |
|---------------|---|
| a. drowsiness | a |
| b. insomnia | b |
| c. hives | c |
| d. skin rash | d |

21. The usual oral dose of secenal at bedtime is:

- | | |
|-------------------|---|
| a. 1.0 milligrams | a |
| b. 10 milligrams | b |
| c. 0.1 Gram | c |
| d. 0.5 Gram | d |

22. Mbl-iron is useful in treating anemia because it supplies:

- | | |
|---------------------|---|
| a. vitamin B12 | a |
| b. folic acid | b |
| c. ferrous chloride | c |
| d. ferrous sulfate | d |

23. Theragan is effective because it produces therapeutic levels of:

- | | |
|----------------------|---|
| a. potassium | a |
| b. iodine | b |
| c. chloride | c |
| d. none of the above | d |

24. The administration of Trancopal produces which of the following effects?

- | | |
|---|---------|
| a. Counteracts the effect of histamine in allergic reactions. | a only |
| b. Acts as a tranquillizer | b only |
| c. Acts as a skeletal muscle relaxant | a and d |
| d. Acts as a peripheral vasodilator. | b and c |

25. The administration of prednisone:

- | | |
|--|---|
| a. suppresses clinical evidence of infection | a |
| b. acts as a digitalis substitute | b |
| c. causes hypotension | c |
| d. causes renal damage | d |

26. Which of the following statements apply to Percodan?

- | | |
|--------------------------------------|-------------|
| a. Exerts its effect up to six hours | a and c |
| b. Produces pin-point pupils | b and d |
| c. May be habit forming | a, c, and d |
| d. Is more potent than morphine | all of them |

27. Mercuhydrin exerts its effect by:

- | | |
|--|---|
| a. blocking the ability of the kidney tubule to reabsorb sodium. | a |
| b. increasing the ability of the kidney tubule to reabsorb sodium. | b |
| c. increasing the ability of the kidney tubule to reabsorb water | c |
| d. none of the above | d |

28. The administration of hydrodiuril:

- | | |
|---|---|
| a. increases the twenty four hour urine output. | a |
| b. decreases the twenty four hour urine output. | b |
| c. elevates the blood pressure | c |
| d. increases cardiac output | d |

29. The toxic symptoms of nitroglycerin include:

- | | |
|-----------------------------|---------|
| a. blanching of the skin | a and c |
| b. flushing of the skin | a and d |
| c. a drop in blood pressure | b and c |
| d. a rise in blood pressure | b and d |

30. Aureomycin will most likely be prescribed for a patient with the following:

- | | |
|-----------------------------|-------------|
| a. fever of unknown origin | b only |
| b. urinary tract infection | c only |
| c. acute monilial infection | b and d |
| d. acute rheumatic fever | all of them |