

Application To Duke University School Of Medicine

The Physician's Assistant Program

As A Major Study Program For The Bachelor Of Health Science Degree



DEPARTMENT OF

**COMMUNITY HEALTH SCIENCES**

DUKE UNIVERSITY MEDICAL CENTER, DURHAM, N. C.

Submitted by:

D. Robert Howard, M.D., Director  
Physician's Assistant Program

Submitted to:

Roger A. Bulger, M.D., Associate Director  
of Medical Education for Allied Health

Submitted on:

March 1, 1971



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## I. OBJECTIVES AND PREREQUISITES OF THE PHYSICIAN'S ASSISTANT PROGRAM

### A. Needs To Be Filled

Current methods of delivering health services are undergoing extensive modification because they are woefully inadequate to meet either present or future social demands. Previous methods cannot cope with society's mandate to provide comprehensive health and medical services for all rather than medical services for some.

Modern medical technological developments, changing patterns of care, and the increase and distribution of the population have all created new burdens. The net result is a critical manpower shortage evident at all levels but most notably in the category of physician services.

If the limited number of physicians are to be utilized effectively they must be relieved of the responsibility for personally performing repetitious tasks and functions that do not require their educational and professional background. The education of physician's assistants, initiated at Duke and subsequently instituted at other teaching centers across the country, has demonstrated clearly the capability of assistants to extend the reach of physicians. In order to attract adequate numbers of qualified candidates for the health industry at all levels, it is imperative that their education be integrated and structured so that everyone has the opportunity to progress to the level of his competence and desire.



B. Program Educational Objectives

The objective of the Physician's Assistant Program is to create capable assistants at the intermediate professional level who, by working with physicians, can complement their services and increase their productivity. While it is not anticipated that the effort at Duke University will have any significant numerical impact on the national shortage of physician services, as the initiator of this concept, Duke serves as a model to medical educators across the country. In its developmental phase the Duke Program has demonstrated the feasibility of upgrading allied health workers to assume ever greater responsibility in patient care. This has created an opportunity for an economically sound career progression for those who are capable and motivated to fulfill a more responsible role in health services delivery but who, for reasons beyond their control, have been denied this opportunity in the past. Now it is essential that an opportunity for academic career development be incorporated into the program.

Secondary objectives of the program include evaluation of achievement-oriented educational programs, and development of new techniques for basic science and clinical teaching at the intermediate level.

Duke has been the leader in the development of this concept; it is fitting that the University continue its leadership role. The integration of academic and economic career advancement characteristics can help resolve the existing fragmentation of health services. Until the dead-end characteristics of allied health careers can be overcome, it will be impossible to achieve



the efficiency necessary to meet today's societal demands for health services.

C. Relationship Of Objectives To Needs

The physician's assistant, selected and trained by the physician in the university setting, is capable of working closely with a physician. He is able to supervise, train, and communicate with a variety of other health workers who also support the physician. Because the physician's assistant is taught to assume responsibly and reliably many of the doctor's traditional tasks and functions, he allows the doctor to function more efficiently and still maintain a functional "doctor-patient relationship".

The concept of the university-trained physician's assistant is unique in several ways. First, physician's assistants have been taught to supplement and not replace currently available health team talents. Second, because most physician's assistants have had previous training and experience in the health field, our program has helped create a career ladder for people who want to assume increased responsibilities in patient care and reap greater economic rewards but do not have the desire or opportunity to become a doctor. By doing so, we have provided a means of reducing the loss of talented people into medically unrelated industries. Third, the physician's assistant provides a feasible alternative to an otherwise impossible demand for physician services. Fourth, by eliminating tasks from the physician's role that are repetitious and do not require his sophisticated capability, the physician's career becomes more challenging and stimulating.

While initial efforts were directed solely toward training



ex-military corpsmen to function with community-based general practitioners and general internists, two other worthy objectives were early realized and have since been incorporated in the program. First, interest expressed by capable people serving in the traditional health occupations have made it evident that this concept could be beneficially extended to their needs. It has since been clearly established that people in any health related profession can be readily upgraded to assume more responsibility in the area of patient care. Developing a means of professional improvement has encouraged capable young people who otherwise would have sought unrelated opportunities with more evident means for advancement to seek careers in health services.

Second, although the plight of the community-based primary practitioner is a problem of great magnitude, consultants too have become aware of the value professional assistants could be in specialty practices. Rather than initiating several programs, the curriculum has been modified so that during the first sixteen months students are instructed in a core curriculum that meets the needs of all specialties from family practice to radiology and pathology. As a result of this broader teaching approach a more effective educational experience has evolved. In keeping with the original objective, however, most of the clinical teaching has continued to be in family medicine, internal medicine, and pediatrics.

#### D. The Need For The Baccalaureate Degree

In the past, efforts to overcome the dead-end characteristics of allied health occupations have been unsuccessful because of vested interests in a poorly organized system. Lack of understanding,



variation in local needs, selfishness, and the search for occupational identity have all been contributing factors. Now, however, society demands comprehensive health services for all rather than medical services for some. This makes it imperative that the existent deficiencies be overcome.

In order to get enough manpower, the health industry must be viewed in relationship with others with which it must compete. Societal attitudes relative to academic achievement must also be considered. If a person is to make competent judgments, it is essential that that person be educated to the extent necessary for making such judgments. Academic recognition is and will continue to be one of society's primary measures of such competence.

Because of the relation of the physician's assistant to existing health professions, because of the need to create a system of career progression, and because of the academic requirements for other health professions, it is essential that academic recognition be a part of this new profession.

#### E. Academic Program Prerequisites

The Physician's Assistant Program will not require any course prerequisites beyond those already established by the University for the Bachelor of Health Science degree. These include a minimum of 16 course equivalents at "C" grade level or above from an accredited institution to meet lower division requirements. The transferable credit must include one course in English, three courses in natural or formal sciences, three courses in social sciences or history, and one course in the humanities. As with other undergraduate programs, the students will also be required to comply with



university physical education requirements.

F. Non-academic Program Prerequisites

Prerequisites for admission into the program include:

1. A high school diploma or its equivalent by examination.

All applicants must have some science courses in their academic background (preference is given to candidates with two or more years of successfully completed college course work).

2. Previous experience in the health field with at least one year involving extensive direct patient contact.

3. Three character references and personal evaluations. One evaluation must be from a physician with whom the applicant has worked, one by the applicant's current supervisor, and one by an unrelated acquaintance of five years or more.

4. Completion of the Scholastic Aptitude Test and the Math Achievement Test-Level I of the College Entrance Examination Boards.

5. A completed application form with a photograph.

6. Transcript records from high school, college, military schools, and all other academic training.

7. Psychological testing for the purpose of determining the applicant's personality profile.

8. Candidates for the specialty program in radiology, must submit evidence of having satisfactorily completed an accredited two year radiology technology program and have a minimum of two years experience as a registered radiologic technician.

G. Criteria For Student Selection

Candidates for the program are selected on the basis of their



previous experience, their motivation, and evidence of their ability to meet successfully the requirements of the program. Their academic ability is determined on the basis of their College Entrance Examination Board scores and their previous academic achievement. Applicants are considered without regard to race, creed, sex, or national origin.

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## II. DETAILED CURRICULUM BREAKDOWN

### A. Course Objectives And Course Content

The upper-division requirements include the following sixteen courses which are intended to provide the student with an in-depth understanding of the basic medical sciences and their clinical applications. Because of their systemic coordination these courses may be taken simultaneously, but students desiring to take them independently must complete the first six courses as prerequisites for the next eight courses. In addition, all students must successfully complete the first fourteen courses as necessary prerequisites for the two required clinical courses. This structuring is necessary because of the interdependent relationship of the course content.

#### 1. Analysis of Health Systems Development

##### a. Description and Objectives

A seminar and group discussion course for the purpose of 1) developing a working knowledge of medical terms through the study of Greek and Latin word roots and by studying and correcting medical records. 2) developing an appreciation of the many people and organizations involved in delivering comprehensive health service to a community through governmental and voluntary health agencies; 3) understanding medical ethics through a study of their development and their application to the current health team structure; and, 4) developing an appreciation of medical records and the potential role of computer



technology in data processing.

b. Content

Lectures and discussions included in the course cover the following subjects:

Word formation and pronunciation

Word clusters by systems

Terms describing planes and direction of reference

Terms describing direction of movement

Terms describing anatomical postures

Practical applications for understanding medical terms

Suffixes pertaining to conditions of the body

Prefixes dealing with numbers and amounts

Human body surface anatomical terms

Terms used with reference to body locations

Terms related to medications and treatment

Problem oriented medical records (Weed System)

Educational, clinical and research applications of the

Weed System

Health care systems

Systems components

Integration of systems in clinics

Local health agencies and their services

Voluntary health agencies and their services

North Carolina State Board of Health

North Carolina Department of Mental Health

North Carolina Public Welfare Agency

North Carolina Vocational Rehabilitation Center



Other North Carolina Health agencies

Federal government health agencies and their roles

The role of insurance in medical economics

Economic and social implications of medical services

The role of law in the practice of medicine

Laws and their relationship to physician's assistants

Man and disease

Medicine and public health in antiquity

Medicine and diseases of the Middle Ages

The Renaissance scientific revolution and medicine

The Paris School and its role and influence

The influences of the industrial revolution on medicine

19th century medicine

19th century pathology

The germ theory

Anesthesia and antiseptics

Changing patterns of disease and life expectancy

Changing patterns of medical care

Medical sects and medical ethics

The Hippocratic oath and its current effects

The development of the computer and the history of data  
processing

The history of computers in medicine

Data processing cycles

MEDITRAN and VISTAR computer systems

Data input and classification

The electronic computer, its elements and capabilities

Numbering systems and control units of the computer



Input and output devices

The programming cycle

Control of stored programs

Role of small computers in the hospital environment

FORTTRAN programming and program preparation

Systems analysis and procedures

Basic processing methods

Utilization of computers in automated medical histories

File organization techniques

On-line patient monitoring

2. Anatomy and Physiology I

a. Description and Objectives

A lecture-laboratory course developed to provide the student with an understanding of human structure and function beginning with the cell as the basic component, and progressing with the anatomic and physiologic relationships of the skin, head, neck, eyes, ears, nose, throat, and the cardiovascular and respiratory systems. Instruction includes 63 hours of lecture by the faculty and 51 hours of laboratory exercises for the purpose of performing and observing dissection of the human body.

b. Content

Subjects covered in the lecture portion of the course are integrated with the laboratory experiences and include:

The development of the skin

Integument and its appendages

Development of the cranium and head



The structure and function of the mandible  
Structure and relationships of the facial bones  
Anatomic relationships of the cranial bones  
Muscles and fasciae of the anterolateral region of the neck  
Cranial nerves, their relationships and functions  
The olfactory system  
The tongue  
The tunica of the eye  
Refractory systems of the eye  
Accessory organs of the eye  
Structure of the external ear  
Structure and function of the middle ear  
Structure and function of the internal ear  
The external nose  
Nasal and sinus cavities  
Structure and function of the larynx  
Components of the heart  
Structure of the pericardium  
Pulmonary circulation  
Circulation of the head and neck  
The mediastinum  
The trachea and bronchi  
Structure and components of the lungs  
The physiologic functions of the cell  
Cellular variation in physiologic function  
Cellular reproduction  
Extracellular and intracellular fluid  
Fluid transport through cellular membranes



Membrane potentials and action potentials  
Excitation and rhythmicity of cellular function  
Synaptic cellular and intercellular functions  
Multicellular structures  
Red blood cells  
The reticuloendothelial system  
Leukocytes  
Physiology of blood groups  
Transfusion reaction  
Physiology of tissue transplantation  
Cardiac musculature  
Electrocardiac physiology  
Electrocardiac measurement  
Cardiac hemodynamics  
Cardiac cycles  
Chamber functions and stroke volume  
Elasticity of arteries and arterial blood flow  
Arterial, venous, and capillary pressure  
Auto-, neuro-, reflex and humoral regulation  
Lymph  
Pulmonary circulation  
Coronary circulation  
Specialized variations in blood flow  
Cardiac output  
Regulation of venous return  
Physiology of hypertension  
Regulation of mean arterial pressure



Cardiac failure

Physiologic aspects of circulatory shock

Physiologic aspects of heart sounds

3. Anatomy and Physiology 2

a. Description and Objectives

A lecture-laboratory course developed to provide the student with an understanding of human structure and function of the endocrinologic, gastrointestinal, renal, reproductive, musculoskeletal, and neurologic systems. Instruction includes 63 hours of lecture by the faculty and 51 hours of laboratory exercises for the purpose of performing and observing dissection of the human body.

b. Content

Subjects covered in the lecture portion of the course are integrated with the laboratory experiences and include:

The mouth, including the teeth and salivary glands

The structure and function of the pharynx

The esophagus

The structure, function, and circulation of the stomach

The structure, function, and circulation of the small intestine

The large intestine, including the appendix and rectum

The liver and the gallbladder

Development, structure and function of the pancreas

Development and function of the kidneys and urinary collection system



The male genital organs

The female genital organs

Endocrinologic organs

Bones and muscles of the upper extremity and hand

Bones and muscles of the lower extremity and foot

The vertebral column

Classification and structure of articulations

Abdominal musculature

The spinal cord

Roots of spinal nerves

The medulla oblongata

The pons

The cerebellum

Cerebral ventricles

The mesencephalon

The proencephalon

Structure of the cerebral cortex

Brain pathways

Meninges

Cerebrospinal fluid

Spinal nerves

The visceral nervous system

Formation of urine

Regulation of fluid volume by the kidneys

Regulation of the acid-base balance

Gaseous exchange in the lungs

Gas transport and regulation



Pulmonary ventilation  
Respiratory insufficiency and its effects  
Transmission of nervous impulses  
Physiologic functions of the ear  
Physiologic functions of the eye  
The proprioceptors  
The reticular activation system  
The limbic system  
Body temperature and regulation  
Adrenocortical hormones  
Thyroid and its functional derivatives  
Insulin and glucagon  
Parathyroid hormone  
Pregnancy and lactation  
Fetal and neonatal physiology

4. Chemical Biology and Pharmacology I

a. Description and Objectives

A lecture and discussion course developed to include scientific knowledge necessary for understanding the normal and chemotherapeutic chemical functions as they relate to the body and specific organ systems. This first portion of a two semester sequential course includes a review of inorganic chemistry and instruction in the basics of biological chemistry and pharmacology.

b. Subjects covered in the lectures and discussions include:

Basics of inorganic chemistry



Chemical fundamentals

The structure of matter

The Periodic Table

The basis of chemical interactions

Atoms, molecules and electron theory

Atoms, molecules and chemical reactivity

X-rays

Radioactivity

Nuclear chemistry

Radioisotopes of medical importance

Physiologic effects of by-products of nuclear explosions

Oxygen and oxidation

Formula and equation writing

The chemistry of water

Solutions for laboratory use

Ionization reactions

Chemical actions in solutions

Ionic reactions

Acids

Bases

Hydrolysis and pH analysis

Inorganic salts

Organic salts

Properties of non-metallic salts

Basic considerations of organic chemistry

Classification of organic compounds

The hydro-carbons

Alcohols



Aldehydes and ketones  
Organic acids  
Esters and ethers  
Amines and amides  
Cyclic organic compounds  
Introduction to basic organic chemistry  
Basic mechanism of drug actions  
Drug absorption  
Distribution, metabolism, and excretion  
Enzyme induction and pharmacogenetics  
Drug safety and effectiveness  
Neuropharmacology  
Adrenergic drugs  
Cholinergic drugs  
Atrophine and cholinergic blocking agents  
Adrenergic blocking agents  
Neuro-muscular blocking agents  
Drugs affecting catecholamine binding and release  
Pharmacologic approach to hypertension  
Histamine and hypo-tensive peptides  
Antihistaminic agents  
Cardiac glycosides  
Antirrhhythmic drugs  
Coronary vasodilators and antianginal drugs  
Anticoagulants  
Diuretic agents  
Therapy of edema



Insulin and oral hypoglycemics

Chemotherapy with sulfonamides

Antibiotic drugs

Antituberculous drugs

Antifungal drugs

5. Chemical Biology and Pharmacology 2

a. Description and Objectives

A lecture and discussion course developed to follow Chemical Biology and Pharmacology 1. This course is intended to expand the students' understanding of normal and chemotherapeutic chemical functions as they apply to all organ systems.

b. Content

Subjects covered in the course of lecture and discussions include:

Definition and general properties of carbohydrates

Classification of carbohydrates

General reactions of carbohydrates

Digestion and absorption of carbohydrates

Fate of absorbed glucose

Miscellaneous circulatory carbohydrates

Abnormal carbohydrate metabolism

Methods for the determination of carbohydrates

Collection and preservation of specimens for carbohydrates

Distribution of fluids and electrolytes

Gamblegrams



Intracellular fluid  
Extracellular fluid  
Serum electrolytes  
Distribution of water  
Maintenance of normal body fluids  
Fluid and electrolyte balance and shock  
Acid and base balance  
Buffering agents in plasma and red cells  
Carbon dioxide-bicarbonate  
Excretion of the hydrogen ion  
Role of hemoglobin  
Role of the kidney  
Metabolic acidosis  
Respiratory acidosis  
Metabolic alkalosis  
Respiratory alkalosis  
Fatty acids  
Glycerides  
Hydrolysis and saponification of lipids  
Hydrogenation of lipids  
Lipids and steroids  
Digestion, absorption and storage of lipids  
Oxidation of lipids  
Origin of ketone bodies  
Ketosis and acidosis  
Tests for ketone bodies  
Lipoproteins  
Lipoprotein electrophoresis



Interrelationships of lipid-carbohydrate-protein metabolism

Primary structural features of proteins

Classification of amino acids

Essential and non-essential amino acids

Peptide bond

Secondary structural features of proteins

Spatial configuration of proteins

Isoelectric points

Electrophoresis of serum proteins

Amino acids and proteins as buffers

Denaturation

Classification of proteins

Tests for proteins

Digestion and absorption of proteins

Nitrogen balance and the dynamic state of body proteins

Important reactions of amino acids in the body

The synthesis of urea

Interrelationships of protein, carbohydrate and lipid metabolism

Total serum protein and its clinical significance

Interpretation of electrophoretic patterns of serum protein

Paraproteins

Myeloma proteins

Chemical nature of enzymes

Metal ion activators and trace metals in biology

Mechanism of enzyme actions

Theory of enzyme actions



Inhibition of enzyme actions due to poisons

Inhibition of enzyme actions due to antimetabolites

Enzymes in medical diagnosis

Antituberculous drugs

Antifungal drugs

Antimalarials

Anthelmintics drugs and amoebicides

Sulfones

Hypnotics and sedatives

Seizure and anticonvulsant drugs

Narcotic analgesics

Non addictive analgesics and anti-inflammatory drugs

Corticosteroids

Thyroid hormones and antithyroid drugs

Parathyroid, vitamin D, and calcium metabolites

Vitamins

Posterior pituitary hormones

Antacids

Antidiarrheal drugs

Gout drugs

Local anesthetics

General anesthetics

Alcohol

Electrolytes

Neoplastic drugs

Poisoning and intoxications

Drug interactions

Dermatologic preparations



Eye and ENT preparations

Basics of prescription writing

6. Human Growth and Development 1

a. Description and Objectives

A lecture and discussion course designed to acquaint the students with the normal and abnormal development of humans as it relates to behavioral characteristics. The effect or consequences of congenital and environmental influences are studied as they relate to the pediatric patient, the adult, and the geriatric patient.

b. Content

Subjects covered during the course of instruction include:

Dimensions and disciplines of psychiatry

Physical growth and development

Personality deviations

Personality development - normal and abnormal

Neuroses

Mental retardation and cerebral palsy

Behavior disturbances related to physical disease

Motor function assessment of infants

Exogenous reactions

Deprivation, neglect, and abuse

Symptomatic psychoses

Affectur disorders

Introduction to geropsychiatry

Theories of aging



Age related changes in psychological capacities  
Schizophrenia  
Geriatric medicine  
Somatic therapies and geriatric psychopharmacology  
Geriatric neurology  
Geriatric nursing and rehabilitation  
Forensic psychiatry and mental status  
Psychodynamics of aging - basic concepts  
Work and retirement  
Psychiatric treatment: verbal and social  
Psychopathology of aging - depression and psychotic  
conditions  
Psychopharmacology: major tranquilizers  
Psychotherapeutic approaches with aged patients  
Family dynamics and conflict - family counseling  
Psychopharmacology: antidepressants  
Sociocultural determinants of mental illness in the aged  
Social attitudes toward aging and mental illness  
Ecology of senescence and principles of environmental planning  
Patterns of care for the aged and chronically ill  
Community psychiatric service concepts  
Social and psychiatric services available for Durham residents

7. Clinical Diagnosis I

a. Description and Objectives

A lecture-laboratory course that is the first portion of a two semester continuing course. The course structure integrates a basic understanding of laboratory aspects of technologic



procedures used in the evaluation of disease processes with an opportunity to develop skills in performing some technologic procedures. The scope of this course includes basic laboratory and surgical procedures.

b. Subjects covered in the lecture and laboratory portions of this course include:

- Types of laboratory equipment
- Collection of blood samples
- Hemoglobin and hematocrit evaluations
- Red blood cell counting
- White blood cell counting
- Staining and preparation of blood smears
- Leukocytic differential morphology
- Sickle cell preparations
- Bleeding and clotting times
- Nucleated red cell counts
- Reticulocyte counts
- Lupus preparations
- Erythrocyte sedimentation studies
- Gross and microscopic urinalyses
- Bacteriologic specimen collection
- Incubation and growth of bacteria
- Bacteriologic staining techniques
- ABO type and crossmatching
- Laboratory determination of Rh antibodies
- Preoperative and postoperative case procedures
- Suture materials, their indications and types



Surgical knots

Use, care, and nomenclature of surgical instruments

Airway devices

Respirators and their use

Oral and tracheal intubation techniques and care

Techniques of intravenous infusion

Venous cutdowns and catheterizations

Arterial punctures

Wound closure and management

8. Clinical Diagnosis 2

a. Description and Objectives

A lecture-laboratory course that is the sequential portion of Clinical Diagnosis 1. The scope of this course includes common surgical procedures as carried out on laboratory animals (dogs), clinical chemistry determinations, and the interpretation of electrocardiographic tracings.

b. Subjects covered in the lecture and laboratory portions of this course include:

Surgical repair of facial wounds

Thyroidectomies

Parathyroidectomies and their manifestations

Surgical management of abdominal problems

Gastrectomies and gastrostomies

Bowel resections and colostomies

Thoracotomies and thoracenteses

Partial lung resections



Traumatic surgery

Surgical care of compound fractures

Immunohematology and isoimmunization

Immunohematologic reactions

Coomb's testing

Blood urinary nitrogen determinations

Urobilinogen determination using urobilistix

Urinary calcium determination (Sulkovitch)

Cephalic flocculation

Serum enzymes, their indications and implications

Colorimetric techniques in enzyme studies

C-reactive protein and ASO determinations

Serum glucose determinations

Gastric analyses and acid determinations

Protein bound iodine studies

UCG and HCG pregnancy testing

ECG as a diagnostic aid

Function and operation of ECG machines

Standard, augmented, and ventricular leads

Depolarization sequences and vector formation

Vector principles and vectorcardiography

Vector plotting and assignments

Electrocardiographic abnormalities

ECG manifestation of pericarditis

ECG manifestation of myocardial infarction

ECG manifestation of digitalis

ECG manifestation of quinidine



Differentiation and determination of arrhythmias  
Artificial pacemakers, types, indications, and implantation  
Principles of defibrillation and cardioversion  
Cardiac resuscitation

9. Technological Evaluations 1

a. Description and Objectives

A lecture and discussion course, with additional field trips where applicable, structured to provide an understanding of the function and limitations of peripheral medical sciences used in the evaluation and determination of various medical and health problems. The course includes instruction in clinical radiology and basic concepts of epidemiology with emphasis on the basic elements and common clinical applications of these services.

b. Content

Subjects covered during the course of lectures and field observations include:

Introduction to radiology and radiologic terminology  
Radiographic contrast agents  
Radiation protection  
Topographic anatomy  
Osseous anatomy  
Fractures, trauma  
Radiologic anatomy of the kidney, ureter, bladder  
Intravenous pyleograms  
Radiologic evaluation of the gall bladder



Intravenous cholangiography

Radiologic evaluation of the esophagus

Principles of gastrointestinal fluoroscopy

Radiologic evaluation of the upper gastrointestinal tract

Radiologic evaluation of the colon

Basic epidemiology in regard to veterinary medicine and  
human health

Animal experimentation and its epidemiologic implications  
in human health

Introduction to zoonotic diseases and human health and the  
role of domestic, wild, and cold-blooded animals

Epidemiologic aspects of rabies

Epidemiologic control of rabies

Epidemiologic aspects of leptospirosis

Epidemiologic aspects of tuberculosis

Brucellosis

Environmental hygiene and epidemiology

Foods of animal origin and their hygiene

Epidemiology of salmonellosis

Epidemiology of trichinosis

Epidemiology of other food-borne diseases

Epidemiology of snakebites

Epidemiologic approaches to chronic non-infectious diseases

Population epidemiology and studies in reproductive biology

## 10. Technological Evaluation 2

### a. Description and Objectives

A lecture and discussion course structured to build on the



knowledge acquired in Technological Evaluations 1. During this sequential course the student continues his studies of the functions and limitations of peripheral medical sciences. The course includes further instruction in radiology and the application of epidemiologic principles in the field of cardiovascular, metabolic and malignant diseases. Also in this portion of the course the student is introduced to the basic elements and common applications of microbiology.

b. Content

Subjects covered in the lectures and discussions include:

Radiologic principles of nuclear medicine

Brain, lung and liver scanning

Radionuclide examinations

Malabsorption syndrome

Radiographic anatomy of the lung

Silhouette sign - segmental consolidation

Principles of roentgenologic chest examinations

Pitfalls and clues in roentgenologic chest examinations

Radiology of the heart and congestive heart failure

Miscellaneous roentgenologic lung lesions

Basic pediatric radiology

Correlation of brain scanning and cerebral angiography

Basic mammography

The natural history of stroke in the stroke belt of the  
United States

Transient Ischemic Attack: recognition, prognostic  
significance and possibility for treatment



Hypertension: clinical significance, etiology, early detection and prevention of secondary damage to the heart, brain and kidneys

Clinical significance, etiology, epidemiology and long term consequences of obesity

Treatment of obesity by caloric restriction

Ischemic Heart Disease, its natural history, predictors, risk factors and early detection

Bronchogenic cancer

Histology and epidemiology of breast cancer

Female genital cancer - causes and detection

Prostatic cancer and bladder cancer, their epidemiology and methods for early detection

Epidemiologic manifestations of leukemia, lymphoma, Hodgkin's disease

Epidemiologic manifestations of oral cancer, esophageal cancer, stomach cancer, colon cancer

Epidemiologic manifestations of thyroid cancer, pancreatic cancer, and hepatic cancers

Epidemiologic manifestations of childhood cancer

Basic principles of bacteriology

The general characteristics and classification of bacteria

Physiological and chemical characteristics as determinative procedures

Microscopic examination of bacteria

Preparation and inoculation of culture media

Effect of physical and chemical agents on bacteria



Yeast and molds

Food bacteriology

The micrococci

The streptococci

Diplococcus pneumoniae and the klebsiella group

Gram-negative cocci (genus neisseria)

The corynebacterium group

The mycobacteria

The pasteurella group

The hemophilus group

The coliform or colon-typhoid-dysentery group and intermediate forms

The anaerobic spore-formers (genus clostridium)

The actinomycetes

The spirochetes

The rickettsiae

The viruses

Bacteriophage

Pathogenic protozoa

Prevention and spread of communicable diseases

## 11. Clinical Medicine I

### a. Description and Objectives

A lecture-demonstration-discussion course providing a detailed study of the natural history of disease processes, aberration of normal physiology caused by disease, the means of recognizing these abnormalities, and the nonsurgical,



surgical, empirical and modern methods of restoring body function to normal or the closest compromise with normal.

The student learns about disorders associated with abnormalities of chromosomes, inborn errors of metabolism, viral, rickettsial, bacterial and mycobacterial infectious agents, and all other known or suspected etiologies. Students concentrate on those disease processes associated with skin, eyes, ears, nose, mouth, throat, neck and the respiratory and cardiovascular systems.

b. Content

Subjects covered during the lectures, demonstrations, and discussions include:

An introduction to clinical medicine

The anatomy and physiology of the skin

Principles of wound healing

Infections involving the skin

Evaluation, care, and treatment of burns

Inflammatory dermatoses

Malignant and premalignant lesions of the head and neck

Allergic reactions involving the skin

Connective tissue disorders and venereal disease

Dysfunction and repair of a cleft palate

The eye: basic anatomic and embryologic mechanisms

Embryology of the eye - orthoptic physiology

Optics - refraction, refractive errors

Diseases of the outer eye

Glaucoma

Diseases of the inner eye



Ocular manifestations of nervous and systemic disease  
Traumatic injuries to the eye and orbit  
Preventive ophthalmology  
Anatomy and physiology of the external and middle ear  
Mechanisms of sound perception and audiology  
The inner ear  
ENT emergencies  
Allergic and vasomotor conditions  
Nasal disorders and sinusitis  
Pharyngeal and laryngeal disorders  
Allergic diseases  
Skin testing for allergies and mycoses  
Diseases of the bronchopulmonary system  
Disease of the bronchus  
Pulmonary emphysema  
Pneumoconiosis  
Bronchopulmonary insufficiency  
Pneumonic processes  
Mediastinal diseases  
Diseases of the pleura  
Pulmonary emboli  
Bronchitis and bronchiectasis  
Clinical circulatory physiology  
Impulse initiation  
Function of the heart as a pump  
Peripheral circulation  
Autonomic aspects of cardiovascular function



Heart failure

Shock

Diagnostic techniques in circulatory disorders

Acute rheumatic fever - rheumatic heart disease

Coronary artery disease

Pericardial diseases

Congenital heart disease

Introduction of electrocardiography

Arrhythmias

Treatment of heart failure

Treatment of arrhythmias

Aortic aneurysms

Care of the infarct patient

Peripheral vascular disease

12. Clinical Medicine 2

a. Description and Objectives

A lecture-demonstration-discussion course developed as a continuation of Clinical Medicine I. In this sequential course the students receive detailed instruction in diseases associated with the endocrinologic, gastroenterologic, renal, reproductive, hematopoietic, neurologic, and musculoskeletal systems.

b. Content

Subjects covered during the lectures, demonstrations and discussions include:

Endocrine physiology

Pituitary disorders



Adrenal disorders  
Thyroid disorders  
Cushing's disease  
Addison's disease  
Gonadal diseases  
Diabetes  
Hypoglycemia  
Disorders of carbohydrate metabolism  
Fluid and electrolyte imbalance  
Esophageal diseases  
Hiatus hernia and esophagitis  
Gastric secretion  
Gastritis and pernicious anemia  
Peptic ulcer disease  
Zollinger-Ellison syndrome  
Enterohepatic circulation  
Hepatic secretion of bile  
Cholecystitis and cholelithiasis  
Gallstone formation  
Intestinal absorption and malabsorption  
Pancreatitis  
Pancreatic carcinoma  
Disorders of the small intestines  
Regional enteritis  
Ulcerative colitis  
Diverticulosis, neoplasm and vascular disease of the colon  
Hepatitis, cirrhosis and alcoholic liver



Normal renal physiology

Acute renal failure

Chronic renal insufficiency

Glomerulonephritis

Nephrotic syndrome

Hypertension

Hemodialysis and renal transplantation

Pyelonephritis

Obstructive uropathy

Diagnostic urology

Congenital anomalies of genitourinary system

Genitourinary tract infections

Urinary tract calculi

Urologic malignancies

Benign prostatic hypertrophy

Cancer of the prostate gland

Paraplegia and the neurogenic bladder

Anemias

Bleeding disorders

Leukemia

Bone marrow evaluations

The neurological examination

Multiple sclerosis

Amyotrophic lateral sclerosis

Myesthenia gravis

Cerebrovascular disease

Convulsive disorders



Parkinson's disease

Intracranial tumors and aneurysms

Disc disease

Cerebral trauma

Basic physiology of joint motions

Sprains, strains, and dislocations

Fracture classification

Principles of fracture treatment

Problems and complications of reduction

Traction

Internal fixation and its indications

Congenital orthopedic deformities

Hypopituitary dwarfism

Cretinism

Osteitis deformans

Senile osteoporosis

Bamberger-Marje disease

Sudeck's atrophy

Osteomyelitis and pyogenic arthritis

Affections of the neck, shoulder, jaw, spine and thorax

Affections of the low back and hip

Affections of the ankle, foot, and knee

Affections of the elbow, wrist, and hand

Inflammation and disease of connective tissue

Gout and arthritis

Problems of infection and contamination in bone and joint

injuries and abnormalities



13. Patient Evaluation 1

a. Description and Objectives

A lecture-seminar-discussion course with extensive clinical exposure developed to introduce the student to techniques used in eliciting patient histories and performing physical examinations. This portion of a two semester sequential course of instruction includes detailed instruction in the elicitation and proper recording of the chief complaint, history of present illness, systemic review, past medical history, social history and family history. Instruction includes both the traditional and problem-oriented approach of recording data from the patient interview.

b. Content

Subject covered during the lectures, and student presentations include:

Determination of the chief complaint

The etiology of symptomatology

Quantification and qualification of the chief complaint

Investigation of the present illness

Extent and quantification of the present illness

Affecting dietary influences

Affecting environmental influences

Affecting emotional influences

Affecting physical influences

Affecting chemical influences

Affecting therapeutic influences



Interrelationships of symptomatology

Alterations of symptomatology

Influences of disease processes on symptomatology

Relativity of pertinent negative symptomatology

Relationship of the systemic review to the present illness

Components of the systemic review

Information from positive and negative review findings

Integral questioning patterns

Symptomatology associated with the head

Symptomatology associated with the neck

Symptomatology associated with the eyes

Symptomatology associated with the ears

Symptomatology associated with the nose

Symptomatology associated with the mouth

Symptomatology associated with the throat

Symptomatology associated with the respiratory system

Symptomatology associated with the cardiovascular system

Symptomatology associated with the gastrointestinal system

Symptomatology associated with the genitourinary system

Symptomatology associated with the reproductive system

Symptomatology associated with the musculoskeletal system

Symptomatology associated with the neurological system

Symptomatology associated with the hematopoietic system

Symptomatology associated with the endocrinologic system

Indications for and influence of vital signs

Components of a comprehensive social history

Components of a comprehensive family history



Components of a comprehensive past medical history  
The interval history - its indications and limitations  
Oral presentation of the historical interview  
Written presentation of the historical interview  
Reliability of historical data  
Historical data and the comatose patient

14. Patient Evaluation 2

a. Description and Objectives

A lecture-seminar-discussion course with extensive clinical exposure developed to acquaint the student with techniques and procedures used in the physical examination of patients. Students are expected to integrate the physical findings with data collected in the historical interview in such a way that the supervising physician can determine the next appropriate diagnostic or therapeutic step. Successful completion of the course should include development of an ability to accurately detect and record all physical signs and findings, integrate these with historical data, and put in writing all historical and physical findings in such a way that when countersigned by the physician, they may be acceptable as part of the patient's permanent medical record.

b. Content

Subjects covered and skills acquired during the lecture, clinical exposure, and seminar presentations include:

Determination and description of the general physical status  
Determining and recording vital signs



Examination of the skin for pertinent findings

Complete examination of the head

Examination of the neck

Examination of the eyes (including fundusoscopic examination)

Elicitation of tonometric measurements

Determination of visual acuity

Determination of visual fields

Examination of the external ear and auditory canal

Examination of the tympanic membrane

Air and bone conduction auditory measurements

Examination of the nose, nasal septum, and turbinates

Examination of the mouth, teeth, gums, tonsils, and palate

Evaluation of cranial nerve function

Examination of the neck and thyroid gland

Examination of the chest and ribs

Tactile, percussive, and auscultatory examination of the  
lungs

Tactile, percussive, and auscultatory examination of the  
heart

Evaluation of peripheral arterial and venous pulses

Auscultatory, tactile, and percussive examination of the  
abdomen

Examination of the abdomen for organomegaly

Examination of the abdomen for direct, indirect, and  
rebound tenderness

Other abdominal physical findings

Examination of the rectum and anus



Examination for inguinal or femoral hernia  
Examination and evaluation of the prostate gland  
Examination and evaluation of the pelvis  
Musculoskeletal examination of the spine and extremities  
Examination of the nervous system

15. Medical Inpatient Service

a. Description and Objectives

An eight-week full-time clinical rotation where the student learns to apply his basic medical knowledge to the problems and situations encountered on a general medical inpatient service. During this course the student participates in all ward functions and clinical teaching services. He carries out initial patient evaluations, makes daily rounds, records patient progress notes, performs routine clinical laboratory examinations and follows the progress of patients through their diagnostic and therapeutic course until discharge. When the patient is ready for discharge, he compiles and records a narrative summary for inclusion in the patient's medical record.

b. Content

During this clinical course the student participates in:

Ward rounds and conferences

Clinical pathological conferences

Noon teaching conferences

Afternoon specialty conferences

Evaluation and reporting of patient's conditions



Diagnostic evaluation plans  
Therapeutic plans and regimen  
Progress of assigned patients  
Basic laboratory procedures  
Assigned clinical reading  
Proficiency at performing venopunctures  
Administration of intravenous infusions  
Nasogastric intubations  
Lumbar punctures (as available)  
Bone marrow biopsies (as available)  
Initial patient evaluations  
Narrative summary preparations

16. Medical Outpatient Service

a. Description and Objectives

An eight week full-time clinical rotation where the student learns to apply his basic medical knowledge to problems and situations encountered on an outpatient service. During this rotation the student is responsible for carrying out and recording initial patient histories and physical examinations and reviewing his findings with the resident in charge. He is also responsible for performing routine diagnostic laboratory studies and arranging for and tabulating the data for clinical chemistry and other diagnostic studies. During this rotation the student is provided with an opportunity to become acquainted with the etiologic and other influencing factors of common illnesses. In the evenings



the student participates in the care and treatment of emergency patients with his resident supervisor. He acquires a working knowledge of procedures required in life-threatening emergencies and learns to operate the equipment used in their treatment.

b. Content

During this clinical course the student participates in:

Routine patient evaluations

Routine blood counts

Administration of intravenous fluids

Treatment of the patient in acute shock

Treatment of the patient in status asthmaticus

Treatment of the patient in status epilepticus

Treatment of the patient in cardiac arrest

Treatment of the patient in pulmonary failure

Cardiopulmonary resuscitation

Blood gas collection and analysis

Blood cultures

Urinary catheterization

Intravenous cutdown and catheterization

Nasogastric intubation

Analysis of the comatose patient

Sterile technique

Suturing minor lacerations

Maintenance of the respiratory airway

Control of venous and arterial hemorrhage



Developing therapeutic plans for routine illnesses  
Patient triage

B. Relationship Of Course Content To Educational Objectives

When the Physician's Assistant Program was initiated in 1965, it was decided not to develop a task oriented training program, but, rather, to formulate a basic medical curriculum at the undergraduate level. Since the beginning the feeling has been that the physician's assistant should possess a broad understanding of theoretical and scientific concepts so that he could function effectively ten or twenty years later when current task oriented skills might be outmoded. Further, support of this reasoning was provided by practitioners whose techniques had changed with the times.

It was reasoned that in order for the physician's assistant to develop the necessary judgement used in the daily practice of medicine and to have the desired flexibility and mobility, he would have to possess a broad understanding of principles and human behavior.

On this assumption, the educational objectives were formulated and the curriculum content was developed. The curriculum has changed and the methods have improved due to advancing technology. Critical review of our objectives is undertaken annually in light of changing social demands and professional responses. This has resulted in modification of the curriculum.

C. Curricular Overlap With Other Health Programs

At the present time, little coordination of allied health and nursing education is evident. It can be anticipated that many changes will be forthcoming as Duke University studies more thoroughly



the duties of nurses and other health professionals. Currently, however, only nursing and medical technology are involved with a degree oriented program.

Although there is little in common between these two professions to result in curricular overlap, every effort has been made to explore mutual knowledge concepts so that all can benefit from the efficiency of coordinated teaching programs.

New emphasis in nursing education has brought an awakening of interest in the preparation of nursing students and graduates to assume greater clinical responsibilities. In an effort to provide the nursing student with increased skills in the area of patient evaluation, the School of Nursing is now offering a course in patient evaluation as an elective. This course (described above) is taught in conjunction with the Physician's Assistant Program.

Because a broad understanding of physical and biological chemistry is essential for many health professionals, the Physician's Assistant Program has sought and received cooperation from the medical technology faculty to teach it to the physician's assistant students. Due to the variation of the laboratory role of these two professionals, the laboratory portion of the course has been deleted from the physician's assistant curriculum, but the course content is otherwise essentially the same.

Where possible, coordinated teaching in areas of curricular overlap with the medical students has been pursued. A sharing of faculty for anatomy and clinical medicine has been utilized even though the two student bodies are taught separately because of the greater exploration of these topics undertaken by the medical



students.

D. Academic Relevancy

Application of theory to practice occurs at three phases. In the initial didactic phase of the program, the student is exposed to clinical situations of the type with which he will ultimately be involved. During the two courses in patient evaluation, the student examines his increasing theoretical knowledge in the light of practical problems. Finally he learns to apply the theoretical base of his educational experience with his encounter of practical problems.

The second point of theoretical application to practical situations occurs when the student moves exclusively into the clinical setting. It is at this point in his educational experience that he learns to apply his scientific knowledge in the evaluation of patient problems. In this phase where he is exposed to inpatients, outpatients, and emergency patients, he develops the ability to use his scientific knowledge to solve problems and to use the practical problems to challenge his scientific understanding. This integration of academia and practicum develops the necessary foundation for decision making.

The third point of theoretical application comes after the "core" portion of the program when the student moves into one of the more than twenty clinical specialty programs. In the final portion of his formal education, he learns to integrate his scientific knowledge and clinical skills and relate them to a specific clinical discipline.

E. Individualized Student Programs

Because the students have backgrounds in virtually every health



occupation, all possible latitude has been incorporated in the curriculum. For students with evident deficiencies, arrangements are made to provide supplemental instruction so that they can be overcome. For students who are experts in one or more courses, arrangements are made to have them provide tutorial assistance for deficient students and/or pursue extracurricular course studies.

A second opportunity for educational flexibility occurs after the completion of the core curriculum. Because the students have had several years of experience as health workers, they generally have their goals clearly in focus before beginning their course of instruction. To achieve the primary objectives of the program (creating professional assistants for the community based, primary care physician), the selection of candidates is made with this in mind. Due to the limited clinical facilities for training assistants of this type, other students are chosen to fill the slots in the specialty programs.



### III. ADMINISTRATION AND OPERATIONS

#### A. Faculty And Staff Qualifications

With the exception of occasional guest lecturers from other teaching institutions and the Durham community, all course instruction is provided by the faculty and staff of the Duke University School of Medicine and the Durham Veterans Administration Hospital. Instruction in the Physician's Assistant Program has been provided on a cooperative basis by all the clinical departments, hence, it is inappropriate to include individual names in this application. The names of cooperating faculty are published annually in the official Duke University Bulletin on the Physician's Assistant Program.

#### B. Faculty Requirements

Because of the cross-clinical complexity of the medical science curriculum, it would be impossible to provide depth and variation in the teaching services unless there were a broad spectrum of faculty support. Through organizational management, it has been possible to assemble a highly qualified faculty from existing personnel. Insofar as numerical requirements are concerned, however, the program is utilizing approximately four full-time equivalent faculty positions during this core phase of the curriculum.

#### C. Size And Growth Of The Program

In 1965, the program enrolled three students in its original class. Between 1965 and 1968 the class size grew to fifteen students. In 1969, forty students were enrolled, and the class size remained stable in 1970. Because of concomitant obligations of the Medical



School to educate an increased number of medical students, no change in size is anticipated in 1971.

Long range plans can envision a student enrollment of sixty students per class by 1972, after the new didactic teaching facilities are completed and when new clinical teaching services are available.

D. Required Physical Support

Classroom facilities for the forty students must be available in or near the medical center complex on a five day a week, full-time basis. Larger classes would require proportionately larger facilities.

Experience has shown that when more than five students (including medical students) are receiving instruction in a clinical ward of forty beds, the quality of the learning suffers. Physician's assistant students perform in much the same way as medical students, therefore the overall ratio of beds per student should not be less than 8:1 for the inpatient rotation. This is equivalent to fifty-four beds on an annual basis.

In the outpatient clinic, because of the volume of patients, numerical considerations are not relevant. In this setting, experience has shown that two new patients and six return patients on a daily basis is an ideal number. The limiting factors in the outpatient service are the availability of resident teaching time and facilities and equipment necessary for carrying out the patient interview and examination. Scheduling of these clinical services has presented no problem in the past since the facilities at Duke Hospital, the Durham and Oteen Veterans Hospitals, and the U.S. Public Health Service



Hospital at Baltimore can be utilized.

Laboratory facilities have been arranged through the central teaching laboratories and the research laboratories in the medical center. Students spend one afternoon a week in the laboratory setting for a total of 120 hours. Indications are that the scheduling of laboratory facilities would present no problem even with an enrollment of sixty students per class.

E. Type And Number Of Patients Required

During the didactic portion of the core curriculum the students' contact with patients is limited to the two courses in patient evaluation. During these two courses each student is assigned a patient to interview or examine once a week. During the student's weekly patient contact, he must have the opportunity of dealing with a coherent and rational patient for a period of about two hours. Although this might be done with outpatients, the student interviews and examinations are generally carried out in the early evening hours, making inpatients who are either recuperating or hospitalized with relatively minor conditions the most desirable.

The type and number of patients varies for the clinical portion of the program. For the two rotations that are part of the core curriculum, it is almost essential that the student be exposed to patients with a variety of problems (general medical patients) so that he can learn to react appropriately.

The number of patients must be calculated with reference to each type of clinical experience and has been included in the description of essential clinical facilities.



F. Methods Of Student Evaluation

Student progress is monitored with written, oral, and practical examinations. At the beginning of the program, students are pretested to determine their initial understanding of the content of each course. Periodic examinations, administered by the faculty, cover the material included in the lectures, demonstrations, and reading assignments. Final examinations are compared with the course pretests to ensure that each student has learned what he will need to know.

Student progress in the laboratory courses also is evaluated by written examinations covering the subject matter and, further, by practical examinations to ensure that each has mastered the skills he needs.

During the clinical aspect of the core curriculum, student progress is measured by attendance, written examinations on reading assignments, practical examinations for acquired skills, and oral questioning relative to assigned patients and problems encountered on daily rounds and teaching conferences. In the clinical setting, the student progress is also influenced by behavioral characteristics, including appearance, and the ability to relate effectively and compassionately with the patient.



#### IV. FISCAL ASPECTS OF THE PROGRAM

##### A. Budget

Support of the program in its developmental and early demonstration phases has been provided indirectly through the Medical School and directly through foundation grants. From 1965-1968 all the teaching was provided on a voluntary basis by members of the faculty and staff of the Medical School. Partial support for the administrative development was provided by the Josiah Macy, Jr., Foundation of New York, and the remainder of the support came from departmental funds. Some stipend money, from a grant by the National Heart Institute, was made available to assist in student support.

In 1969 and 1970, the program began to receive support from a five-year grant in the amount of \$100,000/year from the Carnegie and Commonwealth Foundations. Also, further annual funding of \$169,662 direct support and \$34,540 indirect support was granted by the North Carolina Regional Medical Program.

Other miscellaneous support brings the total annual budget to \$204,914 per year of direct support and \$34,540 per year of indirect support. This funding covers the cost of the program so that departmental funds are no longer required.

Money is needed for long-range support. Sizable portions of the annual budget will be supplied by the students in the form of tuition. At the present, tuition fees would bring \$180,000 annually to defray the expenses. Because future tuition rates are not known, and because percentage of return after the first four years has not been determined, it is impossible to calculate long-range support



from this source. Because the opportunities of reducing the costs of teaching through automated, self-instructional, achievement-oriented programs are only now being explored, and because the state of the economy precludes accurate forecasting, the long-range costs are impossible to determine. It is realized that support, exclusive of tuition, in the range of \$100,000 to \$200,000 annually will be required for the continued operation of the program.

Between tuition support and funding by the current granting agencies, the program is already fully funded for the next two years. In the event that sufficient funding is not available beyond 1975 the program would have to be cut in size or discontinued.