

DOCUMENT RESUME

ED 083 892

HE 004 637

AUTHOR Lave, Judith R.; And Others
TITLE Paramedics: A Survey of the Issues.
INSTITUTION Carnegie-Mellon Univ., Pittsburgh, Pa. Graduate
School of Industrial Administration.
SPONS AGENCY Department of Health, Education, and Welfare,
Washington., D.C. Office of the Secretary.
REPORT NO WP-24-70-1
PUB DATE Mar 71
NOTE 56p.; Revised study
EDRS PRICE MF-\$0.65 HC-\$3.29
DESCRIPTORS *Health Occupations; *Health Personnel; *Higher
Education; *Medical Services; *Paramedical
Occupations

ABSTRACT

This report examines some of the issues surrounding the use of paramedic personnel. Following background information, emphasis is placed on programs and demonstration projects, training programs, the potential role of paramedics, the potential functions of paramedics, quality of care, acceptance of paramedics by patients and other personnel, the economics of paramedics, productivity, reimbursement policies, education and career mobility, and legal issues. Each issue is discussed in relation to relevant literature. An extensive bibliography is included. (Author/MJM)

ED 083892

PERMISSION TO REPRODUCE THIS COPY-
RIGHTED MATERIAL HAS BEEN GRANTED BY

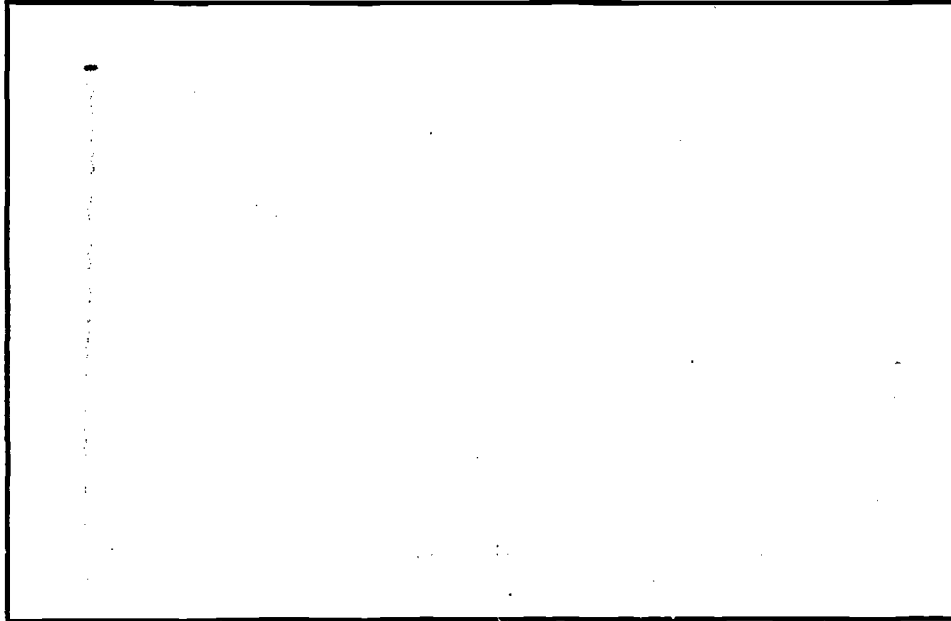
Justin B. Lane

TO ERIC AND ORGANIZATIONS OPERATING
UNDER AGREEMENTS WITH THE NATIONAL IN-
STITUTE OF EDUCATION. FURTHER REPRO-
DUCTION OUTSIDE THE ERIC SYSTEM RE-
QUIRES PERMISSION OF THE COPYRIGHT
OWNER.

U S DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRO-
DUCED EXACTLY AS RECEIVED FROM
THE PERSON OR ORGANIZATION ORIGIN-
ATING IT. POINTS OF VIEW OR OPINIONS
STATED DO NOT NECESSARILY REPRE-
SENT OFFICIAL NATIONAL INSTITUTE OF
EDUCATION POSITION OR POLICY.

HE

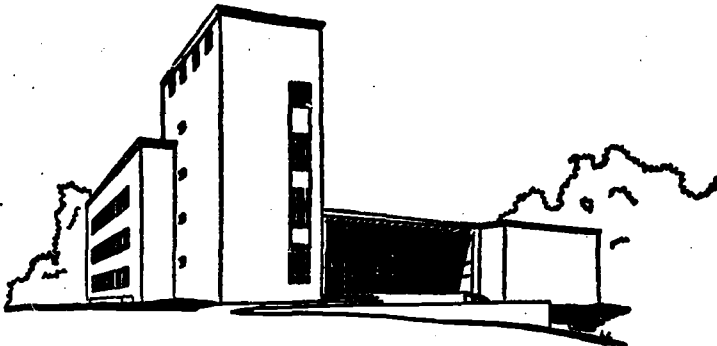


Carnegie-Mellon University

PITTSBURGH, PENNSYLVANIA 15213

GRADUATE SCHOOL OF INDUSTRIAL ADMINISTRATION

WILLIAM LARIMER MELLON, FOUNDER



HE 004 637

ERIC
Full Text Provided by ERIC

PARAMEDICS: A SURVEY OF THE ISSUES

Judith R. Lave, Lester B. Lave

and

Thomas E. Morton

September 1970

Revised March 1971

Preliminary Draft. Not to be quoted without permission of the authors.

This paper was financed by a contract with the Office of the Secretary, U.S. Department of Health, Education and Welfare and by PHS Grant # R01 HS 00069 HSR from the National Center for Health Services Research and Development. The views are those of the authors and do not necessarily represent those of the sponsoring agencies. We are indebted to the people at most of the projects described for their help and courtesy; we thank especially Dr. Genrose Copley, Michael Samuels, Dr. Henry Silver, Dr. David Waxman, and Dr. Alfred Yankauer.

PARAMEDICS: A SURVEY OF THE ISSUES

I.	Introduction	1
II.	Background	2
	Physician Shortage	2
	Introduction of the Paramedic	4
III.	Programs and Demonstration Projects	5
	Training Programs	6
	Demonstration Projects	9
IV.	Potential Role of Paramedics	9
	Potential Functions of Paramedics	12
	Quality of Care	16
V.	Acceptance of Paramedics	19
	Patient Acceptance	20
	Acceptance by Other Personnel	23
VI.	The Economics of Paramedics	24
	Productivity	24
	Reimbursement Policies	27
VII.	Education and Career Mobility	28
VIII.	Legal Issues	32
IX.	Summary and Conclusion	35

I. INTRODUCTION

The shortage, maldistribution, and inefficient use of physicians-- particularly primary physicians--has received much attention recently. Suggested solutions focus on either increasing the number of physicians or the efficiency with which primary medical care services are produced. The number of physicians can be increased by enlarging the class size in medical schools, establishing more medical schools, or shortening the training period. These relatively conservative solutions involve expanding the current system without making basic changes. Solutions which require basic changes in the way medical care is delivered include increasing the physician's efficiency through the use of assistants, analyzing and rearranging physician tasks, and changing his role as the primary person interacting with the patient.

This report concentrates on the second group of solutions, specifically on increasing physician efficiency through the development of the "paramedic"-- a health care worker who performs primary care tasks formerly reserved for the physician. Only health workers interacting with patients are considered, including nurses in expanded roles such as nurse-midwives and PNP's. (Considerable controversy surrounds the name for such a worker. We will always use the generic term paramedic; however, in citing specific studies or programs we will use the name assumed therein). Task analysis has shown that many of a physician's duties can successfully be delegated to a person with less training without significantly increasing either the risk of an unsatisfactory outcome or patient discomfort. The paramedic can release appreciable physician time, in some tasks almost on a one-to-one basis. Paramedics can also be used to: (a) increase the profitability of a practice, (b) reduce strain on other health workers, and (c) perform some important aspects of medical care which formerly were neglected.

The issues surrounding the use of paramedic personnel are complex and fundamental to the way medical care is to be delivered. There is disagreement about the name and definition of paramedic, the tasks they should perform, the amount of prior training and experience they require, the additional training they will need, their acceptance by both patients and other deliverers of health care, and their relationship to the physician. This report will explore each of these issues. For each issue, we raise the central problem and then discuss the literature which is relevant to it. While we try to clarify the implications of the various issues, this report will not attempt to reconcile all the controversies. It is important to note that published papers are basically supportive of the paramedic.

II. BACKGROUND

Physician shortage

Although researchers do not agree on the existence of a physician shortage, they generally concur that there is a maldistribution of physicians among the specialties and by location. There is a crisis in the availability of practitioners providing family care for many Americans. The introduction of the paramedic into American medicine is primarily a response to the perceived shortage of physicians and the lack of adequate family health care.

Morgan gives an interesting history of the physician shortage [1]. In 1910 the Flexner report, which "revolutionized" medical education in the United States, argued for high medical school accreditation standards and the elimination of "diploma mill" doctors. By 1930 high standards were generally enforced with a consequent increase in physician quality but a significant decrease in numbers of physicians graduated. Since then, new medical school graduates have barely kept constant the number of physicians per capita. However, higher incomes, changes in public attitudes, and increasing government involvement in health have vastly expanded the demand for medical services, a demand that has been only partly offset by the flow of foreign trained physicians to the

U.S. [2, Ch. 2 and 3].^{1/} Another cause of shortage of primary care physicians is the increasing number of physicians who are attracted into specialization. While the overall doctor-patient ratio has increased slightly from 149 to 156 per 100,000 from 1950 to 1966, the doctor-patient ratio of physicians providing family care (general practitioner, internist, and pediatrician) has decreased from 75 to 50 per 100,000 [2, p. 72].

Knowles [3] documents both the physician shortage and the maldistribution of physicians, and presents a good bibliography on the health manpower shortage issue. The Bane Report [4] and the first two volumes of the 1967 Report of the National Advisory Commission of Health Manpower [5] also document the shortage. According to Fein [2, Ch. 1] the shortage problem depends partly on definition but at current prices the demand for physician services exceeds the supply. He projects that from 1965 to 1975 demand will increase from 22 to 26 percent while the supply will increase only 13 percent, excluding foreign physicians who immigrate, or 19 percent including immigrants [2, Ch. 5].

If the market is the criterion, Hansen [6] disagrees with Fein, maintaining that no shortage exists and that physicians do not earn a high rate of return on their investment in medical education. Presumably, Hansen would argue that unless lower quality applicants were taken, the training period shortened, or other factors changed, increasing the supply of physicians would be difficult.

Ginzberg [7, 8] has argued most consistently against the existence of a physician shortage. He believes that the problem is "excess demand," not "deficient supply." Overdoctoring takes the form of unnecessary visits, unnecessary surgery, the fashionable annual physical, and certain types of well care. Much of this excess demand stems from physicians' advising their patients to seek additional services.

While arguing that there is no overall shortage, Ginsberg does indicate that physicians are badly distributed. However, his solution to the maldistribution problem is not to increase the supply of physicians, which would result only in more overdoctoring and higher health costs, but to increase the income of the poor, control drug abuse, and generally improve the basic health level of all people. He feels that medical services in the ghetto can be improved by upgrading the public health nurse and giving scholarships to medical students, conditional upon serving an internship in the ghetto. Whatever the general disagreements, it is evident that the delivery of medical care would be improved by a better distribution of physicians across geographic areas and specializations.

Introduction of the Paramedic

The development of paramedics is a partial solution to the perceived shortage of physicians and to the existing maldistribution of physicians, both by location and specialty. Where it is impossible to provide easy access to physicians, such as in rural areas, a paramedic can be trained to provide a high level of service, referring more difficult cases to his supervising physician.^{2/} Paramedics can be trained to assume many primary care tasks with a resulting improvement in some aspects of the quality of care, improvement in patient satisfaction, and more time for the specialist to perform the complex tasks that he was specifically trained to accomplish.

The paramedic concept is not new. In most European countries, including many with much lower infant mortality rates than our own, deliveries are usually performed by nurse-midwives, with an obstetrician on call for difficult deliveries [9]. The Soviet Union has a health service personnel category

called a "feldsher," as well as different classes of physicians [10]. Roughly an equal number of physicians and feldshers are graduated each year with two and one-half years of medical school for the feldsher and six for a physician. Feldshers act as physician assistants in urban areas, while in rural areas they are quite autonomous, treating most routine cases without referral [11, 12].

In the United States nurses and allied health personnel are already assuming many tasks once considered the sole province of the physician. As the skills and training of the physician (and his assistants) have improved, part of the physician's work (such as giving intravenous injections and taking blood) has been delegated. The public health nurse, medical corpsmen, and organizations such as the Frontier Nursing Service of Leslie County, Kentucky, are assuming the paramedic role when necessary. Hence while the paramedic concept is not new, the recent formalization of various training programs and the support given by organized medicine is new.

III. PROGRAMS AND DEMONSTRATION PROJECTS

Many programs to train nurses, corpsmen, and others as paramedics have been established. Kadish and Long [13] have reviewed these programs briefly, and the Professional Activities Branch of the Department of Health, Education and Welfare [14] has released a partial listing of such programs, including their stage of development, curriculum, certificate award, and program director. Ledney [9] lists the midwife training programs. Position statements containing guidelines for the definition and education of various kinds of paramedics have been issued by some of the national professional organizations including: the American Medical Association [15], the Board of

Medicine of the National Academy of Sciences [16], the Association of American Medical Colleges [17], the American Academy of Pediatrics [18] and the American Society of Internal Medicine [19]. Collins and Bonnyman [20] compare the types of programs offered with the recommendations of the various professional organizations.

The training period of most existing paramedic programs is either about four months or two to three years. The short-term programs take highly trained, experienced students and give them a new orientation, some didactic training, and new clinical skills. The short training period means that the corpsmen entering Medex or the nurse entering a nurse practitioner program must be initially highly qualified. The longer programs take applicants with much less training (two years of college "pre-med" or some practical experience as a corpsman or LPN) and give them roughly one year of didactics, one year of clinical training, and one year of internship.

Several paramedic training programs and demonstration projects are described below. These are characteristic of the range of programs and are the ones which have been the focus of the evaluations discussed in the rest of this report.

Training Programs

1. Duke University: Physician's Assistant Program [21].

Applicants should have a high school education including some science and three years of medical experience (medical corpsmen or licensed practical nurse). The course comprises nine months of didactic work followed by fifteen months of clinical practice. The student is trained to assist a particular physician and to carry out some of his more routine tasks as requested. He may be trained as either a generalist or a specialist. As of July 1, 1970, the program had 29 graduates, 13 involved in patient care and 16 involved in

both administration and patient care. Thirteen additional students were to graduate in September, 1970, nine of whom have accepted jobs involving patient care as their primary responsibility.^{3/}

2. University of Colorado: Child Health Associate [22].

Applicants, who must have two years of undergraduate work at an approved college, take a two-year course with the first year devoted to the basic sciences, and the second to clinical experience. After a B.S. is awarded, graduates must serve a year of internship. The associate is trained to treat almost all the problems of well children, as well as most mild disease states. Within established limits, the associate is qualified to diagnose, counsel, and prescribe. The first class will graduate in 1971.

3. University of Washington: Medex [23].

The program accepts only highly skilled, independent duty, ex-medical corpsmen for a three-month course of intensive training, followed by a one-year internship with the future employer. Employers are rural physicians who have agreed in advance to hire the Medex at \$8,000 to \$12,000 per year after the internship. During the 15 month program, the student is paid \$500 a month. The Medex is allowed to perform all physician functions, except those requiring a very high degree of skill. The first class graduated in August, 1970.^{4/}

4. Bowman Gray University: Physician's Assistant [24].

Applicants must have either two years of approved "pre-med" work or corpsmen experience. The 24-month program includes one year of didactic training and one of clinical experience. The first six months are part of a "core" curriculum, common to other allied health students. The program began in September, 1970.

5. University of Colorado: Pediatric Nurse Practitioner (PNP) [25].

Applicants must have B.S. degree in nursing. The course consists of four months

of intensive theory and practice in pediatrics with emphasis on nursing management of children and the nurse's role in community settings. Upon graduation, some PNP's have operated "solo" in field stations and in low income rural areas where they give total care to both well children and to approximately half the ill children; the remaining ill children are referred to a conventional clinic. Other PNP's work in private offices with pediatricians, giving almost complete well care and participating in the care of the sick child. As of April, 1970, 64 students have graduated from the program; forty-two are "practicing," four are teaching, three are in graduate school, and fifteen have become inactive.

While no formal study of training costs has been done, Dr. Henry Silver estimates that this program costs about \$4,000 per student. In addition to estimated training costs of \$1,000, students are paid a salary.^{5/}

6. Massachusetts General Hospital: Pediatric Nurse Practitioner [26]. Applicants must be registered nurses, currently working in either a private office or public clinic, with an employer interested in cooperating with the program. The course consists of didactic work one and one-half days a week for 16 weeks, while the applicant simultaneously receives on-the-job practice in the new techniques. In addition to assisting the physician, the PNP will assume most of the responsibility for well child care, as well as make house and hospital calls. As of June, 1970, 73 nurses have graduated from the course. Of the 35 nurses who had graduated by June, 1969, 25 or 72 percent, are functioning as nurse practitioners.

Dr. Alfred Yankauer estimated that the program's new tuition of \$800 probably does not cover the full cost of training.^{6/}

Demonstration Projects

1. Kansas University: Nurse Clinic [27].

This one-year project (1965) used a control and an experimental group to demonstrate that a public health nurse can be trained to act independently in the care of patients (especially children and old people) with certain kinds of chronic care needs.

2. Montefiore Hospital Medical Group [28, 29].

Dr. G. A. Silver and M. Seacat in a four-year demonstration study (1963-1967) using both control and experimental groups evaluated the effects of introducing a public health nurse into obstetric and pediatric practice in association with a physician. This study tried to establish the limits of her potential role.

3. New Mexico: Family Nurse Practitioner [30].

A nurse, the wife of a rancher, in an isolated area in New Mexico, was specially trained by several of the faculty at the University of New Mexico. She essentially operates a solo "field station" which is linked to the University by telephone; emergency cases are taken to the hospital by ambulance. Two days a week of physician supervision are planned for the clinic.

4. California: Nurse Midwives (1961-1962) [31].

Two nurse-midwives provided obstetrical care in a rural county in California. The supervising physician gave the first interview, but for routine cases the midwife handled the remainder of the visits, the delivery, and the postnatal discharge.

IV. POTENTIAL ROLE OF PARAMEDICS

Manpower for Training

Little work has been done on the cost of paramedic training. (Two PNP programs were estimated to cost about \$1,000 for four months training.) The

physician's assistant (PA) program at Duke University is estimated to require about the same resources per year to train a PA as to train a medical student [32, p. 51]. Since it takes from 5 to 7 years to train most physicians, one less physician must be trained for every three PAs trained.

This latter comparison makes it evident that, without an expansion of medical schools and faculties, it will be difficult to increase significantly the number of two-year programs. Even the PNP programs consume educational resources and so a major expansion of these programs would require some adjustment in medical schools and teaching hospitals. Over the next five to ten years, short term programs (particularly those taking registered nurses) can be the only important source of paramedics.

Discharged corpsmen are not an important source of candidates for these short programs. Some confusion exists about the potential supply of highly skilled medical corpsmen who are qualified for short programs such as Medex. Approximately 32,000 men with some medical care experience leave the service annually. (About 10,000 have enough primary care experience to make them potential candidates for two-year training programs, such as that at Duke University [32, p. 49]. A much smaller number have enough training and independent duty experience to qualify for Medex.)^{7/}

If one considers numbers alone, the registered nurse seems the only potential source for large numbers of paramedic personnel in the short run. The AMA has recently taken a strong position on expanding the nurse's duties [33, 34]. Dr. Ernest B. Howard, Executive Vice President, has stated "it is the conviction of many in the AMA that with only modest additional training, 100,000 nurses could become associated with physicians in such a way as to expand

markedly the physician's ability to serve his patients" [35]. The AMA statement also indicates that, since nurse practice acts are rather vague on the functions of an RN, licensure problems would be minimal.

The main objections to using nurses as paramedics have come from organized nursing associations such as the ANA which maintain: (1) the nursing shortage would be intensified, (2) legal difficulties might arise, and (3) the position of nursing as an independent profession would be endangered [36]. The ANA estimates that in 1968 there were 613,188 active nurses (of which 47,628 worked in private offices) and 285,791 inactive nurses [37, p. 11-16]. The upgrading of 100,000 nurses to paramedic status would seem to be too major a loss for nursing to absorb. However, Yankauer, a strong proponent of using nurses as paramedics, argues that many nurses have retired because of low pay and often tedious duties and that many would return if both pay and job interest were upgraded. (See for example [26, p. 878] and [38, p. 548-550].) However, little research has been done to determine how much higher salaries and changes in duties would effect a return to nursing careers. Additional arguments for using the nurse as the basic source for paramedics include: (1) there will never be a shortage of women entering the nursing profession and (2) the nurse is already an accepted member of the medical team and could move into the new role with comparatively little difficulty.

The proponents of longer programs which do not require applicants to have had nurse training argue: (1) nurses do not make good paramedics because nursing is hierarchical and is becoming more rigid and because women are not interested in professional careers; (2) longer training programs can be more innovative (by formulating an entire curriculum instead of a four month supplement); and (3) the potential supply of paramedics will be larger if

the program is two years instead of nurse training plus four months. Many of these arguments seem to stem from personal experience, rather than any systematic study. (See for example [32, p. 49] and [39].)

Registered nurses we would argue are the only important source of paramedics over the next five to ten years. As shown in the section below on acceptance of paramedics, careful evaluation of nurse paramedics suggests that they can provide a high level of medical care and be accepted by both physicians and patients. It is evident that nurse paramedic programs must receive major attention now, but the longer programs should not be allowed to lapse, since they hold the potential for a different type of paramedic drawn from a different manpower pool.

Potential Functions of Paramedics

Depending on the applicant's qualifications and the length of the training program, a paramedic can be trained to do virtually any tasks ranging from taking temperatures to performing thoracic surgery. The former could be done by almost anyone after five minutes training, while the latter would require a very special applicant and nine years of training beyond college (and be indistinguishable from a medical student). To specify the best training program and set of tasks, one must first know the capabilities of the student and the tasks the physician is willing to delegate. Since paramedics are a new personnel category and involve the medical and economic self-interests of the physician, little agreement exists on the exact tasks the paramedic should perform. Much more experience with paramedics of various training levels is needed to determine their best role. One beginning step would be to: (1) rank the individual tasks done by each type of physician

according to increasing difficulty in terms of judgment and technique and (2) assess how much judgment, physical skill, and independence can reasonably be expected from a nurse with four months of additional training or an ex-corpsman with two years of supplemental training.

The potential functions of paramedics are also partially dependent on which primary care tasks physicians are willing to delegate. Yankauer et al. [38, 40] determined the percentage of physicians willing to delegate specific tasks (Table I). Interestingly, the academic pediatricians believed more tasks could be delegated than did practicing physicians [40, p. 739]. In a survey of practicing Wisconsin physicians by Coye and Hansen, most physicians approved of an assistant's taking a medical history but were opposed to allowing the paramedic to give routine anesthetics, perform ordinary deliveries, or do portions of physical examinations [41]. Yet many medical educators regard taking a medical history as a task that demands the doctor's judgment; the latter tasks are more routine, although each has more potential danger and requires more technical training.

With regard to the paramedic's level of independence and authority, there is much more disagreement. The physician's assistants at Duke University and the pediatric nurse practitioners at the Massachusetts General program, for example, are trained to assume "dependent" roles as physician's assistants who carry out assigned tasks. The pediatric nurse practitioners at the University of Colorado and the child health associates at the University of Colorado are trained to be more independent (but not independent in the manner of a chiropractor).

Physicians oppose the autonomous paramedic for a host of reasons which are a mixture of professional concern and economic self-interest. (Coye and Hansen find that no anesthesiologists believe assistants

TABLE I: CURRENT OFFICE PATIENT CARE TASKS

	Percent Pediatricians Delegating Task	Percent Pediatricians Favoring Delegation*
Information/Children	29	92
Information/Immunization	43	90
Interpret Instruction	31	85
Telephone/Childcare	47	78
Family Social History	42	75
Interval History/Well Child	18	65
Past Medical History	32	63
Advice/Feeding-Development	22	62
Telephone/Minor Medical Advice	53	59
Advice/Minor Medical	32	52
Interval/History Sick Child	15	45
Advice/School Child	9	40
Present Illness History	25	39
Exam/Well Child	9	25
Exam/Sick Child	12	19

*These are approximate figures derived from a bar chart

Source: Yankauer, et. al. [38, p. 540].

should give anesthetics, and only two percent of obstetricians believe assistants should deliver babies.) Yet eight percent of physicians as a group would delegate anesthesia, and twelve percent would delegate an uncomplicated delivery [41, p. 531]. It is certainly no accident that most "autonomous" paramedics find service in rural and ghetto areas.

The willingness of physicians to delegate tasks to a paramedic is surely a complicated function of legal liability, peer group pressure, patient attitudes, expectation of the quality of care delivered by the paramedic, and the number of hours in the physician's work week. While some office nurses and public health nurses have assumed many primary care tasks, few physicians have hired and trained nurses for these tasks. Their failure to do so probably reflects fear of malpractice suits, the fact that physicians have little training in delegation, fear that the paramedic won't give high quality care, and other such factors, rather than an unwillingness to delegate taking histories, giving shots, and checking on a patient's progress. (This is partly borne out by the report that physicians who have worked with paramedics in demonstration projects have grown more willing to delegate tasks, even if they were initially hostile to the paramedic concept. See for example [28, p. 1099].)

It is an important economic insight that various medical inputs -- the nurse, the aide, the physician -- can all be combined in different ways to restore health. For example, a routine physical examination can be performed solely by a physician, by a nurse-physician combination where the history, weight, height and temperature are taken by the nurse, or by a physician-nurse-technician combination where the assistants perform a number of tests and the role of the physician is restricted to the interpretation of the tests. These different ways of delivering the same service can be designed to provide medical care of a similar quality but with vastly different implications for cost and utilization of scarce resources such as physician time. We

believe that the current interest in paramedics should be justified by their potential to produce medical care in many different ways potentially saving much physician time and increasing the efficiency of producing medical services.

Medicine is unique among manufacturing and service industries in the United States in that there is no gradation of skill and training levels. The physician has at least 21 years of education, and generally 24 or more. In an office setting, the next highest educational level is usually his secretary with perhaps 12 years of training and occasionally a nurse with 15 years of education. Even in an institutional setting, the next highest level of training is 15 or 16 years. There is no reason to believe that all of the 24 years of training are necessary for most of the tasks performed by the physician.

Improvements in medical care delivery have been impeded in that many innovations are slow to be adopted since physicians do not have the time to search for them or to train new personnel to apply them. Increasing the number of paramedics and other assistants would result in people with more diverse kinds and levels of training; it would permit innovations to be adopted more rapidly and rationally. These paramedics could also do a more thorough job in counseling, health education, and various preventive health measures.

Quality of Care

In discussing how the introduction of the paramedic will affect the quality of care, one might distinguish three dimensions of quality: the social and psychological aspects of care; the medical efficacy of the care; and quality of care as perceived by the patient.

Medical care involves a great deal more than surgical repair or the diagnosis and treatment of an acute condition. Most medical care is palliative and affects neither the severity nor the duration of the disease. Patients must be informed about the nature of their illness and helped to adjust to chronic illness and recover from surgery. Paramedics who have special training or additional time for the patient can perform many of these tasks better than a physician. Delegation of these tasks can improve the quality of care, increase patient satisfaction, and free the physician to perform more complicated tasks.

In evaluating medical efficacy, one must look at care under real, rather than ideal, conditions. While a board certified pediatrician doing a workup on a well baby in a teaching hospital can do a much better and more thorough job than a paramedic, the relevant comparison is whether the pediatrician in his office does a better and more thorough job.

Virtually all reported experience with paramedics is with specially trained nurses. Thus, it is difficult to distinguish good paramedic care from good nursing care. It is possible that what the patients really need is good nursing care, a service neither physicians nor paramedics (except those with good nursing backgrounds) are prepared to deliver. This objection cannot be answered without more evaluations of the non-nurse paramedic.

The evidence suggests that quality of care need not decline if paramedics are introduced. The paramedic is trained to be cautious. Lewis et al. [42] compared the outcome of care for chronic patients provided at a nurse clinic with that provided at a regular medical clinic. Most chronic patients treated by the nurse clinicians reported a significant reduction of discomfort and many

were able to return to work or find employment. Some patients in the control clinics left jobs and most experienced no change in discomfort, as expressed by frequency of complaints. The authors argue that differences in outcome were "related not to the patients selected for the study or to the abilities of the practitioners caring for them but to the different processes of care emphasized by physicians and nurses" [42, p. 648].

Duncan et al. [43] reviewed 182 charts of children seen first by a pediatric nurse and subsequently by a pediatrician. The pediatrician observed a total of 278 conditions, of which 239 were in total agreement with the findings of the PNP. Of the 39 differences in assessment, 37 were judged not significant. (Usually the PNP assessed more conservatively. For example, she felt tympanic membranes sufficiently infected for referral, an incorrect judgment according to the physician.) In one case of significant difference the PNP believed an erythema of the throat to be the primary site of the child's illness and thought the child ill enough to be seen immediately by the physician; the physician diagnosed pneumonia. In the other case, the PNP evaluated a boy with a fever and erythema of the throat. She did not feel the child was ill enough for immediate referral and suggested he return the next day. During the night the child developed acute symptoms and was seen by a physician, who incorrectly diagnosed meningitis. (The researchers expressed doubt that the findings of two physicians would be as close.)

These results indicate that the quality of medical care need not be impaired when a paramedic assumes the primary care role. Each paramedic is trained to refer the patient to a physician when there is any doubt. Indeed, as evidenced below in the section on patient acceptance, paramedics may actually provide better quality care than physicians since: (1) they can

spend more time with the patient and so can more fully explore possible medical difficulties and (2) they often provide a more relaxed atmosphere in which the patient feels free to ask additional questions about health matters.

The paramedic might engender a slightly increased probability of an incorrect assessment or incorrect suggested treatment when compared to a physician. The risk, however, is small enough that no one, for example, would seriously advocate forbidding registered nurses to give shots or perform other routine tasks. A board certified pediatrician who spent the same amount of time with each child as the paramedic will probably make fewer assessment and treatment errors. However, the difference in quality of care is likely to be small and, in practice, the pediatrician spends much less time with the child. The question then becomes whether we are willing to tolerate the slight potential increase in risk with using a paramedic for the potential gain in health care delivery.

Thus, the answer to the question of "what tasks might be delegated to the paramedic?" is all those tasks that the paramedic can perform with essentially the same risk level as a physician.

V. ACCEPTANCE OF PARAMEDICS

There is now general acceptance of paramedics in a dependent role in organized medicine. The AMA [15] and the American Academy of Pediatrics [18] have endorsed such roles strongly. There is much more hesitation in accepting the independent paramedic.

A major conflict centers around nurse-midwives. The American College of Obstetricians and Gynecologists has refused to take a stand. There is ample evidence that a well trained nurse-midwife can handle most deliveries [10, 31, 44], yet many states bar them.

Physicians who have worked with paramedics are reported to be favorable in their attitudes [23, 25]. Even physicians who were initially suspicious accepted the paramedics [29, 42]. However, Resnick [45] reports that some physicians expressed hostility to the nurse practitioner, claiming that she was practicing medicine illegally. Other physicians are reported to oppose the concept [46, 47]. Much of the controversy centers around the quality of care issue. Since some physicians assume that the paramedics provide medicine of low quality, they oppose the introduction of a second class medical system. Rather than continue to review these fears, we point out the evidence on the quality of care in the previous section and the evidence on patient acceptance in the following section. We would also point out that general acceptance will depend partly on one's philosophy towards medical care. Stead has succinctly put the point this way [39, p. 207]:

We do have a difference in point of view between those people who believe the past can be recreated and shored up by tinkering with it here or there, and those individuals who believe that a new era is beginning, that an old era is ended and that not too much time should be spent in tinkering with it or shoring up the past. It seems clear to me that one era is ended and that another has begun.

Patient Acceptance

For the paramedic to make an important contribution to health services, he must be accepted by the patient. Patients who refuse to see paramedics and seek care elsewhere may force physicians to abandon the use of paramedics.

Methods for evaluating patient acceptance have been built into all demonstration projects, and in each case the level of patient acceptance has been high. During the Kansas Demonstration Project, many chronically ill patients preferred the nurse practitioner, because she gave them more individual attention and psychological support [42, p. 1238]. Plans to study the characteristics of patients asking to leave the nurses' clinic had to be dropped, since only 3 out of 33 patients transferred [42, p. 1238]. In the Montefiore project, Ford, Seacat and Silver report less than twenty percent of the patients responded negatively to the nurse practitioner [28, p. 1102]. For both obstetrical care and pediatric services, most patients preferred to see both the nurse practitioner and the physician [28, p. 1102-1103].

Day, Egli, and Silver [48] reported similar acceptance for Colorado Pediatric Nurse Practitioners utilized in private practice. One group of "old patients" received care both before and after the PNP's arrival; the "new patients" received care only after the PNP's arrival (which meant spending less time per visit with the pediatrician). About 92 percent of all patients reported no significant interference with their ability to communicate satisfactorily with the physician. A full 52 percent of new patients, and 22 percent of old patients actually felt that their ability to communicate with a physician had improved. Ninety-five percent of the mothers were satisfied with their contact with the PNP [48, p. 206].

Several considerations are crucial in assessing and facilitating patient acceptance, including many subjective factors which are hard to analyze. Since the paramedic earns a much lower salary than a physician, he can lower the cost of medical care by assuming some of the tasks usually done by a physician

at a higher cost. Such savings, if passed on to the patient, may facilitate patient acceptance. Skinner [49], for example, offered his patients the option of seeing his nurse practitioner (for well child care) at a fee lower than he charged for his own time. He reports that many patients accepted the option of lower cost care and were satisfied with the nurse. The failure of other physicians to price a paramedic visit lower than their own visits may lead some patients to feel exploited, by being seen by the "doctor's assistant." Similarly, indigent people who never pay fees may be sensitive to any apparent degradation in being sent to the "doctor's assistant."

In a detailed study, Pondy et al. [50] used questionnaire techniques to assess patient attitude toward Duke University physician's assistants in four different settings: two ophthalmology clinics, an allergy clinic, and a community general practice clinic. Using regression techniques, they analyzed the relationship between patient acceptance and patient socio-economic characteristics. The results indicated that the higher the patient's education level, the greater was his acceptance of the PA. Patient acceptance of the PA was highest in the small community clinic (unfortunately, there were no controls for what the PA did in the different settings). The authors speculated that patients with more education could more quickly grasp the potential of PA's for the efficiency of the health system as a whole. Not surprisingly, patients with low incomes had low acceptance, since they felt they were receiving lower quality care because they were poor; acceptance by the rich was also low because they felt they were paying for the "best."

The relatively unenthusiastic reaction of the poor to paramedics may have implications for patient acceptance of such personnel in poverty areas. The enthusiastic support of physicians and an explanation of the paramedic's role are crucial.

The School of Health of the Oklahoma Medical School and the College of Business Administration at Oklahoma State University are jointly developing a demonstration project to assess the effectiveness of former military independent-duty medical technicians. After a training period of six months, the technician will help provide primary health care in doctorless rural areas in Oklahoma. In several studies of potential patient acceptance of these technicians, results indicate that the residents of the study communities would use the paramedic 75 percent of the time and would go to existing physician resource in other towns for the remaining 25 percent of their visits [51, 52]. Distance from a physician was the most important variable affecting acceptance [52, p.2]. Socio-economic variables were not significant although there was some tendency for acceptance to increase with income and education and to decrease with age. (Price was not used as an independent variable.)

Acceptance by Other Personnel

No formal studies have been done on the acceptance of the paramedic by other health personnel, nor on the importance of such acceptance. Personnel in large institutions have expressed a somewhat ambivalent attitude toward paramedics. While they accept the paramedic, at least in theory, it appears crucial that a physician be actively "in charge," that is, be responsible for, accessible to, and supportive of the paramedics.

There is also evidence that nurses will resist the interposition of this new role between them and the physician. As already discussed, the ANA has been critical of turning nurses into nurse practitioners. As part of the pediatric nurse practitioner (PNP) program at Massachusetts General Hospital [26], the PNP is being prepared for such problems, with much

time being spent discussing the conflicts of role orientation. Program personnel also visit the office where the PNP will practice to explain the new role to office employees. Resnik, reporting anecdotes about the nurse clinician program at Kansas, noted that she had some difficulties obtaining services from social workers [45, p. 7].

Persons trained specifically as physician's assistants might be expected to have less trouble in this area than nurses who have been retrained. Breyspraak and Pondy [53] evaluated eight graduates of the Duke University program, but it is difficult to generalize the results.

It seems reasonable to conclude that acceptance by other health workers will be a difficult problem for the paramedic, at least initially. When the paramedic's role is better understood and more widely accepted, these problems should disappear. Such acceptance is important enough however, that efforts should be made to isolate the crucial variables and speed the process of acceptance.

VI. THE ECONOMICS OF PARAMEDICS

Productivity

An implicit assumption behind the concept of the paramedic is that he is an economically viable worker and that his introduction into the health team will lead to an increase in the efficiency with which primary care is delivered. Since this is the critical assumption behind the support for paramedics, (and also one critical to their employment by physicians) we now discuss some of the studies that bear on this subject.

Task analysis of physician activities, (the best studies are those of pediatric practice) indicate that some physician duties may be assumed by non-physicians with appropriate training. Yankauer, et al. [38, p. 524] and Bergman et al.

[54] determined, for example, that the average pediatrician spends about 50 percent of his time on well baby care and 30 percent treating minor illnesses -- tasks appropriate to paramedics. (A study by Anderson et al. of pediatric practice in a small North Carolina town concluded that in rural settings less time was spent on well baby cases [55].) Silver argues that three pediatric nurse practitioners can replace roughly the time of one pediatrician [56, p. 3]. This estimate reflects a particular distribution of services rendered by the pediatrician and may not include the time a pediatrician must spend supervising. Robert Howard states that physicians using a Duke trained physician's assistant estimate that they have been able to increase their patient output from 30 to 100 percent [57, p. 415].

Some of these estimates have been verified in practice. For example, in a study in a health station in a low income housing project when the PNP operated "solo" (a physician came in half a day a week), Silver found that 70 percent of the patients could be completely cared for by the paramedic, and another 11 percent could be cared for after telephone consultation with a physician [22, p. 173].

Schiff et. al. [58] studied the productivity of a PNP trained in the University of Colorado program. In a private office manned initially by two pediatricians who both had full patient loads, the total number of patients seen increased by 18 percent after the PNP was hired [p. 65]. (The study did not indicate whether the PNP was fully occupied and if the pediatricians worked the same hours.) Although the PNP was paid \$7,600 (about 37 percent higher than an ordinary R.N.), essentially no increase in office overhead occurred and total office income increased by \$17,000 [p. 66]. A time analysis showed that on a well child work up, physician time was reduced from about 14 to 4 minutes [p. 66]. The PNP took about 30 minutes per well child work up. The replacement of 10 minutes of physician time by 30 minutes of PNP time agrees

well with the overall increase of 36 percent for one physician or 18 percent for two physicians. Since most patients felt their overall care improved, these statistics may represent a decided underestimation of the value of the PNP.

The introduction of the paramedic into the medical team will not necessarily increase the number of patients treated. Physicians, for example, could spend an inordinate amount of time in supervision. Physicians have little training in delegation, and it is unclear how many paramedics can be supervised effectively by one physician. Second, if the physician is very busy, he may choose to keep his case load constant and decrease the number of hours he practices. In this case his money income will decrease, but his satisfaction may increase since he will have more leisure. If the physician's case load is kept constant, the number of medical services provided in the community will not increase in the short run. (The time the physician spends with each case may affect quality however.) In the long run, services may increase since certain types of practice may become relatively more attractive.

The only data we have where a physician has kept his case load level is from an unpublished study of a general practitioner who hired a physician's assistant trained at Duke University. Before he hired the assistant, he saw an average of 219 patients per week and spent an average of 9.85 minutes per visit. During the two months after hiring the assistant, he saw 214 patients per week and spent 5.6 minutes per patient; the assistant spent 5.8 minutes per patient and saved the doctor about 43 percent of his time. In the same number of office contact hours per week (36), the doctor could potentially have treated 76 percent more patients. Since he did not, his income has suffered, but his office practice is more attractive and he has more free time.^{8/}

During the Kansas Nurse Clinic demonstration [27, 57] in which nurse practitioners treated chronic patients, the overall costs of providing care were reduced in an interesting way. Patients in the experimental group who saw the

nurse practitioner were allowed 30-minute visits at about twice the frequency of control patients who had 15-minute physician visits. Since the nurse practitioner costs about 3/8 of the physician cost of outpatient care rose about 70 percent. However, the increased care enabled the experimental group to reduce patient days spent in the hospital by one-third. Since hospitalization formed the bulk of total costs for these chronic patients, overall costs for the control group were reduced from \$127 to \$99 per patient per year -- a reduction of more than 20 percent [27, p. 1239].

The productivity of the paramedic will vary according to the setting in which he is employed. In a large institution or group practice the paramedic can often be employed full time, since he can play a specialized role and capitalize on his training and qualifications. The employment of paramedics may also lead to a lower employment of physicians in institutions. In private practice the opportunities for a paramedic to perform the tasks for which he was trained may be more limited. Some evidence on the placement of paramedics comes from the data on the physician's assistant trained at Duke University. Of the 22 physician's assistants who are involved in patient care, the majority have been hired by large organizations. Specifically, eight are working for physicians in solo practice, three for physicians in group practice, and eleven are working in institutional settings, such as hospitals or prisons.^{9/}

Reimbursement Policies

Little research has been done on how the paramedic should be reimbursed and on what basis patients should pay for his services. The AMA has strongly endorsed a fee for service concept. Both Skinner [49] and the pediatricians reported in the Schiff [58] study paid their PNP's a salary but charged the PNP patients on a fee for service basis.

A more critical problem arises when third parties are introduced. The reimbursement policies can hinder the paramedic's productivity or perhaps even prohibit his introduction. Will Medicaid, Blue Shield, Blue Cross, or Medicare pay for a visit in which the patient sees only a paramedic? In the Kansas program, Medicare would not reimburse the hospital unless the patient was seen by a physician, and Blue Shield, to date, will not pay for obstetrical care by a midwife. We presume, however, that payment would be made if a physician "saw" the patient during each visit and signed the chart.

While these rules are laudable attempts to police the system and keep patients away from quacks, they have reduced the efficiency and productivity of paramedics. (Hershey argues that legal recognition must be given to the paramedic before these reimbursement problems can be solved [60].) For example, the Kansas experience indicated that a nurse practitioner and patient often had to prolong a visit for 15 to 20 minutes until a physician could see the patient and sign the chart.^{10/}

VII. EDUCATION AND CAREER MOBILITY

The whole health manpower educational system must be restructured to allow health personnel to increase more rapidly than in the past. In this extremely complex issue, both formal education and on-the-job training must be considered together with those for doctors and other allied health personnel. Because of the complexity of the subject and the need for much more research and experimentation, we shall merely sketch the broad outlines of the paramedic issue. (For a more complete discussion of directions in medical education see [61, 62, 63, 64, 65, 39].)

Long range revamping of medical education will have two major advantages. First, it will enable a more economical use of existing teachers and medical education facilities, since in the short to medium range it is difficult to

materially affect the supply of these resources. Second, long range revamping might make health careers more attractive to potential entrants by reducing the costs of education (where feasible), of transferring to a related health career, and of keeping up-to-date in a rapidly changing field. Revamping the system will produce educational efficiency and career mobility.^{11/} (These terms are used for convenience, although they do not capture the full scope of the issues. For example, greater career mobility not only encourages new entrants, but also increases the substitutibility of supervisory personnel in the short run, thus directly increasing the productivity of a given system.)

In current educational practice in the health professions, the training for each health specialty is completely separate. Especially in introductory courses, medical students, nurse trainees, and pediatrical assistant trainees may all take similar, but separate, courses. Child behavior courses, for example, are taught by different instructors with different emphases. Since such classes could profitably be larger, there is a direct economic incentive for schools to design common courses wherever feasible. The greatest impediment to such changes is the historic semi-autonomy of each specialty.

Career mobility has a four main dimensions: vertical, horizontal, geographic, and time. Vertical mobility refers to the ease with which a person can use and augment his knowledge and training to qualify for a "higher" level profession. (In the U.S.S.R. a chief attraction of becoming a feldsher is the increased accessibility to medical school training [11, 12].) Horizontal mobility refers to the ease with which a person may add to his training by changing to a similar health profession at the same level, as in switching from an obstetric to a pediatric assistant. Horizontal mobility also refers to the flexibility in functions which can be built into a profession so that underutilized assistants in one function can fill vacancies in other functions. Geographic mobility

refers to the ease with which a professional may find similar employment in various areas of the country, while time mobility refers to the ease with which he can keep up with technological changes in his speciality. Both geographic and time mobility are closely related to the issue of broadly based general education-versus-specific apprentice training. The current tendency for the Registered Nurse to take a four-year B.S. degree from a university rather than the older three-year, hospital-based certificate has ensured the nurse much greater mobility at the cost of an extra year of education and initial on-the-job training. Any change in the educational system inevitably produces changes in the training of health personnel assigned to certain specific tasks. This, of course, raises the issue of measuring how the quality of care is affected. The quality of care administered by paramedics has already been discussed, but in revamping medical education all allied health personnel must be considered simultaneously.

Perry argues that the whole health field must be subjected to detailed "task analysis," such as has been done extensively in pediatrics [65, p. 110]. To be effective, task analysis should precede any major restructuring of curricula and requirements.

Light [66, p. 79] joins the argument for task analysis, listing it as a prerequisite for the following activities: (1) identifying which components should be taught in the classroom and which on the job; (2) identifying and assigning competency levels for performance; (3) determining which functions can be assigned to a person of given competency; (4) developing more equitable pay schedules; (5) documenting methods for educational equivalency credits; (6) clarifying teaching-learning objectives; and (7) reassessing duties and responsibilities of the specialist in the field.

The task analysis methods used by industrial engineers in private industry are necessarily slow and cannot be easily implemented in the health field, where

the "output," patient health is difficult to measure. To be effective, such studies must cross professional lines and obtain the full cooperation of the various professional societies such as the AMA. (As noted above, the AMA has issued guidelines for developing new health occupations which seem to strongly support these goals [15] although practical support is more difficult to assess.)

A second prerequisite for developing major curricula changes are university-associated test clinics where the performance of new types of personnel can be evaluated. Current clinics are not adequate for this purpose since the emphasis must be on testing rather than training; these two functions are probably disparate enough to require separation.

Detailed task analysis and adequate "test laboratories" may provide the tools with which educators and practitioners together may solve the medical education problem. The general outline of this revision will probably be based on the "core curriculum" concept by which standardized courses are taken by all personnel. Such standardization enables personnel to use previous training and experience as a basis for upgrading their skills. Thus, certain aspects of the first year or two of the curriculum would be common to medical students, nurses, and paramedics.

The core curriculum concept has several important advantages. First, the concept of the medical team for both community programs and private group practice is becoming increasingly popular. But it is often difficult to obtain smooth cooperation from team members who are unaware of each other's full function. Duncan and Kemp [61, p. 501] point out that a common initial curriculum, together with seminars on the team process should facilitate this development. Katherine Anderson [24], emphasizes that a core curriculum is planned for the physician's assistant program at Bowman Gray.

Considerable evidence indicates that the most serious obstacle to increasing total health care in the short to middle run is the lack of educational facilities. While Morgan [1] and others have suggested shortening medical school requirements, another solution would seem to be the rapid creation of new medical schools. Because such expansion is extremely difficult, as Estes [67, p. 959] has pointed out, existing facilities must be used as efficiently as possible. The core concept, with its economies of standardization, is one means of increasing efficiency.

A third advantage of the core concept lies in the increased career mobility it affords the allied health worker. Currently a nurse wishing to become a physician can carry very few of her previous courses into the medical school program even if the material is quite similar. To facilitate career mobility, considerable pressure is being applied to establish equivalency examinations whereby practical experience can be substituted for formal training. (For further discussion on allied health manpower see [68, 69, 70, 71].)

A core curriculum, and the career mobility it offers, will perhaps have a greater effect on physician's assistants than on nurse practitioners. With approximately four months of training, the nurse can become a paramedic, a role offering higher pay and more clinical responsibility. However, what kind of advancement is possible for the type of physician's assistant produced by Duke University? Will the student gain any credit towards becoming a physician? Will lack of advancement and the possibility of always being "only an assistant" deter qualified applicants? The core curriculum idea could enable the paramedic to become a physician in less time than the student entering medical school.

VIII. LEGAL ISSUES

A good introduction to legal issues is found in [72], a conference to draft model legislation for physician's assistants. All states can prosecute anyone

practicing medicine (diagnosing, treating, performing surgery, or prescribing) without a license. According to the court's clarification of such state laws, most tasks being considered for paramedics would constitute the illegal practice of medicine. For example, some states have explicitly outlawed nurse-midwifery. Legislation was not enacted to outlaw paramedics; rather it stems from an earlier period when the principal concern was protecting the public from quacks. The legislature, if supported by organized medicine, would be open to revising the laws.

Hershey [73, p. 72] believes that in most serious malpractice litigation, the unlicensed therapist is treated as a layman and, thus, automatically considered negligent. Many current practices could be questioned under this interpretation, however, and, if brought to court, the licensing laws would be liberalized quickly. The law tends to confirm current medical practices rather than determine them. Hershey [73, p. 74] also notes that hospitals, which now set the standards for physicians practicing within their confines, could certainly do the same for paramedic personnel, and that private physicians might find such guidelines helpful in setting standards in their private offices.

The principal method for permitting allied health personnel to practice has been to license each group. These licensure laws specify training and the limit of tasks and protect the individual from criminal prosecution and civil malpractice suits. However, they also limit change and introduce rigidity into a system where medical technology is changing rapidly. Legislatures have been unable to revise specific licensure laws rapidly enough to prevent inefficient use of personnel.

The licensure laws make it necessary for an applicant to complete a full, formal training program, no matter what his initial qualifications. For example, for an LPN to become an RN, she must return to nursing school for the full program and an RN must go through four years of medical school and a year of

internship, to become an MD. Licensure has already introduced into medicine some of the worst facets of the skilled craft unions.

The results of a series of conferences on the legal implications of the Duke physician's assistant program are summarized in the report of a Conference on Legislative Proposals for Physician's Assistants [72]. Conference delegates agreed that the state medical practice acts should be amended and that licensure was a bad way to proceed. Several states, such as Oklahoma, have acts which give the physician the widest possible scope:

Nothing in this article shall be so construed as to prohibit service rendered by a physician's trained assistant or registered nurse or a licensed practical nurse if such service be rendered under the direct supervision and control of a licensed physician [72, p. 23].

One proposal would modify this wording so that the "act, task, or function is performed in accordance with such rules and regulations as may be promulgated by the Board of Medical Examiners" [p. 38]. A more strict proposal would have the Board of Medical Examiners specify what training is necessary for specified roles and tasks [72, p. 37-8]. A third proposal would have the Board of Medical Examiners consider a petition by an individual physician or institution which specifies the training of a particular employee and the tasks he will perform [72, p. 41].

These proposals differ as to the amount of responsibility given to the physician and as to who shall judge a candidate's qualifications or performance. The AMA supports proposals which would give wide scope to the physician and allow for "...growth in the delegation of duties to ancillary health workers" [74, p. 1057]. The AMA proposal would probably lead to more

abuse than the others, but it would also increase the number of paramedics and encourage innovation in the way they are used.

To date, state legislatures have taken a wide range of approaches. Colorado requires strict licensure for Child Health Associates, whereas Arizona, Florida, Kansas, and Oklahoma have adopted permissive laws similar to those recommended by the AMA. Curran (as has the AMA [74]) has criticized the Colorado Child Health Associate law:

This new group is tightly locked into a highly detailed piece of legislation that regulates their activities comprehensively and minutely. It is an excellent model of what should not be done with any licensed group of professionals, traditional or newly formed [75, p. 1085].

California has recently enacted a law which requires the physician to petition the Board of Medical Examiners to certify a particular applicant to perform specified duties. The future is not at all certain although there seems to be almost universal agreement that licensure should be avoided.

IX. SUMMARY AND CONCLUSION

A principal problem with medical care delivery in the United States is the shortage and maldistribution of primary physicians. As a result, people in urban ghettos and many small towns receive inadequate medical care and medical costs are spiraling. One solution to this shortage is to expedite the training of "paramedics" to assume many of the physician's routine tasks, thereby increasing the effectiveness of the physician.

The literature cited provides convincing evidence that training paramedics and delegating primary care tasks to them has much to offer in improving the delivery of medical care. The introduction of the paramedic increases the potential for substituting inputs in the delivery of medical care, for using innovations more effectively and disseminating them more rapidly, and for improving the quality of care by providing certain types of service which have not been offered. Expanding the use of paramedics promises better medical care for people who currently have no access to care, a slower rate of increase in medical care costs, and better medical care for middle class families who find it difficult to see their overworked physician.

For the next five to ten years, the only major source of paramedics is the pool of registered nurses, since they require only about four months of additional training. However, the two-year programs for training paramedics should not be ignored, since they offer a different type of paramedic and the possibility of more innovative approaches to training and the delivery of medical care.

Many of the tasks performed by physicians could be delegated to someone with less training. Indeed, any task which would be performed by a paramedic without major increases in patient discomfort, or in the risk of an unsatisfactory outcome, are potential tasks for a paramedic.

Task analysis and other observations of the demand made on the physician can form the basis for extensive reforms in the training of physicians, as well as dictate the curriculum for paramedics. Education can be reorganized so that "core" courses common to all medical personnel are taken together, both to save teaching resources and to foster a team approach to medicine. Much can be gained by designing programs to foster vertical, horizontal, and geographic mobility of medical personnel.

Acceptance of the paramedic by physicians, patients, and other health workers need not be a problem. The paramedic can relieve the physician of much of his work, and can add to his income. The paramedic can give the patient a more thorough interview and examination; he can help to make a practice run more smoothly and relieve some of the work and strain of other health workers. In some tasks the paramedic can release physician time on almost a one for one basis. On other tasks, the lesser training of the paramedic means that it will take him two to three times as long to perform the task, compared with a physician. Finally, the paramedic has been used to perform tasks which the physician perceives to be worthwhile, but which he has neither the time nor training to accomplish. While the paramedic earns much more than other health workers, he can add significantly to the profitability of a practice. However, we should note that to the extent the physician decreases his number of hours worked, and number of patients seen there will be some income redistribution effects.

Perhaps the major unresolved issues concern the nature of the training programs for paramedics and their status under the law. We have argued that training programs should be designed so that major components are common to a number of different levels of programs. As a goal, the general education portions should be common to medical students and technicians, much as high school and college education is common. As part of this process, the barriers between professions should be broken down so that credit is given for both formal training and experience in seeking higher levels of training.

In general new paramedics have no formal status under the law (with the exception of upgraded nurses). It is important that, in the course of gaining recognition, career mobility and potential tasks be given wide scope. Licensure of detailed categories of paramedics is probably the worst way of giving paramedics legal status. Instead, sufficient flexibility must be introduced that physicians and their paramedics can find the proper delegation of tasks in the course of working together.

Our reading, site visits, and conversations have convinced us that expediting the training of paramedics and delegating new tasks to them has much to offer in improving the delivery of medical care in the United States. We feel that sufficient evidence has been collected on these programs to justify major expansion and encouragement.

Footnotes

1. In 1969 approximately 2,307 graduates of foreign medical schools (excluding Canada) were granted licenses to practice medicine in the United States. JAMA, vol. 212, no. 11, June 15, 1970, p. 1949.
2. The basic question to be answered by the demonstration project (still in the planning stages) being developed by the School of Health of the University of Oklahoma Medical School and the College of Business Administration at Oklahoma State University is to learn if former military independent-duty medical technicians can be trained to assist in providing primary health care in doctorless rural communities.
3. Private communication from Dr. Louis Pondy, Duke University.
4. Three other Medex programs are on going in North Dakota, New Hampshire and Alabama. Medex programs are in the planning stage in California and Utah.
5. All figures come from private communication from Dr. Henry Silver.
6. All figures come from private communication from Dr. Alfred Yankauer.
7. The Department of Health, Education, and Welfare, the Department of Defense have cooperated in establishing MEDHIC--a program designed to assist the serviceman or woman trained in medical skills while in the service in finding a career or furnish training opportunities in the allied health professions when they return to civilian life.
8. Private communication from Dr. Pondy, Duke University.
9. Private communication from Dr. Pondy, Duke University.
10. Private communication from Dr. Waxman, University of Kansas Medical Center.
11. Legal issues which also profoundly affect career mobility will be discussed in the next section.

References

1. Morgan, R., "Physician Assistants: Their Role in Medicine in the Years Ahead," J. Maine Med. Assoc., vol. 59, no. 11, November 1968, p. 219-223.
2. Fein, R., The Doctor Shortage: An Economic Diagnosis, Washington, D.C. Brookings Institution, 1967.
3. Knowles, J. H., "The Quality and Quantity of Medical Manpower: A Review of Medicine's Current Efforts," J. Med. Ed., vol. 44, February 1969, p. 43-118.
4. Bane, F., Physicians for a Growing America. Report of the Surgeon General's Consultant Group on Medical Education, U.S. Public Health Service Publication No. 709, Washington, D.C., U.S. Government Printing Office, 1959.
5. Report of the National Advisory Commission on Health Manpower, Washington, D.C., vol. 1 and 2, 1968.
6. Hansen, W. L., "Shortages and Investment in Health Manpower," The Economics of Health and Medical Care, The Univ. of Mich., 1964, p. 75-91.
7. Ginzberg, E., "Facts and Fancies About Medical Care," AJPH, vol. 69, no. 5, May 1969, p. 785-794.
8. Ginzberg, E., "Physician Shortage Reconsidered," NEJM, vol. 275, no. 2, July 14, 1966, p. 85-87.
9. Ledney, D., "Nurse-Midwives: Can They Fill the OB Gap?" RN, January 1970, p. 38-45.
10. Forgotson, E. H. and Forgotson, J., "Innovations and Experiments in Uses of Health Manpower," Medical Care, vol. 8, January, February 1970, p. 3-14.
11. Sidel, V. W., "Feldshers and Feldsherism," NEJM, vol. 278, no. 18, May 2, 1968, p. 987-992.
12. Sidel, V. W., "Feldshers and Feldsherism," NEJM, vol. 278, no. 17, April 25, 1968, p. 934-939.
13. Kadish, J. and Long, J., "The Training of Physician Assistants: Status and Issues," JAMA, vol. 212, no. 6, May 11, 1970, p. 1047-1051.
14. Professional Activities Branch, HEW, "Selected Training Programs for Physician Support Personnel," (mimeographed pamphlet).
15. AMA Council on Health Manpower: Guidelines for Development of New Health Occupations (adopted by the AMA House of Delegates, Denver, Colorado), December 1969.

16. Board of Medicine, National Academy of Sciences, "New Members of the Physician's Health Team: Physician's Assistants," Washington, D.C., 1970.
17. Report of the AAMC Task Force on Physician's Assistant Programs, Association of American Medical Colleges, Washington, D.C., February 1970.
18. American Academy of Pediatrics, "Suggested Essential Guidelines for the Training of Pediatric Nurse Associates, Pediatric Office Assistants and Pediatric Aides," *Comprehensive Health Services, Career Development Issue*, vol. 1, no. 3, March 1970.
19. Report of the Ad Hoc Committee on Allied Health Professionals, American Society of Internal Medicine, San Francisco, January 1970.
20. Collins, M. E. and Bonny G. C., "Physician Assistant and Nurse Associate: A Review," presented, #5-B, University Court, Charlottesville, Va.
21. Duke University Bulletin, "Physician Assistant Program Brochure," 1970-71.
22. Silver, H. and Hecker, S., "The Pediatric Nurse Practitioner and the Child Health Associate," J. Med. Edu., vol. 45, March 1970, p. 171-176.
23. "Medex: Another Answer to the Physician Shortage?" JAMA, vol. 211, no. 4 January 26, 1970, p. 572-579.
24. Anderson, K. H., "The Physician's Assistant Program at Bowman Gray," Bull. Pediat. Pract., vol. 4, no. 4, March 1970.
25. Silver, H., Ford, L. and Day, L., "The Pediatric Nurse-Practitioner Program," JAMA, vol. 204, no. 4, April 22, 1968, p. 298-302. Complete description of the program including schedule of Daily Activities of Pediatric Nurse Practitioner Students is available from Dr. Henry K. Silver, Professor of Pediatrics and Director of Pediatric Nurse Practitioner Program, University of Colorado Medical Center.
26. Andrews, P., Yankauer, A. and Connelly, Jr., "Changing the Patterns of Ambulatory Pediatric Caretaking--An Action-oriented Training Program for Nurses," AJPH, vol. 60, no. 2, May 1970, p. 870-879.
27. Lewis, C. and Resnik, B., "Nurse Clinics and Progressive Ambulatory Patient Care," NEJM, vol. 277, December 7, 1967, p. 1236-41.
28. Ford, F., Seacat, M. and Silver, G., "The Relative Roles of the Public Health Nurse and the Physician in Prenatal and Infant Supervision," AJPH, vol. 56, no. 7, July 1966, p. 1097-1103.
29. Seacat, M., "A Study of Relative Roles of Public Health Nurse and Physician in Prenatal and Infant Supervision," mimeographed final report.

30. "New Mexico Hamlet Avoids Medical Isolation," JAMA, vol. 207, no. 10, March 10, 1969, p. 1808-1809.
31. Montgomery, T., "A Case for Nurse-Midwives," Amer. J. of Obstet. and Gynecol., vol. 105, October 1, 1969, p. 309-13.
32. Howard, D. R. and Fasser, C. E., "A Progress Report on Duke University's Physician's Assistant Program," Hosp. Progress, vol. 51, February 1970, p. 49-55.
33. "AMA Urges Major New Role for Nurses," Amer. Med. News, vol. 13, no. 1, February 9, 1970.
34. Montgomery, B., Report to the Bd. of Trustees--AMA Position Statement on Nursing, adopted by the House of Delegates, June 1970.
35. Howard, Ernest B., "Organized Medicine," The AMA, Lowell Lecture, Boston University Medical School, January 6, 1970. (As reported in 33 above.)
36. "AMA Unveils Surprise Plan to Convert R.N. Into Medic," Amer. J. Nurs., vol. 70, no. 4, April 1970, p. 691-93. (Some of these issues are discussed.)
37. American Nursing Association, Facts About Nursing, 1968 edition, 10 Columbus Circle, New York.
38. Yankauer, A., Connelly, J. P. and Feldman, J. J., "Pediatric Practices in the United States," Pediatrics (Supplement), vol. 45, February 1970, p. 521-554.
39. Stead, E., Jr., "Educational Programs and Manpower," Bull. N.Y. Acad. Med., vol. 44, no. 2, February 1968, p. 204-213.
40. Yankauer, A., Connelly, J. P. and Feldman, J., "A Survey of Allied Health Worker Utilization in Pediatric Practice in Massachusetts and the U.S.," Pediatrics, vol. 42, no. 5, November 1968, p. 733-742.
41. Coye, R. and Hansen, M., "The Doctor's Assistant. A Survey of Physicians' Expectations," JAMA, vol. 209, July 28, 1969, p. 529-33.
42. Lewis, C., Resnik, B., Schmidt, G. and Waxman, D., "Activities, Events and Outcomes in Ambulatory Patient Care," NEJM, vol. 280, no. 12, March 20, 1969, p. 645-649.
43. Duncan, B., Smith, A. and Silver, H., "Comparison of the Physical Assessment of Children by Pediatric Nurse Practitioners and Pediatricians" (mimeographed), University of Colorado, March 1970.
44. Kaufmann, C., "How They Train Midwives at Columbia," Resident Physician, vol. 14, February 1968, p. 96-101.
45. Resnik, B. A., "The Nursing Clinic: An Experiment in Ambulatory Patient Care" (mimeographed), presented to the Kansas Nursing Assoc.

46. Crook, W., "A Practicing Pediatrician Looks at Associates, Assistants, and Aides," Pediat. Clin. N. Amer., vol. 16, no. 4, November 1969, p. 929-938.
47. Stitham, L., "Physician's Assistants: More Problems or Less?" J. Maine Med. Assoc., vol. 59, November 1968, p. 225-226.
48. Day, L., Egli, R. and Silver, H., "Acceptance of Pediatric Nurse Practitioners," Amer. J. Dis. Children, vol. 119, March 1970, p. 203-208.
49. Skinner, A., "Parental Acceptance of Delegated Pediatric Services," Pediatrics, vol. 41, May 1968, p. 1003-1004.
50. Pondy, L., Campier, B., Rice, T. and Knapp, A., "A Study of Patient Acceptance of the Physician's Assistant," unpublished manuscript, Duke University, February 1970.
51. Fry, F., "A Study of the Acceptability of the Former Military Independent Duty Corpsman as a Medical Resource in Rural Communities," unpublished Masters Thesis, Oklahoma State University, May 1970.
52. Mingo, K. and Fry, F., "An Analysis of the Variables Related to the Acceptance of Physician's Assistants in Doctorless Rural Communities," working paper, Oklahoma State University, 1970.
53. Breyspraak, L. and Pondy, L., "Sociological Evaluation of the Physician's Assistants Role Relations," Group Practice, vol. 18, no. 3, March 1969, p. 32-41.
54. Bergman, A. B., Probstfield, J. L. and Wedgewood, R. L., "Task Identification in Pediatric Practice," Amer. J. Dis. Child, vol. 118, September 1969, p. 459-468.
55. Anderson, J. H. and Powers, L., "The Pediatric Assignment," North Carolina Med. J., vol. 31, no. 1, January 1970, p. 1-8.
56. Silver, H., "New Patterns of Personnel for Children's Services. A Blueprint for Child Health Care for the Next Decade," paper presented at 38th Annual Meeting of the Amer. College of Pediatrics, October 18, 1969.
57. Howard, D. R., "The Physician's Assistant," Kansas Med. Soc. J., vol. VXV, no. 10, October 1969, p. 411-416.
58. Schiff, D., Fraser, C. and Walters, H., "The Pediatric Nurse Practitioner in the Office of Pediatricians in Private Practice," Pediatrics, vol. 44, no. 1, July 1969, p. 62-68.
59. Gerber, A., "Comments on Ambulatory Care in Nurse Clinics," NEJM, vol. 278, no. 13; March 1968, p. 737.
60. Hershey, N., "Patient Free Choice: A Relative Concept for the Insured Patient," The Insurance Law Journal, no. 533, February 1969, p. 71-80.

61. Duncan, B. and Kemp, R., "Joint Education of Medical Students and Allied Health Personnel," Amer. J. Dis. Child, vol. 116, November 1968, p. 499-504.
62. "Educational Programs in Areas Allied with Medicine," JAMA, vol. 210, no. 8, November 24, 1969, p. 1524-1529.
63. Estes, E., Jr., "Medical Education--Reformation or Revolution," Amer. J. Med. Sci., vol. 256, December 1968, p. 335-339.
64. "Medical Education in the U.S.: Education Programs in Areas Allied to Medicine," JAMA, vol. 206, no. 9, November 25, 1968, p. 2053-58.
65. Perry, J., "Career Mobility in Allied Health Education," JAMA, vol. 210, no. 1, October 6, 1969, p. 107-110.
66. Light, I., "Growth and Development of New Allied Health Fields," Amer. J. Med. Technol., vol. 36, no. 2, February 1970, p. 75-83.
67. Estes, E. H., Jr., "The Critical Shortage--Physicians and Supporting Personnel," Ann. Intern. Med., vol. 69, no. 5, November 1968, p. 957-962.
68. Kissick, W., "Effective Utilization: The Critical Factor in Health Manpower," AJPH, vol. 58, no. 1, January 1968, p. 23-29.
69. Levine, H., "Career Ladders and Equivalency Examinations: What Does It All Mean?" Amer. J. Med. Technol., vol. 35, no. 11, November 1969, p. 714-720.
70. Greenfield, H. and Brown, C., "Allied Health Manpower: Trends and Prospects," Columbia University Press, 1969.
71. Zimmerman, T., "Laddering and Latticing: Trends in Allied Health," Amer. J. Occup. Ther., vol. 24, no. 2, March 1970, p. 102-105.
72. "Model Legislation Project for Physician's Assistants" (mimeographed), Department of Community Health Services, Duke University, June 30, 1970.
73. Hershey, N., "An Alternative to Mandatory Licensing of Health Professionals," Hosp. Progress, vol. 50, March 1969, p. 71-74.
74. "Of Physician Assistants: Editorial," JAMA, vol. 212, May 11, 1970, p. 1057.
75. Curran, W., "New Paramedical Personnel--to License or Not to License?" NEJM, vol. 282, May 7, 1970, p. 1085-6.

Paramedic Bibliography†

Is There a Physician Shortage?

1. Bane, F. Physicians for a Growing America. Report of the Surgeon General's Consultant Group on Medical Education, U.S. Public Health Service Publication No. 709, Washington D.C., U.S. Government Printing Office, 1959.
2. Darley, W. et. al. "Medicine, Money, Manpower--The Challenge to Professional Education 3" Oppor. ity for New Excellence, NEJM, vol. 276, no. 25, June 8, 1967, p. 1414-1423.*
3. Estes, E. H., Jr., "The Critical Shortage--Physicians and Supporting Personnel," Ann. Intern. Med., vol. 69, no. 5, Nov. 1968, p. 957-962.
4. Fein, R., "An Economist's View. Medical Manpower--A Continuing Crisis," JAMA, vol. 201, no. 11, Sept. 11, 1967, p. 171-173.
5. Fein, R., The Doctor Shortage: An Economic Diagnosis, Washington, D.C. Brooking Institution, 1967.
6. Ginzberg, E., "Facts and Fancies About Medical Care," AJPH, vol. 59, no. 5, May 1969, p. 785-794.
7. Ginzberg, E., "Physician Shortage Reconsidered," NEJM, vol. 275, no. 2, July 14, 1966, p. 85-87.
8. Green, M., "The Clinician's Art: Some Questions for Our Time," Pediatrics, vol. 43, no. 2, Feb. 1969, p. 157-159.
9. Hansen, W. L., "Shortages and Investment in Health Manpower," The Economics of Health and Medical Care, The Univ. of Mich., 1964, p. 75-91.
10. Knowles, J. H., "The Quality and Quantity of Medical Manpower: A Review of Medicine's Current Efforts." J. Med. Ed., vol. 44, Feb. 1969, p. 43-118.*
11. Report of the National Advisory Commission on Health Manpower. Vol. 1 and 2. Washington, D. C. 1968.
12. Stewart, W. H., "Implementing the Report of the National Advisory Commission on Health Manpower," JAMA, vol. 210, no. 10, Dec. 8, 1969, p. 1911-1913.

Analysis of Medical Practice

13. Anderson, J. H., Powers, L., "The Pediatric Assistant," North Carolina Med. J., vol. 31, no. 1, Jan. 1970, p. 1-8.*
14. Bergman, A. B., Probstfield, J. L., Wedgewood, R. L., "Task Identification in Pediatric Practice," Amer. J. Dis. Child, vol. 118, Sept. 1969, p. 459-468.*

† This is a more complete bibliography of the paramedic literature.

* Articles with an asterisk contain an extensive bibliography.

15. Connelly, J. P., Yankauer, A., "Allied Health Personnel in Child Health Care," Pediat. Clin. Amer., vol. 16, no. 4, Nov. 1969, p. 921-927.
16. Field, M. G., "Health Personnel in the Soviet Union, Achievements and Problems," AJPH, vol. 56, Nov. 1966, p. 1904-20.
17. Forgotson, E. H. and Forgotson, J., "Innovations and Experiments in Uses of Health Manpower," Medical Care, vol. 8, Jan., Feb. 1970, p. 3-14.
18. "Is There a 'Feldsher' in Your Future?" Med. Econ., vol. 46, Feb. 17, 1969, p. 234-248.
19. Szimonisz, L. B., "Lesson From Russia," NEJM, vol. 278, June 6, 1968, p. 1296.
20. Lurre, A. I., "Feldsherism Deplored," NEJM, vol. 278, no. 23, June 6, 1968, p. 1296.
21. Sidel, V. W., "Feldshers and Feldsherism," NEJM, vol. 278, no. 18, April 25, 1968, p. 987-992.*
22. Sidel, V. W., "Feldshers and Feldsherism," NEJM, vol. 278, no. 17, May 2, 1968, p. 934-939.
23. Siegel, E., "Pediatric Allied Health Services in North Carolina," North Carolina Med. J., vol. 30, July 1969, p. 265-269.
24. Yankauer, A., Connelly, J. P., Feldman, J., "A Survey of Allied Health Worker Utilization in Pediatric Practice in Massachusetts and the U.S.," Pediatrics, vol. 42, no. 5, Nov. 1968, p. 733-742.
25. Yankauer, A., Connelly, J. P., Feldman, J. J., "Pediatric Practices in the United States," Pediatrics (Supplement), vol. 45, Feb. 1970, p. 521-554*
26. Yankauer, A., Connelly, J. P., Feldman, J. J., "Physician Productivity in the Delivery of Ambulatory Care," Med. Care, vol. 8, no. 1, Jan., Feb. 1970, p. 35-46.
27. Yankauer, A., Connelly, J., Feldman, J., "Task Performance and Task Delegation in Pediatric Office Practice," AJPH, vol. 59, no. 7, July 1969, p. 1104-1117.

Training Programs

28. AMA Dept. of Health Manpower, "Operational 'Physician's Assistant' Projects," (Mimeographed pamphlet)
29. AMA Dept. of Health Manpower, "The Child Health Associate: A New Training Program in Colorado," JAMA, vol. 212, no. 6, May 11, 1970, p. 1045-1046.
30. Anderson, K. H., "The Physician's Assistant Program at Bowman Gray," Bull. Pediat. Pract., vol. 4, no. 4, March 1970.
31. Andreoli, K. G., et. al., "Physician's Assistants. Training Physician's Assistants at Duke," Amer. J. Nurs., vol. 67, July 1967, p. 1442-1443.

32. Andrews, P., Yankauer, A., Connelly, J., "Changing the Patterns of Ambulatory Pediatric Caretaking--An Action-oriented Training Program for Nurses," AJPH, vol. 60, no. 2, May 1970, p. 870-879.
33. "Conference on Current Status and Development of Physician's Assistant Program," Mimeographed Conference Proceedings, Durham, North Carolina, Oct. 28, 1968.
34. Duke University Bulletin, "Physician Assistant Program Brochure." 1970-71.
35. Estes, E. H., Jr., "Advantages and Limitations of Medical Assistants." Amer. Geriat. Soc., vol. 16, no. 10, Oct. 1968, p. 1083-1087.
36. Howard, D. R., "The Physician's Assistant," Kansas Med. Soc. J., vol. VXX, no. 10, Oct. 1969, p. 411-416.
37. Howard, D. R., Fasser, C. E., "A Progress Report on Duke University's Physician's Assistant Program," Hosp. Progress, vol. 51, Feb. 1970, p. 49-55.
38. Ingles, T., "A New Health Worker," Amer. J. Nurs., vol. 68, no. 5, May 1968, p. 1059-1061.
39. Kadish, J., Long, J., "The Training of Physician Assistants: Status and Issues," JAMA, vol. 212, no. 6, May 11, 1970, p. 1047-1051.
40. "Medex: Another Answer to the Physician Shortage?" JAMA, vol. 211, no. 4, Jan. 26, 1970, p. 572-579.
41. Myers, H. C., "A New Educational Program for Physician's Assistants," Med. Times, vol. 97, no. 3, March 1969, p. 140-144.
42. Pounds, L. A., "The Physician Assistant Program at Duke University," Bull. Pediat. Pract., March 1970.
43. Professional Activities Branch, HEW. "Selected Training Programs for Physician Support Personnel," (Mimeographed pamphlet)
44. Silver, H., "Pediatric Practitioners Program." (Mimeographed Course Syllabus and Bibliography of PNP Program)
45. Silver, H., Ford, L., Day, L., "The Pediatric Nurse-Practitioner Program," JAMA, vol. 204, no. 4, April 22, 1968, p. 298-302.
46. Silver, H., Ford, L., Stearly, S., "A Program to Increase Health Care for Children: The Pediatric Nurse Practitioner Program," Pediatrics, vol. 39, no. 5, May 1967, p. 756-760.
47. Silver, H., Hecker, S., "The Pediatric Nurse Practitioner and the Child Health Associate," J. Med. Edu., vol. 45, March 1970, p. 171-176.
48. Stead, E., Jr., "A College Based Physician's Assistant Program," Med. Times, vol. 98, Aug. 1968, p. 847-850.
49. Stead, E., Jr., "A New Approach to the Doctor Shortage," Resident Physician, vol. 13, Feb. 1967, p. 89-93.

50. Stead, E., Jr., "Conserving Costly Talents--Providing Physician's New Assistants," JAMA, vol. 198, no. 10, Dec. 5, 1966, p. 1108-1109.
51. Stead, E., Jr., "The Duke Plan for Physician's Assistants," Med. Times, vol. 95, Jan. 1967, p. 40-48.

Demonstration Projects

52. Ford, D., Seacat, M., Silver, G., "The Relative Roles of the Public Health Nurse and the Physician in Prenatal and Infant Supervision," AJPH, vol. 56, no. 7, July 1966, p. 1097-1103.
53. Gerber, A., "Comments on Ambulatory Care in Nurse Clinics," NEJM, vol. 278, no. 13, March 1968, p. 737.
54. Lewis, C., Resnik, B., "Nurse Clinics and Progressive Ambulatory Patient Care," NEJM, vol. 277, Dec. 7, 1967, p. 1236-1241.
55. Lewis, C., Resnik, B., "The Nurse Clinic--Dynamics of Ambulatory Patient Care--New Roles for Old Disciplines," Kansas Med. Soc. J., Mar. 1967, p. 123-124.
56. "New Mexico Hamlet Avoids Medical Isolation," JAMA, vol. 207, no. 10, March 10, 1969, p. 1808-1809.
57. Perlman, L., "Comment on Ambulatory Care in Nurse Clinics," NEJM, vol. 278, no. 13, March 1968, p. 736-737.
58. Resnik, B. A., "The Nursing Clinic: An Experiment in Ambulatory Patient Care." (Mimeographed) Presented to the Kansas Nursing Assoc., 10 pages.
59. Seacat, M., "A Study of Relative Roles of Public Health Nurse and Physician in Prenatal and Infant Supervision." (Mimeographed final report), 67 pages.
60. Seacat, M., Schlachter, L., "Expanded Nursing Role in Prenatal and Infant Care," Amer. J. Nurs., vol. 68, no. 4, April 1968, p. 822-824.
61. Vogl, A., "More Medical Help from Non-M.D.'s." Med. Econ., Aug. 8, 1966, p. 57-67.
62. Wise, H., "Montefiore Hospital Neighborhood Medical Care Demonstration: A Case Study," Milbank Mem. Fund Quart., vol. 48, July 1968, p. 297-307.

Midwives

63. Eisenberg, H., "How an R.N. Midwife Can Help," Med. Econ., May 15, 1967, p. 78-85.
64. Kaufmann, C., "How They Train Midwives at Columbia," Resident Physician, vol. 14, Feb. 1968, p. 96-101.
65. Ledney, D., "Nurse-Midwives: Can They Fill the OB Gap?" RN, Jan. 1970, p. 38-75.
66. Montgomery, T., "A Case for Nurse-Midwives," Amer. J. of Obstet. and Gynecol., vol. 105, Oct. 1, 1969, p. 309-313.

Sources of and Potential Functions of Paramedics

67. "AMA Unveils Surprise Plan to Convert R.N. Into Medic," Amer. J. Nurs., vol. 70, no. 4, April 1970, p. 691-693.
68. "AMA Urges Major New Role for Nurses," Amer. Med. News, Feb. 9, 1970.
69. Coye, R., Hansen, M., "The Doctor's Assistant. A Survey of Physicians' Expectations," JAMA, vol. 209, July 28, 1969, p. 529-533.
70. Goldstein, J., "Medical Corpsman as a Source of Civilian Manpower for New Jersey," Medical Care, vol. 8, Jan., Feb. 1970, p. 254-269.
71. Montgomery, B., Report to the Bd. of Trustees-AMA Position Statement on Nursing. Adopted by the House of Delegates, June 1970.*
72. Stead, E., Jr., "Current Concepts. Training and Use of Paramedical Personnel," NEJM, vol. 277, Oct. 1967, p. 800-801.

Quality of Care

73. Duncan, B., Smith, A., Silver, H., "Comparison of the Physical Assessment of Children by Pediatric Nurse Practitioners and Pediatricians." (Mimeographed), University of Colorado, March 1970.
74. Lewis, C., Resnik, B., Schmidt, G., Waxman, D., "Activities, Events and Outcomes in Ambulatory Patient Care," NEJM, vol. 280, no. 12, March 20, 1969, p. 645-649.

Acceptance of Paramedics

75. Breytspraak, L., Pondy, L., "Sociological Evaluation of the Physician's Assistants Role Relations," Group Practice, vol. 18, no. 3, March 1969, p. 32-41.

76. Crook, W., "A Practicing Pediatrician Looks at Associates, Assistants, and Aides," Pediat. Clin. N. Amer., vol. 16, no. 4, Nov. 1969, p. 929-938.
77. Day, L., Egli, R., Silver, H., "Acceptance of Pediatric Nurse Practitioners," Amer. J. Dis. Child, vol. 119, March 1970, p. 203-208.
78. Denison, J., "Physician Assistants: A Threat or a Challenge," J. Maine Med. Assoc., vol. 59, Nov. 1968, p. 224-225.
79. Fry, F., "A Study of the Acceptability of the Former Military Independent Duty Corpsman as a Medical Resource in Rural Communities," unpublished Masters Thesis, Oklahoma State University, May 1970.
80. Mingo, K. and Fry, F., "An Analysis of the Variables Related to the Acceptance of Physician's Assistants in Doctorless Rural Communities," working paper, Oklahoma State University, 1970.

81. Morgan, R., "Physician Assistants: Their Role in Medicine in the Years Ahead," J. Maine Med. Assoc., vol. 59, no. 11, Nov. 1968, p. 219-223.
82. Patterson, P., et al., "Parent Reaction to the Concept of Pediatric Assistants," Pediatrics, vol. 44, July 1969, p. 69-75.
83. Pondy, L., Dampier, B., Rice, T., Knapp, A., "A Study of Patient Acceptance of the Physician's Assistant," unpublished manuscript, Duke University, Feb. 1970, 14 pages.
84. Skinner, A., "Parental Acceptance of Delegated Pediatric Services," Pediatrics, vol. 41, May 1968, p. 1003-1004.
85. Stitham, L., "Physician's Assistants: More Problems or Less?" J. Maine Med. Assoc., vol. 59, Nov. 1968, p. 225-226.

Productivity of Paramedics

86. Estes, E., Jr., "The Duke Physician Assistant Program: A Progress Report," Arch. Environ. Health, vol. 17, Nov. 1968, p. 690-691.
87. Schaefer, M. B., "A Study of the Feasibility of Using a Doctor's Assistant in Rural Areas," unpublished Masters Thesis, Oklahoma State University, May 1970.
88. Schiff, D., Fraser, C., Walters, H., "The Pediatric Nurse Practitioner in the Office of Pediatricians in Private Practice," Pediatrics, vol. 44, no. 1, July 1969, p. 62-68.

Education and Career Mobility

89. "AMA Guidelines for Development of New Health Occupations," Denver, Colorado, Dec. 1969.
90. Bergman, R., "Education of Paramedical Personnel," Int. Nurs. Rev., vol. 16, 1969, p. 161-166.
91. Duncan, B., Kemp, R., "Joint Education of Medical Students and Allied Health Personnel," Amer. J. Dis. Child, vol. 116, Nov. 1968, p. 499-504.
92. "Educational Programs in Areas Allied with Medicine," JAMA, vol. 210, no. 8, Nov. 24, 1969, p. 1524-1529.
93. Estes, E., Jr., "Medical Education--Reformation or Revolution," Amer. J. Med. Sci., vol. 256, Dec. 1968, p. 335-339.
94. Estes, E. H., Jr., "Task Oriented vs. Degree Oriented Training Concept. . . Use of Personnel," Military Med., vol. 134, June 1969, p. 386-389.
95. Greenfield, H., "Manpower Problem in the Allied Health Field," JAMA, vol. 206, no. 7, Nov. 11, 1968, p. 1542-1553.

96. Greenfield, H., Brown, C., "Allied Health Manpower: Trends and Prospects," Columbia University Press, 1969.
97. Hamburg, J., "Core Curriculum in Allied Health Professions," JAMA, vol. 210, Oct. 6, 1969, p. 111-113.
98. Hapgood, D., "Health Professionals: Cure or Cause of the Health Crisis?" Hosp. Top., vol. 47, Nov. 1969, p. 24-26.
99. Kissick, W., "Effective Utilization: The Critical Factor in Health Manpower," AJPH, vol. 58, no. 1, Jan. 1968, p. 23-29.
100. Levine, H., "Career Ladders and Equivalency Examinations: What Does It All Mean?" Amer. J. Med. Technol., vol. 35, no. 11, Nov. 1969, p. 714-720.
101. Levy, L., "Factors Which Facilitate or Impede Transfer of Medical Functions from Physicians to Paramedical Personnel," J. of Health and Human Behavior, vol. 7, Spring 1966, p. 50-54.
102. Light, I., "Growth and Development of New Allied Health Fields," Amer. J. Med. Technol., vol. 36, no. 2, Feb. 1970, p. 75-83.
103. McCreary, J., "The Health Team Approach to Medical Education," JAMA, vol. 206, no. 7, Nov. 11, 1968, p. 1554-1557.
104. "Medical Education in the U.S.: Education Programs in Areas Allied to Medicine," JAMA, vol. 206, no. 9, Nov. 25, 1968, p. 2053-2058.
105. Perry, J., "Career Mobility in Allied Health Education," JAMA, vol. 210, no. 1, Oct. 6, 1969, p. 107-110.
106. Rutstein, D., The Coming Revolution in Medicine, MIT Press, 1967.
107. Selden, W., "The Development of Professionalism in the Allied Health Field," JAMA, vol. 206, Nov. 11, 1968, p. 1545-1547.
108. Stead, E., Jr., "Educational Programs and Manpower," Bull. N.Y. Acad. Med., vol. 44, no. 2, Feb. 1968, p. 204-213.
109. Zimmerman, T., "Laddering and Latticing: Trends in Allied Health," Amer. J. Occup. Ther., vol. 24, no. 2, March 1970, p. 102-105.

Legal Issues

110. "Accreditation and the Supply of Physicians," JAMA, vol. 210, no. 8, Nov. 24, 1969, p. 1584-1585.
 111. "Accreditation for Allied Medical Groups," Rhode Island Med. J., vol. 53, Jan. 1970, p. 43-44.
 112. Anderson, B., "License of Paramedical Personnel," Paper presented at the 65th Annual Meeting of the Federation of State Medical Boards of U.S., Feb. 7, 1969.
- Child Health Associate Law--House Bill 1169, Colorado State Legislature.

114. Curran, W. J., "Health Manpower and the Law: A Cautious Revolution," AJPH, vol. 58, no. 7, July 1968, p. 1276-1277.
115. Curran, W. J., "New Paramedical Personnel--to License or Not to License?" NEJM, vol. 282, May 7, 1970, p. 1085.
116. Curran, W. J., "Public Health and the Law," AJPH, vol. 58, Sept. 1968, p. 17 754.
117. Hershey, N., "An Alternative to Mandatory Licensing of Health Professionals," Hosp. Progress, vol. 50, March 1969, p. 71-74.
118. Hershey, N., "Patient Free Choice: A Relative Concept for the Insured Patient," The Insurance Law Journal, no. 533, Feb. 1969, p. 71-80.
119. "Licensure of Health Occupations," JAMA, vol. 208, no. 11, June 16, 1969, p. 2154-2155.
120. McAdams, D., "The Licensure Dilemma," Hosp. Progress, vol. 50, July 1969, p. 49-53.
121. "Physician's Guidelines for Delegation of Duties and Functions to Nurses," Wisconsin Med. J., vol. 68, Jan. 1969, p. 42-43.
122. Maxwell, I., "Responsibility for the Acts of Another. II Paramedical Personnel," Nova Scotia Med. Bull., vol. 47, Feb. 1968, p. 57-59.
123. "No Legal Barriers Seen," Amer. Med. News, Feb. 9, 1970.
124. "Model Legislation Project for Physician's Assistants," (Mimeographed) Duke University, June 30, 1970.
125. Stead, E., Jr., "The Physician's Assistant--Job Description and Licensing," Med. Times, vol. 97, Aug. 1969, p. 246-247.

General Articles

126. "Can Doctors' Aides Solve the Manpower Crisis?" Med. World News, Jan. 1970.
127. Collins, M.E. and Bonnyman, G. C., "Physician Assistant and Nurse Associate: A Review," processed, #5-B, University Court, Charlottesville, Va., 65 pages.*
128. Darley, W., "Allied Health Personnel and Their Employment for the Improvement of Medical Care," NEJM, vol. 281, Aug. 21, 1969, p. 443-445.
129. Degnon, G., "Pediatric Response to Health Manpower Shortages," Bull. Pediat. Prac., Sept. 1969.
130. Donovan, J., "A Medical Corpsman Project," Calif. Med., vol. 111, Dec. 1969, p. 487-490.
131. Enebepe, P., "The Village Medical Aides--Alaska's Unsung, Unlicensed, and Unprotected Physicians," Alaska Med., vol. 11, Dec. 1969, p. 124-127.

132. Fendall, N., "The Auxiliary in Medicine," Israel J. Med. Sci., vol. 4, no. 3, May-June 1968, p. 614-637.
133. Javits, J., "Medical Corpsmen in Civilian Health Efforts," NEJM, vol. 281, Oct. 23, 1969, p. 964.
134. Lahav, E., "Methodologic Problems in Health Manpower Research," NEJM, vol. 277, no. 18, Nov. 2, 1967, p. 959-962.
135. Letourneau, C., "The Assistant Physician," Hosp. Management, vol. 105, Apr. 1968, p. 55-57.
136. Mase, D., "Basic Principles in Manpower Utilization," Pediat. Clin. N. Amer., vol. 16, no. 4, Nov. 1969, p. 915-920.
137. Myers, H., "The Physician's Assistant," W. Va. Med. J., vol. 65, Sept. 1969, p. 303-304.
138. "Physician's Assistant: Medicine Acts to Meet Manpower Need," Dental Survey, The Journal of Dental Practice, vol. 45, no. 4, April 1969, p. 23-27.

139. "Physicians' Assistants: 'Considerable Interest--and Some Controversy'," JAMA, vol. 205, no. 12, Sept. 16, 1968, p. 28.
140. "Physician's Assistant: Solving the Shortage," Mod. Med., vol. 37, no. 23, Nov. 17, 1969, p. 111-112 & 117.
141. Raibe, F., "Medical Assistants," J. Arkansas Med. Soc., vol. 64, no. 12, May 1968, p. 475-477.
142. Rice, D., "The Future Use of Paramedical Personnel in Private Medical Practice," Canadian Med. Assoc. J., vol. 97, p. 1597-1602.
143. Silver, H., "New Patterns of Personnel for Children's Services. A Blueprint for Child Health Care for the Next Decade," Paper presented at 38th Annual Meeting of the Amer. College of Pediatrics, Oct. 18, 1969.
144. Silver, H., "Use of New Types of Allied Health Professionals in Providing Care for Children," Amer. J. Dis. Child, vol. 116, Nov. 1968, p. 486-490.
145. Smith, J., Mottram, E., "Extended Use of Nursing Services in General Practice," British Med. J., vol. 4, Dec. 16, 1967, p. 672-674.

146. Wilbur, Dwight, "Rx for Doctorless Areas: A Special Report," Medical Economics, Jan. 6, 1969, p. 28-31.
147. Wingert, P., "The Pediatric Nurse Specialist in the Community," Nurs. Outlook, vol. 17, no. 12, Dec. 1969, p. 28-31.
148. Yankauer, A., "Allied Health Workers in Pediatrics," Pediatrics, vol. 41, June 1968, p. 1031-1032.