

## Chapter 4

# Productivity, Costs, and Employment

# Productivity, Costs, and Employment

Several studies have examined the scope of practice and productivity of nurse practitioners (NPs), physician assistants (PAs), and certified nurse-midwives (CNMs); how that scope relates to the tasks usually undertaken by physicians; and the implications of this evidence for the employment of these providers and for the costs of medical care.

Questions related to productivity include the nature and size of the contributions NPs, PAs, and CNMs make to medical practices' outputs (e.g., encounters between providers and patients). Questions related to costs include how much a

practice must spend to employ an NP, PA, or CNM and how much society must spend to train these types of practitioners. Questions related to employment compare productivity with the costs of employment to ascertain whether medical practices could gain from employing more NPs, PAs, or CNMs, and whether society could gain from training more NPs, PAs, and CNMs. Because of the complexity of the issues involved and the lack of data, these questions are seldom addressed together. The literature does, however, permit the piecing together of some parts of this puzzle.

## SCOPE OF PROFESSIONAL PRACTICE

### Services Provided by Nurse Practitioners and Physician Assistants

The tasks NPs and PAs are trained to perform encompass a broad spectrum of *primary* care activities involving diagnosis and therapy (see ch. 1). Distinguishing between NPs and PAs on the basis of task descriptions is difficult. NP training may emphasize counseling and health promotion activities to a greater degree than PA training does, but the major difference lies in the practitioners' relationships with physicians. By definition, PAs work under physicians' supervision, whereas NPs have collaborative relationships with physicians and other health professionals.

Most observers conclude that most primary care traditionally provided by physicians can be delivered by NPs and PAs. Hausner and others (105) conclude that 60 to 80 percent of the tasks normally performed by primary care physicians can be provided by NPs and PAs without consultation. Record and others (192) estimated that 90 percent of pediatric care can be provided by NPs and PAs, and that NPs and PAs can substitute for physicians in providing 50 to 75 percent of all primary care services. Hausner and others (105) argue that NPs and PAs can safely perform enough



Photo credit: American Nurses Association

NPs are trained to perform a broad spectrum of primary-care activities.

of the primary care responsibilities to be considered viable alternatives in providing primary care, even where direct supervision is unavailable.

What NPs and PAs are trained to do and what they do in practice maybe different. Their actual roles depend on the settings in which they work. Limited information exists as to how practicing

NPs and PAs actually spend their time. A 1979 review cites four reports indicating that “nurse practitioners, in particular, emphasize preventive services,” including one report concluding that NPs can provide as much as 75 percent of the well-person care for both adults and children (218). Other studies have found that NPs engage more often than physicians in providing interpersonal care (221) and chronic care (32). However, beyond these sorts of indications and references to the NP orientation to health education, counseling, and preventive and chronic care, accurate descriptions of the actual specific tasks performed by NPs do not exist. Indeed, such information would be difficult to obtain, because the range of primary care services provided by NPs in outpatient settings is so broad.

Little information exists concerning trends in the freedom of NPs to function independently of physicians. Nearly two-thirds of the pediatric NPs responding to a national survey in 1978 said that a physician was always physically present when they worked. Only 39 percent of the respondents to a similar survey in 1983 noted that a physician was always present (44). These findings suggest some movement toward administrative independence, but more data on other types of NPs working in a variety of settings are required in order to establish whether the trend is significant.

Although PA training programs also include health education and counseling, relatively little empirical evidence exists on how much health-promotion and disease-prevention services PAs actually provide. In general, PAs tend to focus more than NPs on providing acute care services (138). PAs place less emphasis on preventive services (218) and “provide selective patient services,” whereas NPs are oriented more “toward treatment

## PRODUCTIVITY

If the tasks performed by NPs, PAs, and CNMs overlap substantially with those performed by physicians, an obvious potential exists for these providers to substitute for physicians in the sense of performing tasks typically and characteristically carried out only by physicians. NPs, PAs, and CNMs can also complement physician care

of the ‘whole patient’ “ (160). These generalized characterizations do not apply universally, but they illustrate an important distinction between PAs and NPs: PAs tend to function primarily as substitutes for physicians, generally providing only services that physicians provide, whereas NPs are likely to provide both services usually provided by physicians as well as services generally provided by nurses.

### Services Provided by Certified Nurse-Midwives

In 1982, the American College of Nurse-Midwives (ACNM) (10) conducted a survey of its members which obtained detailed information about the specific tasks performed by CNMs in clinical practice. Of the approximately 1,000 CNMs responding, over 75 percent delivered prenatal, labor, delivery, and postpartum care as well as family planning and normal gynecological services. The CNMs’ responses to detailed questions about tasks showed that they provide the full range of services within their areas of expertise and they assume specific responsibility for many of the tasks which they perform without physician direction and supervision. CNMs clearly can substitute for physicians in performing a significant share of the tasks normally carried out by physicians. A major difference between CNM care and physician care is that CNMs are less likely than physicians to prescribe drug treatments, which may reflect both philosophical differences and legal restrictions. CNMs also tend to use less high-priced technology than physicians, and CNMs do not perform major surgery. In collaboration with physicians, however, CNMs manage high-risk patients during the prenatal, labor, and delivery stages.

by providing some services, such as counseling or health education, not currently provided by many physicians or not carried out to the same extent.

Whether a service is a substitute or a complementary service is often difficult to determine.

Technically, empirical measurement of substitutability is complicated by the need for large amounts of accurate data on the prices and utilization levels of resources used in the production process as well as on the output of the production process. Therefore, studies of the role of NPs, PAs, and CNMs have taken the more straightforward approach of productivity analyses based on small samples, case studies, or simulations.

Productivity, simply stated, is output per unit of input. The productivity of medical practitioners is frequently expressed in terms of the number of patients seen per week or per hour of the practitioners' time. In comparing physicians with NPs, PAs, and CNMs, the appropriate method of measuring productivity depends on whether the NPs, PAs, or CNMs are working under direct supervision by physicians or working interdependently with physicians. For example, studies of PAs directly supervised by physicians examine how employing PAs marginally affects total practice output (e. g., the additional number of patients seen per week). Or time-and-motion studies of the production process might examine the tasks performed by PAs and how long they take, as compared with the time physicians would take. To evaluate the productivity of practitioners working in collaboration with physicians, as CNMs work, studies could compare the number of patients seen per week in collaborative practice with the number of patients seen for the same service by an obstetrician. Physicians could also be compared with NPs, PAs, or CNMs with regard to the number of minutes required per encounter for a particular type of patient or medical service. This approach attempts to control for case mix.

Comparing the productivity of physicians and PAs is facilitated by the fact that the tasks they perform overlap significantly. Indeed, PAs tend to provide essentially the same services physicians perform. The need to understand differences in content of care, therefore, is not as great in comparing physicians with PAs as in comparing physicians with NPs, who generally provide a much wider range of services.

## Nurse Practitioners' and Physician Assistants' Productivity

Studies of NPs' and PAs' productivity have generally taken one of three approaches:

1. time per visit (comparing how much time physicians and NPs or PAs take to complete office visits);
2. average number of visits per unit of time (comparing how many visits different types of providers handle in a given period of time); and
3. marginal product (assessing the effect of adding an NP or PA on a practice's total number of patient visits).

Most studies of NPs and PAs indicate that these providers spend more time per office visit than do physicians (242). For example, Mendenhall and others (160) found in a national survey of physician practices that NPs averaged 19.4 minutes per direct encounter with a patient, PAs averaged 13.3 minutes per encounter, and physicians spent slightly more than 11 minutes per encounter. A study by Charney and Kitzman (52) yielded similar results, but studies are not unanimous on this issue. In a large health maintenance organization (HMO)—a special setting—Record and others (191) reported that PAs spent less time per routine visit (an average of 7.1 minutes) than physicians did (8.9 minutes). The study noted, however, that:

... a sampling of medical charts revealed that even where the presenting morbidity was the same, physicians tended to get somewhat older patients with a greater number of associated morbidities, including chronic diseases, which might easily explain the time difference.

Also, Kane and others (129) found little difference in the amount of time physicians and physician assistants spent per visit. These data support the conclusion reached by Record and her colleagues (192) in a review of more than a decade of experience and studies, that "there is more of a tendency for NPs than for PAs to vary from physicians in the average amount of time spent on an office visit."

The shorter average time physicians, as compared with NPs and PAs, spend with patients translate into greater productivity over time. In other words, the number of encounters with patients per hour or per work week is higher for physicians than for NPs or PAs. Mendenhall and others (160) reported the following:

- NPs average 7.9 direct encounters and 2.4 telephone encounters with patients per day;
- PAs average 14.2 direct encounters and 2.6 telephone encounters with patients per day;
- physicians who supervise NPs or PAs average 18.9 direct encounters and 3.4 telephone encounters with patients per day; and
- physicians who do not supervise NPs or PAs average 21.4 direct encounters and 5.7 telephone encounters with patients per day.

Data from a recently completed national survey of rural health care delivery organizations indicated that primary care physicians saw an average of 105.6 patients per week and worked 48.6 hours per week, whereas NPs and PAs saw an average of 75.0 patients per week and worked 40.7 hours per week (107). On the average, then, these physicians, saw 2.2 patients per hour, compared with 1.8 patients per hour for NPs and PAs. Romm and others (199) found that, compared with PAs, NPs spent more time per patient and, therefore, saw fewer patients per week. Because physicians work more hours per week than do PAs and NPs, these productivity comparisons are best made on a per-hour basis, i.e., adjusting for the number of hours worked per week. Overall, the findings indicate that, in terms of patients seen per unit of time, NPs are less productive than PAs, who, are less productive than physicians. However, this result does not adjust well for severity of illness (i.e., case mix), nor does it necessarily mean that physicians are relatively cost-effective. For example, physicians might be three times more productive than NPs and PAs are, but cost six times as much as they do.

The extent to which hiring an NP or PA increases the output of a practice has been the subject of some debate (110, 111, 153). LeRoy (138) reported increases of between 20 and 90 percent in the productivity of physicians' practices that added NPs. Hershey and Kropp (110) used a model

to estimate that the productivity gain maybe only 20 percent after calculating the "offsetting changes in measures such as provider time available for nondirect patient care activities, patients' waiting time, waiting room congestion, practice hours, and supervisor requirements." The findings of Mendenhall and others (160) indicate that even though direct encounters between patients and the supervising physician decline when an NP or PA is hired, the practice's total output increases. Record and others (192) reported "greatly varying results" in studies of how adding an NP or a PA to a practice affected its productivity. Some studies found NPs and PAs to have greatly increased productivity, and other studies found that adding PAs or NPs actually decreased the number of patients seen. The one fact about which researchers appear to agree is that the potential for increasing productivity is greater in large practices than in small ones (111, 192).

Three major problems arise in assessing productivity in terms of length of encounter or number of patients seen per unit of time. First, these units of measure do not reflect the content of the care provided or the severity of the patients' illnesses. Because some visits require more skill than other visits Holmes and others (114) applied a relative-value measure of productivity, considering both the number of visits and the complexity of those visits. The researchers found that although physician-NP teams handled only 5.7 patient visits more than physician-nurse teams handled each day, the teams with NPs were 26 percent more productive in terms of total value-weighted services (114). The difference in content of care is an important consideration because NPs provide more time-consuming services, such as health education and counseling, than do physicians and physicians are capable of providing some medical services that NPs cannot provide. Measures unadjusted for content and complexity of work may yield biased estimates of relative productivity.

The second major problem in basing productivity estimates on numbers of patients or lengths of visits is that these measures inadequately reflect the ultimate objective of medical care. The purpose of medical care is to treat and prevent health problems rather than to provide individ-

ual services. Recognizing this fact, Salkever and others (213) examined the productivity of physicians and NPs in terms of episodes of care, because episode-based assessments account for differences in referral, and because “the episode is also a more appropriate unit for measuring differences in effectiveness of care, since the outcome of the care process may be causally related not only to a service received at a single visit, but to any services received over the course of the episode.” The researchers found that the per-episode costs were about 20 percent lower when NPs were the initial providers than when physicians were the initial providers.

A third major problem in ascertaining productivity is that existing studies reflect current substitution practices, which may not fully exploit the potential for using NPs and PAs cost-effectively. The fact that NPs and PAs can safely perform numerous medical-care services suggests that these practitioners have the capacity to be highly productive as individuals and to contribute substantially to the productivity of the organizations in which they work. But a key factor affecting the productivity of NPs and PAs is the extent to which their employers—often physicians—are willing to delegate tasks to them.

The evidence about what physicians actually delegate as opposed to what they can safely delegate is limited. A recent study of physicians in a large HMO (125) found that physicians did not delegate as many tasks as they thought NPs and PAs could handle safely. General internists, pediatricians, and obstetrician/gynecologists indicated that 49, 46, and 29 percent, respectively, of their total office visits could be shifted safely to PAs and NPs. The internists and pediatricians, however, were willing to shift only about 28.5 percent of their visits to NPs and PAs, and obstetrician/gynecologists were willing to shift only about 14 percent of their visits. Most pediatricians and obstetrician/gynecologists cited their patients’ preferences for being treated by physicians and the physicians’ own needs to maintain overall proficiency by seeing a full range of patients as the primary reasons for not delegating more. The primary reasons most internists cited for not delegating more were that seeing only complex cases

would be too demanding and that patients preferred to receive care from physicians (125).

In addition to reflecting physicians’ willingness or unwillingness to delegate responsibilities, the productivity of NPs and PAs depends on many factors, including practice type (solo or group), practice setting and size, case mix, how long the NPs or PAs have been practicing, practice regulations, and how much autonomy the NPs or PAs have. Many of these factors are beyond the control of NPs and PAs, however, which means that the potential or capacity of NPs and PAs has a limited effect on their productivity and, consequently, on their ability to affect the cost of care. Indeed, most productivity analyses consider NPs and PAs as part of physicians’ practices. Little evidence exists as to the productivity and cost-effectiveness of NPs and PAs as autonomous practitioners.

In sum, the studies of the productivity of NPs and PAs suggest that:

- physicians can substantially increase their practices’ output by employing NPs or PAs who operate under the supervision of physicians;
- although PAs, and, especially, NPs see fewer patients per hour than physicians see, these practitioners are capable of carrying substantial proportions of the workloads of primary-care physicians; and
- practice setting may be an important factor in NPs’ and PAs’ productivity, as evidenced by the differences in the use and productivity of NPs and PAs in HMOs and traditional settings.

The potential suggested by these studies is limited by the reluctance of physicians to delegate tasks. Evidence shows that physicians are reluctant to use NPs or PAs even to the extent that physicians think feasible and safe, basing their reluctance on patient preferences.

### **Certified Nurse= Midwives’ Productivity**

Compared to the many studies of NPs and PAs, much less information is available on the productivity on CNMs. Furthermore, “it is characteris-

tic of the nurse-midwifery studies that they concentrate on outcome" (67). This almost exclusive focus on outcome rather than process limits information about CNMs' involvement in producing services.

One study (253) indicated that CNMs were only "about 23 percent as productive as obstetricians when the number of deliveries was used as the output measure." But the same study reported when the volume of patient visits was used as the output measure, CNMs were 98 percent as productive as obstetricians.

As with NPs, the content of care provided by CNMs must be understood because they stress the

interpersonal aspects of care, such as counseling, health education, and patient interaction (103, 184). Such an understanding is necessary in order to specify what facet of the care provided by CNMs contributes to the positive outcomes their patients experience (226).

Data from the ACNM survey (1984) suggest substantial possibilities for CNMs to substitute for physician care. Many CNMs are already assuming responsibility for a wide variety of complex tasks in prenatal, labor, delivery, and postpartum care.

## COSTS AND EMPLOYMENT

Although considerable scope exists for substituting of NPs, PAs, and CNMs in providing some of the care traditionally provided by physicians, the resulting increases in productivity are not enough, by themselves, to justify greater employment of these practitioners in private practices. From the standpoint of a private firm, the marginal value (as measured by the amount patients would pay for the additional output) must compare favorably with the marginal cost (i.e., the salary and related expenses) of hiring an NP, PA, or CNM. From the perspective of a long-run investment in training, either by society or by the trainees, the value (i.e., compensation) placed on the output of the NPs, PAs, or CNMs must compare favorably with the costs of training to justify expending the resources.

In 1983, annual salaries for NPs, PAs, and CNMs averaged about \$25,000, compared with the \$60,000 to \$80,000 median salaries of primary-care physicians (18). This wage gap raises several questions. What are the costs and benefits to society of using NPs, PAs, and CNMs rather than physicians? And if NPs, PAs, and CNMs are cost-effective substitutes, why isn't their employment increasing relative to the employment of physicians?

NPs, PAs, and CNMs, clearly could not completely replace physicians, because the scope of the NPs', PAs', and CNMs' professional activities is constrained by their more limited training,

reimbursement policies, legal barriers, and practice setting characteristics. Furthermore, NPs, PAs, and CNMs sometimes compete with professionals other than physicians or operate independent practices. Nonetheless, given the large overlap of their practices, primary care physicians provide an appropriate comparison group for considering the employment of NPs, PAs, and CNMs. Although some information is available about salaries, the figures are imprecise enough that the discussion must be carried out in approximate and qualitative terms.

### Costs and Benefits of Training Nurse Practitioners, Physician Assistants, and Certified Nurse-Midwives

Estimates of the social and private rates of return to investments in training and education indicate the value placed on these investments by society and private individuals, respectively. The best of such computations require large amounts of data on earnings over the career of the individual. However, some conceptual issues can be addressed qualitatively. In theory, the rate of return on investment in the training of NPs, PAs, or CNMs can be calculated without reference to the training or earnings of physicians. Society must expend a certain amount to train a person to be an NP, for example, and this investment yields a return of about **\$25,000** per year (plus

fringe benefits) minus what the person would have earned otherwise.

An alternative approach would be to consider the costs and benefits of training someone to be an NP, PA, or CNM instead of training the person to be a physician. The costs to society of training an NP, PA, or CNM are much less than the costs of training a physician. The direct costs related to education such as payments for instructors, supplies, and facilities, are greater for physicians than for NPs, PAs, and CNMs, probably on a yearly as well as overall basis. The indirect costs, primarily what the individual would have earned during the time spent in training, are also greater for physicians, because more years of schooling are required.

Differences between the social and private rates of return primarily reflect differences in the costs of education. The more that government subsidizes training, the higher will be the private rate of return, compared with the social rate. Little evidence exists as to what either rate of return is or what the differential between the two is, but educational subsidies over the years have been considerable. Scheffler (217) provides an estimate of the private rate of return as of the early 1970s, arguing that “. . . the private rate of return is sufficient to produce a relatively strong demand for PA training; therefore, an increase in government support is unwarranted.” He finds high rates of return—over 20 percent—comparable to those received by physicians. The available data are probably insufficient to allow distinctions between these two types of investment, but thinking about them qualitatively is useful.

#### **Nurse Practitioners and Physician Assistants**

The most recent estimates of the costs of educating physicians and NPs, PAs, and CNMs were made in 1979 by the Congressional Budget Office (CBO). CBO estimated the mean total costs of educating NPs and physicians at that time to be \$10,300 and \$60,700, respectively. Assuming, conservatively, that these costs increased at an average annual rate of 6 percent, the total educational costs would have been \$14,600 for NPs and \$86,100 for physicians as of 1985.

A substantial portion of these direct costs are borne by taxpayers, rather than by the trainees. Society, through government support, has invested heavily in the training of NPs as well as physicians. For example, between 1975 and 1982, the Federal Government spent \$65.9 million on educating NPs. These funds supported approximately half the NP training programs in the United States (251).

The indirect costs—primarily foregone earnings—are substantial, but they are difficult to estimate with any precision. Because a physician spends about 6 more years in training than does an NP, the indirect costs an individual must pay to become a physician are much greater. Determining the value of the foregone earnings for those individuals who become doctors versus those who become NPs is a more complex empirical task. Clearly, however, several NPs could be trained for the cost of educating one physician.

Extrapolating from CBO's estimates of PA-training costs (242), the total direct costs of training a physician assistant would have been \$16,900, compared with \$86,100 for training a physician as of 1985. The indirect costs for PAs are about the same as for NPs. Thus, the total costs of training are higher for PAs than for NPs, but the average earnings of PAs are higher than those of NPs (\$24,500 versus **\$23,500**) (44,237). Although, a more precise comparison would require some adjustment for the sex compositions of the two groups, the chief implication of the studies is that PAs, like NPs, are much less costly to train than physicians.

#### **Certified Nurse-Midwives**

The tuition charges for nurse-midwifery education vary considerably among programs, but an estimated average of the annual cost of educating a nurse-midwifery student is approximately \$12,000 (78). The total cost of training is increasing with the growing trend toward master's degree programs, which last 2 years and are usually twice as long as certificate programs. Approximately 40 percent of the Nation's CNMs have graduated from master's degree programs. The average total training cost for certificate and

master's programs combined is about \$16,800, compared to the \$86,100 cost of physician training as of 1985.

### Costs and Benefits of Private Employment of NPs, PAs, and CNMs

Because physicians or group practices sometimes must choose between hiring additional physicians and hiring NPs, PAs, or CNMs, the perspective of the physician as employer should be considered in any attempt to understand the employment levels of these nonphysicians. Using NPs, PAs, and CNMs to provide services that would otherwise be provided by physicians can benefit society with lower fees if the cost of providing services by the nonphysicians is less than that of providing services by physicians and if the savings are passed on to patients. The costs of employing an NP, PA, or CNM include salary, fringe benefits, supervisory expenses, costs of any expansion necessitated by adding another provider to the staff and costs of resources used by the additional provider. These costs must be compared with the costs that would be incurred if a physician were added to the practice. The benefits a practice receives by hiring an additional provider are the additional fees the provider's services generate for the practice.

#### Nurse Practitioners

How employing a nurse practitioner would affect the cost of a practice cannot be determined with any precision, but the following simple calculation provides a rough picture of the effect. The median salary of NPs in clinical practice in 1983 was approximately \$23,500. If fringe benefits averaged 25 percent of salaries, total costs would be about \$29,500 per year. This is far below the \$82,000 net income of young physicians (19). Hiring a nurse practitioner or another physician might also result in indirect costs for such things as new office space, new equipment, additional support staff, and additional resources.

Total practice costs would change in composition because physicians would spend some time supervising the NP instead of providing visits, or the NP might order more or fewer lab tests than the physician would have. However, the basic

question is whether the total value of the practice output increases enough (i.e., would there be enough additional revenue) to cover the additional cost of the NP?

Denton and others (61) examined the effect of the additional costs in a hypothetical calculation of the savings that would have resulted in Canada in 1980 "had nurse practitioner time been substituted for physician time in the provision of all services for which such substitution has been demonstrated to be safe and feasible." The researchers concluded that the savings from this widespread use of NPs would have been from 10 to 15 percent for all medical costs (or from \$300 million to \$450 million) and that the savings would have amounted to between 16 and 24 percent of the total costs for ambulatory care. Furthermore, the researchers determined that their "estimates are quite insensitive to demographic changes and will be as valid in the future as they are today."

These findings are supported somewhat by the findings of Salkever and others (213), who compared patterns of treatment for otitis media and sore throat by three types of prepaid group practices—NP only, NP-physician team, and physician only. With respect to otitis media, the findings support the contention that NPs' services are less expensive than those of physicians. Services provided by NPs alone are less costly than those provided by physicians alone or by NP-physician teams. The researchers found no difference, however, between the cost of treatments for otitis media by physicians alone and NP-physician teams. The findings were similar for care of sore throats. These results confirm earlier studies (81, 141) comparing the costs of specific medical tasks conducted by nurse practitioners with the costs of the same tasks conducted by physicians.

#### Physician Assistants

The average salary of a PA is \$24,500 and fringe benefits probably amount to about 25 percent of their salaries, making the average direct cost of employing a PA approximately \$30,600 per year a sum much lower than the average income of young primary-care physicians.

Accurately estimating the relative cost of employing a PA versus that of employing a physi-

cian requires an examination of the indirect costs that result from the resources expended by the additional employees. Little information exists about the extent of the costs PAs generate by using a practice's resources. For example, Wright and others (266) found that PAs generate more laboratory costs than medical residents but fewer than medical faculty. The calculations that Denton and others (61) employed for determining that using NPs would save 10 to 15 percent of the total cost for medical care in Canada could apply to using PAs, as well, because the researchers used the term *nurse practitioner* in a broad sense to encompass "several different types of intermediate health professionals."

### Certified Nurse-Midwives

The average salary of CNMs was **\$24,800** in 1983. If their fringe benefits were 25 percent of their salaries, the average direct cost of employing a CNM was approximately \$31,000 that year. The mean net income of obstetricians in 1983 was \$119,900 (before fringe benefits) but because most CNMs have been practicing fewer than 15 years, the most appropriate figure for comparison would be the average salary of young—rather than all—obstetricians. The average income of young obstetrician/gynecologists is \$100,000 per year plus \$25,000 or more for fringe benefits.

As with the other types of health-care providers, the indirect costs a CNM generates by using a practice's resources need to be calculated to determine the full costs of employment. Evidence exists that clients of CNMs have shorter hospital stays than do clients of obstetricians (53, 65). But

Dickstein (53) found that clinic prenatal and postpartum costs in a large HMO were higher for CNMs than for obstetricians, "primarily because midwifery visits are longer and more frequent, use more RN educational time, and include the cost of OB consultations and referrals." Generally, although existing data do not allow precise quantification of the costs of CNM care and physician care, the salary differential probably ensures that the total costs are considerably less for CNMs than for physicians.

### Costs Versus Benefits of Private Employment

The private physician's firm that employs an NP, PA, or CNM incurs extra costs for salary, fringe benefits, capital improvements, and other items. Productivity studies have shown that the time a physician spends supervising the NP, PA, or CNM reduces the number of patients the physician sees, although the reduction is more than offset by the overall increases in practice volume generated by the additional provider. Studies have not, however, directly addressed whether the value of the additional output exceeds the additional cost. In terms of rough magnitudes, the comparison is between a \$25,000 salary (plus other costs) and a 20- to 50-percent increase in the practice's revenues, from a base of \$150,000 to \$200,000 annually. In view of the uncertainty about the extent to which an NP, PA, or CNM would increase marginal revenues, the marginal revenues do not clearly exceed the marginal costs. But the careful accounting by Denton and others (61) in Canada suggests that significant savings are possible for private practices that hire an NP, PA, or CNM rather than an additional physician.

## CURRENT EMPLOYMENT: SETTINGS AND TRENDS

The productivity studies suggest that hiring NPs, PAs, and CNMs may provide private practices a cost-effective alternative to hiring additional physicians. And although private markets may be functioning as expected under existing legal and market institutions, unexploited social benefits may be available from the greater employment of NPs, PAs, and CNMs.

### Nurse Practitioners' and Physician Assistants' Employment

Most of the pertinent studies have addressed the employment of NPs and PAs in primary-care settings, although NPs and PAs work at all levels of health care in a wide variety of settings (154). A 1982 national survey of pediatric NPs, for ex-

ample, revealed that 22 percent of the respondents worked in hospitals, 20 percent in community-health agencies, 17 percent in private pediatricians' offices, 10 percent in specialty clinics, 8 percent in schools, 6 percent in HMOs, and the rest mainly in nursing schools and military clinics (167).

NPs are increasingly being employed in home health agencies (155,196,220,268), and finding work in nursing homes (87,262). NPs are also working in industrial settings (216), correctional institutions (104), and schools (156,228).

Different types of practice settings have different implications for any economic analysis of the benefits of hiring NPs or PAs. For example, comparing NPs with other nurses might be more appropriate than comparing NPs with physicians in such settings as home health agencies, HMOs, schools, and businesses, where NPs might be employed instead of, or in addition to, registered or licensed nurses. In these settings, the NPs—the more costly alternative—might be selected because they could provide a wider range of services. NPs employed in schools, for example, can serve as liaisons among the various health-care providers serving schools; NPs can also provide backup support and in-house education to school nurses and provide educational services to teachers, parents, and students (228).

Because of increases in the variety of settings in which NPs work, their employment rates might reasonably be expected to be higher than ever. But, proportionately fewer NPs are working as nurse practitioners in the 1980s than were doing so in the 1970s (237). The extent to which this decrease reflects increased competition from the growing supply of physicians is unknown.

PAs also work in a wide variety of settings and in every level of health care from primary to tertiary. Of all the Nation's PAs, about one-third work in office-based practices (about half of these PAs work with physicians in solo practices); another one-third or so are based in hospitals; and the remaining one-third work in prepaid groups, public health departments, drug and alcohol rehabilitation centers, industrial settings, nursing homes, prisons and jails, and military facilities (45). Considerable change has occurred in the proportion of PAs employed in various settings. For exam-

ple, the proportion of PAs employed in hospitals grew from about 10 percent in 1974 to more than 30 percent today.

Increasing numbers of NPs, as well as PAs, are finding work in hospitals. This development may not be due to the implementation of prospective payment for hospitals based on diagnosis-related groups (DRGs) and, in fact, maybe occurring despite DRGs. Instead, the trend is probably related in part to the growth in the supply of physicians.

As the number of physicians increases in certain specialties, e.g., surgery, residency positions are being decreased to contain the numbers and PAs [are being] employed as 'junior house staff' to supplement patient care (262).

New employment opportunities for NPs and PAs may also stem from the trend for hospitals to establish community-based, ambulatory-care centers in order to broaden their patient bases and to assure themselves of solid sources of inpatient referrals. Hospital managers recognize that their best interests are served by providing these services as efficiently as possible and, consequently, by employing NPs and PAs.

### Certified Nurse= Midwives' Employment

According to the 1982 ACNM survey, 36 percent of the Nation's CNMs worked in hospitals, 20 percent were in private practice with one or more physicians, 14 percent were in private nurse-midwifery practice, and the remainder worked in public-health agencies, prepaid groups, and other settings (10). Nearly 35 percent of the respondents to this survey revealed that they were not working as nurse-midwives, and about half of these said the reason was that "no nurse-midwifery positions are available in my community."

The data in table 2-3 indicate the changes that have taken place in how CNMs are distributed among the types of organizations in which they work. In general, the shift has been away from employment in hospitals, public health departments, and university health services and toward private practice (9,10). In contrast to NPs and PAs, proportionately fewer CNMs practice in hospitals now than did so in the 1970s: in 1984, only 6.7 percent of the Nation's hospitals had CNMs

on staff (171). More than 14 percent of the Nation's CNMs worked in private nurse-midwifery practice in 1982, compared with 2.4 percent in 1976 to 1977 (9,10).

CNMs are finding increased employment where they are not administratively responsible to physicians. Administrative independence must not be confused with clinical independence, because CNMs do not aspire to clinical independence. They highly value their professional interdependence and collaboration with physicians (13).

Although most NPs and PAs in primary care are supervised directly by physicians, only 48 percent of the CNMs practicing in the United States who responded to the 1982 ACNM survey indicated that their immediate supervisors were physicians. All the responding CNMs, however, collaborated on clinical matters with physicians (10). The proportion varied considerably depending on the type of practice. For example, about 9 of every

10 CNMs in private practice with physicians were supervised directly by physicians, whereas approximately one-third of hospital-based CNMs were under the supervision of physicians. Almost half the CNMs in private nurse-midwifery practice were not administratively responsible to anyone other than themselves, and an additional 22 percent reported to other nurse-midwives. In all, nearly 36 percent of the respondents noted that they were supervised directly by other CNMs (10).

The evidence suggests that CNMs—especially those in private nurse-midwifery practice—tend to function organizationally more independently of physicians than do NPs or PAs. Because of the sixfold increase in the percentage of CNMs working in private nurse-midwifery practices between 1976–77 and 1982, the organizational independence of CNMs has increased markedly. This trend shows no signs of slowing down, although all obstetrics-related care may be decreased by the liability-insurance crisis.

## SUMMARY

Studies show that NPs, PAs, and CNMs can provide services that both substitute for and complement physicians' services, depending on the particular service or type of practice. Moreover, hiring an NP, PA, or CNM increases a practice's total output and costs less than employing an additional physician. Because training is less costly for these practitioners than for physicians, using NPs, PAs, and CNMs rather than physicians for certain services would presumably be cost-effective from a societal point of view, given that the quality of care is equivalent to that provided by physicians for comparable services (see ch. 2). Although additional cost savings might result from greater employment of these providers, the evidence suggests that current employment levels and practices more or less reflect existing market conditions.

The abilities and cost-effectiveness of NPs, PAs, and CNMs raise a question as to why their ranks

have not grown and diffused to a greater extent. Although the private markets for NPs, PAs, and CNMs as employees in physicians' practices do not suggest a current shortage, the removal of payment barriers and limitations could greatly increase the demand for these alternative practitioners. Unless the barriers are altered, the potential savings from a greater use of NPs, PAs, and CNMs will probably remain unexploited.

Continuing research and analysis is needed to ascertain the cost savings that would result from increased employment of NPs, PAs, and CNMs. Many productivity studies have been conducted, but few attempts have been made to compare how NPs, PAs, or CNMs affect the revenues of individual practices with how they affect the practices' costs. Changing market circumstances create a need for both types of studies, but those that compare revenues and costs are especially important.