THE EMPLOYMENT AND USE OF NURSE PRACTITIONERS AND PHYSICIAN ASSISTANTS BY RURAL HOSPITALS

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EXECUTIVE SUMMARY

Nurse practitioners (NPs) and physician assistants (PAs) are both important resources for the delivery of health care services in rural areas. Nevertheless, little is known about the demand for their services by rural employers. The purpose of this paper is:

1. to describe and compare the employment and use of NPs and PAs by rural hospitals in an eight state region in the Northwestern United States (Minnesota, North Dakota, South Dakota, Iowa, Montana, Idaho, Oregon and Washington); and,

2. to examine how market and organizational factors influence the employment of NPs and PAs by rural hospitals.

The data for this study were collected through a telephone interview of rural hospital administrators. Key study findings include:

- Over 50 percent of the rural hospitals located in the eight northwestern states use PAs and 22 percent employ PAs on either a full or part-time basis. Over 30 percent of the hospitals use NPs and 15 percent employ a part-time or full-time NP. Moreover, there is a demand for more of both types of practitioners.

- PAs tend to be employed in small, low volume facilities that have small medical staffs and a small service population, while NPs are primarily found in high volume hospitals in more populated areas that have more types of specialists and more primary care physicians on the hospital's active medical staff.

- Rural hospitals use both NPs and PAs to enhance their delivery of outpatient services and a major factor related to the employment of both NPs and PAs by rural hospitals is the Rural Health Clinic program.

- The majority of hospitals that use NPs, as well as those that use PAs, indicate that NPs and PAs can prescribe medications and order lab tests and x-rays but considerably fewer report that NPs and PAs have admitting or discharge privileges.

- PAs appear to provide a more expanded scope of services in rural hospitals. Nonetheless, rural hospitals seem to employ NPs and PAs for similar reasons: 1) to extend care, assist the physicians or increase access to

primary care; 2) because physicians are unavailable or too difficult to recruit; 3) because NPs or PAs are considered cost-effective or more economical for rural areas; and, 4) for Rural Health Clinic certification.

Rural hospitals are increasingly important employers of nurse practitioners and physician assistants, although there is a greater demand for than supply of both types of practitioners. Increased federal and state support for NP and PA educational programs would allow expanded enrollment and an increase in the number of graduates available for practice in both urban and rural areas. Targeting financial support toward programs with documented efforts for placing graduates in underserved and rural areas would be an effective way of ensuring an increase in the supply of NPs and PAs available for these areas.

The Rural Health Clinic program is a major factor affecting the employment of NPs and PAs by rural hospitals. Although there is concern about the sudden growth and appropriate use of the RHC program, this study suggests that it may be fulfilling its original goal, which was to encourage the use of NPs and PAs in rural areas. Therefore, continued support for the RHC program is recommended as a means of improving the supply of health professionals in rural areas.

Areas for further research include a more rigorous examination of what causes the difference between the types of rural hospitals that use and employ PAs and those that use and employ NPs, which is an important issue in the development of policies to improve the supply and distribution of health professionals in rural areas; an assessment of whether the increasing number of provider-based RHCs and the employment of NPs and PAs by rural hospitals improves access to health care services; and, a more thorough examination of how changes in practice legislation or institutional policies influence the employment of NPs and PAs in rural areas.

INTRODUCTION

During the 1960s and 1970s there was considerable interest in the increased use of Nurse Practitioners (NPs) and Physician Assistants (PAs) as primary care providers in rural and underserved areas. However, their deployment was limited by several factors, including restrictive state practice legislation, resistance by other health care providers, and inequitable or ambiguous reimbursement practices (Weston, 1980; Miller and Byrne, Inc., 1978; Sullivan et al., 1978).

Within their scope of practice, NPs and PAs are able to provide cost-effective and high quality services in a variety of practice settings (Brown and Grimes, 1993; Ventura and Crosby, 1991; U.S. Congress, 1986; Spitzer et al., 1974). As health care costs continue to climb, interest in the increased use of NPs and PAs to provide health care services is resurfacing (Robbins, 1994; Atwater, 1994; Riportella-Muller, Libby and Kindig, 1995). The expanded use of NPs and PAs is perceived as a way of both decreasing health care costs and improving the efficiency of health care delivery (Prescott, 1994). Moreover, the demand for NPs and PAs in rural areas appears to be increasing as many communities find it difficult, as well as costly, to recruit physicians to practice in rural settings (Rural Health On Center, 1995; Landis and Lambert, 1995; Hudson, 1990).

The practice environment for NPs and PAs is changing (Gilliam, 1994). Several states have passed legislation to liberalize NP and PA practice and recognition of the role of NPs and PAs in delivering health care services is steadily growing (Robbins, 1994; OIG, 1993; Primary Care News, 1993). Despite these changes, there are few

studies in the health services literature that assess their effect on the employment and use of NPs and PAs in rural areas. Recently, a national survey was conducted to examine what influences PA's decisions about where to practice (Muus and Geller, 1994) and a national survey of NPs was undertaken to study factors related to choice of practice location, practice barriers, and professional satisfaction (New York Rural Health Courier, 1994). Neither study focuses on how market or organizational factors affect the employment of either NPs or PAs in rural settings.

The purpose of this paper is 1) to describe and compare the employment and use of NPs and PAs by rural hospitals in an eight state region in the Northwestern United States (Minnesota, North Dakota, South Dakota, Iowa, Montana, Oregon and Washington); and, 2) to examine how market and organizational factors influence the employment of NPs and PAs by rural hospitals. For the purpose of this paper employment indicates that the practitioner is a salaried employee of the hospital whereas use indicates that the practitioner provides some services in the hospital but is not necessarily a salaried hospital employee.

BACKGROUND

NPs and PAs share many of the same skills and are often collectively referred to as mid-level providers or non-physician providers. However, they are actually quite distinct with respect to role development, formal training and education, and practice perspective (Robbins, 1993; Huch, 1992). Moreover, there are considerable

differences in the legal scope of practice and the reimbursement policies for NPs and PAs.

A nurse practitioner is "a registered nurse (RN) who has advanced education and clinical training in a health care specialty area" (AANP, 1988). A few states (e.g., Alaska and New Mexico) legally recognize NPs as independent practitioners, but most require that NPs work in collaboration with or under the supervision of a licensed physician (Birkholz and Walker, 1994). PAs "practice medicine with supervision by licensed physicians" (AAPA, 1993) and are therefore, by definition, dependent practitioners (Jones and Cawley, 1994).

The inadequate supply or maldistribution of health professionals is a persistent problem for many rural areas (Kindig and Movassaghi, 1989; U.S. Congress, 1990). Historically, NPs and PAs have been credited with improving the geographic distribution of health care services and improving access to care in rural and underserved areas (U.S. Congress, 1986; Morris and Smith, 1977). Nurse practitioners and physician assistants are considered as both supplements and surrogates for physicians by some rural communities (Lutz, 1993; Ermann, 1990). Nevertheless, there are several considerations related to supply, practice choices (location and specialty), legal scope of practice, reimbursement, and the role of NPs and PAs in the delivery of health care services that could limit their employment in rural areas.

Employment and Use of NPs and PAs

Studies of the employment and use of NPs and PAs have focused primarily on traditional primary care settings (e.g., private physician offices, ambulatory care clinics, and satellite health centers) (Shi et al., 1993; Cherkin, 1980; Crandall et al., 1984; Brooks and Johnson, 1986; Morgan and Sullivan, 1980; Kane, Olsen and Castle, 1978; Spitzer et al., 1974) and HMOs (e.g., Record, 1981). However, NPs and PAs are employed in a variety of practice settings.

In 1994, over 28 percent of PAs practicing on a full-time basis were employed by hospitals (13.7 percent in inpatient settings, 6.6 percent in outpatient settings, and 7.9 percent in university hospitals) (AAPA, 1995). In 1988, approximately 18 percent of NPs were employed in hospitals (8 percent in inpatient settings and 10 percent in outpatient settings) (Towers, 1991).

Published research on hospital-based NPs and PAs tends to focus on the use of NPs and PAs as replacements for medical residents (Green and Johnson, 1995; Riportella-Muller, Libby and Kindig, 1995; Knickman et al., 1992) or examines the use of these practitioners within a specific hospital unit or department (e.g., the emergency department, critical care units) (DeNicola et al., 1994; Curry, 1994; Sturmann, Ehrenberg, and Salzberg, 1990). A study by Willis and Pylitt (1993) describes the scope of practice, credentialing and privileging, and patient care role of PAs with hospital inpatient responsibilities but there are no studies that specifically address the employment and use of NPs and PAs by rural hospitals.

The demand for both NPs and PAs appears to be increasing. Approximately six positions are currently available for each PA and four jobs for each NP (Robbins, 1994). Teaching hospitals and HMOs, in particular, are increasing their demand for PAs and NPs. HMOs use NPs and PAs as primary care and specialty care providers (Moore, 1994; Dial et al., 1995), while teaching hospitals use them to provide many of the services previously furnished by residents (Green and Johnson, 1995; Riportella-Muller, Libby and Kindig, 1995). Increasing demand for NPs and PAs from these primarily urban providers is likely to affect both the specialty and geographic distribution of NPs and PAs, which has implications for the use of these practitioners in rural areas.

Nevertheless, the employment of NPs and PAs by rural hospitals is also on the rise. Data from the American Hospital Association's (AHA) Annual Survey of Hospitals shows that in 1991, approximately 10 percent of non-metropolitan hospitals employed a full time PA while almost 9 percent employed a full-time NP; in 1993, 16 percent employed a full time PA and nearly 11 percent a full time NP (AHA, 1992, 1994). During this time period the total number of non-metro hospitals actually declined while the number that employed NPs and PAs increased.

The roles of NPs and PAs employed by rural hospitals have not been investigated, although several reasons for the growing employment of NPs and PAs have been suggested. For example, hospitals may be expanding their employment of NPs and PAs as they establish community-based ambulatory-care centers to try to broaden their patient base and "assure themselves of solid sources of inpatient

referrals." (U.S. Congress, 1986, p.48). This includes the relatively recent expansion in the number of hospitals establishing Rural Health Clinics, which require that services be provided by either an NP, PA, or certified nurse midwife at least 50 percent of the time the clinic is open (Travers and Ellis, 1992).

Rural hospitals may also be increasing their employment of NPs and PAs because of the need to improve or maintain access to health care services and the inability to recruit or retain primary care physicians (Lutz, 1991; Drozda, 1992). Moreover, the growing number of institutional alternatives to the traditional rural hospital (e.g., EACH/PCH, MAF), which could be effectively staffed by either NPs or PAs (Lutz, 1991; Christianson et al., 1990), might make it more feasible for rural hospitals to employ these types of practitioners.

Finally, growth in the overall physician supply may facilitate the employment and use of NPs and PAs by rural hospitals (U.S. Congress, 1986). PAs, by definition, are dependent practitioners. Thus, the employment of PAs is directly associated with the availability of supervising physicians. Many states also require that NPs work in collaboration with or under the supervision of a licensed physician. So, the employment of both NPs and PAs, in most cases, is contingent on the availability and willingness of physicians to act in a collaborative or supervisory capacity.

Nurse practitioners and physician assistants are both important resources for the delivery of health care services in rural areas. However, little is known about the demand for their services by rural employers. The rural hospital is only one possible employer of NPs and PAs but the prominence of the hospital in the rural health care

delivery system, the increasing use of NPs and PAs by hospitals (Lutz, 1991; AHA, 1992, 1994), and the continuing demand for health professionals by rural hospitals (Lutz, 1991; Bergeron, Buck and Hill, 1993) makes the rural hospital an increasingly important site for examining the employment and use of these practitioners in rural areas.

METHODS

This is a descriptive study of the employment and use of NPs and PAs by rural hospitals. The data for this study were collected through a telephone survey of rural hospital administrators located in eight midwestern and northwestern states (Minnesota, North Dakota, South Dakota, Iowa, Montana, Idaho, Oregon, and Washington). The study is part of a larger project to examine changes in the availability of technology and specialty care in rural hospitals. The hospitals included in the survey were all the rural hospitals in the eight state region as identified for a 1991 baseline survey (Hartley, 1993). The survey was initiated in August, 1994 and concluded in October, 1994 with a response rate of 93 percent (N = 407). The high response rate indicates that response bias should not be a problem.

For the purpose of this study, rural is defined as any hospital not located in a Metropolitan Area (MA) (OMB Bulletin no. 93-05). An MA, as defined by the Office of Management and Budget, is a county that contains a city with 50,000 or more residents; or, an urbanized area with a population of at least 50,000 that is part of a county or counties that have at least 100,000 people (Hewitt, 1989).

Survey respondents were asked to report the number of nurse practitioners and physician assistants that provided services in their facilities, including any services provided in an outpatient or inpatient setting, the emergency room, a nursing home unit, a Rural Health Clinic, or home care services. The administrators were then asked to provide more detailed information about each of the NPs and PAs practicing in their facility, such as the number of years they had provided services, their gender, their salary and employment status (full-time or part-time) if they were employed by the hospital (or who they were employed by if they weren't employed by the hospital) and whether they were members of the medical staff.

The survey also included questions about the types of services provided by NPs and PAs (e.g., inpatient visitation, surgical assistance) and their scope of practice (e.g., admitting privileges, supervision). Open-ended questions were used to elicit information from administrators of hospitals where NPs or PAs are used about the most important reason the hospital uses either an NP or PA and for those that do not use NPs or PAs the most important reason for not using an NP or PA. Finally, the administrators were asked to report the number of NPs, PAs, and physicians they were trying to recruit.

Other survey data which are used in this study include the number and composition of the hospital medical staff, the percent of total hospital revenue from Medicare, whether the hospital owns or manages a Medicare designated Rural Health Clinic, the population of the hospital's service area and the distance to the nearest city with a population greater than 50,000 persons. Data from the 1992 and 1993 AHA

Survey of Hospitals are used to supplement the survey data and provide information about other characteristics of the hospitals, such as bed size, number of admissions, number of outpatient visits, number of surgical procedures (inpatient and outpatient), and the number of full-time hospital employees.

Descriptive statistics for the 407 rural hospitals used in this study are presented in Table 1. Approximately three-quarters (75.2 percent) of the hospitals have fewer than 50 beds and the mean bed size is 45.4 (std. deviation 40.4). The hospitals have, on average, 17.5 physicians on their active medical staff and are located about 92 miles from a city with a population of 50,000 or more residents; over 25 percent are 100 miles or more from a city with 50,000 residents. The average population served by the hospitals is just over 25,000 persons.

RESULTS

Of the 407 rural hospitals in the study, 53 percent indicate that physician assistants provide services in their facility and 31 percent have nurse practitioners who provide services. Sixty-nine hospitals (17 percent) use both NPs and PAs. Overall, there are 459 PAs (45 percent female) providing services in 216 rural hospitals and 265 NPs (88 percent female) providing services in 125 rural hospitals. Approximately 13 percent of the hospitals are trying to recruit an NP and 19 percent would like to recruit a PA.

Eighty-six hospitals employ at least one full-time PA (i.e. the PA works more than 30 hours per week) and two of the 86 also employ part-time PAs. Three

Table 1
Characteristics of Rural Hospitals in the Study
(N = 407)

Hospital Bed Size						Number of Active Physicians on Staff[1]	Distance to a City of 50,000 or more Population	Population of the Service Area
< 25	25-49	50-99	100-199	> = 200	Mean (sd)			
29%	47%	15%	8%	1%	45.4 (40.4)	17.5 (27.7)	91.7 (62.2)	25,242 (36,495)

[1]Standard deviation in parentheses.

hospitals employ part-time PAs only and two did not know whether the PAs they employ were employed full or part time. Of those that employ a full-time PA, the majority (78 percent) employ one or two PAs, although one hospital has 9 full-time PAs. Salaries for full-time PAs range from $40,000 to $100,000 and the median salary is $50,000. This is lower than the national median of $53,234 (AAPA, 1995). Of the hospitals that use PAs, 51 percent use PAs who are employed by a physician, physician group, or clinic, while 9 percent use PAs who are independent contractors. In approximately 74 percent of the hospitals using PAs, the PAs are members of the medical staff (usually identified as an allied or associate member of the medical staff).

Full-time nurse practitioners are employed by 53 rural hospitals. Of the 53 hospitals, only one also employs a part-time NP, although eight other hospitals indicated they employ at least one part-time NP. Salaries for full-time NPs range from a low of $27,500 to a high of $65,000. The median salary for NPs is $50,000, which is similar to the national median of $49,041 for family NPs and $49,798 for adult NPs (Smithing and Wiley, 1995). Of the hospitals that use NPs, 16 (13 percent) said they use NPs who are independent contractors while 57 hospitals (46 percent) use NPs who are employed by a physician, a physician group, or a clinic. The NPs are members of the medical staff in 64 percent of the hospitals that use NPs.

Use of NPs and PAs by Rural Hospitals

Bivariate comparisons of hospitals that use PAs and those that do not, as well as hospitals that use NPs and those that do not, are presented in Table 2. Overall, the

Table 2
Characteristics of Rural Hospitals that Use NPs and PAs

Hospital and Community Characteristics[1]	PAs		NPs	
	Use (n = 216)	Don't Use (n= 191)	Use (n = 125)	Don't Use (n=282)
Hospital Beds	49 (45)	42 (34)	60** (53)	39 (31)
Full Time Hospital Employees	122* (150)	96 (102)	164** (177)	86 (94)
Physicians on Active Staff	20 (32)	15 (22)	30** (39)	12 (19)
Number of Specialty Types on Active Staff (out of 14)	4 (4)	4 (4)	6** (5)	3 (3)
Primary Care Physicians on Active Staff[2]	9 (11)	8 (8)	12** (13)	7 (7)
Hospital Admissions	1509* (1962)	1183 (1334)	2101** (2362)	1026 (1170)
Outpatient Visits (emergency & other)	22,621 (25033)	18,544 (21566)	31,283** (31655)	16,020 (16910)
Surgical Procedures (inpatient and outpatient)	1138 (1739)	867 (1232)	1654** (2079)	725 (1092)
Percent of Revenue from Medicare	54 (14.5)	54 (13.4)	51* (13.9)	55 (13.8)
Owns or Manages a Federally Certified Rural Health Clinic	35%**	16%	30%	24%
Educational Site for NPs, PAs, CNMs or CRNAs	28%**	14%	22%	21%
Currently Recruiting for a Physician	66%	68%	74%*	64%
Population of the Hospital's Service Area	26,731 (38914)	23,558 (33571)	35,559** (44993)	20,690 (31056)
Road Miles to a City of 50,000 Population	92 (60)	92 (65)	95 (60)	90 (63)

[1] Mean values with standard deviations in parentheses
[2] Primary Care is defined as General Practice, Family Practice, Internal Medicine and Pediatrics
* $p < .05$, ** $p < .001$ Compared with hospitals that do not use the practitioner

hospitals that use PAs appear to be slightly larger (i.e. have more beds and employ more staff), have a higher service volume, including significantly more inpatient admissions, and have a larger service population than hospitals that do not use PAs. The hospitals that use PAs also have more physicians and more types of specialists[1] on their active medical staff. Of the hospitals that use PAs, 35 percent own or manage a Medicare certified Rural Health Clinic (RHC), significantly more than the 16 percent of hospitals that do not use PAs but own or manage an RHC. Hospitals that use PAs are also more likely to be an educational site for NP, PA, CNM or CRNA students (28 percent) relative to those that do not use PAs (14 percent).

The hospitals that use NPs are considerably larger (60 beds vs. 39 and 164 full-time staff vs. 86), provide significantly more inpatient, outpatient and surgical services, and serve a much larger population than those that do not use NPs. Hospitals that use NPs also have significantly more physicians on their active staff (30 vs. 12), more primary care physicians (Family Practice, General Practice, Internal Medicine and Pediatrics) and more types of specialists (6 vs. 3) relative to those that do not use NPs. The hospitals where NPs are used receive significantly less of their total revenue from Medicare and are more likely to be currently recruiting physicians. Of the hospitals that use NPs, neither the percentage that own or manage an RHC nor

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[1] The number of types of specialists is simply a count of how many of 14 different types of specialists are represented on the hospital's active medical staff. The specialist variable is a hierarchical scale from 1 to 14 that was developed by Christianson et al., 1993 to describe the composition of the hospital medical staff.

the percentage that are an educational site are significantly different from those that do not use NPs.

Comparisons were also made among hospitals that use both NPs and PAs (n = 69), those that use NPs only (n = 56), those that use PAs only (n = 147), and those that do not use either NPs or PAs (n = 135) (table not shown). Rural hospitals that use both NPs and PAs have more beds, perform a higher volume of services (admissions, outpatient visits and surgical procedures), have more physicians on active staff, more types of specialists, more hospital employees and are located in more populated areas relative to the other groups. Rural hospitals that use NPs only are clearly the second largest group in size (number of beds and number of staff), service volume, and service population, while those that use PAs only are the smallest in size and service volume and receive a greater percent of hospital revenue from Medicare. Both hospitals that use NPs only and those that use PAs only are the most likely to own or manage RHCs.

Employment of NPs and PAs by Rural Hospitals

Taking a closer look at hospitals that use NPs and PAs, Table 3 shows bivariate comparisons of hospitals that do and do not employ each type of practitioner. Whereas the hospitals that use PAs are larger than those that do not, the hospitals that employ PAs are slightly smaller than those that do not. The hospitals that employ PAs have fewer beds, fewer full-time employees, and provide a lower volume of services (inpatient, outpatient and surgical) relative to hospitals that use but do not employ PAs. Hospitals that employ PAs also have significantly fewer physicians on

Table 3
Characteristics of Rural Hospitals that Employ NPs and PAs

Hospital and Community Characteristics[1]	PAs		NPs	
	Employ (n = 91)	Don't Employ (n = 125)	Employ (n = 61)	Don't Employ (n = 64)
Hospital Beds	42 (48)	53 (43)	60 (64)	60 (41)
Full Time Hospital Employees	102 (152)	137 (147)	171 (209)	157 (141)
Physicians on Active Staff	14* (27)	23 (34)	29 (44)	30 (34)
Number of Specialty Types on Active Staff (out of 14)	3** (4)	5 (4)	5 (5)	6 (5)
Primary Care Physicians on Active Staff	7* (10)	11 (11)	11 (12)	13 (13)
Hospital Admissions	1187* (1960)	1743 (1937)	2032 (2563)	2167 (2171)
Outpatient Visits (emergency & other)	18,150* (22438)	25,875 (26377)	30,720 (34044)	31,819 (29460)
Surgical Procedures (inpatient and outpatient)	834* (1766)	1359 (1692)	1665 (2422)	1644 (1709)
Percent of Hospital Revenue from Medicare	55 (16)	53 (13)	50 (15)	52 (13)
Owns or Manages a Federally Certified Rural Health Clinic	69%**	10%	54%**	8%
Educational Site for NPs, PAs, CNMs or CRNAs	36%*	22%	30%*	14%
Currently Recruiting for a Physician	60%	70%	77%	72%
Employ Other Type of Practitioner (NP or PA)	86%**	25%	60%**	8%
Population of the Hospital's Service Area	19,307* (32294)	32,076 (42380)	41,312 (58076)	29,989 (26231)
Road Miles to a City of 50,000 population	102* (69)	84 (52)	95 (62)	96 (59)

[1] Mean values with standard deviations in parentheses
*$p < .05$, **$p < .001$ Compared with hospitals that do not employ the practitioner

their active medical staff (14 vs. 23), significantly fewer types of specialists (3 vs. 5), and are located in both smaller and more remote service areas. Rural hospitals that employ PAs are much more likely to own or manage a Rural Health Clinic (69 percent vs. 10 percent), are more likely to be an educational site for NPs, PAs, CNMs or CRNAs (36 percent vs. 22 percent) and are also more likely to employ NPs (86 percent vs. 25 percent).

While the hospitals that use NPs are considerably larger than hospitals that do not use NPs, hospitals that employ NPs appear to be similar in both size (i.e. bed size and staff size) and scope (number of types of specialists) to hospitals that use but do not employ NPs. However, rural hospitals that employ NPs are more likely to own or manage an RHC (54 percent vs. 8 percent), are more likely to be an educational site for NP, PA, CNM or CRNA students (30 percent vs. 14 percent), and are more likely to employ PAs (60 percent vs. 8 percent) relative to hospitals that do not employ NPs. Rural hospitals that employ NPs also have a larger service area (41,312 vs. 29,989), although the difference is not statistically significant.

A comparison of hospitals that employ both NPs and PAs (n = 18), those that employ NPs only (n = 43), those that employ PAs only (n = 73), and those that do not employ either PAs or NPs (n = 138) showed the same general trend as when a similar breakdown was used to examine rural hospital use of NPs and PAs. Rural hospitals that employ both types of practitioners are larger in size and have a larger service area, while rural hospitals that only employ PAs are smaller in size, have fewer staff, a lower

service volume, and are located in more remote rural areas (located an average of 108 road miles from a city of 50,000 population).

Table 4 compares rural hospitals that employ PAs only with those that only employ NPs. Hospitals that only employ PAs are also much smaller (34 beds vs. 54 beds and 74 full-time employees vs. 152) and provide a lower volume of services relative to hospitals that only employ NPs. Compared with rural hospitals that employ NPs only, those that employ PAs only have significantly fewer physicians on their active medical staff (10 vs. 28), fewer primary care physicians and fewer types of specialists. The population of the area served by hospitals that employ PAs only is approximately one-third the size of the population served by hospitals employing NPs only, and hospitals that employ PAs receive a higher percentage of their total revenue from Medicare (56 percent vs. 48 percent). Compared with hospitals that employ NPs only, hospitals that only employ PAs are much more likely to own or manage a Rural Health Clinic (69 percent vs. 47 percent) and are less likely to be recruiting physicians (58 percent vs. 81 percent).

Modeling the Relationship of NP/PA Employment and Market and Organizational Characteristics

To better understand the employment of NPs and PAs by rural hospitals, a logistic regression model was developed to examine the relationship between market and organizational characteristics and the employment of NPs and PAs while adjusting for the effects of other variables. A logistic model was selected for this analysis with the

Table 4

Characteristics of Rural Hospitals that Employ NPs only vs. PAs only

Hospital and Community Characteristics[1]	Employ PAs only (n = 73)	Employ NPs only (n = 43)
Hospital Beds	34* (33)	54 (58)
Full Time Hospital Employees	74* (96)	152 (185)
Physicians on Active Staff	10** (20)	28 (46)
Number of Specialty Types on Active Staff (out of 14)	3* (3)	5 (5)
Primary Care Physicians on Active Staff[2]	6* (8)	11 (12)
Hospital Admissions	828* (1391)	1777 (2318)
Outpatient Visits (emergency & other)	13,177* (14651)	27,539 (33571)
Surgical Procedures (inpatient and outpatient)	485* (1047)	1419 (2107)
Percent of Revenue from Medicare	56* (17)	48 (16)
Owns or Manages a Federally Certified Rural Health Clinic	69%*	47%
Educational Site for NPs, PAs, CNMs or CRNAs	38%	30%
Currently Recruiting for a Physician	58%*	81%
Population of the Hospital's Service Area	12,599* (13082)	39,291 (57177)
Road Miles to a City of 50,000 Population	108 (74)	101 (70)

[1] Mean values and standard deviations in parentheses
[2] Primary Care is defined as General Practice, Family Practice, Internal Medicine and Pediatrics
* $p < .05$, ** $p < .01$

dependent variable taking two values (0 = do not employ NP/PA 1 = employ NP/PA) (Aldrich and Nelson, 1984). The logistic model expresses the log odds of a particular event (e.g., the log of the odds of employing an NP vs. not employing an NP) as a linear function of a set of explanatory variables, which can be either discrete or continuous (Demaris, 1992).

The coefficients obtained from the logistic regression are interpreted as the change in the log odds of being in the response category of interest (e.g. hospital employs an NP) for a one-unit increase in the corresponding explanatory variable, holding all other explanatory variables constant. An odds ratio can be obtained by exponentiating the coefficient and represents the estimated multiplicative change in the odds for a one-unit increase in the explanatory variable holding all other variables constant (DeMaris, 1992). Since the parameter estimates tend to follow a normal distribution in large samples, dividing the estimates by their estimated standard errors produces a z test, which can be use to test the significance of a particular coefficient (DeMaris, 1992).

Two separate logistic regression models were estimated. The dependent variable in one model was whether or not the hospital employs a PA and the dependent variable in the second model was whether or not the hospital employs an NP. Several sets of variables were included as explanatory variables. One factor of interest, due to the recent increase in the number of provider-based Rural Health Clinics (Rural Health News, 1994), was whether or not the hospital owns or manages a Rural Health Clinic.

Another set of variables (number of primary care physicians and number of type of specialists) was included to investigate the relationship between the employment of NPs and PAs and the characteristics of the hospital medical staff. There continues to be interest and debate regarding whether NPs and/or PAs are substitutes or complements for physicians (Shi et al., 1993; Aaronson, 1991). While more detailed data are needed to formally answer that particular question, this analysis provides a perspective about how NPs and PAs are used by rural hospitals based on the odds of their employment and the availability of physician staff.

The models included a measure of service volume (number of surgical procedures) and the number of full-time employees as proxies for economies of scale; the population of the service area as a measure of the demand for hospital services; and, whether the hospital is an educational site for NP, PA, CNM or CRNA students as a proxy for both supply and familiarity with the use of these types of practitioners. Finally, dummy variables for each of the states were included to capture, albeit somewhat indirectly, the restrictiveness of the state practice environment and practitioner supply. Recent studies have shown that states with less restrictive practice environments, based on such characteristics as practitioner recognition, prescriptive authority and reimbursement policies, tend to have a greater supply of both NPs and PAs (Sekscenski et al., 1994; New York Rural Health Courier, 1994).

The variable coefficients, standard errors, and z values for the logistic regression models are presented in Table 5, along with the chi-square and pseudo-R^2 goodness of fit statistics for each of the models. The goodness of fit (GOF) statistics indicate

Table 5
Logistic Regression Model of Employment of PAs and NPs by Rural Hospitals

	Dependent Variable					
	Employ PA			Employ NP		
Independent Variables	Coef.	Std. Error	Z value	Coef.	Std. Error	Z value
Rural Health Clinic	3.04	.442	6.88***	3.09	.721	4.29***
Number of Primary Care Physicians on Active Staff	.069	.048	1.44	-.082	.052	-1.60*
Number of Types of Specialty Physicians	-.043	.144	-0.299	-.164	.199	-0.825
Number of Full-time Other Employees	.005	.005	1.09	.011	.006	1.81*
Surgical Procedures/Week	-.094	.039	-2.41**	-.079	.050	-1.60*
Surgical Procedures/Week Squared	.0006	.0002	2.87**	.0004	.0003	1.46*
NP/PA/CNM/CRNA Students	.110	.437	0.252	.650	.676	0.962
Population of the Service Area in 1000s	-.023	.016	-1.40	.053	.021	2.41**
SD†	.074	.714	0.104	-1.32	1.06	-1.24
ND	.230	.728	0.316	.184	1.23	0.150
IA	-.087	.566	-0.155	.715	.787	0.909
MT	-.361	.709	-0.509	.322	1.02	0.316
ID	-.489	.982	-0.498	.143	1.00	0.142
WA	-.603	.723	-0.834	1.27	.875	1.45
OR	.326	1.02	0.318	-3.57	1.84	-1.94**
GOF Statistics	chi-sq(15) = 109.4 p<.001 pseudo R^2 = 0.3742			chi-sq(15) = 73.57 p<.001 pseudo R^2 = 0.4280		

†Minnesota is the omitted state category
*p = .10, **p < .05, ***p < .001

that the models do have predictive validity. Odds ratios (ORs) can be obtained for each of the variables, except for the number of surgical procedures per week, by exponentiating the variable coefficient. The surgical procedures per week variable cannot be interpreted in the form of an odds ratio because a squared term was included to capture a curvilinear relationship between surgical volume and the log odds of employing an NP or PA.

Perhaps the most striking result is the presence of a Medicare certified Rural Health Clinic. The odds that a rural hospital that owns or manages an RHC employs a PA are nearly 21 times (OR = 20.91) those of a hospital without an RHC; and, the odds that a hospital with an RHC employs an NP are 22 fold (OR = 21.98), relative to hospitals without RHCs. It is not surprising that the presence of an RHC is strongly associated with whether a rural hospital employs an NP or PA, since RHCs are required by law to use either an NP, PA, or CNM. However, it is important to recognize that RHCs are not a perfect predictor of the employment of either PAs or NPs and that other factors are associated with the employment of NPs and PAs by rural hospitals.

For example, an increase in the population of the service area is associated with a significant increase in the odds of a rural hospital employing a nurse practitioner. An increase in the service population of 1000 persons is associated with an increase in the odds of a rural hospital employing a nurse practitioner of approximately five percent (OR = 1.05). The log odds of employing a PA, on the other hand, are negatively related to the number of persons in the service area.

The number of primary care physicians on the hospital's active staff is negatively associated with the log odds of a hospital employing an NP but positively associated with the log odds of a rural hospital employing a PA. Having more types of specialists on the hospital staff however, is negatively associated with the log odds of employment for both NPs and PAs.

The number of surgical procedures performed per week, demonstrates a non-linear relationship with the log odds of employment in both the NP and PA models. The negative coefficient on the main terms and the positive coefficient on the squared terms indicates that the volume of surgeries is associated with a decrease in the log odds of employing an NP or PA until some point at which surgical volume becomes positively associated with the employment of both NPs and PAs.

Whether the rural hospital is located in South Dakota, North Dakota or Oregon is positively associated with the log odds of employing a PA relative to those that are located in Minnesota. For NPs, whether the hospital is located in North Dakota, Iowa, Montana, Idaho or Washington is positively associated with the log odds of employment as compared to hospitals in Minnesota. However, rural hospitals located in Oregon are significantly less likely to employ NPs compared to hospitals in Minnesota.

Services Provided and Practice Scope of NPs and PAs

The identification of market and hospital characteristics associated with the employment and use of NPs and PAs by rural hospitals is only one step in better

understanding the use of NPs and PAs in rural areas. The types of services they provide and how their practice is structured (e.g., supervision, clinical privileges) are also important. Table 6 shows the percentage of hospitals using NPs and PAs where the NP or PA provides a certain type of service.

Rural hospitals utilize both NPs and PAs to provide a wide-range of services, although it appears that PAs are used somewhat more extensively to provide certain types of services. For example, a higher percentage of hospitals using PAs, compared with those using NPs, indicate that the PAs provide services in the emergency department (68 percent vs. 34 percent), are used as assistants during surgery (52 percent vs. 27 percent), make nursing home visits (60 percent vs. 48 percent) and inpatient rounds (71 percent vs. 54 percent). PAs are also more likely to take call for physicians (62 percent vs. 36). However, a higher percentage of hospitals using NPs (not including CNMs) indicated that the NPs provide obstetrical services more often (29 percent vs. 22 percent) relative to those that use PAs.

Previous studies have shown that practice autonomy (i.e., being able to provide a full, relatively unrestricted scope of services) plays an important part in the practice location decisions of both NPs and PAs in rural areas (Muus and Geller, 1994; Bennett, 1984). Scope of practice, which defines the services that an NP or PA can provide, is primarily a legal issue that is determined by state laws, regulatory boards, health care facilities and supervising or collaborating physicians (Woomer, 1991; Gilliam, 1994). Legislation and regulation governing NP and PA scope of practice not only varies between practitioner types but also varies from one state to the next. Being

Table 6

Type of Service Provided by Use of PAs and NPs

Type of Service	Use PAs (n = 216 hospitals)	Use NPs (n = 125 hospitals)
Inpatient Visitation (i.e., patient rounds)	71%	54%
Emergency Department Services	68%	34%
Ambulatory Clinic Services	79%	69%
Home Health Visits	20%	16%
Nursing Home Visits	60%	48%
Psychiatric Services	7%	5%
Share Call with Physicians	62%	36%
Obstetrical Services	22%	29%
Surgical Assistance	52%	27%
Other Services[1]	5%	9%

[1] For PAs, includes casting, chemotherapy, education for staff, patients and the community, and respite care. For NPs, includes casting, chemotherapy, community and patient education, pediatric services, quality control and respite care.

able to provide a full range of services facilitates the ability of NPs or PAs to provide continuous, high quality care and makes the use of NPs and PAs more efficient (Timmons and Ridenour, 1993). However, expanding the roles and legal practice authority of NPs and PAs is tempered by concern about liability and to some extent issues related to professional domain (Gilliam, 1994).

Some important aspects of scope of practice are: 1) hospital privileges, which are rights and privileges granted by a hospital to a health care practitioner that allow the practitioner to admit and follow patients within the hospital; 2) prescriptive authority, which is the legal authority to write prescriptions for medications, treatments, or devices (Hayden and Rowell, 1982; Inglis and Kjervik, 1993); and, 3) on-site physician supervision, an issue of particular importance in underserved and rural areas. The scope of practice for both NPs and PAs used by rural hospitals are presented in Table 7. Fewer than fifty percent of the hospitals using either NPs or PAs say that the NPs or PAs have admitting or discharge privileges. Moreover, in some cases the practitioner's privileges only apply to certain conditions or require a physician co-signature. On the other hand, the majority of hospitals (over 80 percent for both NPs and PAs) indicate that NPs and PAs are able to prescribe medications and order laboratory tests and x-rays. In approximately 50 percent of the hospitals using them, NPs and PAs are supervised by a physician who is located on-site.

Table 7

Practice Scope of PAs and NPs in Rural Hospitals

Practice Scope	Use PAs (n = 216 hospitals)	Use NPs (n = 125 hospitals)
Have Admitting Privileges	48%	35%
Use Written Guidelines or Protocols	91%	88%
Must be Supervised by on-site Physician	54%	50%
Have Discharge Privileges	46%	35%
Can Prescribe Medications	85%	88%
Can Order Lab Tests and X-Rays	91%	90%

DISCUSSION AND CONCLUSIONS

Nurse practitioners and physician assistants are an important part of the rural health care delivery infrastructure. This study found that over 50 percent of the rural hospitals located in eight northwestern states use PAs and 22 percent employ PAs on either a full or part-time basis. Over 30 percent of the hospitals use NPs and 15 percent employ a part-time or full-time NP. PAs are employed in smaller, lower volume facilities that have smaller medical staffs and a smaller service population. NPs, on the other hand, are employed in higher volume hospitals in more populated areas that have both more types of specialists and more primary care physicians on the hospital's active medical staff. It is not unexpected that more rural hospitals use and employ PAs, since proportionately more PAs practice in rural areas as compared with NPs (Kraditor, 1994; Nurse Practitioners, 1994), but why there are such differences in the distribution of NPs and PAs remains an unanswered question.

Kassirer (1994) argues that "there is every reason to expect that, unless special incentives were offered for practice in underserved areas, their [nurse practitioner] geographic distribution would be not much different from that of primary care physicians" (p.205). While this study does show that NPs appear to be primarily located in rural areas with a more abundant supply of health care resources (e.g., more physicians and greater hospital capacity), the causes of the observed distributional pattern are not clear. For example, it could be that NPs choose not to locate in more isolated rural areas for a variety of reasons, both personal (e.g., lack of spousal employment opportunities) and professional. Or, employment options for NPs could

be less available in these areas. Even if there is a perceived need for more practitioners, hospital administrators or physicians could resist the idea of hiring an NP either because they are uninformed about what an NP does or because they do not feel an NP has the appropriate background and skills for a particular practice setting.

When administrators of hospitals that employ PAs but not NPs (n = 70) were asked why they do not employ an NP, 47 percent said there were no NPs available to hire, 21 percent said they do not have enough demand to support another practitioner, 10 percent indicated that NP licensing and scope of practice were a problem and almost 9 percent said they prefer to employ PAs. Among hospitals that only employ NPs (n = 31), the reasons given for not employing a PA include lack of availability (29 percent), lack of demand (26 percent), licensing or scope of practice issues (23 percent) and they prefer to employ NPs (16 percent).

In general, supply or the lack of availability appears to be a problem in the employment of both NPs and PAs; a problem that may worsen as competition from urban providers continues to increase. One suggested strategy for increasing the supply of practitioners in rural areas is to provide more rural educational experiences (Hafferty and Goldberg, 1986). This study found that having educational arrangements for the training of NP/PA/CNM or CRNA students is positively associated with rural hospital employment of both PAs and NPs, although this association was not statistically significant after controlling for a number of other factors.

Another factor that affects the supply and effectiveness of NPs and PAs in rural areas is the practice environment, both that of the state and the institution that

employs or uses these practitioners (Sekscenski et al., 1994; Hupcey, 1993; El-Sherif, 1995). This study found that hospitals located in Washington state are more likely to employ NPs relative to rural hospitals located in Minnesota. This could reflect the fact that Washington is recognized as one of the more progressive states with respect to NP scope of practice and is one of the most favorable states for NP practice (Pearson, 1995; Sekscenski et al., 1994; Nurse Practitioners, 1994). Washington also has a much higher NP per 100,000 population ratio relative to Minnesota (27.5 vs. 9.1 Nurse Practitioners, 1994).

However, this pattern is not consistent across all states or across models. For example, hospitals located in Oregon, which is another state with a relatively favorable NP practice environment compared to Minnesota, appear to be much less likely to employ NPs. The state binary variable may be a poor measure of the state practice environment and there are likely to be other differences among states that are captured by this variable. Nonetheless, the effect of state practice environments on the employment of both NPs and PAs in rural areas merits further investigation.

The state is not the only entity responsible for determining NP and PA scope of practice. Hospitals also establish policies that affect the roles and practice of NPs and PAs. This study shows that the majority of hospitals that use NPs, as well as those that use PAs, indicate that NPs and PAs can prescribe medications and order lab tests and x-rays but considerably fewer report that NPs and PAs have admitting or discharge privileges. Hospital privileges (also referred to as clinical privileges) are considered an important part of providing continuous patient-focused care (Hayden and Rowell,

1982). In 1984, the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) revised its policies related to the organization of the hospital medical staff, including whether clinical privileges could be made available for NPs and PAs (Gilliam, 1994). However, it is not possible to tell if the surveyed hospitals do not extend clinical privileges to the NPs and PAs they use or if the practitioners (or the PA's supervising physician) elect not to apply for clinical privileges.

Both NPs and PAs play a role in providing ambulatory care services. This study supports the idea that rural hospitals are using both NPs and PAs to enhance their delivery of outpatient services. Moreover, it appears that a major factor related to the employment of both NPs and PAs by rural hospitals is the Rural Health Clinic program. Over the past five years, participation in the Rural Health Clinic program has literally exploded (Rural Health News, 1994). In 1990, there were only 581 Rural Health Clinics in the nation (Lutz, 1993). As of January 1995, there were over 2000 RHCs and approximately 34 percent are provider-based clinics (HCFA, 1995).

This study shows that the odds of employing an NP are negatively associated with the number of primary care physicians on the hospital's active medical staff, while the odds of employing a PA are positively associated with the number of primary care physicians on active staff. This could suggest that NPs are employed as substitutes for primary care physicians in some settings, while the employment of PAs is more likely to depend on the availability of physicians. A more definitive analysis of this issue is warranted.

PAs appear to provide a more expanded scope of services in rural hospitals. Nonetheless, NPs and PAs seem to be employed by rural hospitals for similar reasons. When administrators were asked why they employ NPs, 23 (38 percent) said the NPs were employed to extend care, assist the physicians or increase access to primary care; 14 (23 percent) indicated they were employed because physicians were unavailable or too difficult to recruit; 7 (11 percent) said they were cost-effective or more economical for rural areas; and 6 (10 percent) said they had a Rural Health Clinic and were required to by law. When asked why they employed PAs, 30 (33 percent) said the PAs were employed to relieve physicians, extend medical care or supplement physician care; 20 (22 percent) said they employed PAs because they were unable to recruit physicians or there was a shortage of family practitioners; another 20 (22 percent) indicated that PAs were cost-effective or less costly to employ than physicians; and, 16 (18 percent) employed PAs for RHC certification.

In summary, rural hospitals are becoming increasingly important employers of nurse practitioners and physician assistants. As with primary care physicians, there is a greater demand for than supply of both types of practitioners. Increased financial support, including grants or loans for students and funds to support program development, from both federal and state sources would allow expanded enrollment in NP and PA educational programs (given that faculty are available to support enrollment expansions). This would increase the number of graduates available for practice in urban and rural areas in a relatively short period of time, compared with efforts to increase the number of physician graduates specializing in primary care.

Targeting financial support toward programs with documented efforts for placing graduates in underserved and rural areas would be an effective way of ensuring an increase in the supply of NPs and PAs available for these areas.

There is a distinct difference between the types of rural hospitals that use and employ PAs and those that use and employ NPs. Whether this difference exists for practical reasons (e.g., PAs are more versatile or better suited for practice in rural areas with fewer health care resources), professional reasons (e.g., physicians in these areas prefer to work with PAs) or personal reasons (e.g., many female NPs choose not to practice in more remote rural locations) is still subject to debate. Nevertheless, the reasons for this difference are important for the development of policies to improve the supply and distribution of health professionals in rural areas.

For example, if PA clinical training makes them better prepared for practice in rural areas then resources should be concentrated on ways to facilitate the use of PAs, in particular, in rural areas (e.g. expand or create new educational programs). On the other hand, if many physicians in rural areas are opposed to working with NPs then it is important to determine ways to encourage collaborative working relations between NPs and rural physicians.

The Rural Health Clinic program, which has expanded dramatically in many parts of the U.S., is strongly related to the employment of NPs and PAs by rural hospitals. Although there is concern about the sudden growth and the appropriate use of the RHC program, this study indicates that it may be fulfilling its original goal, which was to encourage the use of NPs and PAs in rural, underserved areas. Seventy-one percent

of the PAs and NPs employed in rural hospitals with provider based rural health clinics started their employment at approximately the time the clinic was established or thereafter. Therefore, continued support for the RHC program is recommended as a means to enhance the supply of health professionals in rural areas.

However, further research is needed to determine whether the increasing number of provider-based RHCs and the employment of NPs and PAs by rural hospitals has improved access to health care services in underserved, rural areas. This includes studies of who is receiving services and the number and type of services provided by different types of practitioners.

Finally, expanding the legal scope of practice of NPs and PAs at the state and institutional levels is a likely way to promote the use of NPs and PAs in rural communities. Additional research is needed to determine how changes in scope of practice affect 1) the supply and distribution of NPs and PAs, 2) the cost and quality of care provided by NPs and PAs in rural settings and, 3) the efficient use of NPs and PAs in a variety of rural practice sites, including rural hospitals. Whether scope of practice or licensure changes would allow increased substitution of either NPs or PAs for physicians without compromising care delivery is a major issue for determining how to effectively use these health professionals to provide rural health care services.

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