

Physicians working with physician assistants and nurse practitioners: perceived effects on clinical practice

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Abstract

Physicians in the United States are increasingly working with physician assistants (PAs) and nurse practitioners (NPs), but little is known about how they perceive working with PAs and NPs affects their clinical practice. We used a new national survey to examine physicians' perceptions of working with PAs and/or NPs on their patient volume, care quality, time use, and workload. Among our analytical sample of 5823 physicians, 59% reported working with PAs and/or NPs. Most reported that PAs and NPs positively affected their clinical practice. Among several findings, physicians working in medical schools and with higher incomes were more likely to indicate that PAs improve their clinical practices in all 4 aspects, while being in specialties with higher women's representation was associated with lower ratings for working with PAs. Native Hawaiian and Pacific Islander physicians and those with higher incomes were more likely to signify that NPs improved their clinical practices in all 4 aspects. These findings provide valuable insights, from the physicians' perspective, on care delivery reform.

Key words: physician assistant/associate; nurse practitioner; physician; interprofessional care; clinical practice.

Introduction

With over 140 910 physician assistants (PAs) and 258 230 nurse practitioners (NPs) in the United States in 2022,¹ physicians are increasingly working alongside these clinicians to provide patient care. In 2016, over one-quarter of primary care and subspecialty practices employed at least 1 PA or NP,^{2,3} and between 2013 and 2019, the proportion of Medicare visits delivered by a PA or NP increased from 14.0% to 25.6%.⁴ Among family physicians, 60%–70% report working with PAs and NPs,^{5,6} and those in rural settings have a higher likelihood of working with PAs and NPs compared with those working in nonrural settings.⁵ A large body of evidence demonstrates the positive impact of PA- and NP-delivered care on outcomes such as cost, access, and quality.^{7–9} Additionally, provider teams consisting of physicians and NPs or PAs outperform solo providers on measures of hypertension, hyperlipidemia, and type 2 diabetes management.¹⁰ Such teams have also been found to provide some benefits in meeting the complex needs of older adults.¹¹ However, despite literature describing the benefits of these interprofessional provider configurations to care delivery, little is known about how physicians who work with PAs and NPs perceive the effects of these arrangements on their clinical practice.

While PAs and NPs fill similar roles in health care, some differences in their education and scope of practice (SOP), which is determined at the state level, exist. Physician assistant

education is based on the medical (ie, physician) model of education with a generalist focus.^{12,13} Upon completion, individuals earn a master's degree and must pass a national certification exam to be eligible for state licensure. Physician assistants can practice across specialties. While PA practice regulations vary by state, physician supervision or collaboration is required upon initial licensure in all 50 states.¹⁴ Nurse practitioners are registered nurses who have received a bachelor's of science in nursing followed by advanced didactic and clinical training through a master's or doctoral degree program.¹⁵ Nurse practitioners are educated within the nursing model of care, and training is focused on a population (eg, family, pediatrics, adult-gerontology) and setting (eg, primary care, acute care). Like PAs, NPs are nationally certified and licensed to practice at the state level. The NP SOP regulations also vary across states. Over half of the states allow for full practice authority for NPs, in which no formal written agreements for physician supervision or collaboration are required for licensure and practice. The remaining states require formal written or collaborative agreements with physicians for an NP to practice in the state.¹⁶ Although not required for practice, PAs and NPs are increasingly completing postgraduate training programs in specific specialties and settings.¹⁷

Prior research has identified various ways that PAs and NPs impact clinical practice. One study found increased physician Relative Value Units (RVUs) and overall revenue after the integration of PAs and NPs into a radiology practice.¹⁸ Another

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study involving nearly 28 000 family physicians found that including PAs or NPs was associated with significantly larger patient panel sizes and a greater number of patient care activities.⁶ However, these studies are limited by reporting practice-level outcomes associated with PA and NP employment and focusing on a single practice site or physician specialty. Few studies have provided evidence of individual physicians' perspectives on working with PAs and NPs across settings and specialties. One study, although dated, examined the perceptions of 600 rural family physicians and found that, although there was a high level of confidence in PAs' and NPs' abilities, physicians were concerned about increasing workloads.¹⁹ The roles of PAs and NPs and their contributions to clinical practice have evolved significantly over the 25 years since that study was published.

This study fills that gap by using new nationally representative survey data to explore physicians' perceptions of working with PAs and/or NPs on their own clinical practice. The research questions guiding this study were as follows: (1) Which types of physicians are more likely to work with PAs or NPs and (2) How do physicians perceive working with PAs and NPs impacts their clinical practice? This study enhances our understanding of PA and NP contributions to clinical practice and care delivery by generating knowledge about their influence on physicians' clinical practice.

Data and methods

Data source

We used data from the Association of American Medical Colleges' (AAMC's) National Sample Survey of Physicians (NSSP) 2022, which were collected between May 10 and November 9, 2022, and include demographic and professional information on a wide range of topics for 5917 active physicians in the United States. The NSSP 2022 dataset was collected using a 2-step method: (1) all eligible respondents from the NSSP 2019 survey were invited and (2) new invitees were selected via a stratified random sample with proportionate allocation, based on the physician's sex, specialty group, age group, and rural status. Postsurvey weights were adjusted for differential nonresponse using the NSSP 2022 survey invitees and calibrated back to known American Medical Association physician population characteristics. Additional details about the NSSP sampling and weighting strategies can be found on AAMC's website.²⁰ This project was approved by the American Institutes for Research's Institutional Review Board.

Measures and outcomes

The NSSP 2022 respondents reported whether they routinely worked with PAs and NPs (prevalence) during the preceding 12 months and, if so, how many (intensity), using an integer ranging from 1 to 100 or more than 100 (see [Appendix B](#) for these distributions). Due to the extremely left-skewed distribution of reported values, we recategorized "more than 100" to 100. Respondents who worked with PAs or NPs were also asked about the impact these clinicians had on 4 areas of clinical practice (ie, outcomes of interest). This was done by assessing physicians' level of agreement or disagreement that "working with PAs and NPs" (1) "allows me to care for more patients" (patient volume), (2) "improves my quality of care" (improved quality), (3) "helps me make better use of my time" (time use), and (4) "decreases my workload" (decreased workload). Ratings were reported on a 5-point Likert scale ranging from 1 (strongly

disagree) to 5 (strongly agree). Physicians also reported the percentage of time they spend providing patient care in rural, suburban, and urban areas. If a physician reported they spent 80% or more of their patient care time in rural areas, they were categorized as "high rural serving." Annual income was reported on a 1 (\leq \$50 000) to 11 (\geq \$500 000) scale with \$50 000 increments. Respondent physicians were categorized into 1 of 4 specialty groups, as detailed in [Appendix A](#).

Statistical analysis

We conducted a set of 8 ordered logistic regressions to explore the relationships between the intensity of working with PAs or NPs and physicians' perceptions of PAs' or NPs' impact on clinical practice. The outcomes of interest, treated as ordinal variables, were patient volume, improved quality, time use, and decreased workload. The independent variables were continuous measures of PA intensity (4 models) and NP intensity (4 models). Additional explanatory variables included physician characteristics (age, gender, and race), employment type (employed, owner, other), practice specialty (grouped), high-rural-serving status, full-time status, work setting, international medical graduate (IMG) status, and percentage of women at the specialty level. We also controlled for PA and NP state SOP regulation (1, restricted; 2, reduced; and 3, full practice) based on the physicians' practice state using data from the American Association of Nurse Practitioners (AANP) and American Academy of Physician Associates (AAPA) in 2022.^{16,21} For NPs, these SOP categories were based on the 3 practice environment determinations used by the AANP.¹⁶ For PAs, we used the AAPA's Six Elements of a Modern PA Practice Act, which include full prescriptive authority and adaptable collaboration requirements,²¹ and consistent with prior analyses, categorized PA SOP into 3 groups based on the number of elements each state had enacted: 1–2 elements = restricted, 3–4 elements = reduced, and 5–6 elements = full practice.^{22,23} Postsurvey weights were adjusted in all analyses. Analyses were performed in Stata SE 17 (StataCorp, College Station, TX).

Limitations

This study is not without limitations. First, although a rigorous approach to sampling and weighting was used, the NSSP 2022 data may still suffer from selection and recall bias. Second, the data are self-reported, and thus, may be subject to respondent bias. Third, the data did not allow us to differentiate among various types of working relationships within practices that exist between physicians and PAs/NPs. Physician assistants/NPs often practice under policies set by their employers or organizations that restrict clinical practice more than what the state regulation allows. These organizational-level policies may have a stronger influence on how physicians perceive working with PAs/NPs.²⁴ That is, in practices where a high level of physician oversight or supervision of PA/NP practice is required (eg, reviewing charts, signing orders), respondents may perceive different effects on the outcomes of interest than physicians who work in practices where they serve in a more consultative role and where PAs and NPs work more independently.²⁵ Fourth, there are many other important aspects of interprofessional relationships that were not measured or controlled in our study, such as the length and frequency of working together, interpersonal dynamics, and role delineation.

Table 1. Summary statistics for study variables.

	No.	Percentage (unweighted)	Percentage (weighted)	SD (weighted)
Routinely worked with PA(s) (prevalence)	5882	43	43	0.49
Routinely worked with NP(s) (prevalence)	5853	47	46	0.50
Gender ^a				
Women	1792	30	37	0.48
Men	4085	69	63	0.48
Other	40	0	0	0.05
Race and ethnicity				
White	5917	65	67	0.47
African American/Black	5917	3	2	0.15
Asian	5917	25	26	0.44
Hispanic or Latinx	5917	4	3	0.18
American Indian and Alaska Native	5917	1	1	0.07
Native Hawaiian and Pacific Islander	5917	0	0	0.05
Other race and ethnicity	5917	2	2	0.15
Employer type (multiple selections)				
Employee	5914	65	64	0.48
Owner	5914	25	26	0.44
Independent contractor	5914	9	09	0.28
Other	5914	0	0	0.11
Specialty group				
Medical specialties	5917	21	17	0.38
Primary care	5917	32	31	0.46
Surgery	5917	19	18	0.39
Other	5917	28	33	0.47
Working full-time	5917	83	82	0.38
Practice setting (multiple selections)				
Medical school	5917	6	7	0.25
Teaching hospital	5917	19	17	0.37
Non-teaching hospital	5917	7	7	0.25
Group practice	5917	20	20	0.40
Government facility	5917	3	3	0.18
Health care system	5917	15	16	0.36
Private practice—solo	5917	9	10	0.30
Locum tenens	5917	2	2	0.14
Private practice—single specialty group	5917	22	21	0.41
Private practice—multi-specialty group	5917	8	9	0.28
Other setting	5917	3	2	0.15
International medical graduate	5917	15	19	0.39
High-rural serving	5831	16	15	0.36

	No.	Mean (unweighted)	Mean (weighted)	SD (weighted)
Number of PAs routinely worked with	2551	7.62	7.68	16.76
Number of NPs routinely worked with	2775	6.05	5.74	12.93
Age	5917	52.00	53.88	10.84
PA scope of practice (1 = most restrictive to 3 = most permissive)	5864	1.97	1.96	0.75
NP scope of practice (1 = most restrictive to 3 = most permissive)	5864	1.91	1.90	0.84
Proportion of women in specialty	5771	36.07	36.27	14.73
Annual income (categorized 1—11)	5862	6.21	6.25	2.70

Abbreviations: AAMC, Association of American Medical Colleges; NP, nurse practitioner; PA, physician assistant.

Source: National Sample Survey of Physicians 2022, AAMC. Weight adjusted.

^aFor Gender, “Women” includes trans-women, “Men” includes trans-men, and “Other” includes agender, genderqueer, nonbinary and other.

Results

Study population

There were 5917 physicians in our analytical sample, of which 63% were men and 67% were White. [Table 1](#) displays summary statistics for all independent variables included in the regression analyses.

Prevalence of working with PAs or NPs

Overall, 59% of respondent physicians reported working with PAs and/or NPs ([Figure 1](#)): 30% reported working with both PA(s) and NP(s), 13% reported working with PA(s) only, and 16% reported working with NP(s) only. Forty-one percent of physicians reported that they did not work with PAs or NPs.

Almost two-thirds (63%) of high-rural-serving physicians reported working with PAs and/or NPs. Across practice specialties, physicians in primary care and medical specialties were slightly more likely to report working with PAs and/or NPs (63% and 62%, respectively) compared with physicians in surgery (56%) or other specialties (57%). Notably, the specialty with the highest percentage of physicians who reported working only with NPs was primary care (23%), and physicians in surgery were the most likely to work with only PAs (19%).

Physicians’ perceptions of working with PAs and NPs on clinical practice

Most physicians reported that working with PAs and NPs positively affected their clinical practice ([Figure 2](#)). Across the 4

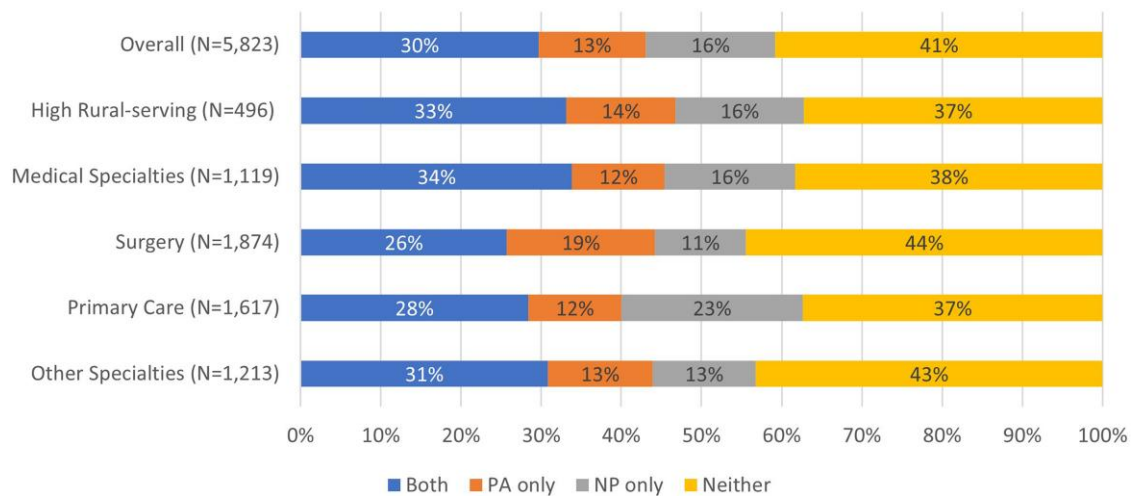


Figure 1. Proportions of physicians who report working with physician assistants (PAs) and/or nurse practitioners (NPs). Source: National Sample Survey of Physicians 2022, Association of American Medical Colleges (AAMC). Values are weight adjusted. A chi-square test was conducted to determine the significance of the differences among 4 groups of specialties (Pearson's $\chi^2[9] = 2.1e+04$; $p = 0.000$). A chi-square test was conducted to determine the significance of the differences between high- and low-rural-serving (not shown in the figure) physicians. (Pearson's $\chi^2[3] = 546.1461$; $p = 0.000$).

outcomes of interest, 47% to 67% of physicians somewhat agreed or strongly agreed that working with PA(s) positively impacted clinical practice (Figure 2A) and 49% to 66% of physicians somewhat agreed or strongly agreed that working with NP(s) did the same (Figure 2B). The greatest perceived impacts of working with PAs and/or NPs were on patient volume (67% and 66% agreement, respectively) and time use (65% and 63% agreement, respectively). There was less agreement among physicians that working with PAs and NPs improved quality of care and decreased workloads, with approximately 20% of physicians reporting disagreement (somewhat disagree, disagree) for each of these 2 outcomes.

Estimated perceived impact of working with PAs and NPs on clinical practice

The following results discussion refers to Tables 2 and 3 that display the results of the ordinal logistic regressions for the associations between the 4 outcomes of interest (patient volume, improved quality, time use, decreased workload) and all independent variables. Overall, there were no statistically significant associations between the number of PAs (Table 2) or NPs (Table 3) with whom physicians worked and the outcomes.

Although physician characteristics, such as gender, age, and race/ethnicity, explained very little of their perceptions working with PAs or NPs, some exceptions emerged: older physicians had higher odds of agreeing that working with PAs helps make better use of their time (odds ratio [OR] = 1.020, $P < .01$); physicians reporting their gender identity as "other" had lower odds of agreeing that working with NPs improves their quality of care (OR = 0.172, $P < .01$); Hispanic and Latino physicians had higher odds of agreeing that working with PAs and NPs increases their quality of care (OR = 3.252, $P < .01$, and OR = 3.087, $P < .05$), and they were also more likely to agree that working with NPs decreases their workload (OR = 2.339, $P < .05$); White physicians had higher odds agreeing that working with NPs improved patient volume (OR = 2.223, $P < .05$); and Native Hawaiian and Pacific Islander physicians had higher odds of agreeing that working with NPs improved all aspects of their clinical practices (ORs ranged from 19.03 to 146.7, $P < .05$ –.001). Also, physicians of other races and

ethnicities had higher odds agreeing that working with NPs increased patient volume (OR = 3.730, $P < .05$) and decreased workload (OR = 3.309, $P < .05$).

Compared with physicians who are employees, physicians reporting "other" employment status had higher odds of agreeing that working with PAs improved the use of their time (OR = 4.789, $P < .01$) and that working with NPs decreased their workload (OR = 3.753, $P < .05$), but they had lower odds of agreeing that working with NPs improved their quality of care (OR = 0.428, $P < .05$). Physicians' perceived impact of working with PAs and NPs on their clinical practice did not significantly differ by rural-serving status.

Compared with physicians in medical specialties, surgeons had higher odds (OR = 1.668, $P < .05$) of agreeing that working with PAs improved quality of care. Physicians in primary care had lower odds of agreeing that working with NPs improved patient volume (OR = 0.732, $P < .05$), quality of care (OR = 0.657, $P < .01$), and time use (OR = 0.697, $P < .05$).

Physicians working full time, compared with those working part-time, reported lower odds of agreeing that working with NPs helped them make better use of their time (OR = 0.647, $P < .05$) or decreased their workload (OR = 0.666, $P < .05$). Both PA and NP SOPs were negatively associated with patient volume (OR = 0.818, $P < .05$, and OR = 0.813, $P < .01$, respectively). That is, physicians working in states with less-restrictive SOP regulations for PAs or NPs had lower odds of agreeing that working with a PA or NP increased the number of patients they could see. No other clinical practice outcome was statistically related to SOP.

In terms of work settings, physicians who work in medical schools had higher odds of agreeing that working with PAs improved all 4 outcomes: increased volume (OR = 1.853, $P < .05$), quality of care (OR = 2.641, $P < .001$), time use (OR = 3.078, $P < .001$), and decreased workload (OR = 2.768, $P < .001$). Physicians who work in medical schools also reported higher odds of agreeing that working with an NP increased patient volume (OR = 1.909, $P < .05$) and decreased workload (OR = 2.525, $P < .001$).

International medical graduates had lower odds of agreeing that working with a PA increased quality of patient care

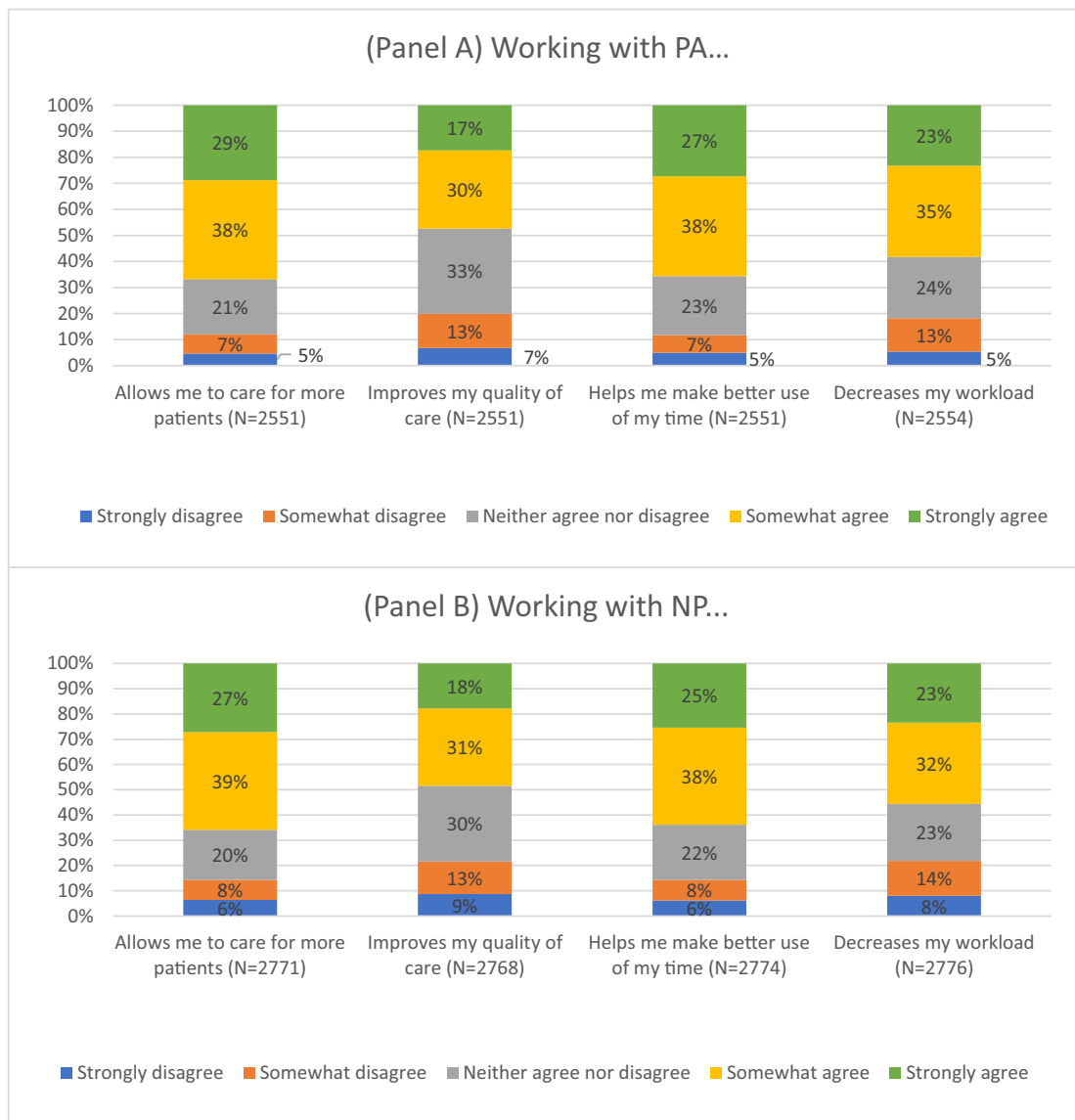


Figure 2. Physicians' perceptions of working with physician assistants (PAs) and nurse practitioners (NPs) on clinical practice. Source: National Sample Survey of Physicians 2022, Association of American Medical Colleges (AAMC). Values are weight adjusted. Bar labels are outcomes of interest: "Allows me to care for more patients" (patient volume); "Improves my quality of care" (improved quality); "Helps me make better use of my time" (time use); and "Decreases my workload" (decreased workload). We conducted 2 series of 6 paired *t* tests (6 for PA statements and 6 for NP statements) to compare the means of agreement (including strongly agree and agree) in each pair of the 4 statements. Except for "PA patient volume" and "PA time use" (not significant), and "NP patient volume" and "NP time use" ($p[T > t] = 0.001$), all other 10 pairs showed a statistically significant difference in an agreement pattern with $p < 0.000$.

(OR = 0.615, $P < .01$) or time use (OR = 0.628, $P < .05$) or decreased workload (OR = 0.633, $P < .05$). Also, as the proportion of women represented in a specialty increased, physicians were less likely to agree that working with a PA improved patient volume, quality of care, time use, and workload. Finally, as reported annual income increased, physicians were more likely to agree that working with PAs and NPs had a positive impact on all aspects of their clinical practices.

Discussion

Using new, nationally represented physician survey data, the results of this study update the literature on the contributions of PAs and NPs to clinical practice. We found that primary care and high-rural-serving physicians were the most likely to report regularly working with PAs and/or NPs, which aligns with

existing literature,²⁶ although we were surprised to find no reported impact on practice for high-rural-serving physicians. Considering that primary care is the most common practice area for NPs, our finding that primary care physicians were the most likely to report working with only NPs was not surprising. Additionally, surgeons were the most likely to report working with PAs, which aligns with a 2022 report indicating that surgery is a top practice setting for PAs.²⁷ Although approximately one-half to two-thirds of physicians reported that working with PAs or NPs positively impacted aspects of their clinical practice (Figure 2), we did not find any statistically significant relationships between the number of PAs or NPs with whom a physician works and our outcomes of interest, suggesting that other factors are more salient to improved clinical practice than the mere quantity of PAs and NPs. We did separate physicians' perceptions of working with PAs from

Table 2. Estimated perceived impact of working with PAs on clinical practice by physician demographic and work characteristics.

	Ordered logistic regression estimates			
	Patient volume	Care quality	Time use	Decreased workload
Intensity PA	0.998 (−0.36)	0.997 (−0.77)	0.996 (−0.78)	1.000 (0.04)
Age	1.006 (0.94)	1.003 (0.47)	1.020** (2.99)	1.007 (1.04)
Gender ^a				
Women (reference)	1.0	1.0	1.0	1.0
Men	1.167 (1.07)	1.130 (0.78)	1.116 (0.75)	1.132 (0.85)
Other	0.661 (−0.30)	0.891 (−0.10)	1.177 (0.20)	0.882 (−0.13)
Race and ethnicity				
White	1.290 (0.50)	1.726 (1.29)	1.030 (0.06)	0.752 (−0.53)
African American/Black	1.189 (0.28)	2.002 (1.45)	1.438 (0.61)	0.592 (−0.81)
Asian	1.775 (1.12)	2.175 (1.85)	1.428 (0.72)	1.001 (0.00)
Hispanic or Latino	1.882 (1.11)	3.252** (2.59)	1.599 (0.85)	1.283 (0.43)
American Indian and Alaska Native	0.402 (−1.60)	1.376 (0.71)	0.619 (−0.80)	0.407 (−1.39)
Native Hawaiian and Pacific Islander	1.770 (0.53)	1.005 (0.00)	0.547 (−0.33)	0.248 (−0.62)
Other race and ethnicity	1.361 (0.49)	2.809 (1.65)	1.097 (0.15)	1.112 (0.16)
Employer type				
Employee (reference)	1.0	1.0	1.0	1.0
Owner	1.161 (0.65)	0.866 (−0.66)	0.973 (−0.12)	1.038 (0.15)
Independent	1.279 (1.00)	1.284 (0.84)	0.977 (−0.09)	1.133 (0.41)
Other	2.417 (1.54)	1.834 (1.67)	4.789** (2.85)	2.454 (1.71)
High-rural serving	0.823 (−1.11)	0.971 (−0.16)	0.993 (−0.04)	1.006 (0.03)
Specialty group				
Medical specialties (reference)	1.0	1.0	1.0	1.0
Other	0.926 (−0.41)	0.811 (−1.10)	1.134 (0.64)	1.165 (0.80)
PCP	0.833 (−1.04)	0.800 (−1.32)	0.803 (−1.25)	0.960 (−0.24)
Surgery	1.039 (0.19)	1.668* (2.44)	1.145 (0.64)	1.157 (0.69)
Full-time status	0.890 (−0.57)	1.015 (0.07)	0.906 (−0.50)	0.940 (−0.32)
PA scope of practice (1 = most restrictive to 3 = most permissive)	0.818* (−2.51)	1.016 (0.19)	0.948 (−0.66)	1.035 (0.42)
Practice setting				
Medical school	1.853* (2.25)	2.641*** (3.72)	3.078*** (4.31)	2.768*** (3.86)
Teaching hospital	1.015 (0.07)	1.019 (0.08)	1.139 (0.59)	1.244 (1.01)
Non-teaching hospital	0.577* (−2.09)	0.867 (−0.52)	0.862 (−0.53)	0.781 (−0.88)
Group practice	0.780 (−1.34)	1.146 (0.71)	0.905 (−0.50)	0.926 (−0.37)
Government facility	0.635 (−1.21)	0.860 (−0.39)	1.212 (0.50)	1.027 (0.06)
Health care system	1.041 (0.20)	1.270 (1.18)	0.989 (−0.05)	1.123 (0.57)
Private practice—solo	0.920 (−0.23)	1.409 (0.89)	0.983 (−0.05)	1.136 (0.34)
Locum tenens	0.471 (−1.89)	0.478 (−1.94)	1.039 (0.09)	1.067 (0.14)
Private practice—single specialty group	0.959 (−0.17)	1.109 (0.41)	1.354 (1.22)	1.218 (0.70)
Private practice—multi-specialty group	1.104 (0.38)	1.403 (1.37)	1.157 (0.58)	1.394 (1.24)
Other setting	0.516 (−1.53)	0.759 (−0.61)	0.660 (−0.87)	1.035 (0.08)
International medical graduate	0.741 (−1.63)	0.615** (−2.63)	0.623* (−2.44)	0.668* (−2.11)
Women's representation at own specialty	0.987* (−2.49)	0.988* (−2.40)	0.989* (−2.18)	0.986** (−2.68)
Income level	1.125*** (3.63)	1.080* (2.25)	1.162*** (4.60)	1.152*** (4.46)
Ordered logistic regression cutpoint 1	0.0619*** (−3.51)	0.179* (−2.32)	0.239 (−1.86)	0.117* (−2.40)
Ordered logistic regression cutpoint 2	0.177* (−2.18)	0.629 (−0.64)	0.622 (−0.62)	0.500 (−0.80)
Ordered logistic regression cutpoint 3	0.712 (−0.43)	3.189 (1.58)	2.693 (1.28)	1.727 (0.63)
Ordered logistic regression cutpoint 4	4.124 (1.79)	15.37*** (3.69)	17.11*** (3.64)	9.559** (2.61)
<i>n</i>	2406	2406	2406	2408

Abbreviations: PA, physician assistant; PCP, primary care provider.

Values are exponentiated coefficients; *t* statistics in parentheses. Weight adjusted. **P* < .05; ***P* < .01; ****P* < .001.

^aFor Gender, “Women” includes trans-women, “Men” includes trans-men, and “Other” includes agender, genderqueer, nonbinary and other.

their perceptions of work with NPs, which produced some insights that may be uniquely relevant to PA or to NP practice.

The statistically significant but very modest association between older physician age and greater agreement that PAs improved time use indicates that greater experience with PAs may contribute to more productive working relationships. Our finding that physicians who work in medical schools had higher odds of agreeing that working with PAs and NPs improved their clinical practice may also reflect greater familiarity with the roles of PAs and NPs. A majority of medical schools require interprofessional education (AAMC),²⁸ which involves

learning about the roles and responsibilities of other health care professionals as well as best practices for effective collaboration.²⁹ As a result, physicians who are affiliated with or work in medical schools may be better prepared than other physicians to engage in productive working relationships with PAs and NPs. Our finding that IMGs are less likely to report that working with PAs improves their clinical practice extends this notion, since IMGs may lack familiarity with the PA role and the inter-professional work environment in the United States.³⁰

Our results that primary care physicians were less likely to agree that NPs positively contribute to quality of care and

Table 3. Estimated perceived impact of working with NPs on clinical practice by physician demographic and work characteristics.

	Ordered logistic regression estimates			
	Patient volume	Care quality	Time use	Decreased workload
Intensity NP	1.000 (−0.09)	0.998 (−0.27)	0.998 (−0.49)	0.992 (−1.54)
Age	1.001 (0.18)	1.009 (1.42)	1.010 (1.63)	1.005 (0.84)
Gender ^a				
Women (reference)	1.0	1.0	1.0	1.0
Men	1.315 (1.87)	1.065 (0.42)	1.254 (1.59)	1.224 (1.44)
Other	1.326 (0.12)	0.172** (−3.03)	1.433 (0.20)	3.569 (1.02)
Race and ethnicity				
White	2.223* (2.02)	1.807 (1.26)	0.623 (−1.32)	2.012 (1.82)
African American/Black	1.808 (1.11)	1.619 (0.89)	0.668 (−0.86)	1.332 (0.57)
Asian	2.159 (1.92)	1.894 (1.33)	0.652 (−1.17)	2.152 (1.94)
Hispanic or Latino	2.382 (1.90)	3.087* (2.30)	1.183 (0.41)	2.339* (2.02)
American Indian and Alaska Native	0.589 (−1.01)	0.951 (−0.07)	0.511 (−1.21)	1.543 (0.58)
Native Hawaiian and Pacific Islander	59.99*** (3.43)	146.7*** (4.57)	19.03* (2.50)	93.97*** (3.92)
Other race and ethnicity	3.730* (2.18)	3.560 (1.83)	0.592 (−0.97)	3.309* (2.07)
Employer type				
Employee (reference)	1.0	1.0	1.0	1.0
Owner	1.422 (1.69)	1.103 (0.48)	1.103 (0.45)	1.030 (0.14)
Independent	0.910 (−0.27)	0.584 (−1.61)	0.581 (−1.58)	0.815 (−0.61)
Other	1.901 (1.71)	0.428* (−2.10)	2.220 (1.35)	3.753* (2.53)
High-rural serving	1.015 (0.10)	0.877 (−0.82)	0.978 (−0.13)	1.059 (0.33)
Specialty group				
Medical specialties (reference)	1.0	1.0	1.0	1.0
Other	0.715 (−1.73)	0.723 (−1.69)	0.863 (−0.78)	1.188 (0.97)
PCP	0.732* (−1.96)	0.657** (−2.60)	0.697* (−2.17)	1.070 (0.42)
Surgery	0.693 (−1.88)	1.008 (0.04)	1.014 (0.07)	1.165 (0.76)
Full-time status	0.757 (−1.34)	0.726 (−1.42)	0.647* (−2.05)	0.666* (−2.10)
NP scope of practice (1 = most restrictive to 3 = most permissive)	0.813** (−2.67)	0.945 (−0.74)	0.880 (−1.66)	0.960 (−0.55)
Practice setting				
Medical school	1.909* (2.56)	1.630 (1.91)	1.474 (1.55)	2.525*** (3.60)
Teaching hospital	1.153 (0.71)	1.098 (0.48)	1.127 (0.62)	1.184 (0.88)
Non-teaching hospital	0.644 (−1.56)	0.686 (−1.32)	0.745 (−1.08)	0.660 (−1.50)
Group practice	0.942 (−0.29)	0.940 (−0.32)	0.761 (−1.38)	0.876 (−0.67)
Government facility	0.738 (−0.85)	0.660 (−1.18)	0.895 (−0.32)	0.781 (−0.75)
Health care system	1.323 (1.35)	1.020 (0.10)	1.070 (0.35)	1.035 (0.18)
Private practice—solo	1.031 (0.09)	0.915 (−0.29)	0.881 (−0.36)	1.144 (0.43)
Locum tenens	0.857 (−0.35)	0.584 (−1.33)	0.983 (−0.04)	0.855 (−0.37)
Private practice—single specialty group	1.256 (0.97)	0.947 (−0.24)	1.326 (1.21)	1.374 (1.37)
Private practice—multi-specialty group	1.424 (1.33)	1.111 (0.47)	1.445 (1.40)	1.300 (1.09)
Other setting	0.949 (−0.11)	0.861 (−0.37)	0.562 (−1.33)	0.929 (−0.14)
International medical graduate	0.875 (−0.73)	0.855 (−0.94)	0.893 (−0.66)	1.104 (0.60)
Women's representation at own specialty	0.997 (−0.67)	0.995 (−1.07)	0.995 (−1.02)	0.996 (−0.78)
Income level	1.118*** (3.93)	1.062* (2.06)	1.124*** (4.13)	1.141*** (4.49)
Ordered logistic regression cutpoint 1	0.145* (−2.58)	0.166* (−2.26)	0.0604*** (−3.76)	0.386 (−1.29)
Ordered logistic regression cutpoint 2	0.369 (−1.34)	0.485 (−0.91)	0.155* (−2.57)	1.320 (0.38)
Ordered logistic regression cutpoint 3	1.232 (0.28)	2.035 (0.90)	0.567 (−0.79)	3.989 (1.87)
Ordered logistic regression cutpoint 4	7.099** (2.63)	9.743** (2.88)	3.298 (1.67)	18.33*** (3.91)
<i>n</i>	2639	2637	2642	2644

Abbreviations: NP, nurse practitioner; PCP, primary care provider.

Values are exponentiated coefficients; *t* statistics in parentheses. Weight adjusted. **P* < .05; ***P* < .01; ****P* < .001.

^aFor Gender, “Women” includes trans-women, “Men” includes trans-men, and “Other” includes agender, genderqueer, nonbinary and other.

time use may partly stem from the fact that, in primary care, NPs provide many of the same services that physicians provide.³¹ That is, NPs may be spending less time providing care that complements or expands physician services than in other specialties. Also, while PAs in primary care also provide many of the same services that physicians do,^{10,32} state SOP laws allow for greater NP autonomy in more than half the states.¹⁶ Thus, NPs may be more likely than PAs to be working independently. Relatedly, our finding that physicians working in states with less-restrictive PA/NP SOP were less likely to agree that PAs or NPs improved patient volume may reflect that, in these states, NPs and PAs

may be more likely to be viewed as working alongside rather than under the supervision of physicians.

Small studies that focused on the contributions of PAs to surgical practices have shown that their employment was associated with reduced resident workloads³³ and surgeons' direct procedural time, allowing the surgeon to engage in other patient care activities.³⁴ Similarly, we found a positive relationship between surgeons' agreement that working with PAs positively contributes to their clinical practice, specifically quality of care. Surgical training is required for all PA students,³¹ and while just 5.4% of PAs complete additional postgraduate specialty training, which is optional, postgraduate surgical programs are

among those most frequently pursued.³⁵ Thus, surgeons' positive perceptions of working with PAs on quality of care may reflect both their familiarity with PAs as well as PA surgical training.

Interestingly, we found that physicians who work in specialties with a higher representation of women had lower agreement that working with PAs improved clinical practice in all 4 aspects. Women's representation in the practice environment has been receiving increasing attention as a factor affecting physician outcomes, ranging from income,³⁴ income equity,³⁶⁻³⁸ and workplace safety.³⁹ Although this relationship warrants further research, the finding that women's representation in a specialty was associated with a reduced odds of agreeing that PAs positively contribute to their clinical practice may reflect the fact that PAs receive relatively less training in specialties with high proportions of women physicians (eg, pediatrics and OBGYN [obstetrics/gynecology]). While PA education requires training in these specialty areas, relatively few optional postgraduate programs for PAs focus on them.¹⁷ Furthermore, less than 2% of PAs practice in women's health, and just over 3% practice in general pediatrics or a pediatric subspecialty.³⁵ Notably, no significant associations (positive or negative) were found between women's representation in the specialty and perceptions of NP influence on clinical practice. While proportions of NPs certified in these areas of practice are just slightly higher, as previously noted, there are twice as many NPs as PAs in the United States. Additionally, unlike PA education, NP education is population-focused, with options that include a focus on neonatology, pediatrics, or women's health.⁴⁰

Last, that high physician income was associated with greater agreement that PAs and NPs improved clinical practice for our 4 outcomes of interest suggests that PAs and NPs may perform tasks that complement or expand physician services, allowing these physicians and their organizations to expand services, increase productivity, and improve care delivery overall. For example, in surgical specialties (the highest-paying physician specialty⁴¹), while PAs and NPs can assist and perform many pre- and postoperative tasks, they cannot perform major surgery.^{42,43} Thus, incorporating PAs and NPs into practices has the potential to free up physicians to perform procedures that lead to greater practice revenue and physicians' earnings.⁴⁴ Consequently, this defined role delineation and labor allocation within practices may positively impact various aspects of physicians' clinical practices.

Conclusion

Health care is becoming increasingly complex, demand for services continues to grow, and the PA and NP professions are rapidly expanding.⁴⁵ As a result, physicians will increasingly be working with these advanced-practice clinicians. This study adds to the growing body of literature focused on PA and NP contributions to the health care system. Although physician perceptions of working with PAs and NPs is just one way to measure their contributions to clinical practice, our results can be useful for policymakers and administrators to inform approaches to effective care delivery reform. Patient and care delivery outcomes are positive with PA- and NP-delivered care, and our study shows that physicians who work with PAs and NPs view these working relationships as positive to their own clinical practice. Adding PAs and NPs to the clinical staff across settings and specialties can improve care delivery and patient outcomes, as well as contribute to improving the workload of other clinicians in the same practice. While

our study results reveal that most physicians had positive perceptions of PA and NP influence on at least some aspect of their clinical practice, some differences emerged that warrant additional study. Further research on interprofessional dynamics, the impact of clinician role delineation across specialties and settings and care delivery models, physician exposure to PAs and NPs, and PA or NP postgraduate training is needed.

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Supplementary material

Supplementary material is available at *Health Affairs Scholar* online.

Conflicts of interest

Please see ICMJE form(s) for author conflicts of interest. These have been provided as supplementary materials.

Notes

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