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Nurse Practitioners as Primary Care Providers with their Own Patient Panels and Organizational Structures: A Cross-Sectional Study

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Abstract

Background.—Health care systems globally are facing challenges of meeting the growing demand for primary care services due to a shortage of primary care physicians. Policy makers and administrators are searching for solutions to increase the primary care capacity. The effective utilization of nurse practitioners (NPs) has been proposed as a solution. However, organizations utilize NPs in variable capacities. In some settings, NPs serve as primary care providers delivering ongoing continuous care to their patients, referred to as patient panels, whereas in other settings they deliver episodic care. Little is known about why organizations deploy NPs differently.

Objectives.—Investigate the NP role in care delivery—primary care providers with the own patient panels or delivering episodic care—within their organizations and understand how work environments affect their role.

Design.—A cross-sectional survey design was used to collect data from primary care NPs.

Settings.—The study was conducted in one state in the United States (Massachusetts). Data from 163 primary care organizations was obtained, which employed between one to 12 NPs.

Participants.—807 NPs recruited from the Massachusetts Provider Database received mail surveys; 314 completed and returned the survey, yielding a response rate of 40%.

Methods.—The survey contained measures of NP role in care delivery and work environment. NP role was measured by an item asking NPs to report if they deliver ongoing continuous care to

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their patient panel or if they do not have patient panel. The work environment was measured with the Nurse Practitioner Primary Care Organizational Climate Questionnaire (NP-PCOCQ). The multilevel Cox regression models investigated the influence of organization-level work environment on NP role in care delivery.

Results.—About 45% of NPs served as primary care providers with their own patient panel. Organization-level Independent Practice and Support subscale, an NP-PCOCQ subscale, had a significant positive effect on NP role (risk ratio=2.33; 95% CI: 1.06–5.13); with a one unit increase on this subscale, the incidence of the NPs serving as primary care providers with their own patient panel doubled.

Conclusions.—NPs can help meet the increasing demand for primary care by taking responsibilities as primary care providers, and organizations can assign NPs their own patient panels. Supporting NP independent practice within organizations promotes NP role as primary care providers. Policy and organizational change focused on promoting NP work environments so NPs can practice as primary care providers can be an effective strategy to increase the primary care capacity.

Keywords

Nurse Practitioners; Patient Panels; Primary Care; Work Environment

Introduction

Health care systems globally are facing challenges to deliver timely, high quality, and cost effective primary care. The growing shortage of primary care physicians is a contributing factor to such imbalance in the demand for care and supply of primary care providers (Scheffler et al., 2008). In the United States (U.S.) as well as internationally fewer medical residents choose primary care specialties, limiting both the current and the future supply of these providers; higher salaries in specialty medicine incentivize these choices (Laugesen and Glied, 2011). Globally, policy makers are contemplating various health care delivery models to meet the growing demand for primary care (Cometto et al., 2013). One such strategy that is widely utilized across many countries to increase the overall capacity of primary care is the better utilization of nurse practitioners (NPs) (Freund et al., 2015, Martínez-González et al., 2015). A recent study conducted in 39 countries showed that they are implementing reforms to shift patient care tasks from physicians to NPs in order to maximize the capacity of the health care workforce (Maier and Aiken, 2016). NPs can play a vital role to help meet the demand for primary care services as systematic reviews of international evidence consistently demonstrate that NPs are capable of delivering high quality of patient care, and the outcomes of their care are equivalent to those of physician care (Horrocks et al., 2002, Martínez-González et al., 2014).

The health care system in the U.S. is also facing major access to care challenges and is unable to meet the growing demand for primary care because of the lack of primary care physicians (Pettersen et al., 2012). Many Americans, especially those with low incomes, struggle to secure timely primary care appointments (Rhodes et al., 2014). It is estimated that in order to complete all recommended preventive, acute, and chronic care guidelines

recommended by national clinical organizations, a primary care physician in the U.S. with a standard patient panel of 2,500—patients regularly under the care of the provider, would require an unrealistic 21.7 hours per day (Yarnall et al., 2009). Furthermore, these estimates were developed prior to the implementation of the Affordable Care Act, which provided millions of previously uninsured Americans with health care coverage and significantly increased the volume of patients seeking primary care (Patient Protection and Affordable Care Act, March 23, 2010). Thus, policy makers are calling for the expansion of the role and scope of practice of NPs to meet the growing demand for primary care (Federal Trade Commission, March 2014, Institute of Medicine, 2010, National Governors Association, 2012).

NPs in the U.S. have a long history of delivering primary care to patients. Their role was first established in 1960s to help children in need to have access to care (Silver et al., 1968, Silver et al., 1967). Since then the NP role and scope of practice evolved, and NPs provide care across the continuum of the lifespan and in a variety of health care settings including acute and long term care settings, and in primary care. NP education and training, which prepares NPs to independently care for patients, prescribe medications, and order necessary tests and equipment for patients is uniform across the U.S.; however, the state level regulations governing this workforce significantly vary from state to state across the country (Barton Associates, 2015). Some states support the NP full scope of practice allowing NPs to independently deliver care or prescribe medications; other states impose restrictions by requiring NPs to have supervisory or collaborative relationships with physicians to be able to deliver care or prescribe medications to their patients (Barton Associates, 2015). Moreover, in addition to these variations in NP practice created by state-level regulatory policies, a wide variability also exists in how organizations employing NPs utilize them in care delivery even within the same state. For example, certain health care organizations employing NPs only allow them to deliver episodic care to patients whereas other organizations deploy NPs as primary care providers who independently provide care to their own patient panels (Laurant et al., 2005, Poghosyan et al., 2015a). Primary care providers being able to deliver care to their own patient panels promotes continuity of primary care {Saultz, 2003 #3570}, which is critical for optimal patient outcomes such as preventing unnecessary hospitalizations {Nyweide, 2013 #3569} and reducing mortality {Wolinsky, 2010 #3571}. In addition, determining patient panels for primary care providers is an important productivity, quality, and outcomes question for policy makers and practice managers (Muldoon et al., 2012). Furthermore, as the NP role is developing globally, attention is shifting towards the productivity of the NP workforce to help health care systems to meet the demand for primary care services, and assigning and determining NP panels is a critical step in achieving that goal (Martin-Misener et al., 2016).

Many factors in the U.S. could affect the ability of NPs to function as primary care providers delivering care to their own patient panels. For example, Medicare which is the largest federal health insurance program in the U.S. covering mostly adult patients ages 65 and older, reimburses NPs at 85% the physician fee schedule for delivering the same services {Centers for Medicare & Medicaid Services, 2002 #2152}. This billing practice incentivizes some health care organizations to bill for NP services under the physician name in order to receive 100% of the fee for the services despite the fact that NPs have the primary care

provider role and deliver ongoing continuous care to patients {Poghosyan, 2013 #1427}. Thus, Medicare data do not accurately capture the patient panels assigned to NPs.

To date, several studies investigated the impact of various regulatory barriers on NP role in care delivery and patients' access to care (Barnes et al., 2016, Cross and Kelly, 2015, Graves et al., 2016). In contrast, comparatively little research has focused on the organizational structures in health care settings employing NPs and how organizations utilize NPs in care delivery as primary care providers with their own patient panel within the same federal and state regulatory environment. Isolated investigations, focusing only on state-level barriers, without considering the characteristics of organizations employing NPs, and the ecological nature of such studies, give limited views about how to develop concrete and feasible organization-level interventions to optimize NP role in care delivery in order to increase the capacity of primary care. To date, little is known why organizations employing NPs within the same state deploy NPs differently given the same state-level scope of practice regulations governing this workforce and the NPs' uniform education and training across the U.S.

NP Patient Panels and Organizational Structures

The NP workforce in the U.S. represents a substantial supply of primary care providers. A recent study suggested that expanding patient panels—the number of patients regularly under the care of the NPs—could substantially mitigate the primary care physician shortages in the U.S. (Auerbach et al., 2013). A 2016 scoping review of 111 peer-reviewed articles and grey literature documents published in the International Journal of Nursing Studies on NP patient panels and caseload found that if NPs have their own patient panel, it leads to improvements in access to care, decreases wait time, promotes chronic disease management, and reduces hospital visits, in addition to improving provider retention (Martin-Misener et al., 2016). Thus, promoting the NP role as primary care providers who deliver continuous ongoing care to their own patient panels could be an effective strategy to increase the capacity of the primary care system.

However, NPs often practice in health care settings with challenging organizational structures that may affect the NP role in care delivery and prevent them from delivering continuous care to their own patient panels as primary care providers. NP work environments within their employment settings are often characterized by poor relationships between NPs and leadership and lack of support for care delivery (De Milt et al., 2011, Poghosyan et al., 2015a, Schiestel, 2007). For example, staff help in terms of preparing NP patients for their visits such as recording patient vital signs, weight, and height, which is necessary for NPs to deliver care to patients, was often not available to NPs {Poghosyan, 2013 #1764}{Poghosyan, 2013 #1427}. Such lack of support leads to NPs taking on patient care tasks typically delegated to medical assistants or registered nurses, resulting in major delays in patient care and increased cost of care. If NPs have access to staff support, the average cost of serving a patient could be reduced by 9%–12% (Liu et al., 2014). Other researchers also found NPs do not have sufficient help to deliver care, including ordering lab work or drawing blood (Brown, 2003, Bryant-Lukosius et al., 2004). Such poor environments also deplete health care organizations from much needed workforce resources as they increase NP job dissatisfaction and turnover (Poghosyan et al., 2015b).

A qualitative study demonstrated that in health care organizations where NPs report favorable work environments characterized by clear understating of NP role by physicians and administrators and favorable relationships, NPs are more likely to practice as independent primary care providers delivering ongoing continuous care to their patient panels (Poghosyan et al., 2013c). While this qualitative study provides important insights about the NP role in care delivery, more research is needed. The objective of this study was to investigate the NP role in care delivery, particularly whether NPs serve as primary care providers delivering continuous ongoing care to their own patient panel or only deliver episodic care within their employment settings from the perspectives of NPs and how NP work environments within the organizations determine the NP role.

Methods

Study Design

This paper is a part of large cross-sectional survey conducted with primary care NPs in one state in the U.S. (Massachusetts) to understand NP role, teamwork, and work environments. NP participants received a paper questionnaire mailed to them at their work address. The details of the study are discussed below and can be found elsewhere (reference removed for review).

Ethical Considerations

The study was approved by the Institutional Review Board of Columbia University Medical Center. The participants of the study received a mailed survey with a consent form at their work address. They were assured that the information they provided is extremely valuable for the study, their responses will be kept strictly confidential, and only the research team will have access to the data. The participants were also informed that the study results will be presented at aggregate form and there will be no way to identify the individuals completing the survey.

Setting

The study was conducted in Massachusetts. We purposefully limited the study to one state in the U.S. to control for variations in the state level scope of practice regulations affecting NPs. The study was conducted in 2012. At the time of the data collection for this study, the NP scope of practice regulations in Massachusetts required NPs to have a collaborative agreement with physicians to practice (Barton Associates, 2015). This meant that NPs in Massachusetts were required to have a physician oversight for diagnosing and treating patients, and prescribing medications to their patients. In 2012, about 3,000 NPs in the state delivered primary care (Pearson, 2012).

Participants and Data Collection

NPs were recruited from the Massachusetts Provider Database (MPD), which is a unique data source containing information about physicians and NPs listed as providers on five major health insurance plans that cover over 50% of Massachusetts' commercially insured residents (Massachusetts Health Quality Partners, 2011). The providers in MPD might also care for patients covered by federal (Medicare) and state (Medicaid) insurance programs;

however, the commercial insurance plans report the information on their providers to Massachusetts Health Quality Partners (MHQP), which developed and maintains MPD. MHQP is a coalition of physicians, hospitals, health plans, patient representatives, and government agencies dedicated to improving the quality of health care in Massachusetts. One of MHQP's initiatives is to maintain a database of health care providers. Annually, MHQP contacts the clinics to update the MPD. The unique strength of this database is that it contains detailed information about each NP employed in the clinic including whether they deliver primary or specialty care and their contact information.

In 2012, we purchased the MPD which contained information about 807 NPs listed as delivering primary care. We extracted their practice addresses and using the modified Dillman method for mail surveys (Dillman et al., 2009), we sent these NPs surveys without incentives. Then we sent a postcard reminder two weeks after the initial survey and conducted the second mailing of non-respondents. Overall, 314 NPs from 163 unique primary care organizations completed and returned the surveys to the research team. We achieved a 40% response rate after accounting for undelivered mail and NPs no longer being employed in primary care. The number of NPs employed in primary care organizations ranged from one to 12.

Measures

The survey contained measures of NP role in care delivery, NP work environment, and demographics. The NP role in care delivery was measured with one global item, which asked NPs to report if they have their own patient panel to whom they deliver ongoing continuous primary care or they do not have their own patient panel. The item allows differentiating NPs with and without patient panels. This item has been previously used in research (Poghosyan and Aiken, 2015).

The NP work environment was measured using the *Nurse Practitioner Primary Care Organizational Climate Questionnaire (NP-PCOCQ)*, which is a psychometrically reliable and valid instrument specifically designed to measure the work context of primary care NPs (Poghosyan et al., 2013d). The tool has 29 items, grouped in four subscales, which ask NPs to rate on a 4-point scale from “*strongly agree*” to “*strongly disagree*” the degree to which certain organizational characteristics are present in their organizations. The NP-PCOCQ's subscales measure the NP work environment with four subscales: 1) NP-Physician Relations (NP-PR) subscale has seven items asking NPs to rate the relationships they have with physicians; 2) NP-Administration Relations (NP-AR) subscale asks NPs to evaluate the relationship they have with the leadership within their organizations with nine items; 3) Independent Practice and Support (IPS) subscale also has nine items and measures support NPs receive for their independent practice; and 4) Professional Visibility (PV) subscale measures how visible NP role is within the organizations with four items. All subscales have high internal consistency reliability with Cronbach's alphas ranging from 0.87 to 0.95 (Poghosyan et al., 2013). The tool also has construct, discriminant, and predictive validity (Poghosyan et al., 2016), and it is currently being used to measure NP work environment in many states in the U.S. as well as internationally (e.g., Australia, Canada, China). The survey tool also collected information on demographic and work characteristics of NPs

including age, sex, education, years of experience, the location of the practice, type of the practice, and size of the practice.

Data Analysis

We first computed the descriptive statistics on NP demographic and work variables. Frequency tables and means with standard deviations were used to describe categorical variables (e.g., sex, education, etc.) and continuous variables (e.g., age, etc.) respectively. We then computed the individual NP-level mean scores on each NP-PCOCQ subscale for NPs with a completion rate on the items of greater than 70% (Bono et al., 2007). Given that the NP work environment is conceptualized as shared perceptions of all NPs within the organization about the organizational characteristics of their employment settings (Schneider, 2000), we aggregated the responses of all NPs within each organization and computed organization-level mean scores on each NP-PCOCQ subscale. Higher mean scores on each organization-level NP-PCOCQ subscale indicate a better NP work environment within their employment settings.

We also created a dichotomous variable to represent the NP role in care delivery to differentiate NPs serving as primary care providers with their own patient panel from those who did not have their own patient panel. Next, we examined the bivariate associations between each predictor—organization-level mean score on each NP-PCOCQ subscale, and the outcome variable—NP role in care delivery (with/without patient panel).

Before building the multilevel models, we assessed for missing data and checked for multicollinearity of the predictors; the Variance Inflation Factor were all less than 10 so multicollinearity was not a concern (Kutner et al., 2004). Twenty-seven NPs did not complete the item on their panel status; thus, we used data from 287 NPs to build the models. The model building started from finding the bivariate associations between the covariates and the outcome variable using t-test for continuous variables and chi-square for categorical predictors. If the p-value was less than 0.20 (Hosmer and Lemeshow, 2000) then the potential predictor was considered for inclusion in the multilevel regression model. The multilevel models accounted for the hierarchical design of the data where 287 NPs, Level-1, were nested in 163 organizations, Level-2. The main predictors in the models, the mean scores on four organization-level NP-PCOCQ subscales, were included as Level-2 variables, as NP work environment was conceptualized as a property of the organization rather than the individual NP. We were interested in studying the effect of each aspect of NP work environment on the outcome measure. Covariate variables measuring NP demographics were entered as Level-1 confounders, and organization-level characteristics were entered as Level-2 confounders. Dichotomized dummy variables were created for nominal variables with more than two categories. For example, NPs' years in current position was transferred from nominal variables into a dichotomized variable differentiating experienced (more than seven years of experience in the current position) and less experienced NPs (less than seven years of experience).

Given the high proportion of NPs having their own patient panel, we adopted risk ratio instead of odds ratio to measure the association between predictors and outcome. Risk ratio

is calculated as the incidence of outcome in those exposed to the factor divided by the incidence of outcome in those not exposed to the factor (Ospina et al., 2012). Cox regression with constant time variable has been suggested by researchers for estimating relative risk (Diaz-Quijano, 2012). Since the Level-2 contextual effects are of substantive interest, centering at grand mean was applied to continuous independent variables in the multilevel models. A procedure for fitting multilevel Cox regression models in Version 9.3 of the SAS System for Windows (SAS Institute Inc, 2013) PROC PHREG, was conducted to build the models. The overall alpha level was set at 0.05 to control for Type I error throughout the study.

Results

Table 1 demonstrates the descriptive statistics on characteristics of NPs and organizations employing NPs and compares them between NPs with and without their own patient panel.

About 45% of NPs (n=132) in the total sample reported having their own patient panel to whom they delivered ongoing continuous care as primary care providers. Ninety six percent of the total sample was female. NPs with a patient panel were slightly older. Years in current position and average hours worked per week were associated with NPs having their own patient panel. Among NPs with a patient panel, most worked in community health centers. A significantly larger proportion of NPs without a patient panel (50% versus 30%) worked in physician offices. The IPS subscale of NP-PCOCQ measuring the support NPs receive in their employment settings for their independent practice was associated with the NP role in care delivery in bivariate analysis at .20 level (Table 2).

The final multilevel Cox regression model with constant time effect assessed the effect of each organization-level NP-PCOCQ subscale on NP role in care delivery, controlling for variables measuring NPs' demographic and work characteristics that were significant in the bivariate analysis. Sex was also included in the final model due to the large difference in the proportions of NPs with their own panel between male and female NPs (62.5% versus 45.7%). Intra-class correlation (ICC) was calculated to assess whether the Level-2 units, or the organization-level, differ on the outcome measures. The ICC coefficient was 0.315, which was higher than the cutoff point of 0.05 (Kreft and de Leeuw, 1998). Therefore, the benefits of using multilevel models were validated. Furthermore, multilevel modeling approach is beneficial compared to single-level modeling even if ICC is less than .05.

The final multilevel Cox regression model is presented in Table 3. None of the control variables, including NP demographics and work characteristics, were significant in the final model. One of the main predictor variables, practice-level IPS subscale of the NP-PCOCQ measuring the support NPs receive for their independent practice, one dimension of NP work environment, had a significant positive effect on NP role in care delivery (risk ratio=2.33; 95% CI: 1.06–5.13). With one unit increase on the organization-level IPS subscale score, the incidence of NPs serving as primary care providers with their own patient panel almost doubled. The model controlled for NP age, sex, years of experience, workload, and the type and location of the practice, which were not significant in the final model. In organizations which provide NPs with support for NP independent practice, NPs

were more likely to have their own patient panel as primary care providers compared to NPs in organizations lacking adequate support. IPS measures aspects of support for independent practice such as physicians supporting NP patient care decisions, NPs being able to freely apply their knowledge and skills to care for patients, or NPs having adequate staff help to care for patients. These aspects of NP work environment allowed NPs to serve as primary care providers for their patients. In addition, IPS has items that measure the organizations' ability to create an environment where NPs can practice independently and not restricting NPs' ability to deliver care within their scope of practice.

Discussion

We studied primary care NP role in care delivery within their employment settings in one state with the same state level scope of practice regulation and whether NP work environments are associated with NP role as primary care providers delivering care to their own patient panels. Our findings are consistent with the existing evidence that even within the same regulatory context, the NP role in care delivery varies from organization to organization (Laurant et al., 2005). We found that not all primary care NPs have their own patient panel for whom they serve as primary care providers; almost half of the NPs we surveyed have their own patient panel. This inconsistency in NP role in care delivery is concerning as all NPs in the state have similar education and are governed by the same state level regulations. Given the projected increase in the number of NPs in the U.S., which is expected to double between 2008 and 2025 (Auerbach, 2012), such underutilization of the NP workforce is concerning. The contributions of the growing workforce of NPs will be limited if organizations employing them do not utilize them to their fullest capacity as primary care providers to allow them to independently deliver care to their own patient panels. Utilizing NPs only in episodic care is not only an underutilization of NPs' advanced skills and competencies, but it also prevents patients from the benefits of continuous primary care and limits the overall capacity of the primary care system. Continuity of primary care is beneficial for patients, especially for those with chronic diseases who need continuous monitoring and follow up by their primary care providers to effectively manage their conditions (Cabana and Jee, 2004, Nutting et al., 2003). A recent study showed that continuity of care for chronic diseases lowered the rates of hospital and emergency department visits, complication rates, and costs {Hussey, 2014 #3573}. As the chronic disease epidemic is growing worldwide, health care systems will be unable to deliver care to these patients given the workforce shortages if they do not develop strategies to promote NP role as primary care providers with their own patient panel.

While organizations within the same state utilize NPs differently, insurance reimbursement policies in the U.S. could explain some of the variability. For example, among NPs who had their own patient panel, most worked in community health centers. While in other health care settings, Medicare reimburses NPs at a 85% of physician fee, in community health centers, Medicare pays all inclusive per visit payment amounts based on costs of the centers that accounts the total number of visits for all patients rather than reimbursement for each individual patient {Department of Health and Human Services: Centers for Medicare & Medicaid Services, January 2013 #1709}. Although in our final model, the work setting of NPs was not a significant predictor, more large scale investigations are needed to understand

how reimbursement policies and practice setting type affect NP patient panels. We did find that NPs are more likely to serve as primary care providers and deliver ongoing continuous care to their own patient panel in organizations where NPs receive support for their independent practice. This finding is consistent with the existing evidence showing that having access to organizational resources such as staff support, clinical information, or exam rooms determine NPs' ability to have their own patient panels (Martin-Misener et al., 2016). Ours and others' findings indicate that organizational structures in employment settings of NPs affect the NP role in care delivery beyond the regulations. Other NP work environment aspects such as the relationships NPs have with physicians or administrators were not associated with NP role in care delivery. In order for NPs to be able to deliver ongoing continuous care to their patient panels they need to have access to organizational resources and support such as support from physicians for care delivery, adequate staff help to prepare NP patients for their visits, or creating an environment where NPs can practice within their scope of practice. As many countries are considering how to shift tasks from physicians to NPs, our study provides evidence that can be used by administrators to effectively use NPs in care delivery. Administrators can provide NPs with the necessary support and resources to enable them to help meet the demand for primary care. Policy makers and administrators can increase the capacity of primary care through modifying work environments within the organizations employing NPs since work environments are easily modifiable by people with power and influence (Denison, 1996). Only when NPs are maximally utilized in care delivery as primary care providers will the health care systems achieve the most value from the NP role in terms of meeting the growing demand for primary care. Results from a systematic review of evidence indicates that NPs provide effective and high quality of care to patients and can safely address the shortages of primary care physicians to increase access to care {Newhouse, 2011 #839}.

The study was conducted in Massachusetts where the scope of practice regulations governing NPs require them to have a collaborative agreement with physicians to practice (Barton Associates, 2015). These restrictive scope of practice regulations may explain some of the variability observed in the NP role in care delivery. However, it appears that organizations employing NPs determine how to deploy them in care delivery. Thus, the restrictive scope of practice regulations may have a lesser impact on the NP role than the organizational policy. Policy makers can take actions to remove unnecessary restrictions placed on NP practice by state regulatory bodies. Having scope of practice regulations that support NP full practice will help health care organizations, which face with challenges for caring large volumes of patients to optimally use NPs and deliver timely high quality care to patients. In addition, removing unnecessary state policy restrictions will allow NPs to exercise their competencies. Thus, as the NP role is evolving globally and their numbers are increasing (Maier, 2015), comprehensive strategies that consider both policy and organizational reforms are necessary to effectively utilize the growing workforce of NPs in health care systems.

The study has several limitations. It was conducted in one state, which may affect the generalizability of the study findings to other states in the U.S. and internationally. NPs from other states might report different deployment models and work environments. Large-scale studies which collect data from more NPs, organizations, and states are necessary. We did

not collect data about characteristics of patients in NP panels or look at the panel size. Future work can focus on understanding which patients benefit most from the care delivered by NPs; however, evidence overwhelmingly demonstrates that NPs can successfully manage a wide range of primary care visits (Horrocks et al., 2002, Newhouse et al., 2011). More evidence is needed to determine panel sizes that an NP can accommodate to meet the needs of growing volume of complex patients and help meet care demand. In addition, we only collected data from NPs. In future work, it will be important to collect data from primary care physicians to understand how effectively NPs and physicians can manage patient panels given the shift to team based care globally (Freund et al., 2015). Our study relied on self-reports and non-response can be an issue. Despite these limitations, the study findings fill a critical gap in evidence to help understand the variability in NP role in care delivery and the impact of organizational structures on the NP role. These findings are critical for optimally utilizing this valuable workforce of providers in care delivery and helping health care systems globally to achieve the most value from the NP role in terms of meeting the growing demand for primary care. Future large empirical studies with NPs working in different states and settings are necessary to understand NP role in care delivery and how various domains of NP work environments affect it in order to produce robust evidence for designing organizational interventions to better utilize NPs.

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What is already known about the topic?

- Health care systems globally are facing challenges of meeting the demand for growing primary care services due to the shortage of primary care physicians.
- Effective utilization of nurse practitioners (NPs) can help meet the growing demand for primary care services.
- Providing NPs with their own patient panel improves access to care, decreases wait time, promotes chronic disease management, reduces hospital visits, and improves provider retention.

What this paper adds?

- Primary care NPs have different roles in care delivery across primary care organizations.
- Only about half of the primary care NPs have their own patient panel to whom they deliver ongoing continuous primary care.
- Organizational structures within the employment settings of NPs affect NP role in care delivery beyond the state level scope of practice regulations.

Table 1.**NP- and Organization- Level Characteristics**

NP-Level Characteristics	NP Role in Care Delivery			p-value
	Total Sample (N=287)	NPs with own patient panel (n=132)	NPs without own patient panel (n=155)	
Age, mean (SD)	49.2 (11.0)	50.5 (12)	48.4 (11)	0.13
Sex N (%)				0.48
Female	276 (96)	126 (95)	150 (97)	
Race N (%)				0.53
White	268 (93)	121 (92)	147 (95)	
Highest Nursing Degree N (%)				0.14
Master's Degree	41 (14)	25 (19)	16 (10)	
Post Master's Certificate	223 (78)	96 (73)	127 (82)	
Married N (%)				0.81
Yes	208 (73)	95 (72)	113 (73)	
Years in Current Positions N (%)				0.06
< 1 year	16 (6)	3 (2)	13 (8)	
1–6 years	109 (38)	46 (35)	63 (41)	
> 7 years	162 (56)	83 (63)	79 (51)	
Average Hours Worked per Week N (%)				<.01
1–20 hours	22 (8)	4 (3)	18 (12)	
21–40 hours	188 (65)	84 (64)	104 (67)	
> 40 hours	76 (26)	43 (33)	33 (21)	
Organization-Level Characteristics				
Main Practice Site N (%)				<.0001
Physician Office	117 (41)	40 (30)	77 (50)	
Community Health Center	84 (29)	58 (44)	26 (17)	
Hospital-based Clinic	45 (16)	13 (10)	32 (21)	
Practice Location				0.002
Urban	164 (57)	88 (67)	76 (49)	
Non-urban	122 (42)	43 (33)	79 (51)	
Number of NPs in each Practice N (%)				0.48
1	16 (6)	9 (7)	7 (5)	
2–5	156 (53)	75 (57)	81 (52)	
6–10	58 (20)	25 (19)	33 (21)	
>11	55 (19)	21 (16)	34 (22)	

* Note. P-values are from the bivariate analysis: Chi-square analysis for categorical variables and independent samples t-test for continuous variables.

Table 2.**NP Work Environment and Association with NP Role in Care Delivery**

NP Work Environment	NP Role in Care Delivery		p-value
	NPs with own patient panel (n=132)	NPs without own patient panel (n=155)	
Subscales	Mean (SD)		
Professional Visibility (PV)	3.20 (.55)	3.13 (.45)	0.45
NP-Administration Relations (NP-AR)	2.87 (.62)	2.88 (.51)	0.82
NP-Physician Relations (NP-PR)	3.37 (.43)	3.37 (.36)	0.95
Independent Practice and Support (IPS)	3.50 (.34)	3.42 (.35)	0.13

* *Note.* P-values are from the independent samples t-test.

Table 3.

Risk Ratio for Assessing the Impact of NP Work Environment on the Proportion of NPs with or without Patient Panels

Organization-level Predictor Variables (Level-2)	Risk Ratio	95% CI		p-value
		Lower	Upper	
NP Work Environment				
Professional Visibility (PV)	1.036	0.541	1.982	0.915
NP-Administration Relations (NP-AR)	0.779	0.412	1.472	0.442
NP-Physician Relations (NP-PR)	0.829	0.413	1.662	0.596
Independent Practice and Support (IPS)	2.328	1.056	5.134	0.036*

Note: The model controlled for the effects of age, sex, experience, workload, practice setting type, and location, which had p-values < 0.20 in bivariate analysis.

^{*} Significant at 0.05 level.