The Role of Nurse Practitioners in Primary Healthcare

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ABSTRACT

Objectives: The employment of more nurse practitioners (NPs) is one of the most promising ways to expand the capacity of medical group practices. The objective of this study was to determine the association of NPs with patient-level cost and quality of care.

Study Design: Eighty-five primary care medical group practices were matched with 315,000 Medicare patients. Per beneficiary per year total costs and quality of care were calculated from Medicare claims data. Data were analyzed using multivariate regression analysis.

Methods: A national sample of primary care medical group practices based on responses to the 2009 Medical Group Management Association Performance Survey. The cost variable was annual risk-adjusted Medicare expenditures per capita for patients attributed to a practice. There were 5 quality of care measures.

Results: Employing NPs in primary care practices is associated with increased risk-adjusted patient cost for up to 1 NP for every 2 physicians, but cost decreases as the number of NPs per physician increases. There was little evidence of systematic association of NPs with quality of care or the practice's net revenue.

Conclusions: Primary care medical group practices need to evaluate the alternate clinical roles of their NPs and develop models that optimize cost and quality of care. Practices that have employed more than 1 NP for every 2 physicians appear to have lower per capita Medicare spending with no adverse effects on quality. Research now needs to explore these causalities.

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The employment of more nurse practitioners (NPs) is one of the most promising ways to expand the capacity of medical group practices to meet the projected needs for primary healthcare created by an aging population and increased health insurance coverage under the Affordable Care Act. However, little is known about the optimal use of these clinicians in primary care medical practices or the effect of NPs on the costs and quality of care. In this manuscript, we report the findings from a study of the association of NPs in 85 primary care medical group practices with risk-adjusted Medicare expenditures per patient (hereafter referred to as "cost"), quality of care, and the practice's net revenue.

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Several recent studies have highlighted the pending shortage of primary care physicians (PCPs). The Health Resources and Services Administration identified more than 5000 primary care shortage areas as of January 2013. These areas affect more than 57 million people, and almost 16,000 additional practitioners are required to meet primary care needs.[1] Moreover, Hofer et al estimated that an additional 4307 to 6940 PCPs would be required just to meet the needs of the newly insured under the Affordable Care Act.[2] A study by Huang and Finegold expanded this analysis to identify geographic areas disproportionately affected by the combination of insurance expansion and the current shortage of PCPs.[3] They estimated that 51 million Americans live in the areas that will experience the greatest effect of primary care shortage.

While numerous studies have focused on the potential contributions of and need for more NPs,[4-7] the factors influencing their roles,[8-11] and the quality of their care,[12-15] few have examined their association with costs; and to our knowledge, none have assessed their association with practice-level costs or the relationships between those costs and quality of care. An extensive recent review of the contributions of advanced practice nurses to primary care conducted by Laurant et al (2014)[16] identified over 1100 publications, but only 3 studies

assessed resource utilization such as consultation rates and prescription drug use, and 2 addressed direct costs, including labor costs per patient visit.

Most of these studies found the performance of advanced practice nurses to be equal to or better than that of physicians. While these studies provide important insights into the performance of NPs, they do not address the challenges faced by primary care medical group practices when they participate in accountable care organizations or similar programs in which patient population–level costs and quality are the main performance measures. As pointed out by Roblin et al (2004),[17] while labor costs per patient visit decline in managed care organizations as more PAs and NPs are employed, more research is needed on delivery system cost savings and cost-effectiveness. This is the focus of our study.

Take-Away Points

Employing more nurse practitioners (NPs) to meet increased needs for primary healthcare could increase costs and have a negative effect on quality if their clinical roles are not clarified.

- Nurse practitioner staffing data indicate that employing 0.25 to 0.50 NPs per primary care physician increases patient-level costs and decreases quality.
- In this staffing range, this suggests that the clinical role of NPs has an adverse influence on performance. Lower staffing has no effect on costs or quality, but employing two NPs per physician reduces costs and improves quality.
- Medical administrators should evaluate the influence of NP staffing ratios on their clinical roles and subsequent cost and quality performance.

METHODS

Data

The data set for this analysis was created by identifying the adult primary care medical group practices that provided organizational and performance data for the Medical Group Management Association (MGMA) 2009 survey. Data on 85 practices were then linked to claims data on the Medicare beneficiaries who received a plurality of their nonhospital evaluation and management visits from the practices.

The practices ranged in size from 5 to 53.2 full-time equivalent (FTE) physicians, with half owned by hospitals. Seventy-three percent have at least 1 NP and 46% have electronic health records (EHRs). The practices are located in 26 states, and although this is not a nationally representative sample of primary care medical group practices, it covers many different regions of the United States and provides a relatively large and diverse convenience sample to support our analysis.

Cost and Net Revenue

Costs are calculated from Medicare claims files and are risk-adjusted using the Medicare Hierarchical Condition Category algorithm plus patient age and gender. Differences in payment rates are adjusted using the Medicare Geographic Practice Cost Index. The resulting per beneficiary per year (PBPY) adjusted costs represent dollar-weighted resource use to provide and manage care for similar patients.

We also include a net revenue after operating costs variable in our analysis to determine the association of NPs with the profit level of the practice. This is an important measure of the relationship between practice-level revenue and cost of care, and a measure of the contribution of NPs to the efficiency of the medical group practice in providing services.

Quality

Five quality-of-care measures are included in our analysis: 3 Healthcare Effectiveness Data and Information Set (HEDIS) variables, non-emergent use of emergency departments (EDs), and ambulatory care–sensitive (ACS) hospitalization rates. These variables are calculated from the Medicare claims files and are specified as follows:

HEDIS measures. These include a) mammography rates: mammography rates compared with clinical guidelines for breast cancer screening; b) cardiovascular disease/low-density lipoprotein (CVD/LDL) rates: LDL test rates for patients with CVD; and c) glycated hemoglobin (A1C) rates: glycated hemoglobin test rates for patients with diabetes.

Measures of inappropriate utilization. These include a) non-emergent ED rate: proportion of ED visits classified as non-emergent based on the Billings algorithm[18]; and b) ACS hospital rate: proportion of hospital admissions classified as resulting from inadequate ambulatory care using the algorithm available from the Agency for Healthcare Research and Quality.[19]

Practice organizational variables. The NP variable is entered into our analyses as the ratio of FTE NPs to FTE physicians and NPs in each practice. Thus, 1 NP and 2 physicians would produce a ratio of 1:3, or 0.33. Since other practice-level attributes have been shown to be associated with cost and quality variables in our previous research, we include 5 of those as control variables in this analysis.[20] Those variables, taken from the MGMA survey, are specified as follows: a) practice ownership: physician-owned, hospital-owned, other-owned (eg, community health centers, health insurance plans, local government agencies); b) net revenue: net revenue after operating costs as a percentage of total net revenue; c) rural versus urban location: rural if in a community of 5000 or fewer population; d) EHR:

Table 1. Descriptive Statistics

	Practices With No Nurse Practitioners (N = 23)		Practices With Some Nurse Practitioners (N = 62)	
Variable	**Mean**	**SD**	**Mean**	**SD**
Dependent variables				
Cost measures				
Risk-adjusted cost	–416.27	1676.82	158.81	1329.35
Net revenue	0.359	0.151	0.372	0.123
Quality measures				
ACS admissions per enrollee	0.117	0.047	0.138	0.116
Non-emergent ED admissions per enrollee	0.047	0.012	0.054	0.019
A1C rate	0.711	0.266	0.677	0.282
CVD/LDL rate	0.723	0.100	0.651	0.094
Mammography rate	0.234	0.127	0.240	0.134
Explanatory variables (practice characteristics)				
NPP proportion	–	–	0.211	0.130
Physician-owned	0.304	0.470	0.452	0.502
Other-owned	0.043	0.209	0.081	0.275
Hospital-owned	0.652	0.487	0.468	0.503
Have EHR	0.435	0.507	0.468	0.503
Years with EHR	2.70	4.80	2.13	3.37
Rural (communities with 5000 or less population)	0.217	0.422	0.323	0.471

A1C indicates glycated hemoglobin; ACS, ambulatory care–sensitive hospitalizations; CVD, cardiovascular disease; ED, emergency department; EHR, electronic health record; LDL, low-density lipoprotein; NPP, nurse practitioners per physician.

practice has an EHR; and e) years with EHR: number of years since implementing EHR.

We compiled data on the number of FTE physicians in the practice, but dropped these data from the analyses at the suggestion of a reviewer who pointed out that it could be a mediator between the NP variables and the outcome variables. Dropping them had little effect on the NP coefficients. We also compiled data on the number of patients attributed to each practice. That variable was not significant in any analyses at the 0.05 level, and its inclusion had only a minor effect in 1 regression, as discussed in the Results section.

Analysis

All of these analyses used ordinary least squares regression equations to estimate the association of the explanatory variables, including the NP/physician staffing ratios with patient-level cost and quality and practice-level economic efficiency. As in most organizational-level studies, organizational characteristics are not assigned randomly to organizations, but are "endogenously" chosen by the organization. Thus, we cannot say that a practice that hires an additional NP will experience the effect on the dependent variables that we estimate from our data. However, we can say that practices that have found a way to accommodate a higher ratio of NPs to physicians exhibit the differences (or lack of differences) in the dependent variables that we find in our analyses.

RESULTS

Descriptive statistics for the variables in the analysis are shown in Table 1. The descriptive statistics are shown separately for practices employing no NPs versus some NPs. Only 2 of the differences are statistically significant at the 0.05 level. Practices employing NPs have higher rates of non-emergent ED visits and lower rates of CVD/LDL testing than practices not employing NPs.

Multivariate regression results begin in Table 2. The coefficient of no nurse practitioners per physician (NPPs) shows that on average, Medicare costs are $445 higher per patient for practices that do not employ NPs than practices that employ some NPs, but the difference is not statistically significant. The coefficient of the NP staffing level in the risk-adjusted cost equation is 9374.440 and the coefficient of the squared term is –14,939.620. Both are

Table 2. The Association of NPs and Practice Costs and Net Revenue (N = 85)

	Risk-Adjusted Medicare Expenditures Adjusted r^2 = 0.032				Net Revenue Adjusted r^2 = 0.159			
Variable			95% CI				95% CI	
	Coeff	***P***	**Lower**	**Upper**	**Coeff**	***P***	**Lower**	**Upper**
No NPPs	445.098	.482	–808.790	1698.986	–0.047	.376	–0.153	0.058
NPP proportion	9374.440	.040	420.857	18,328.020	–0.053	.888	–0.807	0.700
NPP proportion squared	–14,939.620	.058	–30,372.250	493.010	–0.382	.560	–1.681	0.918
Physician-owned[a]	–242.864	.484	–930.452	444.723	–0.002	.938	–0.060	0.056
Other-owned[a]	–747.982	.277	–2109.378	613.415	–0.051	.378	–0.166	0.064
Have EHR	–209.060	.627	–1062.103	643.984	0.020	.574	–0.051	0.092
Years with EHR	24.227	.664	–86.340	134.793	0.011	.018	0.002	0.021
Rural	368.783	.314	–356.290	1093.856	0.084	.007	0.023	0.145
Constant	–809.694	.147	–1909.782	290.394	0.351	.000	0.259	0.444

Coeff indicates coefficient; EHR, electronic health record; NP, nurse practitioner; NPP, nurse practitioners per physician.
[a]Hospital-owned practices are the excluded reference variables.

statistically significant at close to the 0.05 level. (Including the number of patients attributed to the physician's practice in that regression improves the precision of those estimates, resulting in a level of significance of 0.046 on the square of the ratio, even though the coefficient of the number of patients is itself not statistically significant.) Those results imply that among practices with some NPs, risk-adjusted PBPY costs are higher up to 0.32 and decline thereafter as the ratio increases. A ratio of 0.32 corresponds roughly to 1 NP for every 2 physicians: 1 NP divided by 1 NP + 2 physicians. In contrast, the mean ratio across the entire sample (including practices that employ no NPs) is 0.154, or about 1 NP per 6.5 physicians. However, among practices employing some NPs, the ratio is 0.211, or about 1 NP per 4.7 physicians. Both ratios are below the cost-maximizing ratio.

Our risk-adjusted cost variable represents a cost to the Medicare program, but it is revenue to the practice, and thus one might expect the NP staffing ratio to exhibit the same nonlinear relationship to the practice's net revenue, but that is not the case. It is important to remember that the net revenue variable is based on all the practice's patients, whereas the risk-adjusted PBPY cost variable is computed only for the practice's Medicare patients.

The number of years the practice has had an EHR is positively associated with net revenue, as is rural location. More experience with EHRs might improve net revenue by improving patient scheduling and other patient flow processes or by capturing more billable services. Rural practices might benefit from lower overhead costs and support staff ratios.

The NP staffing ratio does not appear to be related to non-emergent ED use ratios, but higher ratios are associated with higher ACS admissions (Table 3). The square of the NP staffing ratio is negative in both equations in Table 3, but not statistically significant. Increased ACS admissions may be one of the ways that use of NPs is associated with higher costs up to the ratio of 0.32. However, the extremely poor overall fit of the ACS regression results in a negative r^2 after making the adjustment for the number of explanatory variables. Consequently, it is difficult to interpret these results. Having an EHR is statistically related to lower non-emergent ED rates, but the years of EHR experience is associated with increased non-emergent ED rates.

The relationships of NP staffing ratios and the HEDIS quality measures are similar to the avoidable utilization findings (Table 4). NP staffing ratios are not statistically related to performance on any of these measures.

Physician-owned practices have higher A1C testing rates, as do practices with an EHR. Practices in the other ownership category (owned by a community health center, the government, or a health plan) have higher A1C and mammography rates. Rural practices have lower CVD/LDL rates but do not differ on the other measures.

DISCUSSION

Our data indicate that Medicare costs for primary care medical group practices are associated with the ratio of NPs to NPs plus physicians, but this relationship is nonlinear. The cost-maximizing ratio is 0.32, or about 1 NP for every 2 physicians. Current ratios for all practices and

Table 3. The Association of NPs and Avoidable Utilization (N = 85)

	Non-Emergent ED Visits Adjusted r^2 = 0.094				ACS Admissions Adjusted r^2 = –0.002			
Variable			95% CI				95% CI	
	Coeff	***P***	**Lower**	**Upper**	**Coeff**	***P***	**Lower**	**Upper**
No NPPs	0.001	.924	–0.014	0.016	0.052	.257	–0.039	0.142
NPP proportion	0.075	.161	–0.031	0.181	0.621	.059	–0.025	1.267
NPP proportion squared	–0.113	.222	–0.295	0.070	–0.891	.115	–2.005	0.222
Physician-owned[a]	–0.001	.747	–0.009	0.007	–0.022	.379	–0.072	0.028
Other-owned[a]	–0.003	.703	–0.019	0.013	–0.022	.662	–0.120	0.077
Have EHR	–0.010	.053	–0.020	0.000	–0.037	.240	–0.098	0.025
Years with EHR	0.002	.021	0.000	0.003	0.001	.854	–0.007	0.009
Rural	0.009	.041	0.000	0.018	0.015	.567	–0.037	0.067
Constant	0.045	.000	0.032	0.058	0.084	.039	0.004	0.163

ACS indicates ambulatory care–sensitive; coeff, coefficient; ED, emergency department; EHR, electronic health record; NP, nurse practitioner; NPP, nurse practitioners per physician.
[a]Hospital-owned practices are the excluded reference variables.

those employing some NPs lie below that level. Ratios higher than 0.32 are associated with lower patient costs, but practically not at all with quality.

The theoretical model proposed by Liu and D'Aunno (2012)[21] suggests that these performance differences may result from differences in the clinical roles of NPs at various staffing levels. NPs perform a variety of clinical roles ranging from replacing a physician to assisting the physician. Unfortunately, little is known about the configuration of these clinical roles or how they influence costs and quality of care. This is an important area for future research if the full potential of these nonphysician clinicians is to be achieved.

If higher NP staffing levels are related to the development of team-based patient care, this could account for an association with decreased patient-level costs, although it does not appear that quality of care is improved, nor does it result in improved net revenue in the practices. The NP staffing ratio is unrelated to practice net revenue despite the (nonlinear) relationship of NPs to Medicare costs and the obvious reduction in patient-care costs to the practice if NPs are substituted for physician labor. As noted by Grumbach and Bodenheimer (2004)[22] and Nutting et al (2012),[23] staffing is only 1 part of team care. Much of the effectiveness is related to organizational and cultural factors.

Certainly, more research is needed to document the factors influencing these performance measures and how the practice determines the clinical roles of the NPs once they are employed, as well as how practices bill for the time of NPs, and how the roles of NPs and physician supervision of NPs differ among practices.

CONCLUSIONS

Because practices are choosing their NP staffing levels in addition to many other practice characteristics, it is likely to prove difficult to estimate the true causal effect of NPs or other endogenous practice characteristics on healthcare costs. We cannot say that medical practices will experience the outcomes indicated by our estimated coefficients if they alter the number of NPs they employ. Perhaps there are unobserved variables that influence decisions to hire NPs and also influence patient-level cost and quality. For example, it is possible that practices with more costly patients, even after standard risk adjustment, hire more NPs. More research is needed to explore potential confounders and the causal pathways that link the use of NPs to cost and quality of care.

Our inability to give a causal interpretation to our coefficients makes them less useful for practices or policy makers who are attempting to change practice outcomes by changing the level of NP staffing. However, our findings alert medical group practice administrators and physicians to the need to pay more attention to the roles of nurse practitioners when adding them to their clinical teams.

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Table 4. The Association of NPs and Screening (N = 85)

	A1C Adjusted r^2 = 0.073				CVD/LDL Adjusted r^2 = 0.138				Mammography[a] Adjusted r^2 = 0.033			
Variable			95% CI				95% CI				95% CI	
	Coeff	*P*	Lower	Upper	Coeff	*P*	Lower	Upper	Coeff	*P*	Lower	Upper
No NPPs	0.002	.988	–0.233	0.237	0.046	.264	–0.036	0.128	0.027	.638	–0.087	0.141
NPP proportion	–0.583	.491	–2.259	1.093	–0.201	.496	–0.787	0.384	0.308	.452	–0.504	1.121
NPP proportion squared	0.812	.577	–2.078	3.702	0.383	.452	–0.627	1.393	–0.616	.384	–2.017	0.785
Physician-owned[b]	0.139	.035	0.010	0.268	0.001	.971	–0.044	0.046	0.028	.375	–0.035	0.091
Other-owned[b]	0.224	.084	–0.031	0.479	0.000	.995	–0.089	0.089	0.162	.011	0.038	0.286
Have EHR	0.178	.030	0.018	0.337	0.021	.452	–0.035	0.077	–0.019	.633	–0.097	0.059
Years with EHR	–0.016	.130	–0.037	0.005	0.000	.992	–0.007	0.007	0.007	.173	–0.003	0.017
Rural	–0.027	.698	–0.162	0.109	–0.066	.007	–0.114	–0.019	0.001	.982	–0.065	0.067
Constant	0.628	.000	0.422	0.834	0.681	.000	0.609	0.753	0.181	.001	0.081	0.281

A1C indicates glycated hemoglobin; coeff, coefficient; CVD, cardiovascular disease; EHR, electronic health record; LDL, low-density lipoprotein cholesterol; NP, nurse practitioner; NPP, nurse practitioners per physician.
[a]N = 84 for the mammography regression due to 1 missing value.
[b]Hospital-owned practices are the excluded reference variables.

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REFERENCES

1. Shortage designation: health professional shortage areas & medically underserved areas/populations. HHS website. http://www.hrsa.gov/shortage/. Accessed March 7, 2013.
2. Hofer AN, Abraham JM, Moscovice I. Expansion of coverage under the Patient Protection and Affordable Care Act and primary care utilization. *Milbank Q.* 2011;89(1):69-89.
3. Huang ES, Finegold K. Seven million Americans live in areas where demand for primary care may exceed supply by more than 10 percent. *Health Aff (Millwood).* 2013;32(3):614-621.
4. Reinhardt U. A production function for physician services. *Review of Economics and Statistics.* 1972;54(1):55-66.
5. Cooper RA. New directions for nurse practitioners and physician assistants in the era of physician shortages. *Acad Med.* 2007;82(9):827-828.
6. Hooker RS, McCaig LF. Use of physician assistants and nurse practitioners in primary care, 1995-1999. *Health Aff (Millwood).* 2001;20(4):231-238.
7. Brown SA, Grimes DE. A meta-analysis of nurse practitioners and nurse midwives in primary care. *Nurs Res.* 1995;44(6):332-339.
8. Horrocks S, Anderson E, Salisbury C. Systematic review of whether nurse practitioners working in primary care can provide equivalent care to doctors. *BMJ.* 2002;324(7341):819-823.
9. Newhouse RP, Stanik-Hutt J, White KM, et al. Advanced practice nurse outcomes 1990-2008: a systematic review. *Nurs Econ.* 2011;29(5):230-250; quiz 251. Review.
10. Grumbach K, Hart LG, Mertz E, Coffman J, Palazzo L. Who is caring for the underserved? a comparison of primary care physicians and nonphysician clinicians in California and Washington. *Ann Fam Med.* 2003;1(2):97-104.
11. Stange K. How does provider supply and regulation influence health care markets? evidence from nurse practitioners and physician assistants. *J Health Econ.* 2014;33:1-27.
12. Auerbach DI. Will the NP workforce grow in the future? new forecasts and implications for healthcare delivery. *Med Care.* 2012;50(7):606-610.
13. 2013 Nurse practitioner state practice environment. American Association of Nurse Practitioners website. http://www.aanp.org/images/documents/state-leg-reg/stateregulatorymap.pdf. Published 2013. Accessed March 11, 2013.
14. Naylor MD, Kurtzman ET. The role of nurse practitioners in reinventing primary care. *Health Aff (Millwood).* 2010;29(5):893-899.
15. Mundinger MO, Kane RL, Lenz ER, et al. Primary care outcomes in patients treated by nurse practitioners or physicians: a randomized trial. *JAMA.* 2000;283(1):59-68.
16. Laurant M, Reeves D, Hermens R, Braspenning J, Grol R, Sibbald B. Substitution of doctors by nurses in primary care. *Cochrane Database Syst Rev.* 2005;(2):CD001271.
17. Roblin DW, Howard DH, Becker ER, Adams EK, Roberts MH. Use of midlevel practitioners to achieve labor cost savings in the primary care practice of an MCO. *Health Serv Res.* 2004;39(3):607-626.
18. Tools for monitoring the health care safety net [AHRQ publication No. 03-0027]. Agency for Healthcare Research and Quality website. http://archive.ahrq.gov/data/safetynet/tools.htm. Updated September 2003. Accessed March 2014.
19. Billings J. "Ambulatory care sensitive" conditions. NYU Wagner website. http://wagner.nyu.edu/faculty/billings/acs-algorithm.php. Accessed March 2014.
20. Kralewski JE, Wallace W, Wingert TD, Knutson DJ, Johnson CE. The effects of medical group practice organizational factors on physicians' use of resources. *J Healthc Manag.* 1999;44(3):167-182; Discussion 182-183.
21. Liu N, D'Aunno T. The productivity and cost-efficiency of models for involving nurse practitioners in primary care: a perspective from queuing analysis. *Health Serv Res.* 2012;47(2):594-613.
22. Grumbach K, Bodenheimer T. Can health care teams improve primary care practice? *JAMA.* 2004;291(10):1246-1251.
23. Nutting PA, Crabtree BF, McDaniel RR. Small primary care practices face four hurdles—including a physician-centric mind-set—in becoming medical homes. *Health Aff (Millwood).* 2012;31(11):2417-2422. ■

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