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Division of primary care services between physicians, physician assistants, and nurse practitioners to older patients with diabetes

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Abstract

Team-based care involving physician assistants and/or nurse practitioners (PA/NPs) in the patient-centered medical home is one approach to improving care quality. However, little is known about how to incorporate PA/NPs into primary care teams. Using data from a large physician group, we describe the division of patients and services (e.g., acute, chronic, preventive, other) between primary care providers for older diabetes patients on panels with varying levels of PA/NP involvement (i.e., no role, supplemental provider, or usual provider of care). Panels with PA/NP usual providers had higher proportions of patients with Medicaid, disability, and depression. Patients with physician usual providers had similar probabilities of visits with supplemental PA/NPs and physicians for all service types. However, patients with PA/NP usual providers had higher probabilities of visits with a supplemental physician. Understanding how patients and

services are divided between PA/NPs and physicians will assist in defining provider roles on primary care teams.

Keywords

primary care; physician assistant; nurse practitioner; diabetes

INTRODUCTION

The primary care system in the United States is not designed to meet the needs of patients with chronic illnesses such as diabetes (Wagner, Austin, & Michael Von, 1996; Rothman & Wagner, 2003; Sevin et al., 2009). Approximately 80% of visits for chronic illness are delivered in primary care (Grumbach & Bodenheimer, 2002), but American adults with chronic illness receive only 56% of the guideline-recommended care processes for their diagnosed conditions (McGlynn et al., 2003). American adults with diabetes receive approximately 45% of the 13 care processes considered to be indicators of quality care. (McGlynn et al., 2003) The impact of suboptimal diabetes care is significant, given its high prevalence, cost, scope of treatment, and recognition as a tracer condition for health system quality. (Nolte, Bain, & McKee, 2006) Therefore, redesigning primary care to be effective for patients with chronic illnesses such as diabetes has become a national priority. A redesign model supported by physician organizations is the team-based approach to care delivery in the patient-centered medical home (PCMH) (Association of American Medical Colleges, 2008). A frequently discussed variant of the PCMH incorporates physician assistants and/or nurse practitioners (PA/NPs) on the team (Committee on the Future of Primary Care, 1996; Margolius & Bodenheimer, 2010).

To be effective, a team requires an approach to dividing patient care responsibilities that results in clearly defined roles for each team member (Bosch et al., 2009). Historically, the role of PA/NPs has been classified into two categories reflecting level of PA/NP involvement and division of responsibilities between the PA/NP and the collaborating physician: usual provider of care and supplement (Sibbald, Laurant, & Scott, 2006; Starfield, 1998; Hooker & Everett, 2012). However, additional approaches to the division of responsibilities can occur within these broad role categories. Evidence suggests that the uninsured, women and younger patients are more likely to have visits with PA/NPs (Hing, Hooker, & Yates, 2010; Everett, Schumacher, Wright, & Smith, 2009; Aparasu & Hegge, 2001), physicians serve patients with more complex problems (Hooker & McCaig, 2001; Morgan, Shah, Kaufman, & Albanese, 2008), and PAs provide a higher percentage of visits for acute conditions than physicians (48% vs. 34%) (Hing et al., 2010). These studies describe professional practice trends, but they do not address the division of patients and services between PA/NPs and physicians that deliver primary care to a common population, or panel, of patients with chronic illness.

New Contribution

The objective of this study is to describe the division of patients and services between primary care providers on a team that delivers care to panels of patients. Understanding the current approach to the division of patients and services between practitioners will assist in identifying key components of primary care provider role definitions. This is a first step in defining, identifying and implementing PA/NP roles within the primary care team that improve care quality for patients with chronic disease.

METHODS

Study Setting

The providers and patients in the study are associated with a large multi-specialty academic physician group in the US, providing approximately 1.7 million ambulatory patient visits per year in specialty and primary care clinics. The results are based on visits delivered by 210 attending physicians, 24 PAs, 28 NPs, and 51 resident physicians in 32 internal medicine, family practice, and geriatric primary care clinics. We analyzed outpatient visit patterns for Medicare beneficiaries with diabetes assigned to one of the primary care clinics. The Minimal Risk Institutional Review Board approved this study with a waiver of HIPAA authorization.

Sample and Data Sources

The sample included adult Medicare patients with diabetes identified as being managed by the provider group in 2008 based on the plurality provider algorithm (Pham et al., 2007). Patients were required to have data available for 2007–2008 for identification of baseline comorbidities. A validated algorithm identified patients with diabetes in 2007 (Hebert et al., 1999). Electronic health record (EHR) data were linked to the Medicare claims/enrollment data to obtain laboratory values, the provider performing the primary care visit, and the patient's home clinic.

Each panel is defined by the usual provider and the patients for whom that provider delivered the majority of primary care visits. Patients were first assigned to the primary care clinic that provided the majority of their face-to-face visits, then to the provider (physician or PA/NP) that delivered the majority of visits within that clinic. In the event of a tie, patients were assigned to the clinic/provider with the most recent visit. Patient panels grouped patients assigned to the same usual provider of care within a clinic.

Measurements

Visit Level Measures—Indicators were created for the services provided within visits and the provider that performed the visits. Service variables were created by categorizing patient visits according to ICD-9 codes (Fenton et al., 2006), including acute chronic, mental health, and other care (dermatologic, symptoms and ill-defined diseases, prevention and pregnancy, and vision and hearing). If a visit had ICD-9 codes in multiple categories, the visit was assigned to all possible categories. Visits were identified as being performed by the usual provider of care, a physician other than the usual provider (i.e., supplemental physician), or PA/NP other than the usual provider (i.e., supplemental PA/NP).

Patient Level Measures—Patient variables include sociodemographic and clinical variables. Sociodemographic variables included age, race/ethnicity, gender, Medicaid, and Medicare entitlement due to disability. The John's Hopkins Adjusted Clinical Groups® (ACG) System Version 10 (most recent version available is 10) was utilized as an overall measure of morbidity burden in 2007 (Starfield & Mumford, 1991). Additional conditions of interest included diabetes complications (Newton et al., 1999), hypertension, obesity, and depression (Elixhauser, Steiner, Harris, & Coffey, 1998), dementia (Taylor, Fillenbaum, & Ezell, 2002), congestive heart failure (CHF) (Rector et al., 2004), stroke or transient ischemic attacks (TIA) (Buccaneer Computer Systems & Service, 2010), chronic kidney disease (CKD) (Foley et al., 2005) and an end-stage renal disease (ESRD) indicator from the Medicare data.

Panel Level Measures—Panel-level (i.e., provider-level) measures were constructed by aggregating the visit and patient-level measures. Panel characteristics included measures of

size, patient population served, and PA/NP involvement. Measures of size included the number of patients on the panel and the number of primary care providers that performed at least one visit for a patient on the panel in the clinic. Measures of patient population served included average panel ACG score, average age, and percent female. A three category PA/NP involvement variable was created: physician only (i.e., PA/NPs provided no care to patients on the panel), PA/NPs and physicians as supplemental providers (at least one patient on the panel received one visit from the provider), and PA/NPs as usual providers of care.

Analysis

Descriptive analyses of visit-, patient- and panel-level measures were conducted using percentages, means and medians, standard deviations, and 25th and 75th quartiles. Bivariate analyses evaluated the relationship between PA/NP participation on the panel and patient characteristics. To understand distribution of care from the patient perspective, distribution of service delivery between providers was evaluated by calculating the predicted probability of patients receiving different types of visits when on panels with varying PA/NP involvement. The relationship between PA/NP involvement and visits providing each combination of visit type (acute, chronic, mental health and other) and provider type (usual provider, supplemental physician, and supplemental PA/NP) was evaluated using logistic regression with robust estimates of the variance. Predicted probabilities of patients experiencing visits were estimated by PA/NP involvement on the panel. Adjusted predicted probabilities were calculated from models that included patient characteristic variables based on statistical significance in bivariate analyses (p -value ≤ 0.05) and panel size. This approach predicts the outcome (≥ 1 visit) assuming that everyone in the data set was treated as if all covariates in the model were at the mean of the covariates. Confidence intervals were calculated using the linearization method, allowing for correlation among observations.

RESULTS

Patient and Panel Characteristics

Patients in the sample ($N=2603$) had mean age of 72 and were predominantly Caucasian women with an average of 5 chronic conditions (Table 1). An average of 4.9 providers ($SD=3.4$) cared for an average of 9.9 patients ($SD = 13$) on a panel ($N=263$). PA/NPs performed no role for 1019 patients in 45% of panels, a supplemental role for 1454 patients in 42% of panels, and were the usual provider for 130 patients in 13% of panels.

The Division of Primary Care Service Delivery

Demographic characteristics including race, Medicaid buy-in, and entitlement due to disability differed by PA/NP involvement (Table 1). Panels with PA/NPs as usual providers had the lowest proportions of Caucasian patients ($p=0.02$) and highest proportions of patients with Medicaid buy-in ($p=0.05$) and entitlement due to disability ($p=0.01$). The mean ACG for the panel types was similar, but the count and type of comorbid conditions at baseline differed by panel type ($p<0.01$). Panels of patients with PA/NPs as usual providers had higher proportions of patients with depression ($p=0.01$), dementia ($p=0.01$), obesity ($p=0.05$), and ulcers ($p=0.03$). The average numbers of visits per patient on panels with no PA/NP, supplemental PA/NPs, and PA/NPs as usual provider was 4.0, 4.4, and 5.2. (Table 2) The average number of visits with the usual provider was 3.3–3.6 visits. The average number of visits with supplemental providers ranged from 0–1.4, with patients on panels with PA/NPs as usual providers experiencing the highest mean number of visits with supplemental providers. (Table 2)

Different patterns of care delivery by usual providers were observed by usual provider type (Table 3). The probability of patients experiencing a visit with their usual provider for chronic care was higher when physicians performed as usual providers (no PA/NP role=95% and supplemental PA/NPs = 97%) than when PA/NPs performed as usual providers (88 %,) ($p=0.01$). An inverse relationship was seen with probability of acute visits, with patients on panels with PA/NPs as usual providers having higher probabilities ((66%) than patients on panels with no PA/NP role (54%) and PA/NPs as supplemental providers (55%) ($p=0.01$).

Different patterns of care delivery by supplemental providers were observed by PA/NP panel involvement. (Table 3) Patients on panels with PA/NPs as usual providers experienced probabilities of visits with supplemental physicians that were higher than those of patients on panels with physicians as usual providers (Table 3). In contrast, similar patterns in predicted probabilities for visits with usual and supplemental providers were observed with and without adjustment for patient characteristics and panel size.

DISCUSSION

This study describes the division of patient care responsibilities between primary care providers serving common panels of patients with diabetes according to PA/NP involvement. We found that panels of patients with PA/NPs as usual providers had higher proportions of diabetic patients with indicators of social complexity including Medicaid, entitlement due to disability, dementia, and depression. Primary care services were routinely delivered by multiple providers to a common panel of patients and all provider types provided the full range of primary care services. However, the division of primary care services between usual and supplemental providers differed by PA/NP involvement on the panel.

Panels with PA/NPs as usual providers appear to have a higher proportion of socially complex patients, when defined according to poverty (Medicaid), disability, and co-morbid dementia and depression.(Table 1) This finding is consistent with previous research that suggests PA/NPs are more likely to provide care to underserved populations (Grumbach et al., 2003; Everett et al., 2009). The higher proportion of patients with depression and dementia on panels with PA/NPs as usual provider suggests that PA/NPs have the potential to perform novel roles in mental health and care coordination services in primary care settings. In contrast, the clinical complexity of patient panels appears similar regardless of usual provider type, supporting similar findings in other studies (Everett et al., 2009). Possible explanations for these findings include financial incentives to the organization or patient preferences, but additional study is needed to understand mechanisms.

Primary care services for a panel of patients were delivered by multiple providers and all provider types provided the full range of services. The involvement of multiple primary care providers on a panel suggests that there is significant sharing of patient care duties within primary care practices, highlighting the potential benefit of teamwork between providers in primary care. Additionally, when PA/NPs and physicians provided care on panels, patients experienced a non-zero probability of receiving a visit of each care type from physicians and PA/NPs. This supports previous findings that physicians and PA/NPs possess similar capacities for the delivery of comprehensive care (Hing et al., 2010).

However, the approach to division of service delivery between providers differs by usual provider type. Patients on panels with physicians as usual providers of care demonstrate similar patterns of division of service delivery between usual and supplemental providers In contrast, the division of service delivery between providers is different on panels with PA/ NPs as usual providers. The probability of patients having a visit with a supplemental

physician (5–48%) is significantly higher on panels with PA/NPs as usual providers, in comparison to patients on panels with physicians as usual providers (Table 3). This approach to division of service delivery may have several explanations. PA/NPs may not have the clinical expertise to meet all the medical needs of older, complex patients with diabetes and refer the patient to physicians more frequently. Alternatively, it could be a deliberate approach to ensure participation of both providers in the PA/NP-physician dyad and adequate access to care for socially complex patients. While such a team-based approach may reduce interpersonal continuity with a single provider, a deliberate and coordinated approach could improve the capacity of a few providers to influence the quality of care (Pham et al., 2007).

The variation in service delivery of supplemental providers may be explained by variations in workload sharing agreements. Physician-to-physician agreements for cross-coverage of patients served by a clinic reflect an understanding of limited involvement with patients on the panels of other physicians (Starfield, 1998). However, state regulatory policies where the study was conducted require PA/NPs to work in collaboration with, or under the supervision of, physicians (Wisconsin Department of Regulation and Licensing, 2011). This mandated interdependence provides a potential explanation for the increased teamwork between PA/NPs acting as usual providers and supplemental physicians. Adjustment for patient characteristics and panel size lowered the probability of acute visits and visits to supplemental providers for patients with PA/NPs as usual providers, suggesting that need for acute services should be addressed when implementing primary care teams for patient populations with comorbid social complexities. Additional study regarding the impact of supplemental providers on specialist and urgent care utilization is also warranted.

There are several limitations to this study. First, the sample is limited to a single academic physician group in a state where PA/NPs are required to collaboratively practice with physicians. Therefore, our findings may not be generalizable to other types of organizations or where NPs practice independently. However, collaborative practice is required in all states for PAs and 35 states for NPs (Kaiser Family Foundation, 2012) and the study includes a relatively large number of clinics and providers in a state with a broad scope of practice for PA/NPs, making it an ideal environment for studying variation in team-based practice patterns. Second, the analysis is based on claims data. Utilization of administrative data for the definition of the PA/NP involvement on the panel is based on how a patient utilized services, not pre-defined involvement implemented by the system. This approach does not allow us to understand if providers and patients recognize PA/NP involvement on the team. However, defining naturally occurring PA/NP involvement will allow us to identify existing team structures. Third, the data include only the care documented in billing and may not include all care provided (Tang et al., 2007), potentially resulting in non-differential error, as no evidence indicates this effect would be different by level of PA/NP involvement. Finally, the study is limited to older patients with diabetes receiving primary care. This is a subset of patients that are treated in primary care and it is unclear if these results can be generalized to all primary care patients with chronic illnesses.

In this study, differences are observed in the division of patients and services between primary care providers serving a given panel of patients according to level of PA/NP involvement. This information can be utilized for implementing provider roles within a primary care team setting or as a springboard for evaluating the relationship between practice/team structure and healthcare outcomes. Identifying and implementing PA/NP roles that result in effective delivery of primary care to patients with diabetes has the potential to benefit patients, providers, and the healthcare system.

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Table 1

Complexity of Patients with Diabetes on Primary Care Panels in 2008 (N=2603 Patients)

	Total Sample Mean (SD) or %	Patients on Panels with No PA/NPs (N=1019) Mean (SD) or %	Patients on Panels with PA/NPs as Supplemental Provider (N=1454) Mean (SD) or %	Patients on Panels with PA/NPs as Usual Providers (N=130) Mean (SD) or %	p-value
Sociodemographics					
Age (SD)	72 (11)	72 (11)	72 (11)	71 (14)	0.34
Race * - Caucasian	91%	91%	92%	87%	0.02
Black	5%	6%	4%	8%	
Other race/ethnicity	4%	3%	4%	5%	
Female	55%	53%	55%	61%	0.25
Medicaid buy-in *	16%	15%	16%	24%	0.04
Entitlement due to disability *	19%	18%	19%	30%	0.01
Comorbid Conditions at Baseline					
ACG, mean (SD)	1.5 (1.0)	1.4 (1.0)	1.5 (1.1)	1.5 (0.9)	0.23
ACG Count of Conditions * (SD)	5.0 (3.2)	4.8 (3.1)	5.4 (3.2)	5.3 (3.3)	<0.01
Cardiovascular disease - none	47%	49%	47%	41%	0.32
Ischemic heart disease	23%	22%	24%	29%	
Congestive heart failure	29%	29%	30%	30%	
Chronic kidney disease/ESRD	23%	21%	24%	25%	0.19
Dementia *	9%	7%	10%	14%	0.01
Stroke/TIA	8%	8%	9%	8%	0.83
Obesity *	22%	20%	22%	29%	0.05
Drug abuse	2%	2%	2%	5%	0.05
Depression *	22%	20%	23%	31%	0.01
Hypertension	83%	81%	83%	84%	0.30
Diabetes Complications					
Ulcers *	12%	12%	11%	19%	0.03
Amputation	2%	1%	2%	2%	0.25
Eye disease	22%	21%	22%	22%	0.95
Peripheral vascular disease	37%	36%	37%	38%	0.70

PA/NP = physician assistant/nurse practitioner

SD = standard deviation

* p 0.05

Table 2

Description of visits by provider type on panels by PA/NP involvement (N=2,603)

	Doctor as Usual Provider No PA/NP				Doctor as Usual Provider Supplemental PA/NP				PA/NP as Usual Provider			
	Mean #	SD	Min	Max	Mean #	SD	Min	Max	Mean #	SD	Min	Max
Visits with Usual Provider	4	3	1	52	4	2	1	17	3	3	1	24
Visits with Supplemental Doctors	0	1	0	7	0	1	0	10	1	1	0	7
Visits with Supplemental PA/NPs	0	0	0	0	0	1	0	7	0	1	0	3
Total Visits	4	3	1	52	4	3	1	25	5	5	1	43

[§]Reference Group = Doctor as Usual Provider no PA/NP

[¥]Reference Group = Supplemental PA/NP

Adjusted for patient age, race, acg score, medicare, disability entitlement, dementia, obesity, peripheral ulcers, panel size

Other Visit = prevention, pregnancy, ill-defined symptoms, vision and hearing

PA/NP = physician assistant/nurse practitioner

SD= Standard deviation

Table 3
Predicted probabilities of patients experiencing visits with providers on panels by PA/NP involvement (N=2,603)

	Physician as Usual Provider No PA/NP		Physician as Usual Provider Supplemental PA/NP		PA/NP as Usual Provider	
	Predicted Probability		Predicted Probability	p value	Predicted Probability	p value
Visits with Usual Provider[§]						
1 Acute Visits *	54%		55%	0.86	66%	0.01
1 Chronic Visits *	95%		97%	0.02	88%	0.01
1 Mental Health Visits	15%		19%	0.05	15%	0.91
1 Other Visits *	74%		78%	0.02	77%	0.06
Visits with Supplemental Doctors[§]						
1 Acute Visits *	11%		14	0.06	22%	<0.01
1 Chronic Visits *	13%		14	0.74	47%	<0.01
1 Mental Health Visits *	1%		2%	0.42	5%	0.01
1 Other Visits *	11%		12%	0.47	32%	<0.01
Visits with Supplemental PA/NPs[‡]						
1 Acute Visits *			12%		5%	<0.01
1 Chronic Visits *			12%		6%	<0.01
1 Mental Health Visits			1%		0%	0.05
1 Other Visits *			12%		5%	<0.01

* p < 0.05

[§] Reference Group = no PA/NP

[‡] Reference Group = Supplemental PA/NP

Adjusted for patient age, race, acg score, medicaid buy-in, disability entitlement, dementia, obesity, peripheral ulcers, panel size

Other Visit = prevention, pregnancy, ill-defined symptoms, vision and hearing

PA/NP = physician assistant/nurse practitioner