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Ambulatory and Chronic Disease Care by Physician Assistants and Nurse Practitioners

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Abstract: As the US population increases and ages, more patients require care. A reengineered health care system relies on physician assistants and nurse practitioners; however, the extent to which they care for medical conditions is marginally known. We analyzed ambulatory visits by provider type and diagnosis focusing on chronic diseases to identify differences in patients seen by each type of provider. Both physician assistants and nurse practitioners attended 14% of 777 million weighted visits. Overall, diabetes and hypertension accounted for 2% to 4% of visits. The distribution of visits for chronic disease diagnoses appears to be similar for all 3 providers (physicians, nurse practitioners, and physician assistants). These findings may improve organizational efficiency in ambulatory systems. **Key words:** *ambulatory care, chronic disease, hospital clinics, nurse practitioners, physician assistants, rural health*

CHRONIC DISEASES are common in the United States. One half of all US adults report at least 1 condition that is long lasting or recurrent (Centers for Disease Control and Prevention [CDC], 2012). The most prevalent conditions are diabetes, hypertension, heart disease, obesity, depression, hyperlipidemia, arthritis, and cancer (Hing et al., 2008). The US population is growing and aging; at the same time, strategies to manage many chronic diseases are improving and

visits per capita are increasing. The health care system is therefore facing the challenge of complex disease management for greater numbers of patients, a burden that falls largely to ambulatory care (Bodenheimer et al., 2002; Epping-Jordan et al., 2004). Meeting this demand is further complicated by a predicted shortage of many specialists, including family medicine physicians, general surgeons, and internists (Cohn et al., 2009; Petterson et al., 2012; Sargen et al., 2011). A pediatrician and obstetrician shortage has not been predicted (Steinbrook, 2009).

Health care systems focusing on primary care, including chronic disease management, tend to result in healthier populations (Starfield et al., 2005). Such findings suggest that increasing the number of primary care versus specialty physicians in the United States would improve health outcomes (Parchman & Culler, 1994). Despite increasing medical student enrollment and efforts to attract physicians to family medicine and general internal medicine, numbers will not be substantial enough to meet the demand for a

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broad range of health care services (Pettersen et al., 2012; Sargen et al., 2011; Steinbrook, 2009). In response, American health care organizations have turned to new care delivery systems such as the patient-centered medical home. This model uses an ambulatory care-centered, multidisciplinary team approach to address the majority of a patient's medical and mental health needs. Physician assistants (PAs) and nurse practitioners (NPs) are playing a role in the patient-centered medical home model, which includes management of chronic conditions (Everett et al., 2013; Huang & Finegold, 2013; McLellan et al., 2012).

The value of NPs and PAs in ambulatory service delivery is of increasing public health interest for a number of reasons. Studies suggest that NPs may be more likely than physicians and PAs to improve outcomes of diabetic patients in some settings (Jackson et al., 2011; Ohman-Strickland et al., 2008). Other research suggests that PAs and NPs in team-based care can improve efficiency and patient outcomes (Bohm et al., 2010; Hooker & Everett, 2012; Roblin et al., 2011; Roy et al., 2008). To date, there appears to be no national study that has assessed PA or NP roles in chronic disease care or determined whether a division of labor exists between these 3 providers in chronic disease management.

At the confluence of increasing demand for access to care, a growing prevalence of chronic diseases, and expanded utilization of PAs and NPs, we wondered whether any new trends for care were emerging to address health care delivery in the outpatient setting, where 98% of health care is delivered (Phillips & Bazemore, 2010). We undertook a project to examine the national experience of PAs and NPs involved in ambulatory-based care including visits for chronic diseases. The research question centers on whether there is a division of labor between the 3 licensed providers (physicians, NPs, and PAs) in terms of the type of patients seen and particular diagnoses evaluated.

To undertake the study, we turned to the National Hospital Ambulatory Medical Care Survey (NHAMCS). The NHAMCS is a data set

of national samples of visits to outpatient departments (OPDs) of nonfederal and noninstitutional, general, and short-stay hospitals and hospital-based clinics in the United States; the methodology is well described on the Ambulatory Health Care Data page of the CDC Web site (CDC, 2010). Hospital-based ambulatory health care in the United States includes the following: family/general medicine, pediatrics, obstetrics and gynecology (Ob/Gyn), general surgery, and substance abuse. The annual visit rate increased from 29.7 outpatient visits (OPVs) per 100 persons in 2001 to 33.2 OPVs per 100 persons in 2010 (CDC, 2013; Schappert & Rechtsteiner, 2008). All clinics are staffed with varying ratios of doctors, PAs, NPs, and certified nurse midwives (CNMs). The NHAMCS groups NPs and CNMs since CNMs represent less than 2% of the total and both are considered advanced practice nurses. Because the clinic is the point of contact (vs a particular doctor's office) in the NHAMCS, both NPs and PAs are readily identified as the provider of record rather than visits being attributed to physicians for whom they work (Hing et al., 2008). The study time period selected was purposeful because of a noted increase in PA and NP utilization in OPVs over the previous decade (Hing & Uddin, 2010; McCaig et al., 1998). Growth of the NP and PA movements is also reflected in increasing national employment during this same period. Our work builds on a National Center for Health Statistics data brief describing PA and NP care in hospital OPDs from 2008 to 2009 (Hing & Uddin, 2010).

METHODS

All patient visits from 2001 to 2010 (10 years) in the NHAMCS were downloaded and examined to estimate the total share of visits by provider type and to identify any differences in the visits attended by NPs, PAs, and physicians; results were aggregated to identify small differences. The analysis involves weighted OPVs assigned to each type of provider and identified the following visit characteristics: patient age and sex, region of the country, metropolitan status, source

of payment, primary diagnosis (including whether one or more chronic diseases were evaluated), and major reason for visit by category (ie, new/acute problem, chronic/routine problem, flare-up of chronic problem, pre-/postsurgery, or preventive care). A list of 14 chronic diseases included in the NHAMCS survey and identified from the National Center for Health Statistics was used (Centers for Medicare & Medicaid Services, 2012; Hing et al., 2008). Only OPVs where the provider of record was a physician, PA, or NP was included; visits with no diagnosis recorded and OPVs attributed to nurses or other health care professionals were omitted.

The total number of OPVs for the 10-year period was analyzed using differences between the numbers of weighted visits recorded for each group of providers. Sample data were weighted to produce national estimates, and all statistical estimations were made using Stata (version 12.1). The Northern Arizona University institutional review board exempted this study from review because it uses anonymous data made available in the public domain. The research protocol was approved in November 2012.

RESULTS

All visits to OPDs from 2001 to 2010 produced an estimated 77 696 919 weighted visits recorded in nonfederal hospital outpatient clinics (Table 1). In the aggregate, both NPs and PAs accounted for 11.4 million visits. During this decade, the share of all visits for NPs and PAs ranged from 11% to 17%, with a notable increase in visits to NPs over the later 5 years.

Table 2 shows the distribution of visits by patient age bands and sex. Overall, 61% of visits were with female patients and the mean age was 45 years. Patients aged 25 to 64 years accounted for half of the OPVs (51%). Physicians managed a proportionally larger percentage of visits for patients younger than 1 year and patients 45 years and older. In other words, the percentages of physician visits for patients in these age groups were higher than the overall percentage of physician visits. Con-

versely, PAs and NPs managed a proportionally larger share of visits than their total visit distribution of visits for patients 15 to 45 years old.

The distribution of OPVs was stratified by geographical region, urban or rural location, and type of clinic as shown in Table 3. Approximately 85% of all visits occurred in a metropolitan statistical area. Overall, general medicine and pediatric clinics (representing primary care) accounted for 54% of the OPVs, followed by surgery (19%), Ob/Gyn (14%), and "other" (12%).

In this analysis, a few significant differences emerged in the proportional distribution of visits attributed to PAs and NPs. In terms of geography, the largest share of PA OPVs (7.8%) occurred in the West and the smallest share (3.7%) in the Northeast whereas the largest share of NP/CNM OPVs (11.2%) was in the South and the smallest share (6.1%) in the West. Nurse practitioners or PAs were the provider of record for 36% of encounters in nonmetropolitan statistical areas. In surgery, pediatric, and "other" clinics, the distribution of physician visits was greater than the distribution of physician visits overall. Physician assistants were proportionally more represented in general medicine clinics; NPs were proportionally more represented in both general medicine and Ob/Gyn clinics.

The remainder of the analysis focused on visits involving chronic disease care. From 2005 to 2010, the distribution of physician visits involving chronic conditions was slightly higher than the distribution of physician visits overall (Table 4). The share of visits involving chronic disease attributed to PAs was the same as the share of PA visits for all diagnoses; the distribution of chronic disease visits to NPs was slightly lower than the overall distribution of NP visits. Similar to the 2001-2010 examination, the analysis for 2005-2010 shows that physicians managed a proportionally higher number of visits with patients 45 years and older whereas NPs and PAs managed proportionally higher shares of visits for patients younger than 45 years. Physician assistants accounted for 5.3% of the total number of visits (all age groups); however, 5.5% of

Table 1. The Number of Hospital Outpatient Department Visits and the Percentage of Visits by Provider Type, 2001-2010

Year	Physician		Physician Assistant		Nurse Practitioner		Total	
	Estimated Visits	% Share of Visits	Estimated Visits	% Share of Visits	Estimated Visits	% Share of Visits	Estimated Visits	Total
2001	5 800 000	0.87	340 000	0.05	510 000	0.08	6 700 000	1.00
2002	5 900 000	0.87	290 000	0.04	560 000	0.08	6 700 000	1.00
2003	6 800 000	0.85	630 000	0.08	570 000	0.07	8 000 000	1.00
2004	6 100 000	0.88	310 000	0.04	550 000	0.08	7 000 000	1.00
2005	7 000 000	0.89	410 000	0.05	470 000	0.06	7 900 000	1.00
2006	7 600 000	0.86	450 000	0.05	760 000	0.09	8 800 000	1.00
2007	6 300 000	0.84	410 000	0.05	800 000	0.11	7 500 000	1.00
2008	7 700 000	0.82	480 000	0.05	1 200 000	0.12	9 300 000	1.00
2009	7 100 000	0.84	450 000	0.05	900 000	0.11	8 400 000	1.00
2010	7 200 000	0.84	460 000	0.05	910 000	0.11	8 500 000	1.00
Total	68 000 000	0.86	4 200 000	0.05	7 200 000	0.09	79 000 000	1.00

the visits constituted for those younger than 45 years. Nurse practitioners accounted for 9.9% of all visits, and 11.8% of visits involved those younger than 45 years. For patients 65 years and older, PAs attended 5% of the visits whereas NPs attended 6.2%.

In general, for all providers, the distribution of chronic condition visits for each age group was similar to the total distribution of visits within the age group. For example, physicians managed 86.8% of all visits for patients aged 45 to 64 years and 86.7% of visits involving

Table 2. Chronic Disease Outpatient Department Visits by Patient Characteristics and by Provider of Record, 2001-2010

	All Patients			
	Physician	Physician Assistant	Nurse Practitioner	Total
Sex				
Female	84.7	5.4	10.0	48 000 000
Male	86.8	5.4	7.8	31 000 000
Age, yr				
<1	88.1	3.6	8.3	3 200 000
1-4	85.7	5.4	8.9	5 300 000
5-14	84.3	5.3	10.4	8 800 000
15-24	79.9	6.8	13.3	8 900 000
25-45	83.2	6.1	10.8	19 000 000
45-65	87.8	4.8	7.4	21 000 000
65+	89.6	4.7	5.8	12 000 000
65-74	89.3	4.6	6.2	6 800 000
75+	89.9	4.8	5.3	5 700 000
Total	85.5	5.4	9.1	79 000 000

*Subtotals may not sum exactly to total due to rounding in the estimation of the population size.

Table 3. Characteristics of Outpatient Department Visits, Percent Share of Visits by Provider Type, 2001-2010

	Physician	Physician Assistant	Nurse Practitioner	Total
Census geographic region				
Northeast	87.8	3.7	8.5	20 000 000
Midwest	85.2	5.9	8.9	24 000 000
South	83.7	5.2	11.2	24 000 000
West	86.2	7.8	6.0	10 000 000
Metropolitan area status				
MSA	89.8	2.9	7.3	60 000 000
Non-MSA	64.4	17.3	18.4	13 000 000
Total	85.4	5.4	9.2	73 000 000
Type of clinic				
General medicine	81.9	7.7	10.4	48 000 000
Surgery	95.4	2.5	2.0	10 000 000
Pediatric	92.8	1.0	6.2	9 800 000
Obstetrics and gynecology	82.0	1.8	16.3	6 500 000
Substance abuse	93.5	0.3	6.2	150 000
Other	90.3	1.9	7.8	4 600 000
Total (%)	85.5	5.4	9.1	100.0
Total (visits)	62 000 000	3 900 000	6 700 000	79 000 000

Abbreviation: MSA, metropolitan statistical area.

Table 4. Percent Share of Outpatient Department Visits by Select Comorbid Chronic Conditions According to Patient Age and Provider of Record (2005-2010)

	Physician	Physician Assistant	Nurse Practitioner/ Nurse Midwife	Total Visits
Age <54 yr				
None	82.4	5.4	12.2	19 000 000
≥1	83.0	5.9	11.1	8 700 000
Missing	86.4	5.1	8.5	670 000
Total	82.7	5.5	11.8	28 000 000
Age 45-64 yr				
None	86.8	5.0	8.3	3 600 000
≥1	86.7	4.9	8.4	10 000 000
Missing	91.7	5.0	3.3	230 000
Total	86.8	4.9	8.3	14 000 000
Age 65+ yr				
None	89.7	4.4	5.9	1 100 000
≥1	88.6	5.2	6.3	7 000 000
Missing	93.7	2.9	3.4	120 000
Total	88.8	5.0	6.2	8 200 000
All ages				
None	83.4	5.3	11.3	24 000 000
≥1	86.0	5.3	8.7	26 000 000
Missing	88.5	4.8	6.7	1 000 000
Total	84.9	5.3	9.9	51 000 000
Total	43 000 000	2 700 000	5 000 000	51 000 000

a chronic condition; PAs managed 4.9% of all visits and 4.9% of the visits involving a chronic disease in this age group; and NPs managed 8.3% of the total and 8.4% of 45- to 64-year-old patient visits involving 1 or more chronic conditions.

Overall, the most common reason for a visit was a progress visit (return visit), followed by general medical examination (data not displayed). For all 3 providers, the most common chronic disease visits were for diabetes and hypertension, with similar percentages; 2% to 4% of the visits to each type of provider were for diabetes and 2% to 4% for hypertension. With regard to payment, both NPs and PAs were proportionally less likely than physicians to see patients with private insurance and Medicare but proportionally more likely to see “self-pay” patients (data not presented in exhibits). In addition, PAs were proportionally more likely to see “worker compensation” visits.

The distribution of visits to each provider by category identifies some division of labor between the 3 providers (Table 5). From 2001 to 2010, physicians attended a proportionally higher percentage of visits for chronic problems whereas NPs and PAs were proportionally more represented as providers for visits for new/acute problems, with PAs managing a proportionally higher share of the acute care visits than NPs. Nurse practitioners, on the contrary, managed a proportionally higher number of preventive care visits than both PAs and physicians. Evaluating the distribution of each provider type’s own visits shows that 39% of visits to physicians were for a chronic/routine problem or flare-up of a chronic problem whereas only 25% of NP and PA visits were categorized this way. A higher percentage of PA visits were for new or acute problems (59%) than physician (38%) and NP visits (49%), whereas NPs had the highest percentage of visits for preventive care (24%).

DISCUSSION

Over a 10-year period, the presence of NPs and PAs represented in the NHAMCS increased substantially from the previous

decade, reflecting growth of the professions in the United States and their utilization (McCaig et al., 1998). In the aggregate, NPs (8.9%) and PAs (5.4%) attended 14% of all visits and were the providers of record for 36% of nonmetropolitan OPD visits. During the first decade of the century, the percentage of visits attributed to PAs remained relatively constant whereas the percentage of visits to NPs increased from 8% in 2001 to 11% in 2010.

Taken together, the results identify that all 3 providers see a significant proportion of chronic disease diagnoses, with physicians more likely to be the provider of record for a chronic (or routine) problem. Furthermore, the study indicates that physicians oversee the largest proportion of visits with older patients and therefore likely attending to a higher proportion of visits requiring complex disease management. It should be noted, however, that new/acute problems may also involve chronic disease diagnoses and that when analyzing visits based on primary diagnosis (as opposed to category of reason for visit), a similar percentage of visits for each provider type were attributed to the most common chronic disease diagnoses.

While some division of labor did emerge among the 3 provider types, the differences seem minimal. A higher presence of NPs in Ob/Gyn care may help explain the relatively higher percentage of NPs represented in hospital OPVs and the finding that the share of NP visits for preventive care is higher than the share of PA and physician visits for preventive care. Although CNMs represent a very small proportion of the NP category, their presence in the study and the proportionally higher percentage of visits to NPs in Ob/Gyn clinics may explain why NPs were more likely to attend visits with younger female patients and slightly less likely to attend visits involving a chronic condition. As observed by other research, NPs may document more preventive care services than PAs and physicians (McCaig et al., 1998).

Overall, the study findings confirm observations that PAs and NPs are proportionally more represented in rural, underserved locations than ambulatory care physicians

Table 5. Major Reason for Visit Category by Provider Type, 2001-2010

Major Reason for Visit	Physician	Nurse		Total Visits
		Physician Assistant	Practitioner/ Nurse Midwife	
New/acute problems	23 000 000	2 200 000	3 200 000	28 000 000
Between provider share of visits	0.81	0.08	0.11	1
Within provider share of visits	0.38	0.59	0.49	0.4
Chronic/routine problem	19 000 000	700 000	1 300 000	21 000 000
Between provider share of visits	0.9	0.03	0.06	1
Within provider share of visits	0.32	0.18	0.2	0.3
Flare-up of chronic problem	4 200 000	250 000	340 000	4 800 000
Between provider share of visits	0.88	0.05	0.07	1
Within provider share of visits	0.07	0.07	0.05	0.07
Pre-/postsurgery	3 200 000	120 000	110 000	3 500 000
Between provider share of visits	0.93	0.03	0.03	1
Within provider share of visits	0.05	0.03	0.02	0.05
Preventive care	11 000 000	520 000	1 600 000	13 000 000
Between provider share of visits	0.84	0.04	0.12	1
Within provider share of visits	0.18	0.14	0.24	0.19
Total	61 000 000	3 800 000	6 600 000	71 000 000
Between provider share of visits	0.85	0.05	0.09	1
Within provider share of visits	1	1	1	1

and that PAs may be more likely to practice in these areas (Coombs et al., 2011; Dehn, 2006; Dehn & Hooker, 1999; Grumbach et al., 2003; Pedersen et al., 2008). All 3 providers appear to be attending similar types of visits for chronic disease diagnoses. By managing the types of visits noted, PAs and NPs may be allowing physicians to devote a greater proportion of time to older patients requiring more complex disease management, particularly in urban settings.

As the essential determinant of health system equity and effectiveness, ambulatory primary care is the cornerstone not only of health care quality but also a potential for cost containment of health care resources (Hussey et al., 2009; Starfield et al., 2005). Both NPs and PAs are trained in a shorter period of time than physicians and are able to fill many roles in chronic disease management, but they are compensated at lower rates. These attributes may make them optimal team members for expansion of ambulatory care service delivery.

Increasing levels of NP and PA employment are evident in federally funded systems such as the Veteran Health Administration, the military, and Community Health Centers (Hing et al., 2010; Hooker, 2008; Morgan et al., 2012). In many physician private offices and other health care organizations, PAs and NPs are the usual providers of care (Everett et al., 2009; Hing et al., 2010; Hooker & Everett, 2012). In addition, a study suggests that operational changes within the health care system, including greater utilization of PA and NP clinicians, may have the potential to help mitigate some primary care physician shortages (Green et al., 2013). The assessment of visits for chronic disease diagnoses suggests that the utility of NPs and PAs could be leveraged to a greater degree nationally and at a potential cost savings to health care systems. The findings also support the notion that PAs and NPs are capable of playing lead roles in delivery systems such as the patient-centered medical home and may be more likely to do so in nonmetropolitan areas.

LIMITATIONS

The major limitation to this study is the nature of the NHAMCS; a cross-sectional survey undertaken each year does not permit identifying the same provider and is unable to follow patients longitudinally. Because we identified patients by the main diagnosis for each visit, many visits involving a chronic condition were secondary diagnoses and may have been unaccounted for in this analysis. Furthermore, we were unable to assign a chronic disease score to a single visit. Finally, the NHAMCS survey addresses only patient visits and provides no information on health outcomes.

FUTURE RESEARCH

More studies by the National Center for Health Statistics in capturing patient visits are planned for this decade—one tactic is to provide some longitudinal data points based on ambulatory care visits. We argue that research identifying the optimal allocation of labor

in chronic disease encounters between all 3 providers should be undertaken. Such experiments in organizational research should be expanded to include nurses and other health care professionals. Strategies to identify the ideal level of performance for each member of a team are necessary for maximizing health care system efficiency.

CONCLUSION

The US forecast is for health care service demand to outpace the supply of providers. Both PAs and NPs will likely provide a significant and growing role in the management of common ambulatory conditions, including chronic diseases. In view of an increasing call for ambulatory care teams, new public health policies are needed to meet this demand. The NHAMCS results of chronic disease encounters by provider type produce a currency of richness in health care discussions. Shining the light on PA and NP services may be a useful strategy to consider in investigating the efficiency of the health workforce.

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