Practice Patterns of Family Physicians in Practice-Based Research Networks: A Report From ASPN

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Background: **Practice-based research networks are growing and undertaking larger and more complex studies to inform the clinical practice of family physicians. We describe a study that compares clinical behaviors of physicians in the Ambulatory Sentinel Practice Network (ASPN), a large national practice-based research network, with those from the National Ambulatory Medical Care Survey (NAMCS).**

Methods: **A survey, replicating NAMCS, was conducted among 129 family physician members of ASPN. Nested logistic regression was used to determine which services could predict ASPN membership after adjustment for common and easily observed patient and physician characteristics.**

Results: **Of 20 specific patient services, only 4 were predictive of membership in ASPN. Of these 4, 2 were screening or diagnostic services; ASPN physicians were 1.18 times more likely to obtain a blood pressure measurement and 0.60 times as likely to order a culture for streptococcal pharyngitis. ASPN physicians were 2.30 times more likely to provide family planning counseling and 1.66 times more likely to provide smoking cessation counseling after adjusting for patient smoking status.**

Conclusions: **We conclude that there are minimal differences in the practice patterns of family physicians participating in a large national practice-based research network and those included in the probability sample of NAMCS. Additional work is needed to examine further those characteristics of the phenomena observed in practice-based research network research that might affect generalizability of results to the larger community of practicing family physicians. (J Am Board Fam Pract 1999;12:278-84.)**

As the research enterprise in family medicine has matured, studies conducted in practice settings have become an important component of the effort to construct the science base of family practice. Practice-based research networks have been established to conduct this type of research and have proved themselves to be feasible and productive of an important body of research on the basic phenomena of primary care practice.[1-3] By a recent count there are 18 practice-based research networks in family medicine with another 5 in pediatrics and 2 with mixed primary care specialty composition.

The clinicians in these networks are volunteers who have made personal commitments to go beyond routine practice and systematically explore selected practice phenomena. This voluntary nature of the organization creates the potential for selection and observer biases in the studies conducted in networks. Previous work has compared the characteristics of patients seeking care from network physicians with those patient characteristics reported by physicians participating in the National Ambulatory Medical Care Survey (NAMCS). The NAMCS is a national probability sample survey of the content of office visits made in the United States by ambulatory patients to nonfederally employed physicians who are principally engaged in office practice.

One report concludes that the patients receiving care from Ambulatory Sentinel Practice Network (ASPN) physicians do not vary on most important characteristics from those seen by physicians participating in NAMCS.[4] A similar study showed no important differences in characteristics between patients seen in NEON, a practice-based research network composed of resident teaching practices in Ohio, and those patients in the 1990 NAMCS.[5] These studies have shown that the patients' characteristics and the problems

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they bring to family physicians in practice-based research networks are similar to those of the general US population seeking care from family and general physicians.

With the growing number of well-designed research studies conducted in practice-based research networks, it is important to understand better the ways in which studies done in the networks reflect the health and health care events that occur daily in the larger universe of practicing family physicians. This article builds on previous work showing similarity of patients and examines whether the practice patterns of the family physicians in ASPN differ from those of the larger universe of family physicians in the United States. We report a physician-level analysis of services provided by family physicians participating in ASPN compared with services provided by family physicians participating in the 1991 NAMCS. The analysis adjusts for demographic and other characteristics of physicians and patients that would typically be known and controlled for in network studies to isolate differences in care patterns that might be unique to family physicians who participate in practice-based research.

Methods

Study Sites

ASPN currently consists of 148 practices in 43 states and 6 Canadian provinces. The practices include 839 primary care clinicians, most of whom are family physicians; approximately 15 percent are physician assistants or nurse practitioners. The practices provide comprehensive primary care to approximately 600,000 patients. At the time of the study ASPN consisted of 69 practices, of which 54 percent were solo practices (42 percent of the physicians); the others were partnerships (14 percent) or group practices (32 percent). A total of 129 family physicians participated in and completed data collection.

All eligible practices in the network at the time of the study (15 April 1991 through 14 April 1992) participated in data collection. Eligibility criteria were designed to be comparable with the NAMCS data from family physicians and included nonresidency-based family practices located in the United States. Fifty-one ASPN practices met these criteria, and these practices were randomly assigned to 1 of 52 weeks in the survey year. Six practices did not report within the year because of scheduling conflicts, and 7 practices left the network during the year; however, 6 practices joined the network during the study and were assigned to collect data during one of the vacated weeks, which yielded a study group of 44 practices. All of the family physicians (n - 83) in these practices participated. To generate additional power for a nested analysis, we included in this analysis the original data[4] and data from the eligible practices that joined ASPN in 1992 and 1993. This combination provided data from a total of 129 family physicians in 52 practices.

The National Ambulatory Medical Care Survey

NAMCS is a nationwide survey of health providers designed to provide objective information about ambulatory medical services in the United States, and includes the collection of data about a representative sample of office visits to physicians.[6] NAMCS is a continuous survey based on a sample of physicians who collect data for 1 week. The survey addresses the characteristics of patients seen in physicians' offices, the nature of the patients' complaints, and their disposition. Surveys were conducted in 1973, 1975 through 1981, 1985, and 1989 through 1991 and continue annually with a sample size of approximately 2500 physicians. Family physicians and general practitioners contribute on average 30 percent of the reported ambulatory visits.

Data Collection

The data collection and management procedures have been described in detail elsewhere [4] and are only summarized here. Participating practices were randomly assigned to a week of data collection between 15 April 1991 through 14 April 1992. In general, the study used methods identical to those used to conduct NAMCS with the exception of differences in management of missing data.

Within each practice the data collection period for each practice extended from Monday morning through the following Sunday evening. All ambulatory patients receiving face-to-face medical attention from any family physician in a participating practice were counted in this study, and data were collected using the NAMCS data collection form on every other patient seen during the study week. The NAMCS form captured information on the characteristics of the patient, expected source of payment, the patient's complaint(s) or

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Table 1. Comparison of Ambulatory Sentinel Practice Network (ASPN) and National Ambulatory Medical Care Survey (NAMCS) Patient, Physician, and Visit Characteristics.

Characteristics	ASPN %	NAMCS %	*P* Value
Physician sex	(n - 129)	(n - 109)	
Male	76.0	80.7	
Female	24.0	19.3	0.375
Physician age, years	(n - 90)	(n - 109)	
mean, (SD)	44.7 (8.45)	44.4 (10.56)	0.8145
Physician practice location	(n - 129)	(n - 109)	
Rural	55.8	36.7	
Suburban, urban	44.2	63.3	0.003
Patient sex	(n - 3165)	(n - 3713)	
Female	62.2	67.4	
Male	37.8	38.6	0.525
Patient age, years	(n - 3151)	(n - 3713)	
mean (SD)	39.2 (24.59)	38.3 (23.85)	0.1098
Patient ethnicity	(n - 3064)	(n - 3713)	
Non-Hispanic	96.2	93.9	
Hispanic	3.8	6.1	0.001
Payment type	(n - 3192)	(n - 3713)	
HMO	21.4	21.1	0.796
Medicare	18.2	15.4	0.002
Medicaid	13.4	10.3	0.001
Private insurance	34.1	30.9	0.005
Patient paid	24.0	23.1	0.368
No charge	1.4	0.4	0.001
Other payment method	3.4	3.3	0.870
Patient smokes	(n - 2747)	(n - 2832)	
	18.5	14.6	0.001
Primary reason for visit	(n - 3192)	(n - 3713)	
Symptoms	56.6	63.1	0.001
Disease	9.9	7.5	0.001
Diagnostic	14.6	13.2	0.086
Treatment	7.7	6.2	0.013
Injury	3.0	3.7	0.108
Administrative	1.7	2.3	0.082
Pregnancy	3.9	1.7	0.001
Test results	1.6	1.4	0.569
Duration of visit, minutes mean, (SD)	(n - 3168) 14.8 (9.67)	(n - 3713) 16.0 (9.32)	0.0001

reason(s) for visit, diagnosis(es), diagnostic and screening service(s) provided, therapeutic service(s) provided, medication(s) prescribed, disposition, and duration of the visit (time spent with physician only).

A study coordinator in each practice checked the forms for missing data and mailed them to the ASPN office. Forms were logged in and checked for completeness. Unlike the procedure used in the national NAMCS, forms with data missing for questions pertaining to birth date, sex, reason for visit, and diagnosis were returned to the practice for completion. For less critical data, such as diagnostic test and injury relatedness, only forms missing three or more items were returned to the practice for further data recording. Data were missing for no more than 2.5 percent for any item with the exception of ethnicity (3.6 percent). NAMCS reported an item nonresponse rate of 5 percent or less for all data items and makes up missing data by assigning a value from a randomly selected similar record. In this study no values for missing data were assigned.

Coding of data was performed using the same methods and coding schemes used in NAMCS. Diagnoses were coded using the *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM),[7] reasons for visit were coded using *A Reason for Visit Classification for Ambulatory Care*,[8] and medications were coded using a system developed specifically for NAMCS.[9,10] A 10 percent random sample of all forms received were recoded by the agency that has contracted with the National Center for Health Statistics to code NAMCS forms to test for interrater reliability. As reported previously, the interrater agreement rates for reason for visit, ICD-9-CM, and medication codes were 96.6 percent, 91.5 percent, and 96.8 percent, respectively.[4]

Statistical Analysis

Univariate statistics were computed to compare patient, physician, and practice characteristics. Chi-square statistics were calculated for ordinal and nominal variables, and a Student *t* statistic was used for comparison of continuous variables. To examine differences between clinical practices of ASPN physicians and those of physicians participating in NAMCS, we fitted a nested logistic regression model to determine whether the services provided to patients predicted physician membership in ASPN. We used a nested model to account for the multiple patient visits per physician. As we were primarily interested in how ASPN physicians might differ in screening, prescribing, diagnostic, and therapeutic services reported, we adjusted for patient age, sex, race, and ethnicity; type of payment plan; physician age and sex; location of prac-

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tice (rural or nonrural); and primary reason for, duration of, and season of visit. In none of the analyses were the weighting factors provided by the National Center For Health Statistics used. Analyses were performed using SAS and Egret.[11,12]

The primary reasons for visit were collapsed into the same seven modules used in reporting NAMCS data: disease, treatment, symptoms, injuries, administrative, diagnostic or screening and preventive, and test results. Because of the relatively large proportion of visits for pregnancy, we treated these visits as a separate module.

Differences in clinical behavior of the physicians were examined for 20 clinical services captured by the 1991 NAMCS data collection form. Nine other services were included on the form but were documented by family physicians with very low frequency (less than 1 percent in both ASPN and NAMCS) and were not included in this analysis. Services examined included 8 screening or diagnostic tests (urinalysis, culture for streptococcal pharyngitis, resting electrocardiogram, blood pressure, mammogram, Papanicolaou test, exercise electrocardiogram, and cholesterol testing), and 7 therapeutic services (prescription of one or more medications, counseling for smoking cessation, family planning, exercise, diet, weight reduction, cholesterol, and family or social counseling). Three options for patient disposition (referral to another physician, planned follow-up, and admission to hospital) were also examined for their ability to predict physician membership in ASPN.

Table 2. Unadjusted Comparison of 20 Services Provided by Ambulatory Sentinel Practice Network (ASPN) Family Physicians (n - 3192) and National Ambulatory Medical Care Survey (NAMCS) Family Physicians (n - 3713).

Services	ASPN %	NAMCS %	*P* Value
Screening and diagnostic testing			
None	25.5	24.4	0.282
Blood pressure	63.0	60.4	0.023
Urinalysis	13.9	12.6	0.119
Electrocardiogram, resting	2.0	2.8	0.034
Electrocardiogram, exercise	0.1	0.4	0.041
Mammogram	2.0	1.6	0.226
Papanicolaou smear	4.6	4.3	0.476
Culture for streptococcal pharyngitis	2.6	4.0	0.002
Cholesterol screening	4.7	4.7	0.978
Therapy and counseling			
Diet	17.2	14.9	0.009
Exercise	12.1	10.1	0.009
Cholesterol counseling	4.4	4.0	0.440
Weight reduction	5.5	5.1	0.570
Smoking cessation	5.4	2.9	0.001
Family social counseling	4.2	2.5	0.001
Family planning	1.9	0.7	0.001
Medication prescribed	72.7	70.1	0.016
Patient disposition			
Referred to another physician	4.4	5.2	0.116
No follow-up planned	11.3	12.8	0.055
Admitted to hospital	0.4	0.6	0.459

Results

A total of 3192 visits to family physicians in the ASPN network and 3713 visits to family and general physicians participating in the 1991 NAMCS were examined in the analyses to determine which covariates predict association in ASPN.

Table 1 compares the characteristics of patients, physicians, and visits for the ASPN and NAMCS data. As noted in the previous report,[4] there are differences in patient race and ethnicity, method of payment, and physician practice location. Not reported previously was the significantly larger proportion of patients seen by ASPN physicians who were reported by the physician to be smokers. The duration of the office visit was significantly longer on the average in the NAMCS visits (16 minutes vs 14.8 minutes), a finding not apparent in the previous report, which used weighted data.

Table 2 shows the univariate comparisons of the 20 service variables, unadjusted for patient, physician, and visit characteristics. Eleven of the services show a significant ($P < 0.05$) difference between the ASPN and NAMCS patients. These 11 services were used in the logistic regression model shown in Table 3. Only 4 of the services examined entered the model and predicted membership in either ASPN or the NAMCS physician group. Of these services 2 were screening or diagnostic services; ASPN physicians were 1.18 times more likely to obtain a blood pressure measurement and 0.60 times as likely to order a culture for streptococcal pharyngitis. ASPN physicians were

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Table 3. Comparison of Clinical Services Provided by Ambulatory Sentinel Practice Network (ASPN) and National Ambulatory Medical Care Survey (NAMCS) Family Physicians.

Covariates	Odds Ratio	95% CI
Diagnostic and screening services		
Blood pressure*	1.18	1.02, 1.36
Electrocardiogram, resting	1.11	0.73, 1.68
Electrocardiogram, exercise	0.43	0.08, 2.29
Culture for streptococcal pharyngitis*	0.60	0.41, 0.87
Medications ordered	1.14	0.99, 1.32
Follow-up planned	1.04	0.84, 1.27
Therapy, counseling		
Diet	1.14	0.94, 1.38
Exercise	1.00	0.80, 1.25
Smoking cessation*	1.66	1.17, 2.34
Family, social counseling	1.40	0.99, 1.99
Family planning*	2.30	1.26, 4.18

Note: Only the 11 services attaining statistical significance ($P < 0.05$) in the univariate analysis were included in the logistic regression model.
*Services that achieved significance and entered the final model.

2.30 times more likely to provide family planning counseling and 1.66 times more likely to provide smoking cessation counseling after adjusting for patient smoking status.

Discussion

Replicating the NAMCS survey design when collecting data from ASPN practices provides an opportunity to compare the practice patterns of ASPN and NAMCS family physicians for 20 specific patient services. Of these only 4 were found to predict ASPN membership. Of 2 screening and diagnostic services, ASPN physicians were more likely to use one (blood pressure measurement) and less likely to use the other (culture for streptococcal pharyngitis.) Of the 2 counseling services, ASPN physicians were more likely to provide both. Although 4 of the 20 service variables were statistically significant, the 2 screening and diagnostic services varied in opposite directions, and most of the odds ratios are modest. Even with statistical significance for 4 variables, it would be difficult to conclude that the observed differences are clinically important in terms of generalizing network research results to the larger universe of primary care.

The conclusions to be drawn from this analysis are limited by the service variables included in the NAMCS data set, and a more extensive set of clinical services conceivably could expose patterns not apparent from the 20 items included in NAMCS. From these data, however, we conclude that there are minimal differences in the practice patterns of family physicians participating in a large national practice-based research network and those included in the probability sample of NAMCS.

This study adds important information to our growing understanding of research conducted in practice-based research networks. Previous work has shown the similarity of the patients seen by research network physicians but left unanswered the important question of potential differences in the clinical behavior of the clinicians themselves. From the results presented here, we conclude that there are not strong and consistent practice patterns among ASPN physicians that set them apart from the larger community of practicing family physicians.

Although the growing evidence of similarity of patients, and now of practice patterns of physicians, in research networks is reassuring, there remains strong reason to suspect that physicians who devote substantial portions of their time to research are not completely typical of the larger universe of family physicians.

We believe there are at least three distinct and measurable ways in which physicians who participate in practice-based research might differ from the larger universe of practicing family physicians. First, the physicians might be more critical in their reading and analysis of the literature and the increasing number of practice guidelines to which they are exposed. This difference might be captured in part by differences in their knowledge, attitudes, and beliefs about clinical care issues. Second, differences in knowledge, attitudes, and beliefs can result in differences in their practice patterns and the constellation of services they provide to their patients.

Finally, physicians who differ in knowledge, attitudes, and beliefs or in their patterns of clinical care might attract patients with demographic and illness characteristics that differ from those of the general population of primary care patients. Previous studies and the work reported here fail to find important differences in either patient characteristics or physician practice patterns. Future work in ASPN will examine differences in knowledge, attitudes, and beliefs between network physicians and those in the large universe of practicing family physicians. Future work will also

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examine differences among physicians and their patients within the network who do and do not volunteer to participate in a given study.

The results of this study further support the important and central role of practice-based research networks in building the science base of primary care practice. These practicing family physicians, united by a commitment to observe and record carefully the phenomena of their daily practice, will continue to investigate the many challenges they and their patients face in achieving the best possible health status in a rapidly changing health care system. Their work will continue to improve the practice of primary care, where most people receive most of their care most of the time.

Jim Delozier of the National Center for Health Statistics and Nancy Stroup of the Centers for Disease Control made valuable contributions to this article.

Participating Practices

Canada

Alberta: Foothills Family Medicine Centre, Black Diamond.
British Columbia: Gerald Kenefick, MD, New Westminster.
Ontario: Donald McLean, MD, Hamilton; Shelley Metcalfe, MD and Christine Dowdell, MD, Steve Nantes, MD, Kitchener.
Quebec: John Wootton, MD, Keith MacLellan, MD, Maurice Lamarche, MD, Shawville; Centre de Medecine Familiale de Wakefield, Ltd, Wakefield.

United States

Alaska: Resurrection Bay Health Center, Seward.
Arkansas: Batesville Family Practice Clinic, Batesville.
California: Foothills Family Medical Group, Auburn.
Colorado: Arlis Adolf, MD, Marny Eulberg, MD, Denver; Orchard Family Practice, Englewood; Northern Colorado Family Medicine, Greeley.
Florida: Domingo Gomez, MD, Hialeah; Family Medicine Associates, Miami.
Georgia: Titus Taube, MD. Illinois: Mt. Morris Health Center, Mt. Morris.
Louisiana: Linda Stewart, MD, Baton Rouge.
Maine: The Family Practice Center, Bangor.
Massachusetts: Ambulatory Medical and Surgery, Dedham; Fitchburg Family Practice Residency Program, Fitchburg; Peter Barker, MD, Swampscott.
Michigan: Medical School Family Health Center, Escanaba.
Minnesota: Eagle Medical, Excelsior.
Missouri: The James Clinic, Rolla.
New Hampshire: David Beaufait, MD, Enfield; Richard Douglass, MD, Hillsboro; Manchester Family Health Center, Manchester; New London Medical Center, New London.
New Jersey: A. John Orzano, MD, Flemington; Somerset Family Practice Associates, Somerville.
New Mexico: Santa Fe Family Practice, Santa Fe.
New York: Central Square Health Services Center, Central Square; John E. Glennon, MD, Granville; Raj B. Kachoria, MD, Macedon; Canal Park Family Practice, Palmyra.
North Carolina: Aurora Medical Center, Aurora; Bakersville Community Medical Clinic, Bakersville; Roanoke Amaranth Community Health Group, Inc., Jackson.
North Dakota: University of North Dakota Family Practice Center, Minot.
Oklahoma: Enid Family Medicine Clinic, Enid.
Oregon: Dunes Family Health Care, Inc., Reedsport.
Pennsylvania: Highland Physicians, Ltd., Honesdale; Good Samaritan Family Practice Center, Lebanon.
South Carolina: Lewisville Medical Associates, Richburg; Michael Zeager, MD, Taylors.
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Wisconsin: DeForest Area Medical Clinic, DeForest; Kronenwetter Clinic, Mosinee; Terry Hankey, MD, Waupaca.

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