Is Physician Gender Associated With the Quality of Diabetes Care?

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OBJECTIVE — This study examines the association between physician gender and diabetes quality of care.

RESEARCH DESIGN AND METHODS — We examined the association between the gender of primary care physicians (n = 1,686) and the quality of diabetes care they provided to their patients participating in the Translating Research Into Action for Diabetes (TRIAD) study. Main outcome measures were diabetes processes of care including receipt of dilated retinal exams, urine microalbumin/protein testing, foot exams, lipid and HbA_{1c} (A1C) testing, recommendation to take aspirin, and influenza vaccination over 1 year. Intermediate outcomes included blood pressure, A1C, LDL levels, and patient satisfaction. Hierarchical regression models accounted for clustering within provider groups and health plans and adjusted for patient age, gender, race, income, education, diabetes treatment and duration, and health status, along with physician age, years of practice, and specialty.

RESULTS — Compared with male physicians (n = 1,213), female physicians (n = 473) were younger, had more recently completed training, and were more often internists. Patients of female physicians (n = 4,585) were more often women and younger than patients of male physicians (n = 1,783). In adjusted analyses, patients of female physicians were slightly more likely to receive lipid measurements (predicted probability 1.09 [95% CI 1.02–1.15]) and A1C measurements (1.02 [1.00–1.05]) and were slightly more likely to have an LDL <130 mg/dl (1.05 [1.00–1.10]).

CONCLUSIONS — Patients of female physicians received similar quality of care compared with patients of male physicians.

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Previous reports have suggested that female physicians may provide better quality of care than male physicians for health issues that are specific to women (1–3) and patients of female physicians may be more satisfied with their care than patients of male physicians (4). Several studies have also demonstrated that female physicians may provide better preventive care for issues that are not gender specific (1,5). Female physicians may place greater emphasis on preventive therapies (6–9) or may prefer different communication and decision-making styles that facilitate improved quality of care (10–13). However, other researchers have found no difference between male and female physicians in the provision of health care or patient satisfaction (14). These conflicting observations may arise from the inability to adjust for patient demographic characteristics and disease severity in some studies. Also, patients with similar characteristics may cluster within certain practices, and studies have not always adjusted for this clustering of patients within provider groups and health plans. Adjustment for clustering has been demonstrated to lead to different conclusions about the importance of provider-specific characteristics such as specialty (15).

To date, no studies have explicitly examined patients with diabetes. It is possible that any difference in quality of care by physician gender is diminished in this population. Middle-aged women with chronic conditions are more likely to receive preventive services than women without chronic conditions, even after correction for physician specialty, and preventive care recommendations tend to be more uniform for patients affected with a specific disease such as diabetes (16). Alternatively, it is possible that the nature of chronic conditions requires increased contact with the primary care physician and thus accentuates differences in quality of care associated with physician gender. To our knowledge, no studies have reported examination of provider gender and actual risk factor control (i.e., intermediate outcomes such as blood pressure, A1C, and LDL levels), and no studies have examined the association between provider gender and satisfaction with provider communication among patients with diabetes.

Translating Research Into Action for Diabetes (TRIAD) is a multicenter study of diabetes care in managed care that has collected detailed information on patient medical history and diabetes processes of care (17). Using TRIAD, we compared the preventive services and intermediate outcomes provided by male and female physicians for their patients with diabetes before and after adjustment for patient and physician characteristics and after adjustment for clustering within provider

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Abbreviations: PCP, primary care physician; TRIAD, Translating Research Into Action for Diabetes.

A table elsewhere in this issue shows conventional and Système International (SI) units and conversion factors for many substances.

groups and health plans. We hypothesized that female physicians would provide more processes of care than male physicians and have better intermediate outcomes and that female physicians' patients would report greater satisfaction with their physicians' communication, but that these relationships would not persist after adjustment.

RESEARCH DESIGN AND METHODS

— TRIAD has been described elsewhere (17). In brief, TRIAD's study population consisted of a stratified, random sample of adults with diabetes from 10 health plans and 68 provider groups. For the purposes of this analysis, we examined data from four health plans. TRIAD sampled patients with diabetes who were ≥18 years of age, community dwelling, English or Spanish speaking, continuously enrolled in the health plan for ≥18 months, not pregnant, and with at least one claim for health services during the previous 18 months. We next identified each patient's primary care physician (PCP) using the health plan PCP of record. In three health plans, the patient was only allowed to see the PCP of record; in the other health plan, the patient was allowed to see other PCPs in addition to their PCP of record. To be included in this analysis, the patient had to have at least one contact with the PCP of record over the study period (2000–2001). The mean number of TRIAD patients per PCP was 3.8 and the median was 2.0, with a range of 1 to 75. We examined 1,686 physicians and the care they provided to 6,368 patients. Information from patients with diabetes was obtained by survey, medical record reviews, and through health plan administrative data.

Quality of diabetes care was measured by the performance of the following processes of care over a 12-month period: dilated retinal exams; urine microalbumin/protein testing; foot exams; lipid and HbA_{1c} (A1C) testing; recommendation to take aspirin or aspirin use; and influenza vaccination. We also examined the unweighted sum of these seven process measures as a continuous variable ranging from 0 (no services delivered) to 7 (all services delivered). Regarding the process measures, no "gold standard" exists aside from direct observation, and different sources may report different performance rates for the same measure (18). For dilated retinal exams, foot exams, and recommendation to take aspirin or aspirin use, either medical record documentation or self-report was accepted. Influenza examination relied on self-report and other measures relied on documentation in the medical record. We also examined intermediate outcomes, defined as the most recently recorded values in the prior 12 months of three risk factors (A1C, LDL level, and systolic blood pressure). Finally, we measured patients' rating of their satisfaction with their PCP's communication skills using the Consumer Assessment of Health Plans Study 2.0 index, which is scored on a scale of 1–12 and enquires after patient perception of adequate time spent, respect, and communication skills (19).

Information about physician gender, age, years of practice, degree, and specialty and board training were obtained from health plan administrative records. Physicians were classified as generalists if they were board certified in osteopathic or family medicine and as internists if they were board certified in internal medicine. A few internal medicine specialists were PCPs and for the purposes of this analysis were classified as internists. Years of practice and physician age were highly correlated in one health plan; thus, only physician age was included. Patient covariates included age, race, gender, education, income, duration of diabetes, type of diabetes treatment (diet and exercise, oral medication, insulin, insulin and oral medication), and health status.

Analysis

For each process and outcome measure, multilevel or hierarchical regression models were used to calculate estimated predicted probabilities and 95% CIs comparing male and female physicians. The models contained three levels: the health plan, the provider group, and the patient. They were constructed this way to account for the correlation between patients within these particular levels of health care organization. Previous studies have demonstrated the greatest system-level variation at these levels (20). We included an interaction term to examine whether female physicians provided better care to women than men and if male physicians provided better care to men than women. However, inclusion of these terms did not affect provider gender point estimates and were not included in the final models.

Table 1—*PCP characteristics*

	Male physicians	Female physicians	*P* value
n	1,213	473	
Age (years)	47	41	<0.0001
Specialty (%)			0.0008
Internist	64	73	
Generalist	36	27	

The proportion of missing data for covariates ranged from 0% for type of diabetes treatment to 8% for health status score and 16% for any dependent variable. Missing values for covariates from the TRIAD patient survey were imputed. Exposure and outcome variables were not imputed. We conducted a sensitivity analysis to determine whether persons dropped from the multivariate models differed in the characteristics listed in Tables 1 and 2 from the persons who were included. Patients with at least one missing covariate or dependent variable were more often African American (19 vs. 14%), did not complete high school (33 vs. 26%), and had incomes <$15,000 a year (42 vs. 34%) than patients who did not have any covariates or dependent variables missing. They were otherwise similar in gender, age, duration of diabetes, treatment type, and health status. Single imputations were generated using the transcan function in S-PLUS (version 6.1). Each covariate is predicted as a function of all other covariates. Transcan simultaneously imputes missing values while solving for transformations. Restricted cubic splines are used to model continuous variables and imputed values are constrained to be in the same range as nonimputed values. All other analyses were performed using SAS (version 8.0).

RESULTS

— Physician and patient characteristics are illustrated in Tables 1 and 2. Male physicians were more likely to be older and more likely to be generalists than female physicians. Patients of female physicians were more often women and younger than patients of male physicians. Patients of female and male physicians had similar education and income levels and durations of diabetes. Performance of processes of care and for both male and female physicians was higher than previously reported, and female physicians measured A1C, LDL, and urine protein levels more often than male

Table 2—*Patient characteristics*

	Patients of male PCPs	Patients of female PCPs	*P* value
n	4,585	1,783	
Women (%)	49	68	<0.0001
Age (years)	64	61	<0.0001
Race/ethnicity (%)			<0.0001
Hispanic	23	26	
Non-Hispanic black	15	19	
Non-Hispanic white	50	44	
Other	11	12	
Education (%)			0.62
<High school graduate	30	28	
High school graduate	27	28	
Some college	27	27	
≥College graduate	17	16	
Annual income (%)			0.21
<$15,000	37	39	
$15,000–39,000	31	32	
$40,000–74,999	20	18	
>$75,000	12	11	
Duration of diabetes (years)	13	13	0.89
Type of diabetes treatment (%)			0.002
Diet and/or exercise	6	8	
Oral agents only	62	59	
Insulin only	20	19	
Oral agents and insulin	12	14	
Self-reported health status (%)			0.06
Excellent	5	4	
Very good	18	15	
Good	37	38	
Fair	31	33	
Poor	9	9	
Dilated eye exam performed (%)	78	76	0.25
Aspirin advised or recorded (%)	54	50	0.007
Lipid profile assessed (%)	64	69	0.0002
Glycemic control assessed (%)	86	90	0.002
Influenza vaccine given (%)	66	65	0.40
Proteinuria assessed (%)	78	82	0.003
Foot exam performed (%)	83	85	0.11
Unweighted sum (mean)	5.09 (0.02)	5.16 (0.04)	0.11
A1C <8.5% (%)	60	60	0.93
Systolic blood pressure <140 mmHg (%)	54	55	0.34
LDL <130 mg/dl (%)	71	74	0.17
Satisfaction with communication (%)			0.18
>12	52	54	
8–11	38	35	
0–7	10	11	

physicians (Table 2). Male and female physicians also had similar proportions of patients with optimal A1C, LDL, and systolic blood pressure levels (Table 2). Patients of male and female physicians reported similar levels of satisfaction with their physicians' communication skills.

Table 3 illustrates unadjusted and adjusted associations between physician gender and processes of care. In unadjusted models, patients of female physicians reported significantly higher rates of measurement of urine protein, lipids, and A1C, whereas patients of male physicians reported receiving aspirin advice more often. However, the differences were slight, with predicted probabilities ranging from 0.98 to 1.08 (Table 3). Patients of female physicians and male physicians had similar levels of risk factor control.

After adjustment for clustering of patients within provider groups and patient and provider characteristics, patients of female physicians had lipids (predicted probability 1.09 [95% CI 1.02–1.15]) and A1C (1.02 [1.00–1.05]) measured slightly more often than patients of male physicians (Table 3). Patients of female physicians were more likely to have LDL <130 mg/dl than patients of male physicians (1.05 [1.00–1.10]). Female physicians and male physicians did not differ significantly on other processes of care, control of risk factors, or satisfaction. Predicted probabilities for the association between other processes of care and physician gender ranged from 0.98 to 1.01.

CONCLUSIONS — Men and women with diabetes received high rates of diabetes processes of care regardless of whether their PCP was a woman or a man. Patients of female physicians were slightly more likely to have their lipid and A1C levels measured over 12 months than patients of male physicians and patients of female physicians were more likely to have lower LDL levels. However, other markers of quality of care were similar by provider gender. To our knowledge, the effect of physician gender on quality of care for a specific chronic disease has not been previously examined.

Studies that have found greater differences between male and female physicians focused on gender-specific care and preventive care in a broader patient population, instead of persons with diabetes (5,7). Care provided to patients with diabetes may be more uniform than for the population at large because of the presence of disease management programs and other systems-level interventions. Also, studies that found physician gender differences documented poorer preventive care in general, as opposed to our study that documented high performance rates of diabetes processes of care. We were also able to adjust for physician clustering within health plans and provider groups and detailed physician- and patient-level characteristics. Studies that did not find differences between male and female physicians occurred in simulated situations (8) or in a staff/group model setting with relatively high performance rates of preventive care measures (14).

We may have not found larger differences as we also examined a managed care population, albeit several different model types and settings.

Female physicians tend to have different social communication styles than male physicians (4,10,12). In particular, female physicians engage in participatory decision-making more often (13), a practice that encourages diabetes self-management and can improve diabetes outcomes (21). Female physicians also spend greater proportions of the visit on preventive services and counseling, whereas male physicians may devote more time to history taking, a physical examination, and discussing treatment (9). Although speculative, these mechanisms may explain why patients of female physicians had their lipids and A1C measured more often and had better lipid control; the small magnitudes of the predicted probabilities suggest that such mechanisms may not be highly correlated with physician gender.

Strengths of our study include our ability to adjust for health plan, provider group, and patient and physician characteristics and our ability to measure a range of generally accepted diabetes quality of care measures. Limitations included our inability to examine specific mechanisms for the effect of physician gender, including decision-making and presence and awareness of diabetes infrastructure such as disease management programs. We also examined only the gender of the PCP rather than evaluating the effect of the gender of all of the physicians who had contact with the patient. Finally, our findings are applicable to diabetes care in a managed care population and may not extend to other chronic illnesses or to the fee-for-service environment.

Our study is the latest in a series on physician-level characteristics, including race, specialty training, and degree of surgical experience, that demonstrate that physician-level characteristics may indeed influence quality of care but that these influences are small (13,15,22). This work suggests that quality of care may be less an issue of individual physician characteristics rather than a function of the settings in which they practice. As a potential quality improvement target, the benefit of further provider gender research may be smaller than other patient and health-system targets. However, further research could more closely examine the interaction between provider gender and other mechanisms known to affect quality of care, such as disease management programs and electronic reminder systems.

Table 3—*Predicted probabilities for unadjusted and adjusted associations between physician gender and diabetes-specific process of care*

	Diabetes process of care								Diabetes intermediate outcomes and patient satisfaction			
	Eye exam	Proteinuria	Foot exam	Lipids	A1C	Aspirin	Influenza	Composite*	Systolic blood pressure <140 mmHg	LDL <130 mg/dl	A1C <8.5%	Patient satisfaction score†
Unadjusted models	0.98 (0.95–1.01)	1.05 (1.02–1.08)	1.02 (1.00–1.05)	1.08 (1.04–1.13)	1.04 (1.01–1.06)	0.92 (0.87–0.98)	0.98 (0.94–1.03)	0.07 (0.11)	1.03 (0.97–1.09)	1.03 (0.99–1.07)	1.00 (0.95–1.05)	0.04 (0.54)
n	5,282	5,293	5,289	5,291	5,287	5,292	5,249	5,226	5,196	4,005	5,016	5,514
Adjusted models‡	0.98 (0.94–1.02)	1.01 (0.97–1.05)	1.00 (0.98–1.04)	1.09 (1.02–1.15)	1.02 (1.00–1.05)	0.99 (0.93–1.05)	0.99 (0.93–1.04)	0.04 (0.44)	1.04 (0.98–1.11)	1.05 (1.00–1.10)	1.03 (0.97–1.09)	0.10 (0.14)
n	5,124	5,130	5,126	5,128	5,124	5,129	5,088	5,070	5,029	3,884	4,857	5,356

Data are predicted probabilities (95% CI). Referent group is male physicians. *Unweighted sum of the seven process measures; parentheses indicate *P* value. †Parentheses indicate *P* value. ‡Adjusted for provider age and specialty and patient age, race, gender, education, income, diabetes treatment and duration, health status, and clustering within provider groups.

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