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Practitioner Gender and Quality of Care in Ambulatory Cardiology Practices: A Report from the NCDR®

Dipti Gupta, MD MPH^{1,2}, Fengming Tang, MS³, Frederick A. Masoudi, MD MSPH⁴, Philip G. Jones, MS³, Paul S. Chan, MD MSc^{3,5}, and Stacie L. Daugherty, MD MSPH⁴

¹Memorial Sloan-Kettering Cancer Center, New York, NY

²Weill Cornell Medical College, New York, NY

³Mid America Heart Institute, Kansas City, MO

⁴University of Colorado School of Medicine, Aurora, CO

⁵University of Missouri, Kansas City

Abstract

Background—Some studies suggest that female practitioners are more likely than male practitioners to provide guideline-concordant care; however little is known about the role of practitioner gender in cardiology.

Objective—We measured the association between practitioner gender and adherence to the cardiovascular performance measures in the American College of Cardiology's ambulatory PINNACLE (Practice Innovation and Clinical Excellence) Registry®

Methods—Patients with at least one outpatient visit with a unique practitioner were included. Among eligible patients, adherence to 7 guideline-supported performance measures for coronary artery disease (CAD), heart failure, and atrial fibrillation (AF) over 12 months after registry entry was compared by practitioner gender using hierarchical models adjusting for practitioner type (physicians vs. advance practice practitioners) and number of visits.

Results—The study cohort included 1493 individual practitioners who saw 769,139 patients; 80% of practitioners were men. Male practitioners were more often physicians compared to female practitioners (98.2% vs. 43.7%, $p < 0.01$). Accounting for practitioner category and visit frequency, guideline adherence rates were similar by practitioner gender for all measures with the exception of marginally higher rates for CAD performance measures for male practitioners compared to female practitioners (antiplatelet, RR=1.06, 95% CI: 1.03–1.09; beta-blockers, RR=1.06, 95% CI: 1.01–1.10 and lipid lowering RR=1.07, 95% CI: 1.04–1.10) and AF (oral anticoagulants, RR=1.05, 95% CI 1.01–1.09).

Conclusions—In conclusion, male practitioners marginally outperformed their female counterparts in ambulatory practices enrolled in a voluntary cardiovascular performance

Corresponding author: Stacie L. Daugherty, MD, MSPH, Associate Professor of Medicine, Department of Medicine, Division of Cardiology, University of Colorado School of Medicine, 12631 E. 17th Avenue, Aurora Colorado, 80045, Stacie.daugherty@ucdenver.edu.

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improvement registry program. Overall low adherence to some performance measures suggests room for improvement among all practitioners.

Keywords

Gender differences; Cardiovascular outcomes

Background

Performance measures represent measurable indices of care delivery quality that are based on clinical guidelines and associated with improved patient outcomes.(1,2) Adherence rates to cardiac performance measures in both inpatient and ambulatory settings remain largely suboptimal.(1,3,4) Patient and institutional factors have been examined as possible contributors to explain gaps in adherence to guidelines.(5–7) However, few studies have examined the relationship between practitioner factors, such as practitioner gender and quality of care in ambulatory cardiology practices.

The extent to which practitioner gender is associated with differences in the quality of ambulatory care is debated. Several studies suggest that women practitioners are more likely to provide guideline concordant care.(8–14) In contrast, other studies have found no differences in the quality of cardiovascular risk management between women and men practitioners.(15) Reasons for these conflicting findings may be related to limitations in study designs including the use of regional cohorts, cross sectional design, or an inability to account for visit frequency or exclude patients who are ineligible for a particular treatment. Few studies have specifically looked at the role of practitioner gender in the quality of ambulatory cardiology care.(14)

Accordingly, we examined the association between practitioner gender and the quality of ambulatory cardiology care, as quantified by adherence to established disease-specific performance measures, among outpatient cardiology clinics which participate in the American College of Cardiology (ACC)'s PINNACLE (Practice Innovation and Clinical Excellence) Registry®. We specifically assessed performance measures for eligible patients with coronary artery disease (CAD), heart failure due to left ventricular systolic dysfunction (LVSD) and atrial fibrillation (AF). Understanding the potential association of practitioner gender with adherence to performance measures may inform targets for interventions aimed at improving the quality of ambulatory cardiology care.

Methods

Data Source

The National Cardiovascular Data Registry (NCDR) PINNACLE registry consists of consecutive patients from cardiology practices in the United States (U.S.) that voluntarily submit data as part of a national office-based cardiovascular quality improvement program. (16,17) Data are collected at the point of care using a validated electronic medical record-mapping algorithm for patients with hypertension, CAD, heart failure with LVSD, and AF.

(18,19) Registry data quality is maintained through data definitions, standard data collection and transmission, and periodic data quality checks.(18–20)

Study Population

All patients enrolled in the PINNACLE program with at least one outpatient visit with a unique male or female practitioner from 2008 to 2012 were considered for inclusion. To include visits in which the treating practitioner had prescribing authority, only visits with either a physician (Doctor of Medicine [MD] or Doctor of Osteopathic Medicine [DO]) or an advanced practice practitioner (Nurse Practitioner [NP] or Physician Assistants [PA]) were included. Patients were excluded if they saw more than one practitioner over the study interval. Finally, patients were excluded if there was missing data on practitioner gender or practitioner type.

For each performance measure of interest, patients were included in the analysis only if they met eligibility criteria for that particular performance measure. Patients were excluded for individual performance measures if they had a documented contraindication to that particular therapy (e.g., beta-blocker use after myocardial infarction in a patient with hypotension, patient preference to not take oral anticoagulation for atrial fibrillation).

Predictor variables

The primary predictor of interest was the treating practitioner's gender. For each patient visit, the National Practitioner Identifier (NPI) number of the treating practitioner was collected at the point of care. The NPI number was searched within the National Plan and Practitioner Enumeration System (NPPES) database to identify the practitioner's gender and practitioner category (physician or advance practice practitioner).(21)

Outcomes

Among eligible patients, adherence with seven ACC/AHA/PCPI performance measures for CAD (n = 4), heart failure due to LVSD (ejection fraction $\geq$ 40%) (n = 2), and non-valvular atrial fibrillation with high thromboembolic risk (n = 1) were determined (Table 1). The performance measures examined included: 1) use of beta-blockers after myocardial infarction; 2) use of lipid-lowering drug in patients with CAD; 3) use of antiplatelet therapy in patients with CAD; 4) angiotensin-converting enzyme inhibitor (ACE-I) or angiotensin-receptor blocker (ARB) therapy for patients with CAD and either left ventricular systolic dysfunction (LVSD; ejection fraction $\geq$ 40%) or diabetes mellitus (DM); 5) beta-blocker therapy for patients with heart failure and LVSD; 6) ACE-I or ARB therapy for patients with heart failure and LVSD; and 7) warfarin or novel oral anticoagulants therapy in patients with atrial fibrillation and a CHADS2 score of $\geq$ 2.(22)

For each practitioner, adherence was defined as the number of their patients that met the performance measure over the study interval divided by the practitioner's total number of eligible patients for that performance measure. The study interval began with a patient's first visit noted in the PINNACLE registry and ended 12-months later. Therefore, a practitioner was considered adherent for a particular patient if that patient fulfilled the performance measure at any visit over the 12-month study period.

Statistical analyses

Patient demographic and clinical characteristics were compared between those treated by male and female practitioners using chi-square or Fisher's exact tests for categorical variables and Student's t-test for continuous variables.

In the primary outcomes analysis, adherence rates for each of the seven performance measures were compared between female and male practitioners. To assess the association between physician gender and adherence rate, we constructed three-level (with patients nested within practitioners and practitioners nested within clinic sites) hierarchical models, adjusted for practitioner category (physicians or advanced practice practitioners) and number of total visits over 1-year of follow up. In these models, modified Poisson models were utilized to estimate rate ratio (as opposed to an odds ratio obtained from logistic model) because treatment rates exceeded 10%.^(23,24) All analyses were performed with SAS version 9.3 (SAS Institute, Cary, North Carolina).

Results

Study Cohort

Patients—A total of 1,045,711 patients enrolled in PINNACLE (cared for by 1,613 practitioners) were eligible for at least one of the 7 examined performance measures and considered for inclusion. Among these patients, 262,347 (25%) were excluded due to having visits with more than one practitioner; 10,311 (9.9%) were excluded due to missing practitioner category and 3,914 (0.4%) were excluded due to missing practitioner gender. Our final study cohort comprised 769,139 patients cared for by 1,493 unique practitioners. (Figure 1).

Practitioner Characteristics—Of the final study cohort, 1193(80%) were men and 300 (20%) were women. Male practitioners were more likely to be physicians compared to female practitioners (1172 (98% of male practitioners) vs. 131 (44% of female practitioners), $p = <0.001$).

Patient Level Characteristics by Practitioner Gender—The majority of patients in the cohort ($N = 702,726$, or 91%) saw male practitioners. Patients who saw a male practitioner were slightly older, more often male and had a higher prevalence of smoking and CAD. Patients who saw a female practitioner had a higher prevalence of diabetes and hypertension. The mean number of visits over the 12-month study period was slightly higher for male compared to female practitioners (2.22 ± 1.5 vs 2.17 ± 1.5 , $p < 0.001$). (Table 2)

Adherence with Performance Measures by Practitioner Gender—In unadjusted analysis stratified by practitioner gender, male practitioners had higher adherence rates to six of the seven examined performance measures compared to female practitioners. (Table 3). In eligible patients with LVSD, adherence rates for male practitioner was higher than adherence rates for female practitioners for ACE-I/ARB therapy (82% and 79.6% respectively, $p = <0.01$) with no statistically significant difference by practitioner gender for beta-blocker use (90.8% and 91.3% respectively, $p = 0.44$). Adherence rates to oral anticoagulant use in

eligible patients with AF were higher in male practitioners compared to female practitioners (57.4% and 49.2%, $p = < 0.01$). (Table 3).

After adjustment for practitioner type and number of clinic visits, male practitioners had persistently higher adherence with four of the seven performance measures. (Figure 2) Compared to female practitioners, male practitioners were statistically more likely to prescribe antiplatelet (RR=1.06, 95% CI: 1.03–1.09), beta-blocker therapy (RR=1.06, 95% CI: 1.01–1.10), lipid lowering therapy (RR=1.07, 95% CI: 1.04–1.10) for CAD and oral anticoagulants for patients with AF (RR=1.05, 95% CI 1.01–1.09).

Discussion

Among this cohort of ambulatory cardiology practices participating in the PINNACLE registry, overall adherence rates for the CAD, heart failure and atrial fibrillation guideline-based performance measures varied from 45% to 91%. When considering practitioner gender, adherence rates with 3 of the 7 performance measures were similar between male and female practitioners after adjustment for practitioner category and number of clinic visits. Relative to female practitioners, male practitioners were marginally (absolute difference 4% to 8%) more adherent with prescribing therapy for CAD and AF. These findings suggest that, while overall adherence rates to some performance measures remains low, there was little difference in adherence to performance measures between male and female cardiology practitioners treating patients in the ambulatory setting.

Similar to other studies, our findings suggest overall adherence to many performance measures remains low. In a study by Chan et al using an earlier cohort within PINNACLE, adherence with performance measures ranged from 70% to 90%.⁽⁴⁾ Specifically, the adherence for heart failure performance measures was similar to our own; however adherence to oral anticoagulants in atrial fibrillation and medical therapies in CAD were higher than in our study.⁽⁴⁾ Our rates of oral anticoagulants use are similar to recent international studies that have shown adherence rates between 50 and 60%.^(25,26) Therefore, adherence rates to some performance measures remains low and suggest continued room for quality improvement.

Overall, the results of our study do not suggest significant differences in adherence to performance measures based on practitioner gender. Disparities in care based on practitioner gender and its effect on health care processes have been investigated in smaller studies in primary care, obstetrics, gynecology and surgery.^(8–12) A recent study by Tsugawa et al. demonstrated that hospitalized Medicare patients cared for by female internists had lower rates of hospital mortality and readmission compared with those cared for by male internists.⁽²⁷⁾ Mechanisms proposed for the differences in guideline concordant care between male and female practitioners include differences in communication style, decision-making approaches, and length of time spent with patients.^(12,14,27) Contrary to prior studies, we found that female practitioners have slightly lower adherence rates than male practitioners on some performance measures. However, the absolute differences in our study were small (range 4–8%) and less than prior reports of performance differences among male and female primary care practitioners (range from 14–16%). Therefore, our findings suggest

that practice patterns of cardiology practitioners may not vary as greatly by practitioner gender as those seen in primary care settings.

An important difference between ambulatory cardiology practices and primary care practices is the small number of women practitioners in cardiology.(28) Only 20% (n=300) of the overall sample of practitioners in our study was women, which is comparable to national estimates of women in cardiology.(29,30) Further, only 44% of the female practitioners in our study were physicians compared to 98% of male practitioners. Even though women comprise close to half of medical school classes, only $\approx 12\%$ of general cardiologists and $<10\%$ of interventionalists and electrophysiologists are women.(31) Therefore, the overall number of women practitioners, particularly women physicians, in our study was small and future studies with larger numbers of women practitioners are needed.

Our study addresses limitations of prior work by including a robust, nationally representative sample of cardiology patients who met pre-defined eligibility criteria for each performance measure. Further, we were able to adjust for practitioner type and the number of office visits over the course of follow-up. Finally, the data in PINNACLE is not limited to a single disease entity or diagnosis and therefore represents multiple cardiovascular disease states commonly encountered in outpatient cardiology practice. Therefore, we were able to examine whether any gender differences found were common across many different diagnosis suggesting an overall pattern of care. Taken together, our findings suggest that among eligible patients, there is little difference in adherence to performance measures by practitioner gender across a wide range of cardiology conditions.

The results of our study should be interpreted in light of a few limitations. First, participation in PINNACLE is voluntary and highly motivated practices may be over represented. However, there is no reason to believe that potential practitioner gender differences would necessarily differ among participating and non-participating clinics. Second, under-documentation as opposed to true under-performance may explain the suboptimal rates of selected performance measures. However, PINNACLE data are pulled directly from the electronic health record from medications ordered, patient problem lists and diagnostic codes. Since these fields are widely used by health systems for quality tracking and billing purposes, we would expect the incentives to enter complete information are similar for male and female practitioners. Third, because there were baseline differences in patient clinical characteristics among those seen by male versus female practitioners, differences in the patient complexity may have confounded the relationships found. Finally, our study may be underpowered to detect true gender differences given the small proportion of female practitioners, particularly female physicians. Further, our cohort had small numbers of female physicians (n=131, 44% of female practitioners) and male advanced practice practitioners (n=21, 2% of male practitioners); therefore, we are unable to examine whether the differences found significantly vary by practitioner type. These findings should be replicated in larger cohorts that include greater variation by practitioner gender and type.

Conclusions

Male practitioners slightly outperformed female practitioners' adherence to 4 out of 7 performance measures in ambulatory cardiology practices within this large national registry. However, the absolute differences in performance were small (4–8%) suggesting practice patterns among cardiology practitioners may not vary as greatly by practitioner gender as those seen in other settings. Importantly, overall adherence to some performance measures was low for both male and female practitioners suggesting room for improvement among all practitioners. Our findings merit confirmation in future studies among larger cohorts of practitioners in varied clinical settings.

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Figure 1.
Study population

Figure 2.
Adherence to performance measures in men compared to women practitioners.

Table 1

Disease-specific Performance Measures Studied

Coronary Artery Disease	Heart Failure with LVSD	Atrial Fibrillation
<ul style="list-style-type: none"> • Beta blocker use in prior MI • Antiplatelet therapy • ACEI/ARB use in DM/ LVSD • Lipid-lowering agents 	<ul style="list-style-type: none"> • ACEI/ARB • Beta blocker 	<ul style="list-style-type: none"> • Oral anticoagulants

Abbreviations: ACEI = Angiotensin converting enzyme inhibitor; ARB = Angiotensin receptor blocker; DM = Diabetes mellitus; LVSD = Left ventricular systolic dysfunction; MI = Myocardial infarction.

Table 2

Comparison of Patient Characteristics by Treating Practitioner Gender

Patient variables	Patients treated by Male Practitioner # of pts = 702,726	Patients treated by Female Practitioner # of pts = 66,413	P-Value
Age (years)	66.5 ± 14.1	64.5 ± 15	< 0.001
Number of visits	2.22 ± 1.5	2.17 ± 1.5	< 0.001
Gender			
Male	403,598 (57.5%)	30,712 (46.3%)	< 0.001
Female	298,208 (42.5%)	35,619 (53.7%)	
Race			
White	298,499 (89.3%)	26,044 (87.3%)	< 0.001
American African	28,764 (8.6%)	3,116(10.4%)	
Other	7147 (2.1%)	664 (2.2%)	
Tobacco Use - current			
No	416,246 (59.2%)	39,302 (59.2%)	< 0.001
Yes	94,549 (13.5%)	9,355 (14.1%)	
Unknown	191,931 (27.3%)	17,756 (26.7%)	
Heart Rate	71.3 ± 12.8	71.7 ± 12.8	<0.001
Systolic BP	129.5 ± 18.5	128.2 ± 18.2	<0.001
Diastolic BP	75.4 ± 11	75.5 ± 11	0.259
Dyslipidemia	457,975 (65.2%)	43,461(65.4%)	0.16
Hypertension	531,955 (75.7%)	51,568(77.6%)	< 0.001
Prior Stroke	128,130 (18.2%)	16,121(24.3%)	< 0.001
Coronary artery disease	594,661(84.6%)	55,305(83.3%)	< 0.001
Heart failure with LVSD	129,686 (18.5%)	11,845 (17.8%)	< 0.001
Atrial Fibrillation	148,372 (21.1%)	14,988 (22.6%)	<0.001
Prior MI	240,826 (34.3%)	22,297(33.6%)	<0.001
Prior PCI	141,359 (20.1%)	13,999(21.1%)	<0.001
CABG	62,000(8.8%)	4,930 (7.4%)	<0.001

Abbreviations: BP = Blood pressure LVSD = Left ventricular systolic dysfunction. MI = Myocardial infarction. PCI = Percutaneous coronary intervention. CABG = Coronary artery bypass graft.

Table 3

Unadjusted Adherence Rates to Performance Measures by Treating Practitioner Gender

	Adherence rate by treating practitioner gender		
Performance measure	Male	Female	P-Value
Coronary Artery Disease			
Beta blocker use in prior MI	162,989 (64.1%)	14,389 (58.4%)	< 0.001
Antiplatelet therapy	460,920 (71.8%)	39,603 (65.7%)	< 0.001
ACEI/ARB use in DM/ LVSD	127,457 (70.0%)	12,004 (65.8%)	< 0.001
Lipid-lowering agents	454,658 (72.0%)	38,541 (65.4%)	< 0.001
Heart Failure with LVSD			
ACEI/ARB	14,892 (82.3%)	1,505 (79.6%)	0.004
Beta blocker	16,624 (90.8%)	1,752 (91.3%)	0.44
High Thrombo-Embolic Risk Non-Valvular Atrial Fibrillation			
Oral anticoagulants	76,824 (57.4%)	6,713 (49.2%)	< 0.001

Abbreviations: ACEI = Angiotensin converting enzyme inhibitor; ARB = Angiotensin receptor blocker; DM = Diabetes mellitus; LVSD = Left ventricular systolic dysfunction; MI = Myocardial infarction.