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DOES QUALITY OF CARE FOR CARDIOVASCULAR DISEASE AND DIABETES DIFFER BY GENDER FOR ENROLLEES IN MANAGED CARE PLANS?

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Purpose. **To assess gender differences in the quality of care for cardiovascular disease and diabetes for enrollees in managed care plans.**

Methods. **We obtained data from 10 commercial and 9 Medicare plans and calculated performance on 6 Health Employer Data and Information Set (HEDIS) measures of quality of care (β-blocker use after myocardial infarction [MI], low-density lipoprotein cholesterol [LDL-C] check after a cardiac event, and in diabetics, whether glycosylated hemoglobin [HgbA1c], LDL cholesterol, nephropathy, and eyes were checked) and a 7th HEDIS-like measure (angiotensin-converting enzyme [ACE] inhibitor use for congestive heart failure). A smaller number of plans provided HEDIS scores on 4 additional measures that require medical chart abstraction (control of LDL-C after cardiac event, blood pressure control in hypertensive patients, and HgbA1c and LDL-C control in diabetics). We used logistic regression models to adjust for age, race/ethnicity, socioeconomic status, and plan.**

Main Findings. **Adjusting for covariates, we found significant gender differences on 5 of 11 measures among Medicare enrollees, with 4 favoring men. Similarly, among commercial enrollees, we found significant gender differences for 8 of 11 measures, with 6 favoring men. The largest disparity was for control of LDL-C among diabetics, where women were 19% less likely to achieve control among Medicare enrollees (relative risk [RR] = 0.81; 95% confidence interval [CI] = 0.64–0.99) and 16% less likely among commercial enrollees (RR = 0.84; 95%CI = 0.73–0.95).**

Conclusion. **Gender differences in the quality of cardiovascular and diabetic care were common and sometimes substantial among enrollees in Medicare and commercial health plans. Routine monitoring of such differences is both warranted and feasible.**

Cardiovascular disease (CVD) is the leading cause of death and a major cause of disability for both men and women. In 2002, CVD was responsible for more than 403,555 and 456,064 deaths among American men and women, respectively, accounting for 33.7% of all deaths among men and 36.7% among women (Anderson & Smith, 2005). Gender differences in the quality and outcomes of care for the management of CVD have been well documented (Lucas, DeLorenzo, Siewers, & Wennberg, 2006; Rathore et al., 2000; Vacarrino, Krumholz, Yarzebski, Gore, & Goldberg, 2001). Most of these gender differences favor men.

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Relatively little is known about gender differences in other aspects of cardiovascular care—screening for cardiac risk factors, treatment with medications, and control of risk factors—or the extent of these differences in managed care settings. Yet, further reduction in morbidity and mortality from CVD in women depends on improved quality of care for management of CVD and its risk factors in ambulatory practice. For example, hypertension and diabetes, 2 important risk factors for CVD, are often suboptimally managed in practice (Berlowitz et al., 1998; Committee on Quality of Health Care in America, 2001; Health Plan Employer Data and Information Set [HEDIS], 1999; Hyman & Pavlik, 2001). Recent studies indicate that women generally receive fewer preventive services for CVD compared with men (Correa-de-Araujo, McDermott, & Moy, 2006; Correa-de-Araujo et al., 2006). In addition, the impact of diabetes on the risk of coronary death is greater for women than for men (Lee, Cheung, Cape, & Zinman, 2000; Legato, 2000; Liao et al., 1993). A widely used set of measures of these aspects of care is the National Center for Quality Assurance (NCQA) HEDIS (National Committee for Quality Assurance [NCQA], 2002). However, health plans do not stratify measures by gender because the NCQA does not require plans to do so.

In this study, we assess gender differences in rates of performance on 11 measures of the quality of care for CVD and diabetes, a cardiac risk factor, including screening, medical treatment, and intermediate outcomes. This study is among the first to assess gender differences on such a wide range of measures in both Medicare and commercial managed care plans. In considering our findings, it is important to take into account that these 2 types of plans serve different age groups. Whereas commercial plans primarily insure working age adults and their dependents, Medicare plans primarily cover adults age ≥65.

Methods

Data and Measures

We obtained 1999 claims and enrollment data from 9 Medicare and 10 commercial plans representing approximately 200,000 Medicare and 2.1 million commercial enrollees in 4 geographic regions. All 19 plans were affiliated with the same national health insurer.

We used the claims and enrollment data to calculate performance rates for 7 quality measures focused on processes of care for patients with CVD and diabetes (Table 1). This set of measures included 6 NCQA HEDIS measures (β-blocker use after myocardial infarction [MI], low-density lipoprotein cholesterol [LDL-C] check after a cardiac event, and in diabetics, whether glycosylated hemoglobin [HgbA1c], LDL-C, nephropathy, and eyes were checked) and a 7th HEDIS-like measure used by the plans angiotensin-converting enzyme [ACE] inhibitor use for congestive heart failure [CHF]). We used

Table 1. HEDIS Measures Related to Cardiovascular Disease (CVD) and Diabetes

	Summary Definition of Compliance*
β-Blocker after MI	Ambulatory prescription for a β-blocker within 7 days of hospital discharge for acute MI
LDL-C screening after cardiac event	Check of LDL-C within 60–365 days after hospital discharge for the following acute cardiovascular events: acute MI, PTCA, or CABG
ACE inhibitor with CHF†	Prescription for ACE inhibitor or angiotensin II receptor blocker during year for continuously enrolled patients with heart failure
HgbA1c check in diabetics	One or more HgbA1c test conducted during year for continuously enrolled diabetics
LDL-C (lipid profile) in diabetics	At least 1 LDL-C test done during the measurement year or the year prior for all continuously enrolled diabetics
Eye examination in diabetics	Eye screening examination for diabetic retinal disease during year for continuously enrolled diabetics
Nephropathy check in diabetics	A documented test screening for nephropathy during the measurement year for all continuously enrolled diabetics
LDL-C controlled after cardiac event	LDL-C < 130 mg/dL on or between 60 and 365 days after hospital discharge for an acute cardiovascular event (acute MI, PTCA, CABG)
BP controlled in hypertensives	Systolic BP < 140 mm Hg and diastolic BP < 90 mm Hg for enrollees with documented hypertension in first half of the measurement year
HgbA1c controlled in diabetics	The most recent documented HgbA1c level during the measurement year is < 9.5% for continuously enrolled diabetics
LDL-C controlled in diabetics	The most recent check for LDL-C taken during measurement year or the year prior is < 130 mg/dL for continuously enrolled diabetics

Abbreviations: ACE, angiotensin-converting enzyme; BP, blood pressure; CABG, coronary artery bypass graft; CHF, congestive heart failure; HgbA1c, hemoglobin A1c; LDL-C, low-density lipoprotein cholesterol; MI, myocardial infarction; PTCA, percutaneous transluminal coronary angiography.
*Contraindications not shown. For full details on HEDIS measures specifications, see NCQA HEDIS 2000 Technical Specifications Report (1999).
†ACE inhibitor with CHF denominator specified as continuously enrolled members >25 years old with ≥1 face-to face encounter in an acute inpatient, ER, ambulatory setting or nonacute inpatient setting with diagnosis of congestive heart failure (ICD codes: 428.xx, 398.91, 402.x1, 404.x1, 404.x3, 425.4x, 425.5x). Exclusions included pregnant women, enrollees with heart transplant, or implantation or removal of ventricular assist device. Numerator includes eligible enrollees who received a prescription for an ACE inhibitor or angiotensin II receptor blocker, based on 1999 pharmacy claims.

NCQA specifications to compute the 6 HEDIS measures; basic specifications for the ACE inhibitor measure are shown in the notes for Table 1. NCQA HEDIS specifications for several of the process measures, including all the diabetes measures and β-blocker after MI, allow for data collection from both the administrative data and medical chart (this is called hybrid data collection). This is important to note because the performance rates reported here are lower than would be found in other reports. However, we would not expect the approach to affect the gender differences observed.

We also obtained previously calculated scores for 4 additional HEDIS measures that focused on intermediate outcomes of care. These 4 HEDIS performance measures (LDL-C control after cardiac event, blood pressure control in patients with hypertension, and HgbA1c and LDL-C control in diabetics) all required data abstracted from medical charts for a sample of eligible members. Therefore, it was not possible for us to calculate these 4 performance based measures using administrative data alone. Three Medicare and 7 commercial plans, representing 93,000 and 1.7 million enrollees, respectively, provided HEDIS data collected for eligible enrollees sampled according to HEDIS criteria. Table 1 provides summary definitions of the 11 quality measures.

Analyses

We conducted analyses separately for Medicare and commercial enrollees. We used a χ^2 test for categorical data to compare unadjusted performance rates by gender on each measure. We used multivariate logistic regression models to adjust for several covariates including enrollee age and measures of race/ethnicity and socioeconomic status (SES). We used geocoding to obtain measures of enrollee race/ethnicity and SES (Fiscella & Fremont, 2006). This technique provides estimated individual-level measures of race/ethnicity and SES for each enrollee based on the characteristics of their residential community. Residential address was used to determine the census block group (an area equivalent to a small neighborhood with <1,000 inhabitants) in which enrollees lived. Based on block group, we then linked census information about those areas to compute previously validated measures of race/ethnicity (e.g., living in a predominantly black neighborhood, i.e., >66% black) and SES (living in a high poverty [poverty rate ≥20%]; Fremont et al., 2005; Krieger, 1992; Krieger, Williams, & Moss, 1997).

All logistic models also included dummy variables representing individual plans. Confidence intervals were adjusted to account for clustering of enrollees within health plans. Adjusted odds ratios from the regressions were transformed to estimates of relative risks (RR; Zhang & Yu, 1998).

Results

As shown in Table 2, the number of enrollees meeting eligibility criteria varied by measure and insurance type, ranging from 34,981 commercial (45% of whom were women) and 15,252 Medicare (53% of whom were

Table 2. Eligible Enrollee Characteristics by Measure and Insurance Type

	Process Measures				Intermediate Outcome Measures			
	β-Blocker After MI	LDL-C Checked After CE	ACE Inhibitor With CHF	Diabetes Measures*	LDL-C Controlled After CE	BP Controlled	HgbA1c Controlled in Diabetics	LDL-C Controlled in Diabetics
Medicare								
No. of enrollees	275	992	9,559	15,252	558	1,263	1,242	1,242
No. of health plans	7	7	9	9	3	3	3	3
Age (yrs), mean	73	69	76	68	70	73	69	69
Female (%)	40	39	52	53	39	62	54	54
Live in predominantly Black neighborhood (%)	8	6	13	21	7	11	13	13
Live in high poverty neighborhood (%)	11	13	18	25	15	15	17	17
Commercial								
No. of enrollees	727	2,304	6,091	34,981	1,621	2,546	2,812	2,405
No. of health plans	10	9	10	10	6	6	7	6
Age (yrs), mean	53	56	58	52	56	56	51	51
Female (%)	21	23	42	45	20	48	43	43
Live in predominantly Black neighborhood (%)	3	3	10	9	3	6	7	8
Live in high poverty neighborhood (%)	11	11	16	15	8	11	14	15

Abbreviations: CHF, congestive heart failure; CE, cardiac event; HgbA1c, hemoglobin A1c; LDL-C, low-density lipoprotein cholesterol; MI, myocardial infarction.
*HgbA1c, eye examination, lipid profile, and nephropathy test.

women) enrollees for HgbA1c testing in diabetics to 727 commercial (21% women) and 275 Medicare (40% women) enrollees for β-blocker treatment after MI.

Before adjustment for covariates, gender differences in care were detected for 6 of 11 measures among Medicare enrollees, and for 7 of 11 measures among commercial enrollees. Although deficits in the quality of care were evident for both men and women, quality of care was worse for women than men on 5 of the 6 measures for Medicare enrollees and on 5 of the 7 for commercial enrollees (Figure 1). Most of the significant differences were relatively small. However, among Medicare enrollees, there was a 7.9 percentage point difference in LDL-C control among diabetics (41.3% for men versus 33.4% for women; $p < .01$) and a larger difference in LDL-C control in after a cardiac

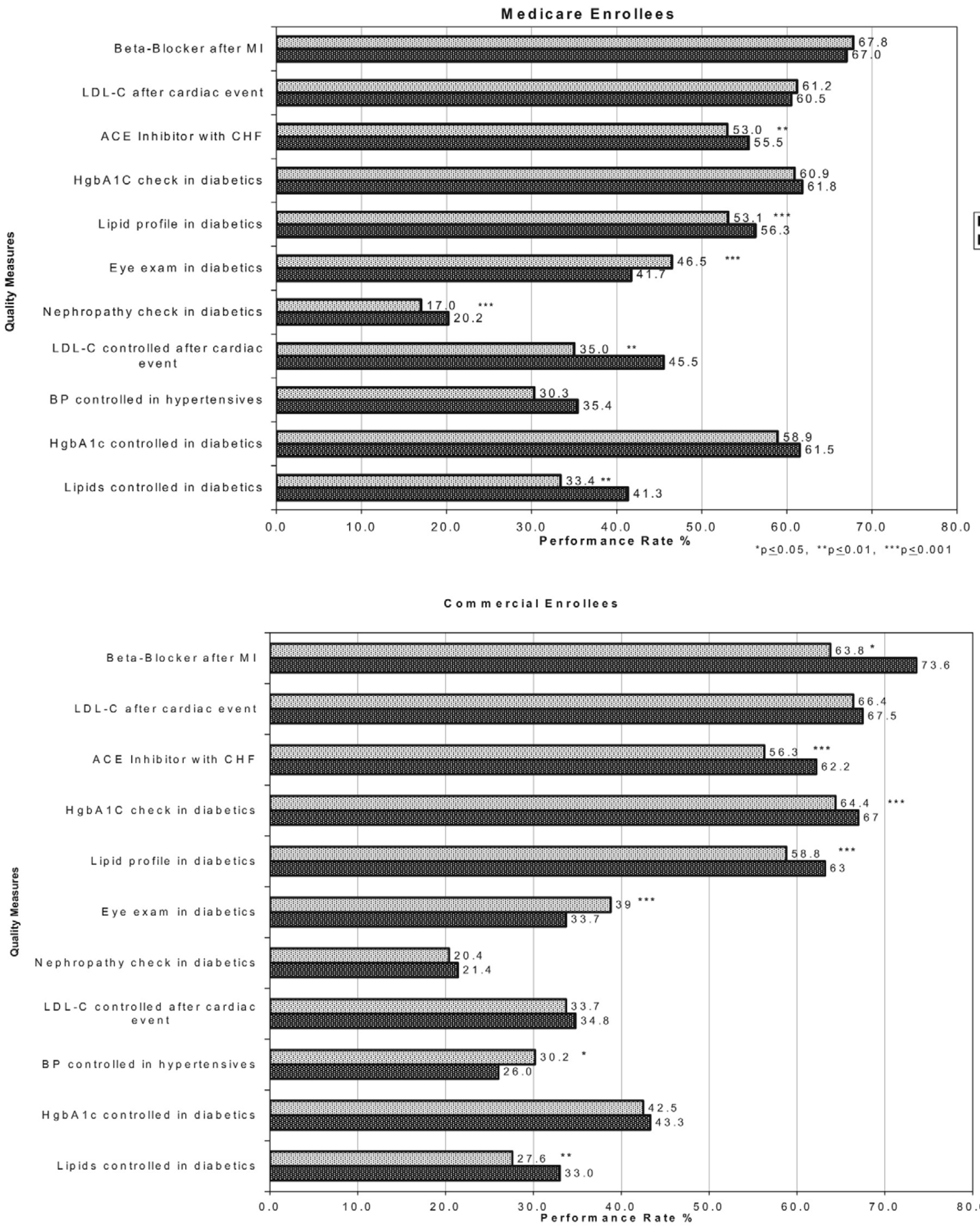

Figure 1. Unadjusted gender differences by quality measure and insurance type.

event (10.5 percentage points; 45.5% for men and 35.0% for women; $p < .01$). Similarly, among commercial enrollees, there were differences of ≥5.0 percentage points favoring men on 3 measures: β-blocker after MI, ACE inhibitor with CHF, and LDL-C control among diabetics. Conversely, diabetic women in both groups were more likely than men to receive an eye examination (46.5% versus 41.7%, $p < .001$ for Medicare, and 38.8% versus 33.7%, $p < .001$ for commercial).

Of note, the largest gender differences occurred among measures for which quality of care was low for both men and women. The implications of this pattern are reflected in the unadjusted relative risk ratios (Table 3). For example, there was a 5.4 percentage point difference favoring men in LDL-C control among diabetic commercial enrollees (see Figure 1); however, overall performance was poor, with fewer than one third of both men and women achieving control. In this case, the unadjusted relative risk is 0.84, indicating that women were 16% less likely than men to have their LDL-C controlled. In contrast, for ACE inhibitor use with CHF among commercial enrollees, where performance was higher (>55%) for both groups, a slightly larger, 5.9 percentage point difference is associated with a smaller relative risk of 0.91 for women compared with men, indicating that women were 9% less likely than men to receive the indicated care. The control measures that were based on a smaller number of chart reviews had wide confidence intervals that could not rule out large differences. These include all the intermediate outcome measures (Table 2; i.e., control of LDL-C, blood pressure, and HgA1c).

As shown in Table 3, when we used logistic regression to adjust for age, race/ethnicity, SES, and individual plan effects, we found significant gender differences on 5 of 11 measures among Medicare enrollees, with 4 favoring men. Similarly, among commercial enrollees, we found significant gender differences for 8 of 11 measures, with 6 favoring men. The largest disparity was for control of LDL-C among diabetics, where women were 19% less likely to achieve control among Medicare enrollees (RR = 0.81; 95% confidence interval [CI] = 0.64–0.99) and 16% less likely among commercial enrollees (RR = 0.84; 95% CI = 0.73–0.95).

The basic pattern of findings did not change after adjusting for covariates, with 3 exceptions. Covariate adjustment eliminated gender differences for lipid profile check among diabetic Medicare enrollees. Two nonsignificant gender differences among Medicare enrollees also became significant after covariate adjustment: ACE inhibitors with CHF and LDL-C control after a cardiac event. Additional analyses (not

Table 3. Relative Risk Ratios for Women Relative to Men* (95% Confidence Intervals)

	Unadjusted*	Adjusted for Health Plan and Sociodemographic Factors†
Medicare		
β-Blocker after MI	1.01 (0.84–1.16)	1.00 (0.81–1.16)
LDL-C checked after CE	1.01 (0.86–1.15)	1.02 (0.92–1.12)
ACE inhibitors with CHF	0.95 (0.74–1.16)	0.96 (0.92–0.99)
HgbA1c check in diabetics	0.99 (0.95–1.02)	1.01 (0.98–1.03)
Lipid profile in diabetics	0.94 (0.90–0.98)	0.99 (0.96–1.02)
Eye examination in diabetics	1.12 (1.05–1.18)	1.12 (1.08–1.17)
Nephropathy check in diabetics	0.84 (0.76–0.92)	0.84 (0.78–0.90)
LDL-C controlled after cardiac event	0.77 (0.54–1.03)	0.78 (0.61–0.96)
BP controlled in hypertensives	0.86 (0.72–1.00)	0.87 (0.78–1.02)
HgbA1c controlled in diabetics	0.96 (0.83–1.08)	0.99 (0.89–1.08)
LDL-C controlled in diabetics	0.81 (0.64–0.99)	0.84 (0.71–0.97)
Commercial		
β-Blocker after MI	0.87 (0.74–0.98)	0.85 (0.72–0.97)
LDL-C checked after cardiac event	0.98 (0.91–1.05)	1.00 (0.93–1.06)
ACE inhibitors with CHF	0.91 (0.86–0.95)	0.90 (0.86–0.94)
HgbA1c check in diabetics	0.96 (0.95–0.98)	0.96 (0.95–0.98)
Lipid profile in diabetics	0.93 (0.91–0.95)	0.95 (0.93–0.97)
Eye examination in diabetics	1.15 (1.12–1.18)	1.17 (1.14–1.21)
Nephropathy check in diabetics	0.95 (0.91–0.99)	0.95 (0.91–0.99)
LDL-C controlled after cardiac event	0.97 (0.81–1.14)	0.89 (0.74–1.07)
BP controlled in hypertensives	1.16 (1.03–1.31)	1.15 (1.01–1.30)
HgbA1c controlled in diabetics	0.98 (0.90–1.07)	1.00 (0.91–1.10)
LDL-C controlled in diabetics	0.84 (0.73–0.95)	0.84 (0.73–0.96)

Abbreviations: ACE, angiotensin-converting enzyme; BP, blood pressure; CE, cardiac event; CHF, congestive heart failure; HgbA1c, hemoglobin A1c; LDL-C, low-density lipoprotein cholesterol; MI, myocardial infarction.

*Derived by logistic regression accounting for clustering of data within health plans. The resulting odds ratios were also adjusted for the prevalence of the quality measure in the male reference group to make them better estimates of the relative risk (Zhang & Yu, 1998).

†Sociodemographic factors were age, living in high poverty neighborhood, and living in a predominantly Black neighborhood.

shown) indicated that for ACE inhibitors with CHF, the confidence interval narrowed after adjusting for individual plan.

Adjusted results differed somewhat for commercial enrollees compared with the older population of Medicare enrollees. Specifically, 3 of the process measures that significantly favored men among commercial enrollees did not differ significantly by gender among Medicare enrollees (β-blocker after MI, HgA1c check in diabetics, and lipid profile in diabetics). In addition, the pattern of gender disparities on control measures differed for enrollees in the 2 types of plans. Although there was a gender difference favoring men on LDL-C control after a cardiac event among Medicare enrollees, men's and women's care did not differ significantly among commercial enrollees. Also, whereas blood pressure control in patients with hypertension favored women in the younger population of commercial enrollees, it did not differ by gender among Medicare enrollees.

Discussion

We found gender differences for a variety of quality of care measures for CVD and diabetes among both commercial and Medicare health plan enrollees in a geographically diverse set of health plans associated with 1 national insurer. Gender differences were observed for screening, treatment, and intermediate outcomes. In general, the quality of care was better on process measures than on intermediate outcome measures and the opportunity exists to improve quality of care for both men and women. Whereas previous research has focused on gender differences in expensive and aggressive treatments for CVD, our findings suggest that gender differences in ambulatory care for CVD using routine low-technology interventions occurred among both Medicare and commercial managed care enrollees. We found lower quality of care for women despite the fact that women of all ages typically have higher rates of physician visits compared with men (National Center for Health Statistics, 2001, 2006). Thus, women may have had more opportunities to receive indicated care.

Of note, our findings suggest that older women may be particularly at risk for not having their LDL-C controlled both among diabetics and after an acute cardiac event. This study illustrates the benefits of stratifying quality assessments by gender to identify whether major subpopulations are at increased risk of lower quality of care. This approach can be used in setting priorities for intervention and improvement and in helping to ensure that quality improvement efforts benefit all population subgroups. Our data confirm the additional challenges of achieving equity on control measures compared to process measures, which has previously been shown with regard to racial/ethnic disparities (Trivedi, Zaslavsky, Schneider, & Ayanian, 2005).

The quality measures evaluated here assess the proportion of enrollees who received the indicated care. Although the gender differences in quality of care measures were small to moderate in size, a substantial number of women might benefit if the gender differences were eliminated. For example, if women's care were brought to a level equivalent to men's for the 10 commercial plans we examined, an additional 787 women with diabetes would have received an LDL-C check. Thus, the potential impact of reducing the observed differences for the millions of women at risk for CVD and enrolled in managed care nationally could be substantial.

Our results underscore the need for efforts aimed at primary and secondary prevention by increasing rates of control of major risk factors for a new or recurrent cardiovascular event. Furthermore, our results suggest that by stratifying HEDIS measures by gender plans may obtain valuable information that can inform activities aimed at improving the quality and outcomes of care with CVD and diabetes.

This study is subject to limitations. Although we observed differences by gender on a variety of measures, we can only speculate as to the underlying causes. Differences could result from differential treatment of men and women, gender differences in health behaviors including patient preferences and adherence to provider recommendations or, in the case of control measures, gender differences in response to treatment. Important clinical covariates that might have an effect on care and that differ by gender are not generally available in the data sets used to estimate performance measures. For example, we lacked information on clinical severity of illness and had very limited information on comorbidities. On the other hand, the quality measures we studied should be provided for all patients who meet the eligibility criteria for each measure. Consequently, differences in clinical covariates are not justifiable causes of the gender differences that we observed.

We used geocoded measures of SES and race/ethnicity rather than individual-level measures. Geocoded measures reflect the characteristics of the communities where enrollees live rather than the characteristics of the enrollees themselves. In addition, our study examined older data for 1 year from 1 national system of Medicare and commercial health plans. For example, Trivedi and colleagues (2005) demonstrated that quality of care for CVD improved substantially between 1998 and 2003 and racial disparities in care narrowed for screening and treatment, but not control. Additional research is needed to determine whether improvements in quality of care have narrowed the gender differences in quality of care.

Furthermore, we did not explore socioeconomic or racial/ethnic disparities among women, which might inform intervention efforts by identifying key subpopulations of women at increased risk of low quality of care. We did conduct plan-level analyses that are reported elsewhere (Fremont, 2002). These analyses suggested that gender disparities were not limited to a few plans, although there appeared to be considerable variation in the extent of disparities at the plan level. Nevertheless, because of wide confidence intervals related to within-plan gender disparities, it was not possible to determine whether plans actually differed on many measures.

Despite increased awareness on the part of women and their clinicians of CVD among older women, more work is needed to improve care for both older and younger women with CVD and diabetes. Further research is needed to determine the cause of observed differences in performance, assess whether performance varies for subgroups of vulnerable women (low income and minority), and determine what interventions might be helpful to improve cardiovascular and diabetes care for women. Moreover, efforts to improve quality of care for CVD need to consider the observed gender differences in treatment and outcomes to improve care for both men and women.

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