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Women's Health Issues 16 (2006) 44–55

WOMEN'S HEALTH ISSUES

GENDER DIFFERENCES ACROSS RACIAL AND ETHNIC GROUPS IN THE QUALITY OF CARE FOR ACUTE MYOCARDIAL INFARCTION AND HEART FAILURE ASSOCIATED WITH COMORBIDITIES

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Received 4 October 2004; received in revised form 24 February 2005; accepted 18 April 2005

This paper provides important insights on gender differences across racial and ethnic groups in a Medicare population in terms of the quality of care received for acute myocardial infarction (AMI) and congestive heart failure (CHF) in association with diabetes or hypertension/end-stage renal disease (ESRD). Both race/ethnicity and gender are associated with differences in the diagnostic evaluation and treatment of Medicare recipients with these conditions. In the AMI group, non-Hispanic Black and Hispanic patients of both genders were less likely to receive aspirin or β-blockers than non-Hispanic Whites. These differences persisted for Hispanic women and men even when they presented with ESRD or diabetes. Rates for smoking cessation counseling were among the lowest among non-Hispanic Blacks and Hispanics with AMI–diabetes and non-Hispanic blacks with AMI–hypertension/ESRD. Gender comparisons within racial groups for the AMI and AMI–diabetes groups show that among non-Hispanic Whites, women were less likely to receive aspirin and β-blockers. No gender differences were noted among non-Hispanic Black and Hispanic Medicare recipients. In the CHF group, Hispanics were the racial/ethnic group least likely to have an assessment of left ventricular function (LVF), even if they had diabetes and had lower rates of angiotensin-converting enzyme inhibitor therapy or even if they had combined CHF–hypertension/ESRD. Gender comparisons in both the CHF and CHF–hypertension/ESRD groups show that non-Hispanic White women were less likely to have an LVF assessment than non-Hispanic White men. Among all subjects, having comorbidities with AMI was not associated with higher markers of quality cardiovascular care. Closing the many gaps in cardiovascular care must target the specific needs of women and men across racial and ethnic groups.

Introduction

Coronary heart disease is the number one killer of both women and men in the United States, with 494,382 deaths reported in 2002. Among both Blacks and Whites, men have higher death rates from coronary heart disease than women (250.6 per 100,000 population for Black men, 220.5 for White men, 169.7 for Black women, and 131.2 for White women). In 1999, the coronary heart disease death rate for Hispan-

The views expressed in this article are those of the authors and do not necessarily represent the views of the Agency for Healthcare Research and Quality or the Federal government.

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1049-3867/06 $-See front matter.
doi:10.1016/j.whi.2005.04.003

ics was 138.4 per 100,000 population (American Heart Association [AHA], 2005).

In 2002, 7,100,000 Americans had a myocardial infarction, a major consequence of coronary heart disease. Gender prevalence by racial and ethnic groups included 5.1% of White, 4.5% of Black, and 2.4% of Mexican American men compared to 2.1% of White, 2.7% of Black, and 1.6% of Mexican American women. Myocardial infarction also accounted for 179,514 deaths (52.3% men, 47.7% women) in that year (AHA, 2005).

An estimated 25% of men and 38% of women actually die within a year after presenting with an initial recognized myocardial infarction (Vaccarino, Krumholz, Yarzebski, Gore, & Goldberg, 2001). Women with myocardial infarction are generally older than men (76 versus 64 years) and have a higher prevalence of cardiovascular risk factors such as diabetes and hypertension (Bello & Mosca, 2004; de Gevigney et al., 2001). High levels of both systolic and diastolic blood pressure are strongly associated with the risk of heart disease in women and men (Mosca et al., 1997), and isolated systolic hypertension affects 30% of women over 65 years of age (Saltzberg, Stroh, & Frishman, 1988). To complicate matters, end-stage renal disease (ESRD) is closely related to hypertension and is associated with morbidity rates that vary among age, race, ethnicity, and gender groups. Blacks have a much higher rate of ESRD than Whites and represent 32% of treated ESRD patients (AHA, 2005). In addition, women with diabetes have a five-fold increase in the risk of developing heart disease, and hypertensive women who also have diabetes have a significantly higher prevalence of left ventricular hypertrophy and atrial enlargement. This may further increase cardiovascular morbidity and mortality (Tenenbaum et al., 2003).

The incidence of congestive heart failure (CHF) is increasing; current statistics for the United States show that nearly 5 million people are affected by CHF, and almost half of them are women. CHF is common among persons 65 years and over, and its prevalence increases exponentially after age 70 (Horowitz, Rein, & Leventhal, 2004). Also, cigarette smoking, hypertension, and diabetes are all found to be more potent risk factors for the development of CHF in women than in men (Pijna & Buchter, 2003).

Because diabetes and hypertension/ESRD can complicate the management and impact the survival of those who suffer from acute myocardial infarction (AMI) and CHF, it is critical that comprehensive high-quality care be provided to all people at both the primary and secondary prevention levels (Abbott, Donahue, Kannel, & Wilson , 1988; Claesson, Burell, Birgander, Lindahl, & Asplund, 2003; Cushman et al., 2002).

The purpose of this paper is to analyze the quality of care received by Medicare beneficiaries with AMI and CHF associated with comorbidities (diabetes and hypertension/ESRD). The overarching research questions we attempt to address relate to whether gender differences across racial and ethnic groups exist in the quality of care these individuals receive and whether having comorbidities in addition to AMI or CHF leads to improved quality of care.

This paper's unique contribution resides in the fact that it goes beyond the scope of the selected measures and data of the National Healthcare Quality Report and the National Healthcare Disparities Report (Agency for Healthcare Research and Quality, 2004a, 2004b, 2005a, 2005b). The additional data analyses include analysis by gender across racial/ethnic groups and analysis of the association of AMI and CHF with comorbidities. Although there is ample evidence that disparities exist in care for cardiovascular disease, the findings presented here afford greater insight into the quality of care provided to the Medicare population with AMI and CHF, and how it differs by gender and race/ethnicity.

Methods

National heart failure and acute myocardial infarction projects

The National Heart Failure and National Acute Myocardial Infarction Projects are initiatives of the Centers for Medicaid & Medicare Services (CMS) to monitor and improve quality of care for Medicare beneficiaries hospitalized with CHF and AMI. Data from both projects have been utilized in the development of the National Healthcare Quality Report and National Healthcare Disparities Report (Agency for Healthcare Research and Quality, 2003a, 2003b, 2004a, 2004b, 2005a, 2005b). For this paper, additional data analysis was performed in collaboration with colleagues from CMS and Colorado Foundation for Medical Care to assess the effect of comorbidities. By concentrating on the assessment of gender and racial/ethnic differences in relation to the care obtained by those with AMI and CHF during 2000–2001, this paper focuses on several aspects of quality of care relevant to women.

Hospitalizations for AMI and CHF were identified from Medicare Part A claims as records with a principal discharge diagnosis of AMI or CHF using the clinical codes of the *International Classification of Diseases, Ninth Revision* (ICD-9). Patients were not classified as having CHF if they were on hemodialysis or peritoneal dialysis (as identified by ICD-9 codes), had been transferred to another hospital, or left the hospital against medical advice. All identified hospitalizations within each state for a 6-month period were sorted by age, gender, race, and hospital. A sample of

750 cases per state (plus Washington, D.C., and Puerto Rico) was selected. For states with fewer than 750 eligible records, all identified records were selected.

Two clinical data abstraction centers performed detailed medical record abstraction, including demographic characteristics, medical history, laboratory evaluations, admission medications, and discharge medications. Data quality was ensured through the use of trained abstractors, electronic data collection instruments, and record re-abstraction. For CHF, abstracted data elements also were used to further exclude patients without valid social security numbers. If a patient was included for more than one hospitalization, one hospitalization was randomly selected for inclusion and others were excluded. For the two heart failure measures used in these analyses, patients who died in the hospital or whose discharge disposition was unknown were also excluded.

The AMI abstracted data elements were used to exclude patients without AMI confirmation. For both CHF and AMI samples, race/ethnicity was determined using both CMS enrollment data and abstracted data elements. A patient was identified as Hispanic if the CMS race/ethnicity variable indicated Hispanic and/or if the abstracted ethnicity variable indicated Hispanic. For those not identified as Hispanic, the abstracted race variable was used to identify non-Hispanic Whites and non-Hispanic Blacks. For cases where this variable was missing or could not be determined, the CMS race and ethnicity variable was used. Patients not classified as Hispanics, non-Hispanic Whites, or non-Hispanic Blacks were excluded from analyses, except for the demographic summary. Gender was identified from the CMS enrollment data.

Patients were considered dually eligible if they were enrolled in both Medicare and Medicaid for at least 1 month from the month prior to the sampling period to the month of admission. Medicare generally covers individuals age 65 and above, although some younger individuals also qualify. Medicaid generally covers low-income individuals. Comorbidities associated with either AMI or CHF included diabetes and hypertension/ESRD. Patients were classified as having diabetes if they had a secondary diagnosis of diabetes and were classified as hypertension or ESRD if they had a secondary diagnosis of hypertension or ESRD using the clinical ICD-9 codes.

Quality of care measures

The description of the measures utilized to assess quality of care for patients with AMI and CHF are summarized in Table 1. Six measures were used for AMI and two for CHF.

Table 1. Quality measures for AMI and CHF

Quality Measures	Description
AMI	
Patients administered aspirin within 24 hours of admission (%)	Aspirin within 24 hours of arrival for patients not transferred from another hospital, not discharged on day of arrival, and with no contraindications to aspirin.
Patients with aspirin prescribed at discharge (%)	Aspirin prescribed at discharge for patients who were alive at discharge, not transferred to another hospital, and had no contraindications to aspirin.
Patients administered β-blocker within 24 hours of admission (%)	β-Blocker within 24 hours of arrival for patients not transferred from another hospital, not discharged on day of arrival, and with no contraindications to beta blocker.
Patients with β-blocker prescribed at discharge (%)	β-Blocker prescribed at discharge for patients who were alive at discharge, not transferred to another hospital, and with no contraindications to β-blocker.
Patients with LVSD prescribed ACE inhibitor at discharge (%)	ACE inhibitor prescribed at discharge for patients who were alive at discharge, not transferred to another hospital, and with no contraindications to ACE inhibitors.
Patients given smoking cessation counseling while hospitalized (%)	Smoking cessation counseling for patients who were cigarette smokers within the year prior to hospital arrival.
CHF	
Patients having evaluation of left ventricular ejection fraction (%)	LVF assessed prior to arrival or during hospitalization for patients alive at discharge, not admitted on ACE inhibitor or ARB, and with no documentation of LVF assessment planned for after discharge instead of during hospital stay.
Patients with LVSD prescribed ACE inhibitor at discharge (%)	ACE inhibitor prescribed at discharge or the existence of a documented reason for not being on ACE inhibitor for patients alive at discharge, not admitted on ACE inhibitor or ARB, not discharged on ARB, and having LVSD and no contraindications to ACE inhibitors.

Abbreviations: ACE, angiotensin-converting enzyme; AMI, acute myocardial infarction; ARB, angiotensin receptor blocker; CHF, congestive heart failure; LVF, left ventricular function; LVSD, left ventricular systolic dysfunction.

Statistical analyses

For all stratifications (e.g., gender by race) rates for measures were computed as the number of patients receiving the treatment, medication, or counseling divided by the number of eligible patients. Gender differences were assessed using χ^2 tests. To account for the sampling design, all tests incorporated probability weights based on the inverse sampling fraction for each state. The analyses were performed using SAS software (Version 8.2). Statistically significant findings with a *p* value significant at the alpha level of .05 are described below.

Results

Demographics

A total of 35,407 cases of AMI (48.7% women and 51.3% men) and 39,405 cases of CHF (57.9% women and 42.1% men) were sampled. Table 2 summarizes demographic data by gender, race/ethnicity, and coverage eligibility for both the AMI and CHF groups. The AMI sample consisted of 87.3% non-Hispanic Whites, 7.3% non-Hispanic Blacks, and 4.1% Hispanics. The majority of the AMI population was covered by Medicare only (82.3%); 17.7% were dually eligible. The CHF sample consisted of 80.1% non-Hispanic Whites, 13.6% non-Hispanic Blacks, and 5.2% Hispanics. The majority of the CHF population was covered by Medicare only (75.2%); 24.8% were dually eligible.

Quality measures for acute myocardial infarction

Table 3 displays data by gender across racial/ethnic groups and coverage eligibility for AMI (all cases), AMI associated with diabetes, and AMI associated with hypertension/ESRD. All measures exclude individuals for whom a treatment was not appropriate, for example, those with a contraindication for aspirin were excluded from the denominator for the aspirin group and nonsmokers were excluded from the smoking cessation counseling measure.

Overall, both non-Hispanic Blacks and Hispanics with AMI were less likely than non-Hispanic Whites to receive aspirin and β-blockers on hospital admission or discharge. Hispanics with AMI–diabetes were not only less likely than non-Hispanic Whites to receive aspirin or β-blocker therapy, but were less likely to receive angiotensin-converting enzyme (ACE) inhibitors and had the lowest rates of counseling to quit smoking. Non-Hispanic Blacks with AMI–diabetes fared worse than their non-Hispanic White counterparts in terms of counseling to quit smoking and receipt of ACE inhibitors. Among individuals with AMI–hypertension/ESRD, Hispanics were less likely than non-Hispanic Whites to receive aspirin and β-blockers, and non-Hispanic Blacks had low rates of counseling to quit smoking, but were more likely than non-Hispanic Whites to receive ACE inhibitors.

Differences by gender

Gender comparisons in the AMI group indicate that among non-Hispanic Whites, women, including those who were not dually eligible, were less likely than their male counterparts to receive aspirin and β-blockers upon hospital admission or discharge. Such gender differences were not observed among non-Hispanic Blacks or Hispanics. Similar findings are seen in the AMI–diabetes group. In addition, dually eligible women in the AMI–diabetes group were less likely than their male counterparts to receive ACE inhibitors, but non-Hispanic Black and dually eligible women were more likely than men to be counseled to quit smoking. Among individuals with AMI–hypertension/ESRD, gender differences were statistically significant only for non-Hispanic White women, who received less aspirin therapy than non-Hispanic White men. Such gender differences were not observed in non-Hispanic Blacks or Hispanics with AMI–hypertension/ESRD.

Differences by race/ethnicity

In the group with AMI, compared to non-Hispanic White women, Hispanics were disadvantaged in terms of receipt of all three drugs/drug classes (aspirin, β-blockers, ACE inhibitors), but non-Hispanic Black women were disadvantaged only in the receipt of ACE inhibitors. Among women with AMI–diabetes, compared with their non-Hispanic White counterparts, non-Hispanic Black women were significantly more likely to receive β-blockers and more likely to receive ACE inhibitors. Among women with AMI–hypertension/ESRD, non-Hispanic Black women

Table 2. Demographic data for a Medicare population with AMI or CHF, 2000–2001

	AMI		CHF	
Demographic Variable	*n*	%	*n*	%
Total	35,407		39,405	
Gender				
Women	17,228	48.7%	22,804	57.9%
Men	18,179	51.3%	16,601	42.1%
Unknown	0	0.0%	0	0.0%
Race/ethnicity				
White non-Hispanic	30,928	87.3%	31,546	80.1%
Black non-Hispanic	2,579	7.3%	5,370	13.6%
Hispanic	1,447	4.1%	2,057	5.2%
Other	443	1.3%	416	1.1%
Unknown	10	0.0%	16	0.0%
Eligibility				
Dual (Medicare and Medicaid)	6,253	17.7%	9,780	24.8%
Medicare only	29,153	82.3%	29,621	75.2%
Unknown	1	0.0%	4	0.0%

Table 3. Gender and race/ethnicity differences in quality of care for AMI and associated comorbidities in a Medicare population

Measure	NHW (%)			*p* Value	NHB (%)			*p* Value	Hispanic (%)			*p* Value	Dually Eligible (%)			*p* Value	Not Dually Eligible (%)			*p* Value	NHB to NHW (*p* value)			Hispanic to NHW (*p* value)		
	Total	W	M		Total	W	M		Total	W	M		Total	W	M		Total	W	M		Total	W	M	Total	W	M
AMI*																										
Aspirin at arrival	83.66	81.35	86.03	**.000**	81.01	79.61	82.80	.303	83.16	85.17	81.29	.338	80.36	79.08	82.84	.105	84.02	81.90	85.97	**.000**	**.039**	.327	.082	.741	.070	**.032**
Aspirin at discharge	84.33	82.55	86.09	**.001**	82.54	81.04	84.42	.366	75.52	74.57	76.42	.753	77.26	77.37	77.06	.921	85.15	83.37	86.73	**.001**	.226	.465	.430	**.000**	**.007**	**.001**
β-Blocker at arrival	68.62	66.67	70.39	**.018**	66.92	62.94	71.66	.104	58.61	56.80	60.33	.665	61.04	59.80	63.19	.438	69.36	67.56	70.86	**.035**	.430	.215	.674	**.001**	**.018**	**.012**
β-Blocker at discharge	78.63	76.32	81.20	**.016**	75.74	77.91	72.41	.403	68.69	69.22	68.08	.915	71.64	71.61	71.71	.986	79.30	77.37	81.32	.051	.263	.624	**.038**	**.011**	.180	**.023**
ACE for LSVD at discharge	70.66	69.48	71.67	.278	80.40	84.43	76.89	.178	61.59	57.04	64.49	.535	67.22	64.31	71.30	.145	71.63	71.47	71.75	.895	**.000**	**.000**	.171	**.020**	**.049**	.144
Smoking cessation counseling	40.84	39.84	41.56	.436	29.84	34.42	26.68	.219	32.84	28.99	34.07	.674	41.88	42.30	41.49	.847	38.70	37.99	39.13	.623	**.000**	.165	**.000**	**.036**	.142	.093
AMI with diabetes																										
Aspirin at arrival	82.92	80.25	85.83	**.001**	80.71	77.81	85.46	.098	84.49	84.25	84.76	.931	77.73	76.74	80.17	.409	84.25	81.49	86.83	**.001**	.289	.390	.904	.490	.201	.749
Aspirin at discharge	80.65	77.93	83.50	**.008**	83.05	80.71	87.46	.232	71.47	68.78	74.51	.512	75.24	74.99	75.85	.864	81.72	78.65	84.50	**.006**	.322	.384	.271	**.006**	.051	.055
β-Blocker at arrival	68.76	66.31	71.00	.140	67.37	64.74	71.16	.472	63.82	61.56	66.33	.692	60.32	62.99	54.99	.276	70.30	67.04	73.01	.052	.697	.741	.976	.250	.430	.447
β-Blocker at discharge	77.77	72.72	82.73	**.007**	77.76	83.04	68.13	.095	62.50	60.96	64.52	.821	71.48	73.43	66.54	.453	78.54	73.78	82.52	**.018**	1.000	**.024**	**.035**	**.006**	.119	**.029**
ACE for LSVD at discharge	70.94	69.83	71.91	.568	85.04	87.08	82.11	.581	56.74	56.37	57.01	.972	71.01	66.50	79.86	**.050**	71.17	72.58	70.14	.525	**.000**	**.000**	.110	**.031**	.180	.085
Smoking cessation counseling	39.26	39.59	39.03	.902	27.98	37.34	16.36	**.031**	20.09	34.28	13.66	.190	40.59	48.11	32.73	**.027**	35.40	34.39	36.02	.736	**.010**	.726	**.000**	**.001**	.660	**.000**
AMI with hypertension/ ESRD																										
Aspirin at arrival	85.48	84.22	87.00	**.020**	82.81	81.24	84.79	.342	84.29	86.08	82.30	.544	82.77	82.43	83.55	.723	85.72	84.54	86.96	**.047**	.087	.168	.322	.575	.509	.147
Aspirin at discharge	85.50	84.10	87.05	**.031**	83.50	82.11	85.28	.461	75.89	77.16	74.50	.745	78.58	78.97	77.71	.759	86.24	84.86	87.60	**.042**	.254	.412	.484	**.000**	.063	**.002**
β-Blocker at Arrival	71.48	70.20	72.83	.196	68.79	65.28	72.93	.217	59.84	64.75	53.93	.337	63.05	61.35	66.64	.360	72.29	71.60	72.95	.498	.303	.177	.976	**.004**	.303	**.002**
β-Blocker at Discharge	80.77	78.61	83.54	.053	75.72	77.66	72.39	.513	71.52	68.30	76.76	.471	72.45	70.59	78.76	.385	81.45	79.95	83.24	.194	.095	.803	.029	.069	.124	.379
ACE for LSVD at discharge	71.47	71.93	71.03	.760	83.39	85.55	81.22	.564	79.69	77.84	81.04	.825	74.32	72.56	77.24	.477	72.26	73.24	71.44	.550	**.000**	**.002**	**.034**	.095	.447	.116

Table 3. Continued

Measure	NHW (%)			*p* Value	NHB (%)			*p* Value	Hispanic (%)			*p* Value	Dually Eligible (%)			*p* Value	Not Dually Eligible (%)			*p* Value	NHB to NHW *p* value)			Hispanic to White (*p* value)		
	Total	W	M		Total	W	M		Total	W	M		Total	W	M		Total	W	M		Total	W	M	Total	W	M
Smoking cessation counseling	41.78	41.78	41.77	1.000	32.15	36.54	28.60	.324	33.92	25.02	38.21	.439	45.07	47.04	42.98	.483	38.39	37.94	38.73	.811	**.002**	.271	**.001**	.162	.061	.610

Bolded *p* value indicates a statistically significant difference between women and men or between NHW and NHB or NHW and Hispanics ($p \le .05$).
Abbreviations: ACEI, angiotensin-converting enzyme inhibitor; AMI, acute myocardial infarction; CHF, congestive heart failure; ESRD, end-stage renal disease; LVSD, left ventricular systolic dysfunction; M, men; NHB, non-Hispanic Black; NHW, non-Hispanic white; W, women.
Source: 2000–2001 National Heart Failure and Acute Myocardial Infarction Projects. Centers for Medicare and Medicaid Services.
*All cases

were more likely than non-Hispanic White women to receive ACE inhibitors. No differences in the receipt of ACE inhibitors were found between Hispanic women and non-Hispanic White women with AMI–diabetes or AMI–hypertension/ESRD.

When comparing men with AMI, Hispanics and non-Hispanic Blacks were less likely to receive β-blockers; Hispanics were less likely to receive aspirin; and non-Hispanic Blacks were much less likely to be counseled to quit smoking than their non-Hispanic White counterparts. Among men with AMI–diabetes, non-Hispanic Blacks and Hispanics fared worse than their counterparts for three measures: aspirin, β-blocker therapy, and counseling to quit smoking. Among men with AMI–hypertension/ESRD, Hispanics were less likely to receive aspirin and β-blockers, and non-Hispanic Blacks received less counseling to quit smoking, but were more likely than non-Hispanic White men to receive ACE inhibitors.

Quality measures for heart failure

Table 4 displays data by gender across racial/ethnic groups and coverage eligibility for CHF (all cases), CHF associated with diabetes, and CHF associated with hypertension/ESRD.

Overall, Hispanics with CHF or CHF–diabetes were less likely than non-Hispanic Whites to receive a left ventricular function (LVF) assessment. Hispanics with CHF–hypertension/ESRD were less likely than non-Hispanic Whites to receive ACE inhibitors.

Differences by gender

In both the CHF and CHF–hypertension/ESRD groups, non-Hispanic White women and women who were not dually eligible were less likely than their male counterparts to have LVF assessment, but no gender differences were found for non-Hispanic Blacks or Hispanics. No gender differences for any of the measures studied here were observed in the CHF–diabetes group.

Differences by race/ethnicity

When comparing women with CHF or with CHF–hypertension/ESRD, no statistically significant differences were found in the receipt of any of the quality measures evaluated in these groups. In women with CHF–diabetes, however, non-Hispanic Black women were found to be more likely than non-Hispanic White women to receive ACE inhibitor.

When comparing men with CHF or with CHF–diabetes, Hispanic men were the least likely to receive LVF assessment, but no differences were seen in the CHF–hypertension/ESRD group for any of the quality measures studied.

Table 4. Gender and race/ethnicity differences in quality of care for CHF and associated comorbidities in a medicare population

Measure	NHW (%)			*p* Value	NHB (%)			*p* Value	Hispanic (%)			*p* Value	Dually Eligible (%)			*p* Value	Not Dually Eligible (%)			*p* Value	NHB to NHW (*p* Value)			Hispanic to NHW (*p* Value)		
	Total	W	M		Total	W	M		Total	W	M		Total	W	M		Total	W	M		Total	W	M	Total	W	M
CHF (all cases)																										
LVF assessment	70.90	68.60	74.00	**<.0001**	70.60	70.20	71.30	.707	66.10	67.50	64.30	.547	64.40	63.60	66.40	.206	72.60	70.90	74.60	**.001**	0.818	0.250	0.112	**0.006**	0.610	**.000**
ACE for LVSD at discharge	64.80	66.00	64.00	.356	64.70	65.60	63.80	.716	59.70	62.80	57.00	.594	59.90	61.50	57.40	.366	65.60	67.30	64.60	.209	.960	.904	.944	0.171	0.569	.177
CHF with diabetes LVF assessment	69.30	67.90	71.40	.065	69.20	66.90	74.00	.118	64.20	64.80	63.50	.866	62.90	61.70	66.30	.214	71.70	71.00	72.40	.496	0.944	0.653	0.379	0.042	0.368	**.035**
ACEI for LVSD at discharge	57.20	55.10	58.60	.384	62.70	66.00	58.60	.368	64.70	64.40	65.00	.970	53.90	54.90	51.90	.700	59.50	59.10	59.70	.881	0.110	**0.021**	1.000	0.162	0.226	.401
CHF with hypertension/ ESRD LVF assessment	72.90	71.30	75.50	**.007**	71.20	70.00	73.00	.406	68.10	66.50	70.20	.639	66.40	65.40	69.00	.297	74.50	73.10	76.30	**.047**	0.230	0.516	0.289	0.052	0.159	.168
ACE for LVSD at discharge	63.90	66.70	61.80	.161	62.00	61.90	62.10	.979	48.40	51.80	44.50	.716	52.80	55.00	49.30	.424	65.50	68.70	63.30	.110	0.497	0.234	0.944	**0.014**	0.089	.057

Bolded *p* value indicates a statistically significant difference between women and men or comparing NHB and Hispanics to NHW ($p \leq .05$).

Abbreviations: ACEI, angiotensin-converting enzyme inhibitors; AMI, acute myocardial infarction; CHF, congestive heart failure; ESRD, end-stage renal disease; LVSD, left ventricular systolic dysfunction; M, men; NHB, non-Hispanic Black; NHW, non-Hispanic White; W, women.

Source: 2000–2001 National Heart failure and Acute Myocardial Infarction Projects, Centers for Medicare and Medicaid Services.

Discussion

In the past, there was the perception that cancer kills more women than heart disease. This perception has been reversed since 1997, but a recent study showed that a significant gap between perceived and actual risk of heart disease still exists and is particularly striking among minority women (Mosca, Appel, et al, 2004; Mosca, Ferris, Fabunmi, Robertson, & the AHA, 2004). One major issue is that patients who do not have the classic symptoms of chest pain and discomfort may delay seeking care and therefore be more likely to be undertreated (Canto et al., 2000). Other factors, such as socioeconomic status, language, and cultural practices, have been shown to delay the recognition and treatment of AMI symptoms in certain populations such as Hispanics or to influence the awareness of risk factors and compliance with treatment (Bretsky, 2002; Henderson, Magana, Korn, Genna, & Rolka, Fagot-Campagna, & Narayan, 2004).

Although advances in technology have contributed to improvements in the diagnostic and therapeutic approaches to myocardial infarction, women do not seem to benefit from such advances, as they continue to suffer inequalities in the utilization of such procedures and to have worse outcomes from AMI than men do (Grady, Chaput, & Kristof, 2003). It is possible, therefore, that the worse outcomes for AMI observed among women compared to men are caused by inequalities in the quality of care they receive. Such inequalities were observed in our study with disappointing frequency. In addition, overall group comparisons indicate that having comorbidities does not imply receiving better quality cardiovascular care. Continuous monitoring of the quality of care for cardiovascular disease in both women and men across racial and ethnic groups is critical to developing strategies to eliminate gaps and improve disease outcomes.

Quality of care for acute myocardial infarction

The most striking finding of this study relates to the very low rates for counseling to quit smoking received by both male and female smokers with AMI in all race/ethnicity groups. Among older adults, smoking rates are higher among Blacks and Hispanics than Whites (data not shown). In our study, only 29.8% of non-Hispanic Black smokers and 32.8% of Hispanic smokers with AMI received counseling, compared with 40.8% of non-Hispanic White smokers. This is a matter of concern, particularly for patients in the AMI–diabetes group, which showed the lowest rates of counseling for Hispanic (13.66%) and non-Hispanic Black (16.36%) men, and low counseling rates even for non-Hispanic White men (39.03%).

Smoking greatly increases the risk of cardiovascular mortality and microvascular complications overall,

but particularly affects those with diabetes (Suarez & Barrett-Connor, 1984). Compared with nonsmokers, the incidence of myocardial infarction is six times higher for women and three times higher for men smoking at least 20 cigarettes per day (Njolstad, Arnesen, & Lund-Larsen, 1996). After myocardial infarction, smoking is associated with an increased risk for recurrent coronary events (Rea et al., 2002). For those who quit smoking, this risk declines to equal that of nonsmokers by 3 years after smoking cessation, but for those who continue to smoke, a 50% increase in this risk is observed when compared to nonsmokers.

Good quality evidence has shown that even minimal counseling that lasts less than 3 minutes can increase overall tobacco abstinence rates (Fiore et al., 2000; Whitlock & Williams, 2003). Increasing counseling session length and frequency was also shown to enhance efficacy in a dose–response manner (Fiore et al., 2000). Multiple opportunities to provide counseling to quit smoking exist. Women, for instance, generally see more than one health care provider, and overall 70% of smokers see a physician each year (Fiore et al., 2000). Health care professionals should emphasize the proven benefits of quitting smoking, particularly after a first myocardial infarction. Counseling should also target the needs of specific gender, race, and ethnic groups. Health care professionals and hospitals and other health care organizations should develop or adopt strategies to ensure that counseling provided to all patients takes into consideration health and behavioral beliefs.

Although we found good rates of aspirin use, confirming findings from prior literature (Califf et al., 2002), there is still room for improvement. Aspirin is generally underprescribed at hospital discharge for women with AMI (Gan et al., 2000). Gender-stratified results in high-risk women indicate that aspirin use can lead to a 20% reduction in the risk of vascular events for both women and men (Antiplatelet Trialists' Collaboration, 1994). This reinforces the need for ensuring that both men and women receive aspirin as part of their standard care for AMI. Prior estimates on the use of aspirin were in the range of 37–62% for Medicare beneficiaries with diabetes discharged after AMI and 63% for outpatients from a large hospital with one or more macrovascular complications (Krumholz, Chen, Chen, Wang, & Radford, 2001; O'Connor, Pronk, Tan, Rush, & Gray 1998; Rolka et al., 2001).

Because strong evidence exists on the efficacy of aspirin use for any patient with diabetes and a history of myocardial infarction or other cardiovascular event (Colwell & American Diabetes Association, 2004; Krein, Vijan, Pogach, Hogan, & Kerr, 2002; Yudkin, 1995), efforts should be made to improve aspirin-prescribing practices for these patients. In particular, race/ethnicity should not preclude Hispanics and Black men from being prescribed aspirin, and the reasons for this disparity should be further investigated.

Use of β-blockers shortly after AMI is known to decrease mortality by 20–25% in both women and men (Beta-Blocker Pooling Project, 1988; Olsson et al., 1992). According to a study evaluating Medicare patients, rates of use of β-blockers after AMI have risen from 21% of eligible patients in the early 1990s to 79% in 1997 (Soumerai et al., 1997). In our study, rates ranged from 55–73% for β-blocker use at hospital admission and 61–83.5% for use at hospital discharge. Yet, Hispanics in general and non-Hispanic White women from any of the study groups were less likely to receive the β-blockers.

Differences in the pharmacologic response to β-blockers have been reported for Black individuals, with β-blockers being less effective for Blacks than Whites with hypertension (Schaefer, Caracciolo, Frishman, & Charney, 2003). Although this difference applies to propranolol (less oral bioavailability and higher metabolic rates in blacks), other β-blockers with similar effectiveness (e.g., labetolol, carvedilol, and metoprolol) have not shown this clinical effect. Also, the concurrent use of thiazide diuretics is known to eliminate this side effect while attaining good therapeutic outcomes. Therefore, in the absence of absolute contraindication, the use of β-blockers should be part of the standard of care for all patients with AMI, and in particular for Blacks who also have diabetes.

Concerns also have been expressed regarding the use of β-blockers among those with diabetes based on the potential development of hypoglycemic episodes in these patients. However, the incidence of such episodes in a series of individuals with hypertension plus diabetes was no different from the incidence for those treated with other drugs such as ACE inhibitors, calcium channel blockers, and thiazide diuretics (Shorr, Ray, Daugherty, & Griffin, 1997). Moreover, myocardial infarction survivors who had diabetes benefited from β-blockade (e.g., reduction of mortality and re-infarction rates) to the same extent as those without diabetes (Jonas et al., 1996; Kendall, Lynch, Hjalmarson, & Kjekshus, 1995; Prichard, Cruickshank, & Graham, 2001).

Used within 36 hours of an AMI, ACE inhibitors can cause a 7% reduction in the risk of mortality in the 30 days after the AMI, but their use was associated with a two-fold increased risk of both hypertension and renal dysfunction (Grady et al., 2003). This may explain the relatively low rates observed for prescribing of ACE inhibitors for AMI. Several randomized trials of patients with AMIs (Cooperative New Scandinavian Enalapril Survival Study [Consensus-II], Gruppo Italiano per lo Studio della Sopravvivenza nell'Infarto Miocardico [GISSI-3], Second International Study of

Infarct Survival [ISIS-4], Chinese Cardiac Study [CCS-1]) have documented comparable statistically significant but small reductions of 7% in mortality owing to treatment with ACE inhibitors in both men and women (ACE Inhibitor Myocardial Infarction Collaborative Group, 1998). The reduction in risk among women was not statistically significant, likely because of the smaller number of women studied. However, data for women outpatients with heart disease and multiple risk factors treated with ACE inhibitors reveals that their risk of cardiovascular events dropped by 20% (Dagenais et al., 2001; Lonn et al., 2002; Yusuf et al., 2000). It seems that women may respond better than men to ACE inhibitor therapy, which reinforces the need for a gender-based approach in the management of AMI.

Quality of care for congestive heart failure

The underuse of ACE inhibitors in individuals with systolic heart failure is a persistent problem throughout the health care community, with 32% of older adults with heart failure being discharged from hospitals without prescriptions for ACE inhibitors (Masoudi et al., 2004). These individuals have a 14% greater risk of dying within a year compared to patients treated with these drugs. ACE inhibitors (e.g., captopril, enalapril, ramipril, lisinopril) are considered the first-choice treatment and are the cornerstone of CHF drug therapy.

ACE inhibitors have been shown to benefit populations underrepresented in clinical trials and those for whom the treatment is still controversial (Masoudi et al., 2004). These include the very old, women, African Americans, and persons with kidney disease and other high-risk conditions. In persons with CHF and left ventricular dysfunction, the use of ACE inhibitors has been shown to improve survival (Shlipak, 2003). Specifically, in women outpatients with documented CHF, the use of ACE inhibitors resulted in a reduction of mortality risk of 15–20% (Flather et al., 2000; Garg & Yusuf, 1995). In one of these studies, women also had a statistically significant 20% reduction in the risk of combined endpoints, such as mortality, readmission for congestive heart disease, and reinfarction.

Although there is evidence for use, rates of use of ACE inhibitors in CHF patients are generally low, with Hispanics showing the lowest rates (48.40% compared to 63.90% for non-Hispanic Whites). Although non-Hispanic Black women with CHF and diabetes were more likely than non-Hispanic White women to receive ACE inhibitors, rates of ACE inhibitors can be considerably improved among all women.

Rates of LVF assessment, one of the most accurate predictors of future cardiac events in the risk stratification of individuals with AMI (Multicenter Postinfarction Research Group, 1983; Roig et al., 1993), ranged from 63.5–76.3%, with Hispanic men, non-Hispanic White women, and women who were not dually eligible being less likely to receive the assessment. Proper LVF assessment facilitates clinical decision making to determine the course of therapy (Grundy, Pasternak, Greenland, Smith, & Fuster, 1999). Despite recent advances in the effectiveness of medications in improving survival and quality of life, problems in self-management of heart failure may contribute to the poor prognosis for this condition (Patel & Konstam, 2002; Horowitz et al., 2004). Many people may fail to realize that swelling and shortness of breath are likely to worsen over time into acutely severe states that require urgent care. Receiving proper care may help them with self-management, delay complications, and improve outcomes and quality of life.

Conclusions

This paper highlights important gender, racial, and ethnic differences in the care of AMI and CHF. One strength of this paper is that the quality measures evaluated, which are considered standards of care, are supported by a considerable, reliable body of evidence and are believed to lead to improved outcomes in patients with cardiovascular disease. Continuous monitoring of these measures, however, is needed to document the link between adoption of standards of care and improved outcomes. With the recent approval by the Food and Drug Administration of the drug combination hydralazine and isosorbide dinitrate to treat severe heart failure in the Black population, further improvement in the quality of care for minorities is expected. The drug combination was found to reduce death rates by 43% and decrease hospitalizations for CHF by 39% compared to placebo (Food and Drug Administration, 2005).

This paper's limitations are imposed by our inability to understand the reasons behind these disparities and the fact that the data presented here do not take into consideration the possible effects of socioeconomic status (e.g., income, education) on the variables studied. Other limitations are imposed by the fact that the quality measures studied here are based on review of hospital charts (i.e., if care is not charted, it cannot be counted). Hospitals may differ in the accuracy and completeness of their charting. Moreover, as is typical of hospital data collection, race and ethnicity are recorded in combination (e.g., a person is either White or Hispanic, but not both). This differs from the preferred way of collecting information, which considers race and ethnicity as separate characteristics.

An increasing number of initiatives now include heart centers or clinics targeting models of care that meet the specific needs of women with cardiovascular disease. Because all these factors can interfere with

adherence to therapy and treatment outcomes, models of care should include educational interventions to improve awareness and knowledge of heart disease and heart failure, particularly among minorities. For example, women recovering from acute ischemic coronary events reported receiving much less information than they expected from health care professionals, and only a few indicated that the clinical decision-making process was shared (Stewart, Abbey, Shnek, Irvine, & Grace, 2004). The development and implementation of cardiovascular programs that target specific gender, racial, and ethnic groups are critical in further advancing care for women and minorities.

The findings presented here provide us with an opportunity to further investigate the reasons why disparities occur, including disparities related to the apparently less-than-optimal care received by those who have comorbidities associated with AMI. We are beginning to understand gender differences in the clinical presentation and outcomes of coronary heart disease (Grady et al., 2003) and heart failure (Pijna & Buchter, 2003), and the AHA has released its 2004 guidelines targeting optimization of lifestyle and medical management of risk factors in women. Our findings, together with other information on racial, ethnic, and gender differences, provide us with a great opportunity to design interventions to fill gaps in current cardiovascular care and to go beyond our discomfort in admitting that we are doing too little and too late and are not yet delivering the best quality of care to women.

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