## IMPROVED QUALITY OF CARE FOR CARDIOVASCULAR DISEASE FOR LATINOS SEEN IN HIGH PROPORTION LATINO VS LOW PROPORTION LATINO CLINICS

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**Background:** Primary care practices that concentrate linguistically and culturally appropriate services for Latinos may result in higher cardiology consultation rates and improved process measure performance for patients with coronary artery disease (CAD) and congestive heart failure (CHF).

**Methods:** Multivariable Cox proportional-hazards regression was used to assess differences in referral at high proportion (HP) vs low proportion (LP) practices. Multivariable Poisson regression was used to assess the frequency of follow-up consultation.

**Results:** Among the 9,761 patients, 9,168 had CAD, 4,444 had CHF, and 3,851 had both conditions. Latinos comprised 11% of the CAD cohort and 11% of the CHF cohort. Multivariable analyses showed higher consultation rates for Latinos at HP practices for CAD and CHF. Blacks and Whites at HP practices had no significant differences in rates of consultation compared to those in LP practices. Latinos at HP practices had 25% more consultations for CAD and 23% more consultations for CHF than Latinos at LP practices. Latinos at HP clinics had higher overall mean quality performance on clinical measures for both CAD and CHF. Latinos at an LP clinic had the largest improvement in quality performance with consultation.

**Conclusions:** Among Latinos with CAD or CHF receiving care within a single large academic care network, Latino patients at HP practices have higher rates of cardiologist consultation and performance on CVD process measures compared to Latino patients at LP practices. Elucidating the essential components of individual practice environments that pro-
vide higher quality of care for Latinos will allow for well designed systems to reduce health care disparities. (*Ethn Dis.* 2015;25[1]:3–10)

**Key Words:** Health Care Disparities, Quality of Health Care, Coronary Disease, Congestive Heart Failure, Cardiology Consultation

## INTRODUCTION

Latinos currently comprise 15% of the US population. It is estimated that by 2050, 1 out of 3 US residents will be Latino.[1] The incidence of coronary artery disease (CAD) and congestive heart failure (CHF) is increasing in the United States, including among the growing population of Latinos.[2] Given the disproportionate burden of cardiovascular disease (CVD) among Latino populations, it is important to further develop clinical care interventions designed to improve evidence-based care.

Racial and ethnic disparities have a multifactorial etiology attributed in part to patient, physician and delivery system factors.[3] Prior research has found that relatively few physicians care for a large share of minority patients,[4,5] and these high minority serving practices have reported lower private insurance reimbursements, difficulty with specialty referrals and more challenges with delivering high-quality care.[6–8] These constrained resources help explain the greater quality-related difficulties delivering care reported by these physicians (eg, coordination of care, ability to spend adequate time with patients during office visits, and obtaining specialty care).[8] However, even within well-resourced health systems, evidence suggests that racial/ethnic minorities continue to have lower quality care for cardiovascular diseases as measured by performance measures and outcomes.[9,10]

The site of primary care is particularly relevant in understanding observed disparities. The clinical practice environment in which Latino patients receive care may be an important contributor to health care disparities. However, there is a paucity of research focused on Latino sites of care. Previous research has primarily focused on Black-White differences and it is not known whether these observed differences in care would be the same for Latino patients.[11] Latino patients may have unique cultural and linguistic differences that could have important repercussions for how care is delivered.

Prior studies have shown that co-management between generalists and cardiologists is one possible mechanism for improving both processes and intermediate outcomes of care for patients with CAD and CHF.[8,10–13] Lower rates of cardiology consultation have been proposed as one mechanism contributing to disparities in cardiovascular care. The ease of obtaining cardiology consultation, in turn, may be mediated by the primary care practice environment in which a pa-

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tient receives care. We hypothesized that even within well-resourced care systems, clinical practice environments that concentrate linguistically and culturally appropriate services for Latinos may deliver higher quality of care and reduce disparities. Specifically, we theorized that primary care practices that serve a higher proportion of Latino patients have higher cardiology consultation rates for patients with CAD and CHF, and subsequently improved CVD quality process measures as compared to practices that serve a lower proportion of Latino patients.

## METHODS

### Study Sites and Population

Utilizing hospital electronic administrative data, we identified 18,785 adult patients (aged 21 to 85 years) receiving care for CAD (ICD- 9 codes 410.xx-414.xx, V45.81, V45.82) or CHF (ICD-9 codes 428, 402.01, 402.11, 402.91, 429.3, 402.x1, 404.x1, 404.x3) in hospital and community-based primary care clinics affiliated with two large academic medical centers in Massachusetts between January 1, 2000 and December 31, 2005. From these cross-sectional data, we selected 10,625 patients who were seen on two occasions in the same primary care clinic within

the twelve months prior to their first primary care visit during the study period (index study visit) to ensure enrollees were regular ambulatory patients in this system. We eliminated 445 patients of racial/ethnic categories other than non-Latino White, non-Latino Black, and Latino due to small numbers and 419 patients with missing race/ethnicity data. Thus, the final sample consisted of 9,761 patients for our electronic medical record review. Our clinical care network consists of 42 clinics. Based on the distribution of Latino patients in our clinics, we defined those clinics having greater than a 20% Latino patient population as a high proportion (HP) practice (HP practices, $n = 7$). The remaining clinics were defined as having a lower overall Latino proportion (LP practices, $n = 35$). Sensitivity analyses were performed at 10% and 30% Latino clinic patient population with similar results as the 20% cutoff. The Human Studies Committee of Partners HealthCare System approved the study protocol.

### Medical Record Review

We obtained electronic medical record data from the Research Patient Data Registry (RPDR), a research and administrative data source designed to identify patients who meet specified criteria through a query tool. Data elements obtained from the RPDR included patients' demographic characteristics (eg, race/ethnicity, sex, age, primary language, and insurance status), laboratory information (including lipids and hemoglobin A1c), comorbid diseases (obtained from outpatient ICD-9 codes), vital signs from each visit (eg, weight), procedure information (eg, echocardiogram), visit record, and site of primary care. Race and ethnicity from the RPDR was collected by registration staff at the time of admission or appointment. Primary care sites included community health centers, off-site satellite practices, and hospital-based practices.

### Performance Measures

We chose quality of care indicators based on national guidelines or standards during the time period studied including the American Medical Association's Physician Consortium for Performance Improvement (PCPI) and American College of Cardiology and the American Heart Association (ACC/AHA) physician performance measures to assess quality of care in CHF and stable CAD.[14,15] We utilized guidelines developed by the PCPI to apply these measures using electronic health record systems.[16,17] For this study, we selected three measures for CAD and two measures for CHF based upon availability of accurate variables in the dataset (Appendix 1). We chose the 2005 guidelines for concordance with the years our data represented, which are similar to the 2011 performance measures.[18,19]

### Statistical Analysis

The main independent variable in all analyses was the Latino clinic patient population dichotomized as HP vs LP clinic. We analyzed patients' demographic and clinical characteristics by condition (CHF or CAD) using descriptive statistics. For each patient, we defined cardiology consultation as any office visit to a cardiologist between their index study visit and the end of the study period. Our first set of analyses used time-to-first cardiology consult in our study period as the outcome. Some of the patient data were censored due to deaths and withdrawals during the six years of follow-up. Accordingly, Kaplan-Meier curves and log rank tests were used to calculate 5-year cardiology consultation rates and to compare time-to-consultation across sociodemographic variables (ie, race/ethnicity, insurance, and sex) and site of care. We then performed multivariable analysis using Cox proportional hazards regression to examine the simultaneous association of sociodemographic variables and site of care with cardiology

consultation controlling for age, comorbid disease, and disease severity (defined as the number of visits in the primary care clinic in the 12-month interval prior to the index study visit). Comorbid disease was defined as a categorized Charlson score for each patient based upon diagnoses obtained from outpatient visit ICD-9 codes during the 12 months prior to the index study visit (Score 0, 1-2, 3-4, and >4). Primary language was not included in any adjusted models due to colinearity with Latino ethnicity. The frailty approach was used to adjust for clustering at the level of the physician. We also introduced interactions of race/ethnicity with sex and with site of care. Nonsignificant interaction terms were removed from the final model.

In a second set of analyses, we used the frequency of follow-up consultation as the outcome variable in a multivariate Poisson regression analysis controlling for demographic characteristics (race/ethnicity, sex, age, and insurance status), site of primary care, comorbid disease, disease severity, and clustering at the level of the provider. All of these analyses were performed on the entire cohort and then stratified by condition. Due to differences in estimates and variances by condition, the final analysis was performed separately for patients with CAD and CHF.

Our third set of analyses focused on performance measures. We calculated the performance for each measure as the percentage of eligible patients with at least one primary care visit in the study year who achieved the performance goal during each twelve-month interval of study participation. Similar to other studies using a composite score, we created a yearly performance score for each patient by averaging the total number of applicable performance measures met for the patient for each year of study participation.[20,21] The yearly score was then scaled to have the same mean and variance as the overall proportion of measures met in the

sample for that year. We tested the significance of each sociodemographic characteristic using repeated measures linear regression models with rescaled average scores as the dependent variable and time as a categorical covariate. Finally, repeated measures hierarchical regression modeling was used to determine the impact of consultation on the performance score controlling for race/ethnicity, age, sex, insurance, comorbid disease, site of primary care, disease severity and clustering at the level of patients nested within providers. We examined differential effects of consultation by including interactions of consultation with patients' race/ethnicity, sex, site of care, and insurance status. We used SAS version 9.2 (Cary, North Carolina) in the analysis.

## RESULTS

### Baseline Patient Characteristics

Among the 9,761 patients, 9,168 (93.9%) had CAD, 4,444 (45.5%) had CHF, and 3,851 (39.5%) had both conditions. Latinos comprised 11% ($n=975$) of the CAD cohort and 11% ($n=474$) of the CHF cohort (Table 1). Compared to Hispanics at LP clinics, Latinos with CAD at a HP clinic were more often primary Spanish speakers (86% vs 74%, $P<.0001$), to have Medicaid (15% vs 11%), to have Medicare insurance (47% vs 36%) but were less likely to be uninsured (8% vs 11%) and have private insurance (30% vs 42%) (global $P=.0004$). In addition, HP clinic patients were more likely to receive their care at a community health center (57% vs 40%) compared to those at an LP clinic who were more likely to be cared at a hospital-based clinic (57% vs 36%) (global $P<.0001$). There was no difference in Charlson co-morbidity score between the two clinic groups.

Compared to Hispanics at LP clinics, Latinos with CHF at a HP clinic were more likely to be female (60% vs 47%, $P=.01$), to be primary

Spanish speakers (88% vs 81%, $P=.03$), to be older (53% vs 41%, $P=.02$), to have Medicaid (12% vs 11%), to have Medicare insurance (54% vs 40%) but were less likely to be uninsured (6% vs 11%) and have private insurance (29% vs 38%) (global $P=.02$). In addition, HP clinic patients were more likely to receive their care at a community health center (55% vs 46%) compared to those at LP clinic who were more likely to be cared at a hospital-based clinic (53% vs 39%, global $P<.0001$). There was no difference in Charlson co-morbidity score between the two clinic groups.

### Likelihood of Cardiology Consultation

The median time of follow up to consultation in this cohort was 1.69 years (616 days). Unadjusted analyses demonstrated that Latinos had similar rates of cardiology consultation compared to non-Latinos (CAD: 79.2% vs 79.7%, $P=.54$; CHF: 87.5% vs 90.6%, $P=.110$). However, Latinos at HP practices had higher rates of cardiology consultation than those at LP practices for both conditions (CAD: 82.2% vs 70.7%, $P<0.001$; CHF 91.2% vs 89.7%, $P<.001$) and this difference persisted in multivariable analyses (CAD: hazard ratio [HR], 1.38; 95% confidence interval [CI], 1.16–1.64 and CHF: HR, 1.40; 95% CI, 1.10–1.81) (Table 2). These models adjusted for sex, race/ethnicity, age, language, site of primary care, insurance status, comorbid disease, and disease severity while controlling for clustering at the level of the physician. In contrast to Latinos, Blacks and Whites at HP practices had no significant differences in rates of consultation compared to those in LP practices.

Multivariable analyses predicting the number of follow-up visits with a cardiologist demonstrated that Latinos at HP practices had 25% more consultations for CAD ($P<.0001$) and 23% more consultations for CHF ($P<.0001$)

**Table 1. Cohort characteristics of Latinos at high proportion and low proportion clinics**

| | CAD Cohort N=975 | | | CHF Cohort N=474 | | |
|---|---|---|---|---|---|---|
| | High Proportion n (%) | Low Proportion n (%) | P | High Proportion n (%) | Low Proportion n (%) | P |
| Characteristic | | | | | | |
| Sex | | | | | | |
| Male | 292 (42) | 128 (47) | .20 | 128 (40) | 80 (53) | .01 |
| Primary language | | | | | | |
| Spanish | 594 (86) | 202 (74) | <.0001 | 282 (88) | 122 (81) | .03 |
| Age | | | | | | |
| 21–45 | 102 (15) | 40 (15) | .20 | 31 (10) | 13 (9) | .02 |
| 46–65 | 290 (42) | 131 (48) | | 118 (37) | 76 (50) | |
| 66–85 | 301 (43) | 103 (38) | | 170 (53) | 62 (41) | |
| Insurance category | | | | | | |
| Private | 206 (30) | 114 (42) | .0004 | 91 (29) | 57 (38) | .02 |
| Medicaid | 104 (15) | 30 (11) | | 37 (12) | 16 (11) | |
| Medicare | 326 (47) | 99 (36) | | 171 (54) | 61 (40) | |
| Uninsured | 57 (8) | 31 (11) | | 20 (6) | 17 (11) | |
| Site of primary care | | | | | | |
| CHC | 393 (57) | 109 (40) | <.0001 | 177 (55) | 69 (46) | <.0001 |
| Hospital-based | 247 (36) | 156 (57) | | 123 (39) | 81 (53) | |
| Off-site satellite | 53 (8) | 9 (4) | | 19 (6) | 1 (1) | |
| Charlson co-morbidity | | | | | | |
| Score 0 | 207 (30) | 90 (33) | .52 | 52 (16) | 38 (25) | .12 |
| Score 1–2 | 312 (45) | 127 (46) | | 145 (45) | 66 (44) | |
| Score 3–4 | 109 (16) | 37 (14) | | 75 (24) | 28 (19) | |
| Score >4 | 65 (9) | 20 (7) | | 47 (15) | 19 (13) | |

CHC, community health center.

than Latinos at LP practices adjusting for sociodemographic and clinical variables listed above controlling for clustering at the level of the physician (Table 3).

## Impact of Consultation on Performance

After adjustment for patients' clinical and demographic characteristics, Latinos at HP clinics had higher overall mean quality performance on clinical measures for both CAD and CHF (CAD: 64% vs 57%, $P<0.0001$; CHF: 67% vs 55%, $P<.0001$) (Table 4) compared to Latinos receiving care in LP clinics. The effect of consultation on quality of care significantly differed by clinic Latino population with those Latinos at a LP clinic having the largest improvement with consultation ($P<.001$) (Figure 1).

## DISCUSSION

Among Latino ambulatory patients with CAD and CHF, we found differences, based on site of care, in receipt of consultation and performance on process measures endorsed by national guidelines. Latino patients at high

*Latino patients at high proportion practices had higher rates of cardiologist consultation and process measure performance compared to Latino patients at low proportion practices.*

**Table 2. Adjusted hazard ratios for receipt of cardiology consultation**

| | Hazard Ratio | Confidence Interval |
|---|---|---|
| Coronary artery disease | | |
| High proportion clinic | 1.38 | 1.16–1.64 |
| Low proportion clinic | 1.00 | 1.00 |
| Congestive heart failure | | |
| High proportion clinic | 1.40 | 1.10–1.81 |
| Low proportion clinic | 1.00 | 1.00 |

**Table 3.  Adjusted rates of follow-up of cardiology consultations**

|  | % of Follow-up Consults | P |
|---|---|---|
| Coronary artery disease |  |  |
|   High proportion clinic | 25% More | <.0001 |
|   Low proportion clinic | 1.00 |  |
| Congestive heart failure |  |  |
|   High proportion clinic | 23% More | <.0001 |
|   Low proportion clinic | 1.00 |  |

proportion practices had higher rates of cardiologist consultation and process measure performance compared to Latino patients at low proportion practices. The improved performance in clinical performance measures suggests a role for consultation in improving outcomes and mitigating performance disparities. Importantly, Latinos at low proportion clinics benefitted the most from cardiology consultation on process measure performance compared to Latinos at high proportion clinics.

Many studies have documented disparities in access to cardiovascular procedures;[3] however, access to cardiology specialists in ambulatory care, often a prerequisite for obtaining cardiovascular procedures, is less well studied. Prior studies of cardiologist involvement in the care of patients with CVD have primarily focused on the hospital or proximal post-discharge setting.[12,22] We found higher rates of consult in our cohorts than previously reported. For example, among active CAD patients in the Veteran's Affairs system, Ho et al found that 27% of patients had a cardiology clinic visit.[13] In the Support Trial, among patients admitted on a generalist service for CHF, 40% received

cardiology consultation.[22] Higher levels of consultation in our cohort may be attributable to the affiliation of primary care practices with academic hospitals, where prior studies report higher utilization of available services and specialty consultation.[7] Thus, variations in the likelihood of consultation in our study may represent a conservative estimate of consultation differences that may be larger in non-academic settings.

Although some health care systems, such as Kaiser Permanente, report high levels of performance, the quality of care as measured here still allows for significant improvement.[23] While suboptimal, these numbers are only slightly lower than the quality reported for the general population of all patients seen during the same period in the same health care system.[6] While we have witnessed dramatic improvements in the inpatient realm, the progress in outpatient care has been slower to improve. In addition, our article focuses on outpatient care where most reported findings vary by health care systems.[24] Importantly, consultation mitigated the quality of care at LP practices suggesting the potential for improvement and a possible quality improvement mechanism.

The literature supports that co-management enhances clinical performance for patients with improved blood pressure and LDL cholesterol control among patients with CAD and improved left ventricular function assessment, increased ACE inhibitor use, and reduced hospitalization and 90-day mortality rates for CHF.[10,11,13] Consultation might improve performance and adherence to guideline treatment by endorsing or refining recommendations from primary care physicians (PCP), balancing relative contraindications with potential benefits. Furthermore, by partnering with primary care physicians, consultants can provide additional monitoring of patients' concerns and adherence, can function as added prescribers for cardiac therapies, and can provide specialized knowledge regarding appropriate utilization of key advances in the management of cardiac patients.[8,25,26] Recent research demonstrates that collaborative care for CAD with specialists is well received by PCPs.[9] Further evaluation is needed to determine if the differential patterns and frequencies of consultation that we report represent underutilization or overutilization before recommending the increase of utilization of specialty services as there are potential disadvantages of increased consultation including cost, difficult care coordination, and increased testing and procedure use.

Previous research has primarily focused on Black-White differences in site of care performance.[11] To our knowledge, our study may be the first to document site of care differences for Latino patients. Many mechanisms may be in play to explain our findings possibly impacting the effective functioning of clinical teams and settings. We hypothesize that clinical practice environments that concentrate linguistically and culturally appropriate services for Latinos may be able to deliver higher quality of care and reduce disparities. In addition, this concentration of care may be associated with

**Table 4.  Adjusted rates of overall mean quality performance**

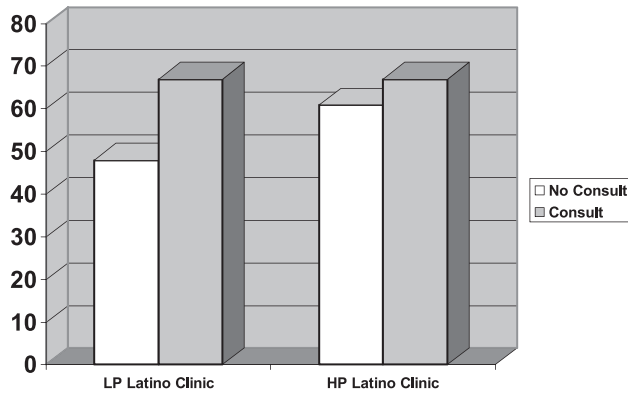|  | Adjusted Rates, % | P |
|---|---|---|
| Coronary artery disease |  |  |
|   High proportion clinic | 64 | <.0001 |
|   Low proportion clinic | 57 |  |
| Congestive heart failure |  |  |
|   High proportion clinic | 67 | <.0001 |
|   Low proportion clinic | 55 |  |

**Fig 1. Effect of Consultation on Performance by Latino Clinic** *P*<.001 for difference in differences

greater patient activation. Activation refers to having the capability and the willingness to take on the role of managing one's own health and health care. Activated patients have the skills, knowledge and motivation to participate as effective members of the care team. Disadvantaged racial/ethnic minorities are more likely than Whites to report decreased patient activation factors. They are less likely to initiate new healthy behavior, reduce high-risk behavior, and adhere to prescribed medical regimens.[27] Importantly, among Latino immigrants, low socioeconomic status, low acculturation and lack of familiarity with the US health care system contribute significantly to low activation.[28,29]

Emerging evidence suggests that focused interventions can increase patient activation and that increased patient activation is associated with a reduction in racial and ethnic disparities.[27,30] Prior research has also demonstrated that patients are more activated with physicians who function effectively within a clinical team and improved clinical outcomes.[31–33] Patients who report that their physician provides specific help with self-management of health are more likely to be activated than patients who did not get that kind of support.[29] Taken together, these findings suggest that delivery systems can be designed to support patient

activation. High proportion Latino clinics may be particularly beneficial for reducing disparities among Latinos.

There are several limitations to our findings. We examined patients receiving care in practices affiliated with two large tertiary hospitals. Our findings may not be generalizable outside of similar academic settings. However, the variations of practice sites in these hospital systems do provide information on the impact of different sites of care, and differences in receipt of consultation may be magnified in settings with fewer cardiologists. Secondly, due to incomplete pharmaceutical data we were unable to assess differences in quality of care for performance measures of CAD and CHF related to medication utilization. Nevertheless, the measures used were selected from consensus-derived, evidence-based measures utilized in prior work.[14,15,34–35]

Another limitation relates to consultation as our primary predictor of quality. There may be other unmeasured variables that account in part for the effects witnessed, such as length of time spent with a patient during a specialty visit vs a primary care office visit or increased attention to testing results. As there are likely factors in the generalist-specialist interaction that are not represented in our models, we use this concept of co-management, operationalized as the number of follow-up

consultations, as a proxy for the intensity of relationship between patients and specialists. However, frequency of follow-up may be related to unmeasured factors at the level of patients (eg, transportation barriers or patient refusal), insurers (eg, number of visits covered annually), providers (eg, availability of appointments), or study design (eg, misclassification of diagnosis). Additionally, performance measures are inherently limited in their ability to predict quality and outcomes, and measures of specialty care have not yet been validated through large-scale implementation. Lastly, although our analyses were conducted on data from 2005, the most recent 2013 National Healthcare Disparities Report still shows unchanged CVD and diabetes mellitus type 2 disparities in the United States. Our findings should be seen as hypothesis generating and should spur more recent evaluations of our findings in other settings.

## CONCLUSIONS

Currently, the patient-centered medical home is endorsed as a strategy to increase access and quality of care.[36] Increased coordination, communication and collaboration among primary care providers and subspecialists are hallmarks of this delivery model. Contrary to many prior reports, concentration of care for Latinos may yield higher quality care. We found that among primary care patients with CAD or CHF within a single large academic care network, Latino patients at HP practices have higher rates of cardiologist consultation and performance on CVD process measures compared to Latino patients at LP practices. Culturally and linguistically tailored site of care may improve both quality and outcomes for CVD. For example, immigrants with language-concordant physicians have improved glycemic control and outcomes compared to those without.[37] In addition, concentra-

tion of care may lead to greater patient activation and as a result higher patient engagement in their care and possibly improved disease management. As the nation develops and implements the patient-centered medical home, elucidating the essential components of these practice environments will allow for well designed systems with improved care for Latinos.

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*Acquisition of data:* Lopez, Cook, Hicks
*Data analysis and interpretation:* Lopez, Cook, Hicks
*Manuscript draft:* Lopez, Cook, Hicks
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## Appendix 1. Selected performance measures

| Indicator | Who Is Eligible? |
|---|---|
| Lipid profile checked in each 12 month interval[a] | All CAD patients |
| Documented LDL≤130 mg/dL[b] | CAD patients with LDL screening documented |
| Hemoglobin A1C≤9%[c] | CAD patients with comorbid diabetes |
| Weight recorded during office visit[d] | All CHF patients |
| Left ventricular function assessment recorded at least once during study period[d] | All CHF patients |

[a] American College of Cardiology, American Heart Association, and Physician Consortium for Performance Improvement. Chronic Stable Coronary Artery Disease Core Physician Performance Measurement Set 2005.
[b] LDL denotes low density lipoprotein.
[c] National Committee for Quality Assurance. Healthcare Effectiveness Data and Information Set.
[d] American College of Cardiology, American Heart Association, and Physician Consortium for Performance Improvement. Heart Failure Core Physician Performance Measurement Set 2005.