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Quality of Care for Heart Failure among Disabled Medicaid Recipients with and without Severe Mental Illness

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Abstract

Objective—To examine the association between severe mental illness (SMI) and quality of care in heart failure.

Methods—We conducted a cohort study between 2001 and 2004 of disabled Maryland Medicaid participants with heart failure. Quality measures and clinical outcomes were compared for individuals with and without SMI.

Results—Of 1801 individuals identified with heart failure, 341 had comorbid SMI. SMI was not associated with differences in quality measures, including left ventricular assessment (adjusted relative risk (aRR) 0.99; 95% CI 0.91–1.07), utilization of angiotensin converting enzyme (ACE) inhibitor or angiotensin receptor blocker (ARB) (aRR 1.04; 95% CI 0.92–1.17), or beta-blocker use (aRR 1.13; 95% CI 0.99–1.29). During the study period, 52.2% of individuals in the cohort filled a prescription for an ACE inhibitor or ARB and 45.5% filled a beta-blocker prescription. Individuals with and without SMI had similar rates of clinical outcomes, including hospitalizations, readmissions, and mortality. Both medication interventions were associated with improved mortality.

Conclusions—In this sample of disabled Medicaid recipients with heart failure, persons with SMI received similar quality of care as those without SMI. Both groups had low rates of beneficial medical treatments. Quality improvement programs should consider how best to target these vulnerable populations.

Keywords

mental disorders; heart failure; quality of healthcare; outcome assessment

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BACKGROUND

Severe mental illness (SMI) has been associated with an increased risk of heart failure, [1,2] a condition associated with significant morbidity and mortality. [3] In general, individuals with SMI represent a vulnerable population with a decreased life expectancy of approximately 25 years as compared to the general population. Much of this decreased life expectancy has been attributed to the high cardiovascular morbidity and mortality associated with SMI. [4–7] Previous studies have shown that persons with SMI may receive inferior cardiovascular quality of care, [8,9] and high mortality rates among individuals with SMI may be partly explained by this gap in quality of care. [10] A recent study of hospitalized persons with heart failure found that any mental illness was associated with poorer quality of care for left ventricular assessment but not with evidence-based medication prescriptions. [11] However, few previous studies have specifically examined quality of care in heart failure among individuals with SMI. As the pressure to improve quality of care measures for treatment of heart failure increases and as persons with SMI have a high premature mortality rate from cardiovascular disease, it would be helpful to know if the SMI represent a group in need of increased attention either in terms of surveillance or a modified care plan for heart failure.

The purpose of this study was to evaluate quality of care and outcomes for heart failure among individuals with comorbid severe mental illness as compared to those without SMI. Our secondary aim was to determine whether any differences in clinical outcomes were mediated by differences in quality of care.

METHODS

Study Design and Population

We conducted a non-concurrent cohort study of disabled Medicaid participants in Maryland with heart failure between fiscal years 2001 and 2004. The cohort was a subgroup of disabled Maryland Medicaid recipients who had been followed since 1993. The initial cohort had the following inclusion criteria: age 21 to 62 between July 1, 1992 and June 30, 1993; two year continuous enrollment in Medicaid; residence in either metropolitan Baltimore or the rural Maryland Eastern Shore. Additionally, cohort participants were designated as having a medical disability for entry into the Medicaid cohort. For our analysis, we included individuals diagnosed with heart failure between July 1, 2000 and June 30, 2004. Heart failure diagnosis was established if a participant had at least one primary inpatient or two primary outpatient International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) codes for heart failure (402.x1, 404.x1, 404.x3, 428) [12] within a fiscal year. The study was approved by the Johns Hopkins Medical Institutions and Maryland Department of Health and Mental Hygiene Institutional Review Boards.

Data Sources and Baseline Variables

Maryland Medicaid administrative claims data provided information on demographics, diagnostic codes for comorbidities, and utilization of medication and health services. Among individuals who were dually covered with Medicare, Medicaid was responsible for co-payments and deductibles for all charges which were primarily covered by Medicare. Therefore, we were able to obtain complete utilization for all dual eligible individuals. We linked data in the cohort to the National Death Index to obtain mortality information.

Our primary exposure of interest was the presence of severe mental illness. Participants were classified as having SMI if they had a diagnosis of schizophrenia or if they had a

diagnosis of bipolar disorder, major depression, or other mental disorder diagnosis and specialty mental health care use.

Demographic covariates included age, race, gender, and urban density. Due to the small number of participants of other races, we restricted the study to white or black participants. Urban density was categorized into rural, urban and suburban. Comorbidities included HIV, diabetes, cancer, coronary disease, hypertension, cerebrovascular disease, peripheral vascular disease, chronic pulmonary disease, chronic renal disease, alcohol abuse, or drug abuse and were defined by the Clinical Classification System from the Agency for Healthcare Research and Quality. [13]

Quality of Care and Clinical Outcomes

Quality of care measures were based on clinical performance measures from the American College of Cardiology/American Heart Association (ACC/AHA). [12] Specifically, we focused on three outpatient quality indicators during the study period: assessment of left ventricular systolic function; prescription filled for either an angiotensin converting enzyme (ACE) inhibitor or angiotensin receptor blocker (ARB); and prescription filled for a beta-blocker.

Individuals were considered to have undergone assessment of left ventricular function if an echocardiogram or radionuclide ventriculogram had been performed. Medicaid pharmacy claims data was used to identify receipt of an ACE inhibitor, ARB, or beta-blocker, which was measured as a dichotomous variable. Additionally, we assessed average percent of days on medication as the sum of the days with supplied prescriptions, divided by the total days eligible for outpatient pharmacy services (total days participants were seen in the cohort minus days in the hospital), a calculation similar to the medication possession ratio (MPR). In the analysis for ACE inhibitor or ARB use, we excluded cases with a history of renal artery stenosis as contraindications. Similarly, we excluded persons with a history of complete heart block or second degree heart block type II for the analysis of beta-blocker usage.

Clinical outcomes included hospitalizations, cardiovascular-related hospital readmissions, and mortality. Total hospitalizations were measured as yearly counts. We excluded primary psychiatric hospitalizations from this outcome due to our assumption that they would be significantly more common among individuals with a mental illness diagnosis. [11] Cardiovascular readmission was defined as a binary outcome of cardiovascular hospitalization within 30 days of an index heart failure hospitalization. [14] Mortality was measured as time to event. All events that occurred through June 30, 2004 were included.

Statistical Analysis

Differences in baseline characteristics between SMI and non-SMI groups were assessed using chi-squared tests for categorical variables and Wilcoxon rank sum tests for continuous variables. Quality of care, number of hospitalizations, and cardiovascular readmissions were compared between groups with generalized estimating equations (GEEs) to account for repeated outcomes among individuals. The outcome variables in the GEEs were modeled to follow a binomial distribution for left ventricular assessment, ACE inhibitor or ARB use, beta-blocker use, and readmissions, and a negative binomial distribution number for hospitalizations. Mortality was compared using Cox proportional hazards. Both the GEE and proportional hazard models compared exposure groups with adjustment for age, gender, race, geographical location, and eleven individual comorbidities (HIV, diabetes, cancer, coronary disease, hypertension, cerebrovascular disease, peripheral vascular disease, chronic pulmonary disease, chronic renal disease, alcohol abuse, and drug abuse). Covariates were

treated as time-varying variables. Statistical analysis was performed using Stata version 10 (Stata Corp, College Station, Texas).

RESULTS

We identified 1801 individuals diagnosed with heart failure during the study period. Of these persons, 341 had severe mental illness. When compared to non-SMI individuals, persons with SMI were, on average, 2.5 years younger and less likely to be black (Table 1). The two groups had similar prevalence of comorbid factors, with the exception of increased drug and alcohol abuse among individuals with SMI. Of participants with SMI, schizophrenia was the most common mental disorder (n=155, 45.5%), followed by bipolar disorder (n=82, 24.1%), and major depression (n=58, 17.0%). The remaining 46 participants were classified as other mental illness diagnosis.

Quality of Care for Heart Failure

Participants with and without SMI had similar rates of left ventricular assessment of about 80 percent (Table 2). The overall prevalence of receipt of any ACE inhibitor or ARB was 52.2%. In the crude analysis, persons with SMI appeared to have a lower rate of ACE inhibitor or ARB use as compared to non-SMI individuals, but this was not statistically significant (RR=0.89; 95% CI 0.78–1.01; p=0.07); the prescription fill rates for the two groups were similar in the adjusted analysis. Among the entire cohort, 45.5% of individuals had used a beta-blocker. In the crude analysis, beta-blocker use was similar between the SMI and non-SMI cohorts. After adjustment for demographic and comorbid factors, participants with SMI had a nonsignificant higher utilization of beta-blockers in comparison to those without SMI (RR 1.13; 95% CI 0.99–1.19; p=0.07).

Among all participants, the average percent of days for spent on either an ACE inhibitor or ARB was 29.2%, while the average percent of days on beta-blocker therapy was 23.9%. (Figure) Among individuals who had taken an ACE inhibitor or ARB, the percent of days on this medication was 56.0%. The average percent of days on a beta-blocker was 52.3% among ever users of therapy.

Clinical Outcomes

Persons with SMI had a higher rate of hospitalization than non-SMI individuals in the crude analysis (incident rate ratio (IRR) 1.08, 95% CI 1.04–1.14; p=0.001), with a 2 percent higher rate of hospitalization in the adjusted analysis (aIRR 1.02; 95% CI 1.00–1.03; p=0.01). (Table 2) The two groups had comparable risk for cardiovascular readmissions.

During the study period, 31.4% of individuals in the study died. SMI and non-SMI individuals had comparable mortality rates of 14.0 and 13.9 per 100 person years, respectively, with no difference in relative hazard of death. (Table 2)

Inclusion of the three quality indicators into the model had little effect on clinical outcomes of hospitalizations, readmissions, or mortality. (Table 3) In these models, quality measures had a varied effect on clinical outcomes. Left ventricular assessment was associated with an increased risk for hospitalizations and mortality. Individuals who had a prescription filled for an ACE inhibitor or ARB were found to have a 9% reduction in number of hospitalizations and a 26% reduction in hazard for mortality; this therapy had no effect on cardiovascular readmissions. Beta-blocker therapy was associated with a decreased risk of hospitalization (IRR 0.95, 95% CI 0.94–0.96) but not for readmission or mortality.

DISCUSSION

In this sample of disabled adult Medicaid recipients with heart failure, severe mental illness was not associated with differences in quality of care. In general, study participants had high rates of left ventricular assessment but low rates of prescription filling for medication shown to have benefit in heart failure. This is important as both ACE inhibitor or ARB use and beta-blocker use were associated with improved clinical outcomes.

In a single previous study assessing quality of care among Medicare heart failure patients with and without mental illness, individuals with mental illness had lower rates of left ventricular function evaluation as compared to individuals with no mental illness. However, as with our study, mental illness was not associated with any difference in use of ACE inhibitors or ARBs. The previous study included all mental illness diagnoses, [11] while our study solely examined individuals with severe mental illness, who have a significantly increased risk of cardiovascular mortality as compared to the general population. [4] There has been little research on quality of care for heart failure among individuals specifically with SMI, while studies of quality of care for other cardiovascular diseases among individuals with SMI have been inconsistent. [15–18] Unlike many previous studies, our cohort consisted of Medicaid recipients with a disability diagnosis. As a result, both SMI and non-SMI individuals may have represented vulnerable populations with similar socioeconomic backgrounds, a factor which may mediate differences in quality of care among individuals with and without SMI. [10] Furthermore, Medicaid insurance in general has been associated with inferior quality of care in heart failure. [19–21] Our findings of no association between SMI status and quality of care may have been driven by similarities in insurance, socioeconomic status, and other risk factors in the exposed and unexposed populations.

While over 80% of individuals in our study had assessment of left ventricular function, utilization of medications shown to improve outcomes in heart failure was strikingly low: 52.2% of the cohort filled a prescription for either an ACE inhibitor or ARB and 45.5% used a beta-blocker. Studies which have looked at medication utilization have found a large range of compliance with evidence based medications. For comparison, use of ACE inhibitor therapy ranged from 36% to 80% and beta-blocker therapy from 23% to 86% among similar studies in the outpatient setting. [22–27] In our study, not only was recommended medication usage found to be low, but medication continuity among takers was also suboptimal. We found that, among people who had used an ACE inhibitor or ARB, on average these medications were only being used 56% for the time on study. Among users of beta-blockers, prescriptions were filled about half of the time. Given our findings, policy should focus on both medication prescribing and continuity among Medicaid enrollees.

Individuals with SMI did not have significant differences in clinical outcomes as compared to individuals without SMI. Previous studies have shown an association between worse outcomes in heart failure both among individuals with any mental disorder [11] and among individuals with depression. [28–31] Our study differs from this previous work by exclusively addressing individuals with SMI as opposed to all psychiatric conditions. Furthermore, both SMI and non-SMI groups in our study had high prevalence of comorbidities including diabetes, cancer, and chronic pulmonary disease, placing all individuals at high risk of clinical events. Similarities in comorbidities and socioeconomic status between individuals with and without SMI may have precluded our ability to detect any differences in clinical outcomes between these two groups.

The quality measures in this study did not play a significant role in mediating an effect of SMI on clinical outcomes. However, we found that all three quality measures were

associated with improved clinical outcomes. A study by Fonarow and colleagues questioned the clinical effectiveness of current quality measures. [32] In that study of patients at discharge, most quality indicators, including left ventricular assessment, had no effect on clinical outcomes. In our study, assessment of left ventricular function was associated with adverse outcomes, a finding that was likely related to disease severity. Fonarow and colleagues did find modest clinical improvements with use of ACE inhibitors, ARBs, and beta-blockers. Similarly, both medication interventions in our study were found to be associated with a trend toward improved clinical outcomes. Utilization of ACE inhibitors or ARBs was associated with a 9% reduction in hospitalization rate and a 26% reduction in mortality, a benefit similar to that observed in clinical trials. [33] Beta-blocker therapy was associated with a 5% reduction in hospitalizations and a nonsignificant trend toward improvement in both readmissions and mortality.

Our study has several limitations. Use of claims data did not allow us to access information related to systolic function. Given the substantial proportion of heart failure patients with normal ejection fraction in the community, [34,35] many of our study participants may have had normal left ventricular systolic function and may not have met heart failure guideline indications for ACE inhibitors or beta-blockers. Nonetheless, our study sample included a substantial proportion of individuals with diabetes, hypertension, and coronary artery disease, who also have indications for these medications. Additionally, our results showed an association between medication use and improvement in clinical outcomes in this cohort.

Although our Medicaid data was rich in information, its limitations may have led to other biases. Claims data may not have perfect precision in assessment of quality indicators. Lack of precision should be random and non-differential, which would reduce power to detect a difference between individuals with and without SMI. Some of our findings may have resulted from unmeasured confounders or residual confounding. Potential contraindications to ACE inhibitors, ARBs, or beta-blockers may have explained why some individuals did not receive a prescription. Nonetheless, several previous studies have similarly used Medicaid administrative data both to evaluate the use of recommended therapies for heart failure [26,27,36] and to associate pharmacotherapy for heart failure with hospitalization outcomes [37–39] in the general medical population.

From a quality improvement standpoint, we cannot determine if poor performance was related to physician or patient factors. Further research will need to determine the mechanisms for suboptimal care in heart failure among Medicaid participants.

In conclusion, we found that severe mental illness in heart failure was not associated with reduced quality of care or clinical outcomes among a cohort of disabled Medicaid participants. The entire cohort of heart failure patients had low rates of therapy with ACE inhibitors or ARBs and beta-blockers, despite the fact that these medications were associated with improved mortality. Further research should address why Medicaid recipients with heart failure receive low rates of beneficial medications. Quality improvement programs should consider how best to incorporate the disabled Medicaid population to ensure that they receive optimal medical care.

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Figure 1. Average Percent of Days on Medications for Participants with Heart Failure
SMI, severe mental illness; ACE, angiotensin converting enzyme; ARB, angiotensin receptor blocker

Table 1

Baseline Characteristics among Medicaid Participants with Heart Failure

	non-SMI (n=1460)	SMI (n=341)	p-value
Age, mean (SD)	59.5 (9.4)	57.0 (9.3)	<.001
Female	67.3	69.5	0.43
Race			<.001
White	27.5	44.9	
Black	72.5	55.1	
Geographic Location			0.32
Urban	86.7	84.8	
Suburban	4.0	5.9	
Rural	9.2	9.4	
Medical History			
HIV	2.3	3.8	0.12
Diabetes	34.5	31.1	0.22
Cancer	11.5	12.0	0.79
Coronary Disease	23.3	26.0	0.29
Hypertension	50.2	53.1	0.34
Cerebrovascular Disease	8.6	10.6	0.26
Peripheral Vascular Disease	8.6	11.4	0.11
Chronic Pulmonary Disease	34.0	41.1	0.02
Chronic Renal Disease	15.3	15.3	0.97
Renal Artery Stenosis	1.6	0.9	0.33
Heart Block	3.2	1.5	0.09
Alcohol Abuse	8.3	15.0	<.001
Drug Abuse	6.7	13.5	<.001
Alcohol or Drug Abuse	13.0	21.4	<.001

SMI, severe mental illness; HIV, human immunodeficiency virus

Values in percentage points unless otherwise specified

Table 2
Comparison of Outcomes in Heart Failure among Medicaid Participants with and without Severe Mental Illness

Quality of Care Outcomes	Comparison Ratio [*] SMI vs. non-SMI				
	non-SMI	SMI	Crude	Adjusted [†]	(95% CI)
<u>Percent, %</u>					
Left ventricular function assessment, %	82.3	80.7	1.01	0.99	(0.91–1.07)
Prescription filled for ACE inhibitor or ARB, %	53.3	47.3	0.89	1.04	(0.92–1.17)
Prescription filled for beta-blocker, %	46.0	43.8	0.99	1.13	(0.99–1.29)
<u>Clinical Outcomes</u>					
Number of hospitalizations, median (IQR)	2 (1,5)	3 (1,6)	1.08	1.02	(1.00–1.03)
Cardiovascular readmissions, %	7.7	9.9	1.24	0.87	(0.49–1.53)
Mortality, %	31.7	29.9	1.00	0.96	(0.77–1.20)

SMI, severe mental illness; ACE, angiotensin converting enzyme; ARB, angiotensin receptor blocker

^{*} Represents relative risk for quality of care outcomes and readmissions; incidence rate ratio for hospitalizations; hazard ratio for mortality

[†] Adjusted for age, gender, race, geographic location, and comorbidities

Table 3

Effect of Severe Mental Illness and Quality of Care on Clinical Outcomes for Heart Failure among Medicare Participants

	Medical Hospitalization IRR (95% CI)	Cardiovascular Readmission RR (95% CI)	Mortality HR (95% CI)
Severe Mental Illness (SMI) vs. non SMI	1.01 (1.00–1.02)	0.94 (0.54–1.66)	0.96 (0.77–1.20)
Assessment of left ventricular function	1.51 (1.48–1.55)	1.90 (0.97–3.69)	1.29 (1.07–1.57)
Prescription filled for ACE inhibitor or ARB	0.91 (0.90–0.92)	1.01 (0.56–1.82)	0.74 (0.61–0.91)
Prescription filled for Beta-blocker	0.95 (0.94–0.96)	0.74 (0.41–1.31)	0.89 (0.73–1.10)
Average percent of days on ACE inhibitor or ARB, increase of 10%	0.99 (0.99–0.99)	1.01 (0.95–1.08)	0.98 (0.96–1.01)
Average percent of days on Beta-Blocker, increase of 10%	0.99 (0.99–0.99)	0.95 (0.88–1.02)	0.99 (0.96–1.02)

IRR, incidence rate ratio; RR, relative risk; HR, hazard ratio; ACE, angiotensin converting enzyme; ARB, angiotensin receptor blocker

Adjusted for age, gender, race, geographic location, comorbidities, severe mental illness status, and quality measures