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Quality of Medical Care for Persons with Serious Mental Illness: A Comprehensive Review

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Abstract

Objectives—Prior studies suggest variation in the quality of medical care for somatic conditions such as cardiovascular disease and diabetes provided to persons with SMI, but to date no comprehensive review of the literature has been conducted. The goals of this review were to summarize the prior research on quality of medical care for the United States population with SMI; identify potential sources of variation in quality of care; and identify priorities for future research.

Methods—Peer-reviewed studies were identified by searching four major research databases and subsequent reference searches of retrieved articles. All studies assessing quality of care for cardiovascular disease, diabetes, dyslipidemia, and HIV/AIDs among persons with schizophrenia and bipolar disorder published between January 2000 and December 2013 were included. Quality indicators and information about the study population and setting were abstracted by two trained reviewers.

Results—Quality of medical care in the population with SMI varied by study population, time period, and setting. Rates of guideline-concordant care tended to be higher among veterans and lower among Medicaid beneficiaries. In many study samples with SMI, rates of guideline adherence were considerably lower than estimated rates for the general US population.

Conclusions—Future research should identify and address modifiable provider, insurer, and delivery system factors that contribute to poor quality of medical care among persons with SMI

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and consider how to best use quality performance measures as part of the larger strategy to improve health for this group.

Keywords

Schizophrenia; Bipolar Disorder; Quality of Care

INTRODUCTION

Persons with serious mental illnesses (SMI) such as schizophrenia and bipolar disorder have a mortality rate two to three times higher than the overall United States (US) population (Brown, 1997; Saha S et al., 2007). Almost all of this premature mortality is due to somatic causes, particularly cardiovascular disease (Daumit GL et al., 2010; Osborn DP et al., 2007; Osby U et al., 2000). Prevalence of every cardiovascular risk factor and risk behavior – including diabetes mellitus (Osborn et al., 2008), dyslipidemia (Osborn et al., 2008), hypertension (Osborn et al., 2008), tobacco smoking (Compton MT et al., 2006), obesity (Osborn et al., 2008), physical inactivity (Daumit et al., 2004) and poor diet (Henderson et al., 2006) – is elevated in the population with SMI. Obesogenic effects of commonly prescribed antipsychotic medications often cause weight gain and alter glucose metabolism, compounding the burden of cardiovascular illness in this group (Casey et al., 2004; McGinty and Daumit, 2011). Persons with SMI are at heightened risk for other somatic conditions as well. In particular, high rates of risky sexual behaviors (Dickerson et al., 2004) and intravenous drug use (Carey et al., 2004) contribute to increased prevalence of HIV in this group (Rosenberg SD et al., 2001). The high burden of somatic conditions in this population leads to costly disability: persons with SMI are the largest and fastest growing subgroup of social security disability beneficiaries in the US (Drake et al., 2013; Substance Abuse and Mental Health Administration (SAMHSA), 2010).

Poor health and disability outcomes in the population with SMI are affected by multiple factors, including severity and complexity of co-morbid conditions (Jones et al., 2004), individual health behaviors (Compton MT et al., 2006; Daumit et al., 2004; Henderson et al., 2006), socioeconomic status (Mueser KT and McGurk SR, 2004), neighborhood and living conditions that may facilitate or impede adoption of healthy behaviors or access to services (Julian Chun-Chung et al., 2003), and – the focus of this review – quality of medical care. Prior studies have shown mixed results regarding quality of care for somatic conditions in the population with SMI. For example, studies of post-myocardial infarction quality of care have shown significant variation in rates of guideline-concordant care across Medicaid beneficiaries (McGinty EE et al., 2012), Medicare beneficiaries (Druss et al., 2000), and veterans with SMI (Desai et al., 2002; Petersen LA et al., 2003). A large body of quality of care research suggests that variation in quality is attributable to a range of interacting patient, provider, insurer, and health-system factors.

Delivery of high quality medical care for somatic conditions in the population with SMI should be a priority given this population's high rates of somatic co-morbidity and premature mortality due to cardiovascular disease. To date, no comprehensive review of the literature has documented and characterized the variation in quality of care for somatic

conditions in the population with SMI. This information could inform development of quality improvement initiatives and provide direction for future research designed to identify and address modifiable provider, insurer, and delivery system factors that lead to poor quality of care for somatic conditions in this vulnerable population. To fill this gap in the literature, we reviewed studies on quality of medical care for cardiovascular disease, diabetes, dyslipidemia, and HIV/AIDs in the population with SMI published in the peer-reviewed literature between January 2000 and December 2013. Our objectives were to provide a comprehensive review of the prior research on quality of medical care for the population with SMI; identify potential sources in variation in quality of care by study population and setting; and identify priorities for future research on this topic.

MATERIALS AND METHODS

We conducted a comprehensive review of studies measuring quality of care for somatic conditions in the population with SMI published in the peer-reviewed literature between January 2000 and December 2013. Robust epidemiologic literature shows heightened rates of cardiovascular disease, the cardiovascular risk factors diabetes mellitus and dyslipidemia, and HIV/AIDS among persons with SMI. Our review therefore focused on studies measuring quality of care for these conditions. Relevant studies were identified by searching the PubMed, Web of Science, EMBASE, PsycINFO, and SCOPUS databases. Full search strategies are included in Appendix A. The titles and abstracts of all articles identified were independently reviewed by two authors (EM and GD) to determine if a given article met the inclusion criteria described below. In the case of discrepancy, the authors reviewed the full article and then conferred in order to make a final determination of whether or not it met inclusion criteria. Reference lists of included articles were examined in order to identify additional studies.

Inclusion and Exclusion Criteria

Studies were included if they met the following criteria: (1) published between January 2000 and December 2013; (2) published in English; (3) conducted in the US; (4) study sample of 100 or more participants; (5) study sample of adults aged 18+; (6) SMI study sample included persons with schizophrenia or bipolar disorder; and (7) measured the quality of medical care for cardiovascular disease, cardiovascular risk factors (diabetes mellitus, dyslipidemia, hypertension), or HIV/AIDS delivered to persons with SMI. We excluded intervention studies designed to improve delivery of quality of care, which were included in a separate review of the intervention literature conducted by this study's authors (McGinty EE and Daumit GL, 2014). The studies in our review are therefore observational and descriptive. As a result, we did not systematically measure the bias of individual studies as is typically done in systematic reviews of clinical trials. Standard bias assessments focus on indicators of internal validity (Owens DK et al., 2009), which are not relevant for descriptive studies.

Data Abstraction

Two authors (EM and JB) abstracted measures of care quality in the population with SMI from included articles using a computer-entry standardized abstraction protocol (see paper

copy in Appendix B). If studies compared quality of care between populations with and without SMI, these measures were also abstracted. In addition, data about the study population (number of subjects, diagnoses, and % antipsychotic users in studies measuring quality of cardiovascular disease or risk factors), study setting (place and time period), and data source(s) was abstracted. Following initial abstraction, a second reviewer checked the accuracy of all abstracted information.

Following abstraction, measures of medical care quality in the population with SMI were compiled in three overarching categories: (1) quality of care for cardiovascular disease, including acute and post-myocardial infarction quality of care and care for congestive heart failure; (2) quality of care for cardiovascular risk factors, including adherence to guidelines for care and treatment of diabetes mellitus, co-morbid conditions among those with diabetes mellitus, and dyslipidemia. Third, we abstracted measures of adherence to guidelines for care and treatment of HIV/AIDS.

Comparison with National Guidelines and Quality of Care in the General US Population: Methods

When available, we compared measures of quality in the population with SMI to national guidelines and measures in the general US population. National guidelines were obtained from the American College of Cardiology and the American Heart Association, the American Diabetes Association, the National Cholesterol Education Program, the HIV Medicine Association of the Infectious Diseases Society of America, and the US Department of Health and Human Services. Measures of care quality in the US population were obtained from reports and peer-reviewed studies using national data sources such as the National Ambulatory Medical Care Survey (NAMCS). When published studies using US data sets were not available, we included estimates from the largest, most representative datasets available in the published literature. To enhance comparability with the quality metrics included in our review, we excluded US estimates measured prior to 2000.

RESULTS

Our search yielded a total of 778 unique studies. 757 studies were excluded for failure to meet inclusion criteria, yielding an initial sample of 21 studies. Two additional studies were identified by searching the reference lists of studies included in the initial sample, for a final sample of 23 articles (see Appendix C for inclusion flow diagram). Summaries of results are presented in Tables 1–3. Tables with detailed information about each quality measure abstracted – including descriptive information about the study population, setting, and data source for each measure – are presented in Appendix D. Information regarding potential sources of variation in each quality metrics, for example study population and setting, is summarized in the text below.

Quality of care for cardiovascular disease in the US population with SMI

Initial Inpatient Treatment of Acute Myocardial Infarction—Reperfusion of a blocked coronary artery is the main goal of initial inpatient treatment of acute myocardial infarction, and this can be achieved through thrombolytic therapy or percutaneous coronary

angioplasty (PTCA), or if needed, coronary artery bypass graft surgery (CABG). PTCA has become more widely available as an initial treatment over the past fifteen years (O'Gara et al., 2013). In this review, 34 total measures were abstracted from four studies (Table 1, Panel 1). Rates of cardiac catheterization (5%–47%), coronary artery bypass graft surgery CABG (2%–20%), and percutaneous coronary angioplasty PTCA (9%–33%) varied. One study reported the percent of patients (64%) with SMI receiving thrombolytic therapy (Petersen LA et al., 2003). Cardiac procedure rates were higher in a study population of veterans than in study populations of Medicare and Medicaid beneficiaries: of veterans received CABG during hospitalization for acute myocardial infarction (Petersen LA et al., 2003), compared to 4% of Medicare beneficiaries (Druss et al., 2000) (Appendix D Table 1, Panel 1).

Adherence to Guidelines for Treatment Following Acute Myocardial Infarction—Twenty-six quality measures were abstracted from four studies. Following acute myocardial infarction, rates of prescription for aspirin (77%–96%), beta-blockers (35%–93%), ACE inhibitors/ARBs (19%–73%) and statins (11%–23%) varied. Rates of post-myocardial quality of care performance indicators tended to be high in veteran populations (Desai et al., 2002; Petersen LA et al., 2003), and varied depending upon the time window in which the measures were ascertained (McGinty EE et al., 2012). Individuals with SMI deemed eligible but not ideal for pharmacotherapy were less likely than their counterparts without SMI to receive guideline-based medications, but patients with and without SMI deemed ideal for drug treatment were equally likely to receive prescriptions (Petersen LA et al., 2003) (Appendix D Table 1, Panel 2).

Adherence to Guidelines for Care of Congestive Heart Failure—Twelve quality measures were abstracted from two studies. The percent of patients receiving left ventricular function (LVF) assessment (47% to 81%) and ACE inhibitor/ARB prescriptions (47%–79%) varied between the two studies comprised of disabled Medicaid beneficiaries and Medicare beneficiaries, respectively.

Quality of care for cardiovascular risk factors for the US population with SMI

Adherence to Guidelines for Care and Treatment of Diabetes Mellitus—Sixty-four quality measures were abstracted from 11 studies. The percent of patients receiving overall guideline-based care (19%–56%), diabetic eye examinations (20%–83%), diabetic foot examinations (78%–87%), HBA1c testing (43%–89%), diabetic nephropathy testing (50%–79%), and pharmacologic diabetes mellitus treatment (70%–95%) varied. Of the 43 measures comparing adherence to guidelines for care and treatment of diabetes mellitus in study populations with versus without SMI, four showed that persons with SMI were more likely to receive recommended care; 11 showed that persons with SMI were less likely to receive recommended care; and 28 showed no differences for those with versus without SMI (Table 2, Panel 1).

Adherence to Guidelines for Care and Treatment of Co-Morbid Conditions among Persons with Diabetes Mellitus—Forty-one measures were abstracted from 10 studies. The percent of patients receiving lipid testing (26%–77%), any pharmacologic

dyslipidemia treatment (52%–67%), any pharmacologic hypertension treatment (84%), and ACE/ARB prescriptions (48%–69%) varied. One study found that 36% of patients received aspirin. Of the twenty-one measures comparing adherence to guidelines for care and treatment of co-morbid conditions among persons with diabetes mellitus, 5 showed that persons with SMI were less likely to receive recommended care.

Adherence to Guidelines for Care and Treatment of Dyslipidemia—Two measures were abstracted from two studies. The percent of patients receiving pharmacologic dyslipidemia treatment ranged from 12%–67%. One study found that 67% of Maryland Medicaid beneficiaries with co-morbid SMI, diabetes mellitus, and dyslipidemia were prescribed statins during 2001–2003 (Kreyenbuhl et al., 2008). In contrast, baseline data from the Clinical Antipsychotic Trials of Intervention Effectiveness (CATIE) trial showed that only 12% of persons with SMI and dyslipidemia received any pharmacologic dyslipidemia treatment (Nasrallah et al., 2006) (Appendix D Table 2, Panel 3).

Quality of care for HIV/AIDS in the US population with SMI

Adherence to Guidelines for Care and Treatment of HIV/AIDS—Sixteen measures were abstracted from four studies. Only one measure of CD4 count monitoring (85%) and viral load monitoring (82%) was abstracted. The percent of patients with SMI prescribed antiretroviral therapy ranged from 51%–83%.

Comparison with National Guidelines and Quality of Care in the General US Population: Results

Table 4 compares adherence to national guidelines in the overall US population and the study populations with SMI included in this review. Comparisons are qualitative in nature and it is important to note that study population characteristics and measurement techniques differed across and within SMI and national study samples. For most metrics, guideline adherence varied considerably across study samples with SMI. In the studies with the highest rates of guideline-concordant care, which were often comprised of veteran populations, care quality was comparable in the SMI and national samples. For example, estimated rates of beta-blocker prescription following acute myocardial infarction in the general US population range from 80–88% (O'Brien et al., 2013; Setoguchi et al., 2007), and the rate was 91% among one study of veterans (Desai et al., 2002). As is evident in the range in rates of guideline-concordant care in Table 4, however, other study samples with SMI had considerably lower rates of guideline-concordant care than general US population samples. For example, only 20% of SMI study samples comprised patients with diabetes served by a large urban hospital (Green et al., 2010) and 30% of Medicaid beneficiaries (Banta et al., 2009) with diabetes received eye examinations, compared to consistent national estimates of 50% or greater(Ali et al., 2013a; National Committee on Quality Assurance, 2013; Paksin-Hall et al., 2013). A similar pattern was observed for guideline-based care following treatment of acute myocardial infarction and lipid testing among persons with diabetes. Adherence to guidelines for care and treatment of HIV/AIDs was comparable in SMI and national study samples.

DISCUSSION

In studies published from 2000–2013, quality of care for somatic conditions in the population with SMI varied by study population, setting and time period. Consistent with the results of a prior review of disparities in care provided to those with versus without SMI (Mitchell et al., 2009), we found that some study populations with SMI were less likely to receive high-quality medical care than their counterparts without SMI. Comparisons with the non-SMI population alone should not be used to identify quality improvement needs, however. In some studies showing no differences in quality for those with versus without SMI, rates of guideline-concordant care were low for both groups, suggesting a need for overall improvements in care quality (McGinty EE et al., 2012). In some study populations with SMI, particularly veteran populations (Desai et al., 2002; Kilbourne et al., 2011), rates of guideline adherence in the population with SMI and general US population were similar. In other study populations, particularly Medicaid beneficiaries, rates were lower (Banta et al., 2009; Blecker et al., 2010; McGinty EE et al., 2012). Our findings suggest that the need for quality improvement likely varies by patient population, insurer, and healthcare delivery system.

The variation in quality of medical care in the population with SMI observed in our review is consistent with the prior literature showing that care quality is influenced by a combination of patient, provider, insurer, and delivery system factors. At the patient level, severity and complexity of co-morbid conditions may influence quality of care (Jones et al., 2004). In our review, rates of guideline-concordant care were lowest among study populations of Medicaid beneficiaries in some states. Medicaid – the insurer for the majority of persons with SMI (Frank and Glied, 2006; Khaykin et al., 2010) – covers low-income and disabled individuals who tend to be sicker than most other insured populations (Bruen BK et al., 1999). Providers' experience treating persons with SMI can also affect care quality (Graber et al., 2000), and insurers' reimbursement policies can constrain – if costs are not covered – services shown to improve quality, such as use of case managers to coordinate care (Unutzer J et al., 2006). Healthcare delivery system factors, such as use of electronic health records and co-location of services, can also influence quality (Druss BG and Mauer BJ, 2010).

Consistent with studies in the overall US population (Asch et al., 2004), in our review veterans with SMI tended to receive high rates of guideline-concordant care. This is likely due in part to the Veteran Health Administration (VHA)'s ability, as a national integrated health care system, to coordinate and monitor quality of care using electronic patient data (Jha et al., 2003) and to implement system-wide quality improvement initiatives (Young AS et al., 2011). In contrast to the VHA, we found lower rates of guideline-concordant care in the Medicaid population with SMI. This finding suggests that initiatives designed to improve quality and reduce costs among Medicaid beneficiaries, such as Medicaid health homes and Accountable Care Organizations, could benefit those with SMI (Bao Y et al., 2013). The majority of persons with SMI are insured by government funded payers: Medicaid and the VHA (Khaykin et al., 2010). Requiring these programs to collect and report standardized quality indicators for care of somatic conditions among beneficiaries

with SMI would provide valuable insight into nationwide gaps in quality and facilitate monitoring of care over time.

Importantly, the large majority of studies in our review did not assess whether provision of guideline-concordant care led to improved health outcomes (exceptions were three studies examining the association between guideline-concordant post-myocardial infarction quality of care and mortality (Druss et al., 2001; McGinty EE et al., 2012; Petersen LA et al., 2003)). Even when process-of-care quality metrics have been validated in the overall US population, it is unclear whether these process measures are good proxies for improved health outcomes in the population with SMI, who may require more intensive care processes to effectively manage their medical conditions. Furthermore, high rates of comorbid conditions, disability, poor health behaviors, and socioeconomic risk factors may lead to poor health outcomes even among persons with SMI who receive high-quality medical care. As a result, improving somatic health outcomes in this group may ultimately require a combination of high-quality medical care, interventions to improve health behaviors – such as exercise and smoking cessation programs – and social services to address the poverty, unemployment, homelessness, and criminal justice involvement experienced by many persons with SMI (Frank and Glied, 2006). Future research should test strategies – which are beginning to be adopted by some Medicaid ACOs (Sandberg et al., 2014) – to integrate not only somatic and behavioral healthcare services but also health behavior interventions and social services for the population with SMI.

The results of our review should be interpreted in the context of several important limitations. The quality measures abstracted from studies were not always directly comparable with one another or with national measures. The time window used to ascertain the measures varied: for example some studies measured a quality indicator over a 30 day period and others measured the same indicator over a one-year period. Measures were abstracted over a 13-year period and could be influenced by secular trends related to changing medical guidelines, particularly for cardiovascular care and HIV. Variation in study populations, data sources (e.g. administrative claims versus medical chart review) and measure specifications make direct comparisons across and within SMI study samples and national samples infeasible. It is possible that our search strategy missed relevant articles, although to minimize that risk we searched the reference list of included articles.

In conclusion, the considerable inconsistency in metrics used to measure quality of medical care in the population with SMI suggests that measurement of a standard set of quality indicators across healthcare systems could inform quality improvement efforts. Future research should focus on identifying and addressing modifiable provider, insurer, and delivery system factors that contribute to poor quality of medical care among persons with SMI and consider how to best use quality performance measures as part of the larger strategy to improve health for this group.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Summary of measures of quality of care for cardiovascular disease in study populations with serious mental illness (SMI), United States 2000–2013

PANEL 1: INPATIENT TREATMENT OF ACUTE MYOCARDIAL INFARCTION					
Measure	**Studies (N)**	**Measures Abstracted (N)**	**Measure range in sample with SMI**	**Guideline Adherence in Study Samples with and without SMI (N Measures)**	**Studies Reviewed**
Percent of Patients Receiving:					
Catheterization	3	8	5% – 47%	More likely in SMI sample: 0 Less likely in SMI sample: 3 No difference: 2	(Druss et al., 2000; McGinty EE et al., 2012; Petersen LA et al., 2003)
Thrombolytic therapy	1	6	64%	More likely in SMI sample: 0 Less likely in SMI sample: 2 No difference: 2	(Druss et al., 2001; Petersen LA et al., 2003)
Coronary artery bypass grafting (CABG)	3	10	2% – 20%	More likely in SMI sample: 0 Less likely in SMI sample: 1 No difference: 4	(Druss et al., 2000; McGinty EE et al., 2012; Petersen LA et al., 2003)
Percutaneous transluminal coronary angioplasty (PTCA)	3	10	9% – 33%	More likely in SMI sample: 0 Less likely in SMI sample: 2 No difference: 6	(Druss et al., 2000; McGinty EE et al., 2012; Petersen LA et al., 2003)
PANEL 2: ADHERENCE TO GUIDELINES FOR TREATMENT FOLLOWING ACUTE MYOCARDIAL INFARCTION					
Percent of Patients Receiving:					
Aspirin	3	7	77% – 96%	More likely in SMI sample: 0 Less likely in SMI sample: 1 No difference: 4	(Desai et al., 2002; Druss et al., 2001; Petersen LA et al., 2003)
Beta-blockers	4	9	35% – 91%	More likely in SMI sample: 0 Less likely in SMI sample: 3 No difference: 4	(Desai et al., 2002; Druss et al., 2001; McGinty EE et al., 2012; Petersen LA et al., 2003)
Angiotensin converting enzyme (ACE) inhibitors or angiotensin receptor blockers	3	8	19% – 73%	More likely in SMI sample: 0 Less likely in SMI sample: 1 No difference: 5	(Druss et al., 2001; McGinty EE et al., 2012; Petersen LA et al., 2003)
Statins	1	2	11% – 23%	More likely in SMI sample: 0 Less likely in SMI sample: 0 No difference: 2	(McGinty EE et al., 2012)
PANEL 3: ADHERENCE TO GUIDELINES FOR CARE AND TREATMENT OF CONGESTIVE HEART FAILURE					
Percent of Patients Receiving:					
Left ventricular function (LVF) assessment	2	4	47% – 81%	More likely in SMI sample: 0 Less likely in SMI sample: 1 No difference: 1	(Blecker et al., 2010; Rathore et al., 2008)

PANEL 1: INPATIENT TREATMENT OF ACUTE MYOCARDIAL INFARCTION					
Measure	**Studies (N)**	**Measures Abstracted (N)**	**Measure range in sample with SMI**	**Guideline Adherence in Study Samples with and without SMI (N Measures)**	**Studies Reviewed**
Angiotensin Converting Enzyme (ACE) Inhibitors or Angiotensin Receptor Blockers	2	6	47% – 79%	More likely in SMI sample: 0 Less likely in SMI sample: 0 No difference: 5	(Blecker et al., 2010; Rathore et al., 2008)
Beta-Blockers	1	2	46%	More likely in SMI sample: 0 Less likely in SMI sample: 0 No difference: 1	(Blecker et al., 2010)

Table 2

Summary of measures of quality of care for cardiovascular risk factors in study populations with serious mental illness (SMI), United States 2000–2013

PANEL 1: ADHERENCE TO GUIDELINES FOR CARE AND TREATMENT OF DIABETES MELLITUS					
Measure	**Studies (N)**	**Measures Abstracted (N)**	**Measure range in sample with SMI**	**Guideline Adherence in Study Samples with and without SMI (N Measures)**	**Studies Reviewed**
Percent of Patients Receiving:					
Overall guideline-based care	2	6	19% – 56%	More likely in SMI sample: 1 Less likely in SMI sample: 1 No difference: 1	(Goldberg et al., 2007b; Leung et al., 2011)
Diabetic eye examinations	8	20	30% – 83%	More likely in SMI sample: 1 Less likely in SMI sample: 3 No difference: 10	(Banta et al., 2009; Clark et al., 2009; Frayne et al., 2005; Goldberg et al., 2007b; Green et al., 2010; Kilbourne et al., 2011; Kilbourne et al., 2008; Leung et al., 2011)
Diabetic foot examinations	3	5	78% – 87%	More likely in SMI sample: 0 Less likely in SMI sample: 2 No difference: 1	(Goldberg et al., 2007b; Kilbourne et al., 2011; Kilbourne et al., 2008)
Glycosated hemoglobin (HBA1c) testing	7	20	43% – 89%	More likely in SMI sample: 0 Less likely in SMI sample: 2 No difference: 9	(Banta et al., 2009; Clark et al., 2009; Frayne et al., 2005; Goldberg et al., 2007b; Green et al., 2010; Krein SL et al., 2006; Leung et al., 2011)
Diabetic nephropathy testing	5	13	50% – 79%	More likely in SMI sample: 2 Less likely in SMI sample: 2 No difference: 6	(Clark et al., 2009; Goldberg et al., 2007b; Green et al., 2010; Kilbourne et al., 2008; Leung et al., 2011)
Pharmacologic diabetes mellitus treatment	2	3	70% – 95%	More likely in SMI sample: 0 Less likely in SMI sample: 0 No difference: 1	(Nasrallah et al., 2006; Weiss et al., 2006)
PANEL 2: ADHERENCE TO GUIDELINES FOR CARE AND TREATMENT OF CO-MORBID CONDITIONS AMONG PERSONS WITH DIABETES MELLITUS					
Percent of Patients Receiving:					
Lipid testing	9	30	26 – 77%	More likely in SMI sample: 1 Less likely in SMI sample: 4 No difference: 10	(Banta et al., 2009; Clark et al., 2009; Frayne et al., 2005; Goldberg et al., 2007b; Green et al., 2010; Krein SL et al., 2006; Leung et al., 2011)
Pharmacologic dyslipidemia treatment	2	5	52% – 67%	More likely in SMI sample: 0 Less likely in SMI sample: 1 No difference: 1	(Kreyenbuhl et al., 2008; Weiss et al., 2006)
Pharmacologic hypertension treatment	1	2	84%	More likely in SMI sample: 0 Less likely in SMI sample: 0 No difference: 1	(Weiss et al., 2006)

PANEL 1: ADHERENCE TO GUIDELINES FOR CARE AND TREATMENT OF DIABETES MELLITUS					
Measure	**Studies (N)**	**Measures Abstracted (N)**	**Measure range in sample with SMI**	**Guideline Adherence in Study Samples with and without SMI (N Measures)**	**Studies Reviewed**
Angiotensin Converting Enzyme (ACE) Inhibitors or Angiotensin Receptor Blockers	2	3	48% – 69%	More likely in SMI sample: 0 Less likely in SMI sample: 0 No difference: 1	(Kreyenbuhl et al., 2008; Weiss et al., 2006)
Aspirin	1	2	36%	More likely in SMI sample: 0 Less likely in SMI sample: 0 No difference: 1	(Weiss et al., 2006)
PANEL 3: ADHERENCE TO GUIDELINES FOR CARE AND TREATMENT OF DYSLIPIDEMIA					
Percent of Patients Receiving:					
Pharmacologic dyslipidemia treatment	2	2	12% – 67%	More likely in SMI sample: 0 Less likely in SMI sample: 0 No difference: 0	(Kreyenbuhl et al., 2008; Nasrallah et al., 2006)

Table 3

Summary of measures of quality of care for HIV/AIDS in study populations with serious mental illness (SMI), United States 2000–2013

PANEL 1: ADHERENCE TO GUIDELINES FOR CARE AND TREATMENT OF HIV/AIDS					
Measure	**Studies (N)**	**Measures Abstracted (N)**	**Measure range in population with SMI**	**Guideline Adherence in Study Samples with and without SMI (N Measures)**	**Studies Reviewed**
Percent of Patients Receiving:					
CD4 Count Monitoring	1	2	85%	More likely in SMI population: 0 Less likely in SMI population: 0 No difference: 1	(Bogart et al., 2006)
Viral Load Monitoring	1	2	82%	More likely in SMI population: 0 Less likely in SMI population: 0 No difference: 1	(Bogart et al., 2006)
Antiretroviral therapy[1]	4	12	51%–83%	More likely in SMI population: 0 Less likely in SMI population: 2 No difference: 1	(Bogart et al., 2006; Himelhoch et al., 2007; Walkup et al., 2001; Walkup et al., 2004)

[1] Includes highly active antiretroviral therapy (HAART), protease inhibitors (PIs), and non-nucleoside reverse transcriptase inhibitors (NNRTIs)

Table 4

Adherence to National Quality Guidelines in the Overall Population and Persons with Serious Mental Illness (SMI)

Measure	National Guidelines[1]	Range of Guideline Adherence Rates in SMI Study Samples Reviewed	Estimated Guideline Adherence Rates in US Study Samples
INPATIENT TREATMENT OF ACUTE MYOCARDIAL INFARCTION (O'Gara et al., 2013)			
Catheterization	Fibrinolytic treatment or angiogram with percutaneous coronary intervention or bypass surgery as needed	5% – 47%	76%–93% (McNamara et al., 2014; Shimony et al., 2014)
Thrombolytic therapy		64%	52.5% (Gibson et al., 2008)
Coronary artery bypass grafting (CABG)		2% – 20%	9% (Shimony et al., 2014)
Percutaneous transluminal coronary angioplasty (PTCA)		9% – 33%	43–69% (Shimony et al., 2014)
GUIDELINES FOR TREATMENT FOLLOWING ACUTE MYOCARDIAL INFARCTION (O'Gara et al., 2013)			
Aspirin/antiplatelet therapy	All patients should take aspirin/antiplatelet therapy barring clinical contraindication	77% – 96%	89%–94 (O'Brien et al., 2013) (McNamara et al., 2014)
Beta-blockers	All patients should take beta-blockers barring contraindication	35% – 91%	80–88% (O'Brien et al., 2013; Setoguchi et al., 2007)
Angiotensin converting enzyme (ACE) inhibitors or angiotensin receptor blockers (ARBs)	All patients should take ACE inhibitors or ARBs barring clinical contraindication	19% – 73%	65%–77% (Goldberg et al., 2007a; McNamara et al., 2014; O'Brien et al., 2013)
Statins	All patients should take statins barring contraindication	11% – 23%	66%–85% (Fang et al., 2014; McNamara et al., 2014; O'Brien et al., 2013)
GUIDELINES FOR OUTPATIENT CARE AND TREATMENT OF CONGESTIVE HEART FAILURE (Yancy et al., 2013)			
Left ventricular function (LVF) assessment	Staging and treatment for congestive heart failure should include left ventricular functional assessment (LVF) and medications in appropriate patients	47% – 81%	88%[1] (Bertoni et al., 2004)
Angiotensin Converting Enzyme (ACE) Inhibitors or Angiotensin Receptor Blockers		47% – 79%	32–73%[2] (Bertoni et al., 2004; Mosalpuria et al., 2014)
Beta-Blockers		46%	38%–49% (Mosalpuria et al., 2014)
GUIDELINES FOR OUTPATIENT CARE AND TREATMENT OF DIABETES MELLITUS (American Diabetes Association, 2014)			
Diabetic eye examinations	Comprehensive eye examination at diagnosis and annually thereafter	20% – 83%	51%–75% (Ali et al., 2013a; National Committee on Quality Assurance, 2013; Paksin-Hall et al., 2013)
Diabetic foot examinations	Comprehensive foot examination annually	78% – 87%	65%–74% (Ali et al., 2013a; Paksin-Hall et al., 2013)
Glycosolated hemoglobin (HBA1c) testing	Monitoring of glycemic control at least two times per year in patients who are meeting treatment goals and at least quarterly in other patients	43% – 89%	87%–91% (National Committee on Quality Assurance, 2013)

Measure	National Guidelines[1]	Range of Guideline Adherence Rates in SMI Study Samples Reviewed	Estimated Guideline Adherence Rates in US Study Samples
Diabetic nephropathy testing	Annual screen for nephropathy	50% – 79%	78%–90% (National Committee on Quality Assurance, 2013)
Pharmacologic diabetes mellitus treatment	Pharmacologic treatment for those meeting elevated glycosylated hemoglobin criteria	70% – 95%	83–89% (Yeh et al., 2010)
GUIDELINES FOR CARE AND TREATMENT OF CO-MORBID CONDITIONS AMONG PERSONS WITH DIABETES MELLITUS (American Diabetes Association, 2014)			
Lipid testing	Measure lipids at least annually	26% – 77%	76%–88% (Ali et al., 2013a) (National Committee on Quality Assurance, 2013)
Pharmacologic dyslipidemia treatment	Statin therapy should be used to treat diabetes mellitus in patients with cardiovascular disease and those aged 40 years and older with one or more cardiovascular risk factors	52% – 67%	51%–63% (Fu et al., 2011; Mann et al., 2009)
Angiotensin Converting Enzyme (ACE) Inhibitors or Angiotensin Receptor Blockers	For mild hypertension, initiate treatment with an ACE inhibitor/ARB if lifestyle therapy alone does not control hypertension for 3 months; for more severe hypertension, initiate treatment with an ACE inhibitor/ARB at time of diagnosis	48% – 69%	45%–64% (Ali et al., 2013b)
Aspirin	Aspirin treatment is indicated for patients at risk of cardiovascular disease	36%	63% (Akers et al., 2012)
ADHERENCE TO GUIDELINES FOR CARE AND TREATMENT OF DYSLIPIDEMIA[3] (National Heart Lung and Blood Institute, 2002)			
Pharmacologic dyslipidemia treatment	Initiate pharmacologic therapy if dietary therapy fails to lower lipids to recommended levels	12% – 67%	36%–39% (Mann et al., 2008) (Li et al., 2010)
ADHERENCE TO GUIDELINES FOR CARE AND TREATMENT OF HIV/AIDS[3] (Aberg et al., 2009; Adults and Adolescents, 2009)			
CD4 Count Monitoring	Monitor every 3–6 months in untreated patients to determine urgency of antiretroviral therapy initiation; monitor after treatment initiation to monitor response to antiretroviral therapy	85%	83% (Blair et al., 2011)
Viral Load Monitoring	Monitor every 3–6 months in untreated patients to determine urgency of antiretroviral therapy initiation; monitor after treatment initiation to monitor response to antiretroviral therapy	82%	83% (Blair et al., 2011)
Antiretroviral therapy[4]	Antiretroviral therapy based on CD4 and viral load counts	51%–83%	85% (Blair et al., 2011)

[1] To the best of the authors' knowledge, this single-state study is the only study to date measuring rates of left ventricular function assessment among individuals with congestive heart failure in the US

[2] Limited studies of rates of angiotensin converting enzyme inhibitors or angiotensin receptor blockers among individuals with congestive heart failure in the US suggest that rates of medication use vary considerably across states.

[3] Guidelines current as of date of literature evaluated for this review; guidelines have since been changed and updated.

[4] Includes highly active antiretroviral therapy (HAART), protease inhibitors (PIs), and non-nucleoside reverse transcriptase inhibitors (NNRTIs)