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## Mentally Ill Medicare Patients Are Less Likely Than Others To Receive Certain Types Of Surgery

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### Abstract

Mentally ill people may face barriers to receiving elective surgical procedures due to societal stigma, and the cognitive, behavioral, and interpersonal deficits associated with mental illness. Using data from a cohort of elderly Medicare beneficiaries in 2007, we examined whether the mentally ill have less access than persons without mental illness to several common procedures that are typically non-emergent and performed at the discretion of the provider and patient. Results suggest that Medicare patients with mental illness are between 30 and 70 percent less likely to receive these “referral-sensitive” surgical procedures. Those who did undergo an elective procedure generally experienced poorer outcomes both in the hospital and after discharge. Efforts to improve the access and outcomes of nonpsychiatric care for mentally ill patients are warranted.

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Mental illness is prevalent among the Medicare population. Approximately 26 percent of older Americans (≥ 65 years) have a major psychiatric condition<sup>1</sup> such as depression or anxiety, and more than 1.7 million have an active substance abuse disorder.<sup>2</sup> As the aging population continues to grow, the number of older persons with psychiatric and substance abuse disorders is projected to double in the next decade and exceed the number of younger adults with mental disorders.<sup>1</sup>

People with mental disorders are at heightened risk for developing medical morbidities such as coronary heart disease.<sup>3–6</sup> Furthermore, compared to other patients, the mentally ill may have poorer outcomes following treatment of their medical conditions.<sup>7–11</sup> For example, mentally ill patients receiving coronary artery bypass graft or other surgeries tend to experience disproportionately high rates of postoperative complications and high rates of hospital resource use.<sup>8,9</sup>

It has also been documented that mentally ill patients with coronary heart disease may face barriers to receiving diagnostic catheterization and revascularization procedures,<sup>12–14</sup> which could be at least partially because of their cognitive, social, and behavioral deficits associated with mental illness. However, the current literature on the underutilization of high-technology procedures among the mentally ill is limited to coronary bypass and coronary angioplasty. To our knowledge, studies have not determined whether people with mental disorders also have trouble getting access to other common cardiovascular or non-cardiovascular procedures, which, similar to coronary bypass, have substantial implications for patient outcomes and quality of life. Such procedures typically require referrals to specialists.

In this article, we compared the relative use rates of several surgical procedures of the sort that are collectively referred to as referral-sensitive procedures.<sup>15–17</sup> Referral-sensitive surgeries are invasive and high-cost procedures that are usually subject to the recommendation of the patient’s referring physician, who in most situations has the discretion to either refer the patient to receive the procedure or to treat the patient medically and conservatively. Typical examples are hip and joint replacement, breast reconstruction after mastectomy, pacemaker insertion, organ and bone marrow transplantation, most coronary artery bypass graft surgery, and coronary angioplasty. We compared rates of these procedures among patients with and without mental illness in a cohort of Medicare fee-for-service beneficiaries age 65 years or older.

We then proceeded to determine whether mental illness predicted important surgical outcomes including length-of-stay, short-term readmission, and short-term and long-term mortality among patients who did receive a referral-sensitive procedure. We hypothesized that compared to patients without mental disorders, mentally ill patients had fewer procedures and worse outcomes after receipt of a procedure.

## Study Data And Methods

The primary source of data was the 2007 Medicare Provider Analysis and Review (MedPAR) part A file, which contained computerized discharge abstracts for the acute care hospital stays of all fee-for-service beneficiaries. Demographic information included age, gender, race/ethnicity, and zip code and county of residence.

We categorized the principal diagnosis and up to nine secondary diagnoses according to the *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) codes, and the principal procedure and up to five secondary procedures by the ICD-9-CM procedure codes. Other data elements included admission type (for example, emergent, urgent, elective), length-of-stay (number of days from admission to discharge), discharge disposition, death date for those who died within two years of admission, and Medicare hospital identification number.

The MedPAR file was supplemented by several other national databases. First, the 2000 US census data allowed us to compute the annual household income level and the percentage of high-school graduates in the zip code area where a patient lives. Next, the 2007 American Hospital Association annual hospital survey file contained information about all hospitals in the United States. Finally, the 2007 Area Resource File, a database of health information maintained by the US Health Resources and Services Administration, provided geographic and health care resource information for each patient’s county of residence.

### Study sample

Using the MedPAR inpatient records, we created a cohort of admissions that represented hospital stays of either referral-sensitive procedures or—as a comparison group—several conditions typically requiring urgent admissions (referred to as “marker” conditions) that have been defined and validated by John Billings and colleagues.<sup>15</sup>

Again, as noted above, these referral-sensitive surgeries are invasive and high-cost procedures that are usually subject to the recommendation of the patient’s referring physician, who in most situations has the discretion to either refer the patient to receive the procedure or to treat the patient medically and conservatively. According to Billings and colleagues, these procedures include hip and joint replacement, breast reconstruction after mastectomy, pacemaker insertion, organ and bone marrow transplantation, most coronary artery bypass graft surgery, and coronary angioplasty.

Marker conditions included appendicitis with appendectomy, acute myocardial infarction (with a length-of-stay of more than five days or a disposition of death), gastrointestinal obstruction, and fracture of hip or femur. The advisory panel convened by Billings and colleagues (1993) asserted that although the receipt of a referral-sensitive procedure is somewhat discretionary and tends to be affected by non-clinical factors such as socioeconomic status, admissions due to marker conditions tend to be much more urgent. As a result, their use is unlikely to be reduced by common barriers to care associated with a patient's socioeconomic status, race/ethnicity, or geography.

Consequently, comparing the relative occurrence of the two types of admissions offers useful insights into potential disparities in the receipt of referral-sensitive procedures, as demonstrated in previous studies.<sup>15-17</sup>

We limited our analyses to Medicare beneficiaries age sixty-five and older, excluding younger beneficiaries because they make up a small group that may have special health needs such as disability or end-stage renal disease that are beyond the scope of this study. The unit of analysis was the hospitalization; a patient may have multiple hospital admissions during the study period.

## Variables

The primary outcome of interest was the likelihood of a beneficiary receiving one of the referral-sensitive procedures. Secondary outcomes included length-of-stay; thirty-day readmission; and in-hospital, thirty-day, and one-year mortality for patients receiving a procedure.

The key explanatory variable was a secondary diagnosis of a mental disorder. We defined coexisting mental illness based on secondary ICD-9-CM codes 290-319, excluding 293.0 and 293.1 for delirium caused by medical conditions, and 305.1 for tobacco use.<sup>18</sup> Note that patients admitted with a principal diagnosis of mental disorder were not included in our sample.

We identified a set of patient-level, hospital-level, and county-level covariates that might affect personal access to inpatient care and hospital outcomes. See the Appendix for the list of these variables, their definitions, and descriptive statistics.<sup>19</sup>

## Statistical Analyses

We conducted bivariate analyses to describe differences between mentally ill and mentally healthy patients in referral-sensitive admissions patterns, outcomes, and other characteristics.

In multivariate analyses we estimated logistic regression models to determine the independent impact of mental illnesses on the likelihood of referral-sensitive admission relative to the likelihood of admission for urgent marker conditions. The binary dependent variable was defined as one for referral-sensitive admissions and zero for urgent admissions due to marker conditions.

We estimated several models in order to compare admissions for each as well as overall referral-sensitive procedures relative to admissions for marker conditions. Each model had mental diagnosis as the key explanatory variable and the same patient, hospital, and county covariates (see the Appendix)<sup>19</sup> as controls.

In further multivariate analyses we focused on patients who received a referral-sensitive procedure and determined the potential outcome differences between mentally ill and other

patients. We estimated ordinary least squares regression for length-of-stay (natural-log transformed), separate logistic regression for thirty-day readmission and thirty-day postoperative mortality, and Cox proportional hazard regression for mortality within one year of surgery.

### Study Limitations

This study has several potential limitations. First, because our analyses were limited to Medicare fee-for-service patients, conclusions may not be generalized to younger patients or to Medicare managed care patients. Second, the prevalence of mental illness could be underestimated in our sample because the secondary ICD-9-CM codes used for case identification may be subject to under-recording or faulty recording in the Medicare administrative database. However, under-identification of mental disorders would bias our results toward showing no group differences in use of surgical procedures and outcomes.

Third, although our multivariate analyses controlled for an extensive set of patient, hospital, and community covariates, we cannot totally rule out the possibility of unmeasured confounding effects. For example, although we used the Elixhauser algorithm (a standard, ICD-9-CM based disease coding method) to control for comorbidities,<sup>20</sup> the hospital claims data do not contain detailed clinical information about severity of medical conditions. If systematic differences in disease severity exist across mental groups (for example, the mentally ill may be medically more vulnerable), our estimates of differential procedure use and outcomes may reflect in part the effect of unmeasured health care needs.

Fourth, our use of admissions for non-discretionary marker conditions as a control group in multivariate analyses<sup>10</sup> assumes that given the emergency nature of these conditions, mentally ill patients should face relatively few barriers to the treatment of these conditions. Billings and colleagues<sup>15</sup> performed small-area analyses and found that hospitalization rates for these conditions did not vary across socioeconomic groups, which provides strong support for our assumption in the analyses. Nevertheless, our study was not able to verify this assumption. Future research is needed to provide direct evidence on the equal likelihood of hospital admissions for marker conditions across mental groups.

Fifth, among those who received a referral-sensitive procedure, part of the increased length-of-stay for mentally ill patients may have been related to the treatment of their mental comorbidities, rather than to the principal procedure leading to admissions. Finally, our analyses were cross-sectional and therefore could only determine the associations, but not causal relationships, between mental diagnosis and receipt of referral-sensitive procedures and procedural outcomes. Our Medicare administrative data do not contain longitudinal information about patients' disease prevalence, outpatient care experience, or referring physician characteristics. Future prospective studies are needed to confirm the causal impact of mental illness on the observed reduction in referral-sensitive use of surgical procedures and worsened outcomes.

### Results

The study sample included Medicare beneficiaries admitted to an acute care hospital for either a referral-sensitive procedure or an urgent marker condition in 2007. Compared to admissions without coexisting mental illness (n = 1,062,449), admissions with a diagnosis of mental illness (n = 199,573) tended to involve older (age eighty versus seventy-seven on average) female (69 percent female versus 54 percent male) patients and to be emergent cases (52 percent versus 37 percent) (see Exhibit A1 of the Appendix).<sup>19</sup>

People admitted with mental illness also demonstrated higher rates of neurological disorders, hypothyroidism, fluid and electrolyte disorders, and anemia, but lower rates of cardiovascular comorbidities, comorbid diabetes, and cancer. The mentally ill patients were less likely to be admitted to a teaching hospital, and were slightly more likely to reside in metropolitan statistical areas, or counties with somewhat higher per capita use of inpatient and outpatient resources (Exhibit A1 of the Appendix).<sup>19</sup>

Exhibit 1 shows that overall, 45.7 percent of admitted mentally ill patients were referral-sensitive; the remaining 54.3 percent were admitted for marker conditions. By contrast, 69.9 percent of admissions of mentally healthy patients were referral-sensitive, and the remaining 30.1 percent were for marker conditions ( $p < 0.001$  based on a chi-square test).

This bivariate analysis suggests lower use of referral-sensitive procedures among mentally ill Medicare beneficiaries, relative to admissions for marker conditions. Multivariate analysis controlling for patient, hospital, and county characteristics confirmed this finding, with the adjusted odds ratio of referral-sensitive admissions being 0.48 for mentally ill beneficiaries (Exhibit 1).

Analyses for several major types of mental illness showed consistently lower proportions of referral-sensitive admissions, with adjusted odds ratios ranging from 0.23 for schizophrenia to 0.76 for post-traumatic stress disorder (Exhibit A2 of the Appendix; the Appendix also provides ICD-9-CM definitions of individual mental illnesses<sup>19</sup>).

Further analyses comparing each referral-sensitive procedure to urgent admissions for marker conditions suggested consistently lower incidence of each procedure among the mentally ill (Exhibit 1). The adjusted odds ratio associated with mental illness was 0.64 for hip/joint replacement; 0.71 for breast reconstruction; 0.55 for pacemaker; 0.39 for coronary bypass; 0.33 for coronary angioplasty; and 0.65 for organ and bone marrow transplant. The relatively lower use of each procedure was also confirmed for individual types of major mental diagnoses (Exhibit A2 of the Appendix<sup>19</sup>).

In final analyses of outcomes for patients undergoing referral-sensitive procedures (Exhibit 2), comorbid mental diagnosis was associated with higher length-of-stay (unadjusted mean length-of-stay, 4.52 days versus 4.25 days; adjusted beta-coefficient 0.13), more frequent readmissions within thirty days of surgery (11.06 percent versus 9.86 percent; adjusted odds ratio 1.18), higher thirty-day postoperative mortality (0.80 percent versus 0.63 percent; adjusted odds ratio 1.31), and higher mortality within the first year after surgery (7.28 percent versus 5.62 percent; adjusted hazard ratio 1.39).

The worse outcomes were confirmed for most subtypes of mental diagnoses (Exhibit A3 of the Appendix<sup>19</sup>). Moreover, we performed similar outcome analyses for each individual referral-sensitive procedure and confirmed the associations of mental illness with increased length-of-stay and higher postoperative readmission and mortality rates for each procedure (results were not presented but are available from the authors upon request).

## Discussion

This national study of elderly Medicare beneficiaries reveals that patients with mental illness were less likely to receive several high-cost and relatively discretionary surgical procedures when compared to patients without mental illness. The lower rates of referral-sensitive procedures, as compared to the rate of admissions for urgent marker conditions, were consistently found among several major mental diagnoses including schizophrenia, other psychosis, major depression, bipolar disorder, substance abuse, and post-traumatic stress disorder.

Moreover, among those who did receive a referral-sensitive surgery, coexisting mental disorders were associated with longer length-of-stay and worse postoperative outcomes including more frequent thirty-day readmissions, and higher risk of short-term and long-term mortality. These findings persisted after adjustment for patient demographics, socioeconomic status, medical comorbidities, hospital types, and community characteristics.

Several studies reported that mentally ill patients with coronary heart disease tended to have lower revascularization rates compared to patients with heart disease who were not mentally ill.<sup>12–14</sup> In a national study of Medicare patients with confirmed myocardial infarction, Benjamin Druss and colleagues<sup>12</sup> found that mental disorders were associated with a 40–80 percent reduced likelihood of receiving cardiac catheterization, and with a 20–70 percent reduced likelihood of receiving revascularization procedures.

Another study by Janet Young and colleagues<sup>13</sup> performed similar analyses on different samples and confirmed the lower revascularization rate associated with mental diagnoses for both elderly and younger adults.

Despite this body of literature focusing on common cardiovascular procedures, there is a lack of research on potential disparities faced by mentally ill patients in receiving other major surgical procedures. The present study contributes to the literature by demonstrating lower uses of a broader set of elective procedures—including revascularization procedures—among mentally ill Medicare patients. The relatively consistent findings across procedures and multiple mental diagnoses indicate significant barriers to medical and surgical care for the nation's large number of mentally afflicted people.<sup>1–2</sup>

We defined referral-sensitive procedures with a validated ICD-9-CM algorithm developed by Billings and colleagues<sup>15</sup> and performed multivariate comparisons using methods that have been used in previous studies.<sup>10,17,21,22</sup> Of particular note, our analyses focused on admissions for referral-sensitive procedures relative to those for treatment of a homogenous group of marker conditions. Given the emergency nature of marker conditions, admissions tend not to vary with patient sociodemographic status and physician discretions.

Thus, to the degree that mentally ill versus mentally healthy patients have equal likelihood of having admissions for marker conditions, the relatively reduced rate of referral-sensitive admissions for mentally ill patients would suggest problems with access to care that may be caused by the cognitive, attitudinal, and behavioral deficits associated with mental illness.

For a number of highly technical surgical procedures such as joint replacement,<sup>23,24</sup> renal transplantation,<sup>25</sup> and cardiac procedures,<sup>26</sup> whether or not a patient is willing to be treated invasively has been found to contribute to the variation in use of surgical procedures across patient subgroups. The preferences of mentally ill patients may be difficult for researchers to elicit due to cognitive deficits and reduced capability for informed decision making.

Studies, however, have shown that mentally ill patients may lack motivation to seek help at the onset of physical symptoms. They also tend not to have routine care providers for their chronic medical conditions, and seek care only in response to medical crises.<sup>27,28</sup> We suspect that similar lack of motivation may exist for mentally ill patients' seeking or agreeing to surgeries recommended by their referring physicians. Future research is needed to explore patient preference and its potential impact on the receipt of surgical care for patients with mental illness.

Evidence also suggests that patients' demographic, social, and behavioral status can affect whether their physicians recommend specialist care such as revascularization procedures.<sup>24, 29–31</sup> For instance, lower education and sedentary lifestyle were associated



with lower referral rates for coronary bypass surgery even when the procedure was clinically indicated.<sup>30</sup> Mental illness tends to be associated with these and other undesirable social and behavioral characteristics.

In addition, the presence of mental and behavioral abnormalities could complicate physician referring decisions by distracting attention away from nonpsychiatric symptoms, diagnoses, and treatment recommendations,<sup>32</sup> and lead to a negative attitude on the part of the referring physician.<sup>33</sup> Meanwhile, due to cognitive abnormalities and possible lack of surrogate support, mentally ill patients may be less able to communicate proactively with the physicians; accordingly, they may be less able to exert their preferences for more aggressive surgical treatment when they do wish to go that route.

Taken together, these factors could place patients with coexisting mental illness in a disadvantaged position when their doctors are deciding what type of treatment to recommend. Alternatively, the relatively lower procedural rate for mentally ill patients may be a result of overuse of some highly technical procedures among the general population.<sup>34</sup> However, we doubt that this explanation would be a primary reason for the lower referral rates associated with mental illness, which tended to be substantial and consistent across procedure types and mental diagnoses.

The findings of increased length-of-stay and postoperative readmission and mortality for mentally ill patients who underwent surgery were consistent with results of previous studies.<sup>7-11</sup> One possible mechanism underlying these findings is that patients with mental illness receive poorer quality of care during their nonpsychiatric hospitalizations,<sup>7-35</sup> which would lead to higher perioperative complication rates,<sup>8,9</sup> increased length-of-stay,<sup>8</sup> and increased post-operative readmissions and mortality.<sup>7,35</sup>

Mentally ill patients may also have reduced access to appropriate post-discharge ambulatory care,<sup>27</sup> and be less compliant with prescribed medications, rehabilitative treatment or other follow-up care,<sup>36</sup> thereby worsening their post-surgical outcomes. Finally, it is possible that unmeasured conditions and severity of disease explain partially the increased risks of adverse outcomes associated with mental illness.

Findings of this study have important policy implications. First, in the context of current fragmented health care systems,<sup>37</sup> concerted efforts are needed to improve mentally ill patients' access to nonpsychiatric care, specifically high-technology medical and surgical care. The reduced access to referral-sensitive procedures among the mentally ill may be caused by both patient factors such as lack of motivation or impaired cognitive skills and provider factors such as reduced referral recommendations. Therefore, initiatives targeted to both sides are necessary.

Furthermore, mentally ill patients face potential disparities in the quality of nonpsychiatric care that they do receive, which may lead to suboptimal outcomes. Policies and practices to assure equally effective treatment for these vulnerable patients are also warranted.

## Conclusion

This study suggests that Medicare patients with mental illness are less likely to receive referral-sensitive surgical procedures compared to patients without mental illness. Furthermore, mental illness was found to be associated with poorer postoperative outcomes and longer length-of-stay. A variety of patient and provider factors may complicate the referring process for surgical care, and worsen surgical outcomes for these vulnerable patients. Efforts to improve the access and outcomes of nonpsychiatric care for mentally ill patients are warranted.

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## EXHIBIT 1

## Admissions For Referral Sensitive Procedures Relative To Marker Conditions For Medicare Patients With And Without Mental Illnesses

	<i>N</i> <sup>a</sup>	% of referral sensitive admissions <sup>b</sup>	Adjusted odds ratio <sup>c</sup>	
			Point estimate	95% confidence interval
Overall referral-sensitive procedures versus marker conditions				
Mental illness	199,573	45.74	0.476	0.469, 0.483
No mental illness	1,062,449	69.90	reference group	
Hip/joint replacement versus marker conditions				
Mental illness	162,023	33.17	0.637	0.622, 0.651
No mental illness	651,025	50.88	reference group	
Breast reconstruction versus marker conditions				
Mental illness	78,239	0.03	0.709	0.417, 1.206
No mental illness	201,198	0.10	reference group	
Pacemaker insertion versus marker conditions				
Mental illness	119,743	9.57	0.547	0.533, 0.560
No mental illness	395,239	19.09	reference group	
Coronary artery bypass surgery versus marker conditions				
Mental illness	114,630	5.53	0.386	0.373, 0.399
No mental illness	397,662	19.58	reference group	
Coronary angioplasty versus marker conditions				
Mental illness	127,705	15.20	0.334	0.327, 0.341
No mental illness	574,205	44.31	reference group	
Organ and bone marrow transplant versus marker conditions				
Mental illness	108,601	0.29	0.653	0.553, 0.772
No mental illness	323,307	1.09	reference group	

SOURCE Authors' analyses of data from the 2007 Medicare Provider Analysis and Review part A file, the 2000 US census data, the 2007 American Hospital Association annual hospital survey file, and the 2007 Area Resource File.

<sup>a</sup>*N* is the number of referral-sensitive admissions, plus the number of admissions for marker conditions.

<sup>b</sup> Calculated as the number of referral-sensitive admissions divided by the number of referral-sensitive admissions plus the number of admissions for marker conditions.

<sup>c</sup> Multivariate logistic regression models adjusted for patient demographics, socioeconomic status, medical conditions, hospital characteristics, and county variables as listed in Exhibit A1 of the Appendix (see Note 19 in text).

## EXHIBIT 2

## Outcomes Of Medicare Patients With And Without Mental Illnesses Receiving Referral Sensitive Procedures

	Length of stay in days	beta-coefficient (a)	30-day readmission		30-day mortality		1-year mortality	
			Rate	Adj Odds Ratio (a)	Rate	Adj Odds Ratio (a)	Rate	Adj Hazard Ratio (a)
Mental illness (n=84430)	4.52±3.60	0.132 (0.127, 0.137)	11.06%	1.175 (1.148, 1.203)	0.80%	1.306 (1.201, 1.420)	7.28%	1.389 (1.351, 1.427)
No mental illness (n=685513)	4.25±4.46	Reference	9.86%	Reference	0.63%	Reference	5.62%	Reference

SOURCE Authors' analyses of data from the 2007 Medicare Provider Analysis and Review part A file, the 2000 US census data, the 2007 American Hospital Association annual hospital survey file, and the 2007 Area Resource File.

<sup>a</sup>Multivariate ordinary least squares (for log-transformed length-of-stay), logistic (for 30-day readmission and mortality) or Cox proportional hazard (for 1-year mortality) models adjusted for patient demographics, socioeconomic status, medical conditions, and hospital characteristics as listed in Exhibit A1 of the Appendix (see Note 19 in text).