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Examining the impact of comorbid serious mental illness on rehospitalization among medical and surgical inpatients

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A B S T R A C T

Objective: Multiple barriers to quality health care may affect the outcomes of postacute treatment for individuals with serious mental illness (SMI). This study examined rehospitalization for medical and surgical inpatients with and without a comorbid diagnosis of SMI which included psychotic disorders, bipolar disorder and major depression.

Methods: We examined hospital discharge records for medical and surgical inpatients from a large urban health system. Descriptive statistics and logistic regression models compared 7-, 30-, 60-, 90- and 180-day rehospitalization among medical and surgical inpatients with SMI (n = 3221) and without an SMI diagnosis (n = 70,858).

Results: Within 6 months following discharge, hospitalized medical patients without an SMI diagnosis (34.3%) and with an SMI diagnosis (43.4%) were rehospitalized (P < .001), while surgical patients without an SMI diagnosis (20.3%) and with an SMI diagnosis (30.0%) were rehospitalized (P < .001). Odds of rehospitalization among medical patients were 1.5 to 2.4 times higher for those with an SMI diagnosis compared to those without an SMI diagnosis (P < .001).

Conclusions: Medical patients with a comorbid psychotic or major mood disorder diagnosis have an increased likelihood of a medical rehospitalization as compared to those without a comorbid SMI diagnosis. These findings support prior literature and suggest the importance of identifying targeted interventions aimed at lowering the likelihood of rehospitalization among inpatients with a comorbid SMI diagnosis.

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1. Introduction

Persons with serious mental illness (SMI) face lifelong challenges in psychological and social functioning that frequently co-occur with compromising physical health conditions. However, owing to a complex interplay of personal, provider and system factors, these persons have diminished access to quality medical care that is continuous, comprehensive and coordinated across levels of the care continuum as compared to the general population [1]. These persons, similar to other populations with multiple comorbidities and psychosocial barriers such as older adults, are at disparate risk for further decline at a critical period, namely, in transitioning to the community after an acute medical or surgical hospitalization. During and after a general medical hospital stay, owing to the complexity of need, poorly integrated care systems and lack of support structures, persons with comorbid SMI diagnoses are likely susceptible to costly failures in proper follow-up in outpatient settings, medication management, treatment adherence and self-care. These challenges may increase their risk for rehospitalization due to recurrences or worsening of prior problems, the onset of new medical problems or the emergence of complications related to the original acute episode [2–5].

With the advent of the Affordable Care Act (ACA), rehospitalization after an episode of acute care became a key indicator of less than optimal, costly and poorly coordinated health care [6,7,8]. This is evident in the ACA’s implementation of initiatives to significantly reduce rehospitalization through payment penalties that incentivize coordination of care across transitions to outpatient treatment, especially for high-risk groups [9]. Among these initiatives is the Medicare Hospital Readmissions Reduction Program which outlines financial disincentives for hospitals with excessive all-cause medical or surgical rehospitalization for patients with a select set of high-risk diagnoses. Although SMI diagnoses are not currently included in the initiative, the program is expected to expand to include other high-risk groups [10].
The relationship between mental illness comorbidity and medical rehospitalization has been previously studied in a number of contexts. Prior research suggests that comorbid psychiatric illness among medical inpatients with cardiovascular disease, pneumonia and diabetes is associated with rehospitalization within 30 days of discharge and beyond [6,10–13]. A few studies more specifically examined the impact of a comorbid SMI diagnoses on subsequent medical rehospitalization for patients with specific chronic health conditions, such as diabetes. For example, in one study, acute care patients with diabetes were more likely to be rehospitalized within 30 days if they had a comorbid bipolar or psychotic disorder, and this increased risk carried through the 24-month study time frame [13]. Another study examined cohorts of patients using longitudinal data and demonstrated over a 4-year period that rehospitalization was associated with a comorbid SMI diagnosis defined as co-occurring mood disorders (bipolar disorder, major depression or dysthymia), or substance abuse among diabetic inpatients. Most recently, in a Danish sample [14,15], persons with a comorbid diagnosis of schizophrenia and major depression were associated with increased risk for rehospitalization for ambulatory care-sensitive conditions or those disorders that usually do not require inpatient care.

This existing research on the association between a comorbid SMI diagnosis and rehospitalization has restricted analyses to patients with particular medical conditions and thus did not examine the broad population of hospital patients with heterogeneous medical or surgical needs. To address this gap in the literature, the current study uses medical record data to examine the impact of a comorbid SMI diagnosis on rehospitalization for both medical and surgical patients at multiple time intervals posthospitalization. This study examined the primary hypothesis that after controlling for a range of demographic and clinical characteristics, a comorbid SMI diagnosis among medical and surgical inpatients will be associated with a significantly higher risk for rehospitalization as compared to other patients without these comorbid SMI diagnoses.

2. Materials and methods

Hospital records were used from January 1, 2011, through December 31, 2013, for patients admitted to three general hospitals, all within the same large urban health system. Analyses examined rehospitalizations considering the impact of a comorbid SMI diagnosis; demographic characteristics, including age, gender, race, marital status and primary insurance status; and clinical characteristics, including specific hospital, admission source, discharge disposition, type of admission, length of stay, primary diagnosis and medical comorbidities. The study design and procedures were approved by the University of Pennsylvania Institutional Review Board.

2.1. Sample

Index hospitalizations included the first, index, medical or surgical hospitalization among admitted patients after January 1, 2012. Hospitalizations were included only if there was 12 months of look-back to capture patient characteristics and 6 months looking forward to capture rehospitalization. Thus, all index hospitalizations were between January 1, 2012, and June 30, 2013. Among these hospitalizations (N = 111,180), patients were selected if admitted for a primary medical or surgical condition [categorized by the All Patient Refined–Diagnostic Related Group (APR-DRGs)]. Patients admitted for a primary psychiatric diagnosis, those admitted for a primary or secondary diagnosis of dementia, those admitted for obstetrics and chemotherapy, those under the age of 18 or over the age of 100, those who died in the hospital and those discharged within 24 h of admission or left against medical advice were excluded from the sample. We chose to exclude patients with very short stays (less than 24 h) or those leaving against medical advice because clinically they would be difficult to engage in a future interventional strategy aimed at reducing rehospitalization. After these exclusions, our study sample included 74,079 patients.

2.2. Construction of serious mental illness, rehospitalization and covariates

Serious mental illness (SMI) is defined in the Federal Register as a significant and chronic impairment in major domains resulting in persistent problems with cognition, mood and life functioning [16]. As such, this study operationally defined SMI to encompass comorbid diagnoses of schizophrenia, bipolar disorder and major depression. This definition of SMI has also been used in other studies examining SMI and subsequent medical rehospitalization [17,18]. Using a 12-month look-back from the index hospitalization, we identified patients who had a comorbid SMI diagnosis using the Agency for Healthcare Research and Quality multilevel clinical classification system (CCS) and included those with a diagnosis of CCS 5.8.1-bipolar disorders [International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes: 296.00–296.99], CCS 5.10-schizophrenia and other psychotic disorders (ICD-9-CM codes: 293.81, 293.82, 295.01–295.95, 29,700.0–298.0) and CCS 5.8.2-major depressive disorder (ICD-9 codes: 296.20–296.36) [6], yielding 70,858 without a comorbid SMI diagnosis and 3221 patients with a comorbid SMI diagnosis. Among those with a comorbid SMI diagnosis, 12.1% (n = 384) had a diagnosis of major depression, 38.2% (n = 1207) had a diagnosis of schizophrenia, and 49.7% (n = 1572) had a diagnosis of bipolar disorder.

All-cause medical/surgical rehospitalization included hospitalizations for a primary medical or surgical diagnosis (hospitalizations for a psychiatric diagnoses or dementia were excluded) that occurred within 7, 30, 60, 90 or 180 days postdischarge. The construction of the variable does not assume that the rehospitalization was for the medical or surgical issue addressed in the index hospitalization. A binary variable was created for each time period. Hospitalizations in these time periods designated as “planned” admissions such as chemotherapy or cardiovascular procedures were excluded.

Covariates were selected based on review of the existing literature on health outcomes among hospitalized patients but were constrained by available data in the medical record. APR-DRGs were used to classify the index primary medical or surgical diagnosis. Variables were also constructed for hospital (A, B or C), age, gender, race, marital status, insurance status and clinical characteristics including admission source (routine, emergency room, outpatient, rehabilitation/long-term care and other institution) and discharge disposition (routine, home health care, skilled nursing/hospice/long-term care and other), and length of stay in days for both medical and surgical admissions. We used the Charlson comorbidity index (excluding depression) [19] to classify co-occurring medical disorders as a marker of illness severity.

2.3. Statistical analyses

Descriptive analyses compared demographic and clinical characteristics of patients with and without a comorbid SMI diagnosis using χ² and t tests by each covariate and by rehospitalization at 7, 30, 60, 90 and 180 days. Unadjusted and adjusted logistic regression models examined the impact of a comorbid SMI diagnosis on rehospitalization at 7, 30, 60, 90 and 180 days for each type of index hospitalization (medical and surgical). Adjusted models controlled for hospital, demographic and clinical covariates; length of stay; Charlson comorbidities and DRG. In order to reduce the probability of type I error associated with running five logistic regression models, an alpha of .01 (i.e., .05 divided by 5) was selected as the a priori level of significance. All analyses were performed using Stata v.11.

3. Results

Tables 1 and 2 describe demographic and clinical characteristics of the sample for patients with and without a comorbid SMI diagnosis.
Patients with a comorbid SMI diagnosis were more likely to be female, black, single, insured by Medicaid and younger. The group with a comorbid SMI diagnosis was significantly younger [mean (M)=52.7, SD=15.1; median = 53] than the group without a comorbid SMI diagnosis [M=58.2; SD=17.4; median = 60] (P<.001).

Patients with a comorbid SMI diagnosis had fewer routine admissions to the hospital as compared to those without a comorbid SMI diagnosis (26% versus 48.4%; P<.001) and were more likely to be admitted from the emergency room (61.5% versus 38.5%; P=.001), discharged to a nursing home (18.0% versus 15.5%; P<.001) and admitted for a medical problem (65.9% versus 43.8%; P=.001). Patients with a comorbid SMI diagnosis were less often admitted for a surgical procedure (34.2% versus 56.2%; P<.001) or discharged to home health care (25.4% versus 30.0%; P=.001) as compared to those without these diagnoses. Those with a comorbid SMI diagnosis had more days in the hospital, particularly for surgical procedures (M=9.5 versus 6.1; P<.001). Patients with a comorbid SMI diagnosis had higher proportions of chronic obstructive pulmonary disease; ulcer disease; mild, moderate or severe liver disease; diabetes; diabetes complications and HIV/AIDS and lower proportions of peripheral vascular disease, any tumor and metastatic solid tumor.

Medical or surgical admissions were classified from the DRG of the index admission. Among medical admissions, patients with a comorbid SMI diagnosis had unadjusted higher rates of rehospitalization in the 7-, 30-, 60-, 90- and 180-day periods (Table 3). Among surgical patients, there was no difference in 7-day unadjusted readmission rates, but 30-, 60-, 90- and 180-day unadjusted readmission rates were higher for those with a comorbid SMI diagnosis.

Table 4 displays the odds ratios for unadjusted and adjusted analyses. Controlling for covariates, medical patients with a comorbid SMI diagnosis had odds that were 1.5–2.5 times higher for rehospitalization at 7, 30, 60, 90 and 180 days as compared to those without a comorbid SMI diagnosis. However, adjusted analyses for surgery patients showed no differences.

### Table 1

| Description of patients (N=74,079) with and without a serious mental illness |
|--------------------------------------------------|---------------------|---------------------|---------------------|---------------------|
| No serious mental illness diagnosis (n=70,858)   | Serious mental illness diagnosis (n=3221) |
| n  | %  | n  | %  | P value  |

### Table 2

| Description of patients (N=74,079) with and without a serious mental illness |
|--------------------------------------------------|---------------------|---------------------|---------------------|---------------------|
| No serious mental illness diagnosis (n=70,858)   | Serious mental illness diagnosis (n=3221) |
| n  | %  | n  | %  | P value  |

### Table 3

| Frequency of rehospitalization by SMI status at index hospitalization (N=74,079) |
|--------------------------------------------------|---------------------|---------------------|---------------------|---------------------|
| Medical admissions  | No SMI diagnosis (n=31,032) | SMI diagnosis (n=2121) |
| n  | %  | n  | %  | P  |

### Table 4

<p>| Odds ratios for unadjusted and adjusted analyses |</p>
<table>
<thead>
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<th>---------------------</th>
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</tr>
</thead>
</table>

a Medical and surgical admissions determined from primary diagnosis from index admission.
the hospital and community-based service settings may provide import-
ance of tailored coordinated transitional care interventions between
persons with a comorbid psychotic disorder, bipolar disorder or major
SMI diagnosis and rehospitalization. Acute care medical episodes for
health care [20,21].

SMI diagnosis likely face a complex array of barriers to quality health
heterogeneous medical needs. Hospitalized patients with a comorbid
sons with a comorbid SMI diagnosis in a population of patients having
between comorbid SMI diagnoses and rehospitalization [10,13,15,17]
comorbid SMI diagnosis was associated with rehospitalization.
patients on rehospitalization to acute care. Analyses showed that even
safety [7]. In that context, the current study retrospectively considered
care stay and an incentive for reducing costs and improving patient
as a proxy measure for the quality of care received during an acute
rates to acute care hospitals. Rehospitalization is thus contextualized
and stigma, still may complicate postdischarge treatment in the context

The study also documented that rehospitalization among surgical
patients with a comorbid SMI diagnosis is not different from that of
patients without these comorbidities. This finding may be explained by
presurgical assessment and screening of high-risk patients, prepara-
and planning of support needed following surgery in community
settings. Even among this highly monitored group, having a comorbid
SMI diagnosis, with its associated cognitive impairments, social de-
pression in this study was signi

4. Discussion

4.1. Current findings

The ACA mandates financial sanctions for excessive readmission
rates to acute care hospitals. Rehospitalization is thus contextualized
as a proxy measure for the quality of care received during an acute
care stay and an incentive for reducing costs and improving patient
safety [7]. In that context, the current study retrospectively considered
impact of a comorbid SMI diagnosis among medical and surgical in-
patients on rehospitalization to acute care. Analyses showed that even
after adjusting for potential confounders, among medical inpatients, a
comorbid SMI diagnosis was associated with rehospitalization.

The findings support prior studies documenting the relationship
between comorbid SMI diagnoses and rehospitalization [10,13,15,17]
and expand this work by highlighting poor health outcomes among per-
sons with a comorbid SMI diagnosis in a population of patients having
heterogeneous medical needs. Hospitalized patients with a comorbid
SMI diagnosis likely face a complex array of barriers to quality health
care including limited access to transitional support postdischarge, com-

4.2. Conclusions and implications for future research

Among acute care patients with diverse medical needs, this study
supports prior research that finds an association between a comorbid
SMI diagnosis and rehospitalization. Acute care medical episodes for
persons with a comorbid psychotic disorder, bipolar disorder or major
depression may challenge care providers to properly stabilize these
patients within the context of vast medical and social needs. Develop-
ment of tailored coordinated transitional care interventions between
the hospital and community-based service settings may provide impor-
tant opportunities for improvement [10,11,13,23]. In response to the

ACA mandates, many health systems are examining various care coordi-
nation and transitional care programs to improve posthospital outcomes
of patients with chronic health conditions. However, little has been done
to address the needs of high-risk patients with comorbid SMI diagnoses
in medical or surgical hospital environments. Medical/surgical hospital
providers often lack expertise in behavioral health and specifically the
care of individuals with a comorbid SMI diagnosis. Thus, hospitals
could prioritize integrated behavioral health and health care planning
when formulating hospital and aftercare plans for patients with these
comorbidities [20]. Evidence-based transitional care models that en-
compass time-limited interventions aimed at promoting continuity of
care could be incorporated into the care of persons with a comorbid
SMI diagnosis from the start of the hospital admission, regardless of
medical comorbidity [24,25]. Unfortunately, most of the research
examining these interventions has specifically excluded persons with
psychiatric comorbidity, and thus there is little reliable information on
the feasibility, associated costs and effectiveness of these programs for
this population [26]. Furthermore, established transitional care models,
as demonstrated in a recent pilot study that examined patients with
medical comorbidities discharged from a psychiatric unit [20], may
not include physical health care providers with specialty education in
the care of people with a comorbid SMI diagnosis and thus be insuf-
icient for ameliorating the barriers to appropriate postdischarge care
among this population. These models typically use an advanced practice
nurse to monitor a standardized care regimen for a single presenting
medical illness. Future research needs to explore the ways in which an
interdisciplinary team approach that encompasses medicine, psychi-

4.3. Study limitations

This study had several limitations. The study was retrospective, and
while the sample was large and from a diverse urban teaching hospital
system, it may not represent nonteaching, rural or other hospitals in
various geographic regions. Additionally, patients could have utilized
hospital services outside the represented teaching hospitals of this
study, and thus, some rehospitalizations may not have been captured in
the data set. Also, medical records used for this study did not include
information about potentially important confounders such as outpatient
service utilization and adherence to self-care or medication regimens.
We also did not include inpatient or outpatient health care utilization
patterns that occurred prior to the index admission. Likewise, the ad-
ministrative and clinical data employed in the analyses did not include
neighborhood or other contextual factors that may possibly influence
the use of hospital services. Furthermore, our definition of SMI does
not factor in other mental illnesses that may confound hospital stays
such as anxiety disorders, personality disorders and substance use. It
is also possible that SMI diagnoses for patients may have been
undercounted. For example, the proportion of inpatients with major de-
pression in this study was significantly lower than that in the general
population, which may be explained by patients being asymptomatic
while in the hospital and the diagnosis not being noted in the medical
record. Despite the limitations, our analyses provide a large and rich
data source to study hospital care and rehospitalization.

Our research adds to existing knowledge and provides more evidence
of the need for development of targeted evidence-based interventions
that are designed to improve hospital care and transitions to community
care for patients with a comorbid SMI diagnosis in medical and surgical
hospital settings. Given the high-risk profile of hospital patients with
a comorbid SMI diagnosis, greater attention is required to enhance the
usual course of a hospital stay with behavioral health specialty interven-
tions that commence at admission and continue from discharge to home.
Transitional care models shown to be effective with other vulnerable

Table 4
Unadjusted and adjusted odds ratios for rehospitalization by SMI status at index hospitali-
zation (N = 74,079)

<table>
<thead>
<tr>
<th>OR</th>
<th>CI</th>
<th>P</th>
<th>OR</th>
<th>CI</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical admissions (n = 33,153)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7-day rehospitalization</td>
<td>3.04</td>
<td>2.58-3.58</td>
<td>&lt;.001</td>
<td>2.27</td>
<td>1.87-2.77</td>
</tr>
<tr>
<td>30-day rehospitalization</td>
<td>1.61</td>
<td>1.44-1.82</td>
<td>&lt;.001</td>
<td>1.60</td>
<td>1.40-1.82</td>
</tr>
<tr>
<td>60-day rehospitalization</td>
<td>1.49</td>
<td>1.34-1.66</td>
<td>&lt;.001</td>
<td>1.54</td>
<td>1.37-1.74</td>
</tr>
<tr>
<td>90-day rehospitalization</td>
<td>1.44</td>
<td>1.30-1.59</td>
<td>&lt;.001</td>
<td>1.51</td>
<td>1.34-1.69</td>
</tr>
<tr>
<td>180-day rehospitalization</td>
<td>1.43</td>
<td>1.31-1.58</td>
<td>&lt;.001</td>
<td>1.49</td>
<td>1.33-1.66</td>
</tr>
<tr>
<td>Surgical admissions (n = 40,926)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>7-day rehospitalization</td>
<td>0.73</td>
<td>0.51-1.04</td>
<td>.08</td>
<td>0.73</td>
<td>0.51-1.03</td>
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<td>30-day rehospitalization</td>
<td>1.37</td>
<td>1.13-1.68</td>
<td>.003</td>
<td>1.07</td>
<td>0.87-1.31</td>
</tr>
<tr>
<td>60-day rehospitalization</td>
<td>1.46</td>
<td>1.23-1.74</td>
<td>&lt;.001</td>
<td>1.11</td>
<td>0.93-1.33</td>
</tr>
<tr>
<td>90-day rehospitalization</td>
<td>1.50</td>
<td>1.28-1.76</td>
<td>&lt;.001</td>
<td>1.12</td>
<td>0.95-1.33</td>
</tr>
<tr>
<td>180-day rehospitalization</td>
<td>1.54</td>
<td>1.32-1.78</td>
<td>&lt;.001</td>
<td>1.15</td>
<td>0.98-1.35</td>
</tr>
</tbody>
</table>

Adjusted for age, race, gender, insurance, 16 Charlson comorbidities, hospital, APR-DRG
primary diagnosis and length of stay (days) for index admission.
* Medical and surgical admissions determined from primary diagnosis from index admission.
populations like older adults could be adapted to a team approach that addresses complex multimorbidity, socially complex needs and lack of engagement with treatment. Such specialized interventions specifically designed for this vulnerable population may well reduce risk for rehospitalization and provide improved continuity and quality of care.

References


