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Nancy P. Hanrahan

Sara Bressi
Bryn Mawr College, sbressi@brynmawr.edu

Steven C. Marcus

Phyllis Solomon

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

Nancy P. Hanrahan, Ph.D., R.N., F.A.A.N. [a,*], Sara Bressi, Ph.D., L.S.W. [b,1], Steven C. Marcus, Ph.D. [c,2], Phyllis Solomon, Ph.D. [c,3]

[a] Northeastern University School of Nursing, Bouvé College of Health Sciences, 102 Robinson Hall, 360 Huntington Ave., Boston, MA, 02115
[b] Graduate School of Social Work and Social Research, Bryn Mawr College, 300 Airdale Road, Bryn Mawr, PA, 19010
[c] University of Pennsylvania School of Social Policy & Practice, Center for Mental Health Policy and Services Research, 3701 Locust Walk, Caster Building, Room C16, Philadelphia, PA, 19104-6214

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ABSTRACT

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].

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* Corresponding author. Tel.: +1 617 373 3649; fax: +1 617 373 8675.
E-mail addresses: n.hanrahan@neu.edu, nphanrahan@gmail.com (N.P. Hanrahan), sbressi@brynmawr.edu (S. Bressi), marcuss@sp2.upenn.edu (S.C. Marcus), solomonp@sp2.upenn.edu (P. Solomon).
[1] Tel.: +1 610 520 2634; fax: +1 610 520 2655.
[2] Tel.: +1 215 573 7941; fax: +1 215 573 2099.
[3] Tel.: +1 215 898 5533; fax: +1 215 573 2099.

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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 inpatients 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 χ^2 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.

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
Demographic characteristics					
Age: *M*, SD, median	*M*=58.2, SD=17.4, median=60		*M*=52.7, SD=15.1, median=53		<.001
Age					
18–35	8405	12.46	446	14.59	<.001
36–50	11,831	17.54	800	26.17	<.001
51–65	21,870	32.42	1223	40.33	<.001
66–85	22,168	32.86	528	17.27	<.001
>86	3179	4.71	50	1.64	<.001
Gender					
Female	35,927	50.54	1714	53.07	.005
Male	34,931	49.46	1507	46.93	
Race					
Black/African American	21,870	32.42	1233	47.14	<.001
White	41,891	59.21	1528	47.45	<.001
Other	6199	8.76	174	5.40	<.001
Marital status					
Single	23,622	33.23	1937	59.97	<.001
Married or partnered	34,577	48.65	740	22.91	<.001
Divorced/widowed	11,479	16.15	465	14.40	.002
Other/unknown	1400	1.97	88	2.72	.003
Primary insurance					
Private	32,891	46.32	1055	32.69	<.001
Medicaid	6935	9.77	835	25.88	<.001
Medicare	29,097	40.98	1277	39.57	.08
Other	2088	2.94	60	1.86	<.001
Hospitals					
Hospital A	37,453	52.53	1555	3.99	<.001
Hospital B	16,720	23.45	909	5.16	<.001
Hospital C	17,126	24.02	776	4.33	<.001

Table 2
Clinical characteristics of patients ($N=74,079$) with and without a serious mental illness

	No serious mental illness ($n=70,858$)		Serious mental illness ($n=3221$)		
	n	%	*n*	%	*P* value
Admission source					
Routine admit	34,419	48.42	840	26.01	<.001
Emergency department	27,392	38.54	1987	61.52	<.001
From another institution	9269	13.04	403	12.48	.35
Disposition					
Routine discharge	35,004	50.65	1358	42.04	<.001
Discharge to home health	21,331	30.01	821	25.42	<.001
Discharge to skilled nursing/ long-term care/hospice/rehab	11,021	15.51	582	18.02	<.001
Other (institution, VA, short-term hospital, correction, state/specialty hospital)	2724	3.83	469	14.52	<.001
Medical admissions	31,032	43.79	2121	65.85	<.001
Surgical admissions	39,826	56.21	1100	34.15	<.001
Charlson comorbid index					
Myocardial infarction	7366	10.37	329	10.19	.74
Congestive heart failure	13,504	19.00	596	18.45	.44
Peripheral vascular disease	6804	9.57	221	6.84	<.001
Cerebrovascular disease	6369	8.96	339	10.50	.003
Chronic obstructive pulmonary disease	16,758	23.58	1115	34.52	<.001
Connective tissue disease	2593	3.65	116	3.59	.87
Ulcer disease	1366	1.92	98	3.03	<.001
Mild liver disease	4244	5.97	358	11.08	<.001
Hemiplegia	1394	1.96	71	2.20	.34
Moderate or severe renal disease	11,408	16.05	549	17.00	.15
Diabetes	15,881	22.35	878	27.18	<.001
Diabetes complications	3026	4.26	190	5.88	<.001
Any tumor	12,415	17.47	353	10.93	<.001
HIV/AIDS	516	0.73	78	2.41	<.001
Moderate or severe liver disease	1315	1.85	91	2.82	<.001
Metastatic solid tumor	5023	7.07	134	4.15	<.001
Index length of stay (in days), medical	*M*=4.9, SD=6.0, median=3.2		*M*=5.1, SD=6.5, median=3.2		<.001
Index length of stay (in days), surgical	*M*=6.1, SD=8.4, median=3.4		*M*=9.5, SD=14.4, median=4.8		<.001

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=50] 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 3
Frequency of rehospitalization by SMI status at index hospitalization ($N=74,079$)

Medical admissions[a]	No SMI diagnosis ($n=31,032$)		SMI diagnosis ($n=2121$)		
	n	%	*n*	%	*P*
7-day rehospitalization	792	2.55	171	8.06	<.001
30-day rehospitalization	3512	11.32	363	17.11	<.001
60-day rehospitalization	5280	17.01	497	23.43	<.001
90-day rehospitalization	6416	20.68	580	27.35	<.001
180-day rehospitalization	8194	26.41	722	34.04	<.001
Surgical admissions	**No SMI diagnosis ($n=39,826$)**		**SMI diagnosis ($n=1100$)**		
	n	%	*n*	%	*P*
7-day rehospitalization	644	1.63	15	1.36	.510
30-day rehospitalization	2773	6.96	102	9.27	.003
60-day rehospitalization	4093	10.28	158	14.36	<.001
90-day rehospitalization	4907	12.32	192	17.45	<.001
180-day rehospitalization	6175	15.50	242	22.00	<.001

[a] Medical and surgical admissions determined from primary diagnosis from index admission.

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

	Unadjusted			Adjusted		
	OR	CI	*P*	OR	CI	*P*
Medical admissions[a] ($n = 33,153$)						
7-day rehospitalization	3.04	2.58–3.58	<.001	2.27	1.87–2.77	<.001
30-day rehospitalization	1.61	1.44–1.82	<.001	1.60	1.40–1.82	<.001
60-day rehospitalization	1.49	1.34–1.66	<.001	1.54	1.37–1.74	<.001
90-day rehospitalization	1.44	1.30–1.59	<.001	1.51	1.34–1.69	<.001
180-day rehospitalization	1.43	1.31–1.58	<.001	1.49	1.33–1.66	<.001
Surgical admissions ($n = 40,926$)						
7-day rehospitalization	0.73	0.51–1.04	.08	0.73	0.51–1.03	.08
30-day rehospitalization	1.37	1.11–1.68	.003	1.07	0.87–1.31	.53
60-day rehospitalization	1.46	1.23–1.74	<.001	1.11	0.93–1.33	.26
90-day rehospitalization	1.50	1.28–1.76	<.001	1.12	0.95–1.33	.18
180-day rehospitalization	1.54	1.32–1.78	<.001	1.15	0.98–1.35	.08

Adjusted for age, race, gender, insurance, 16 Charlson comorbidities, hospital, APR-DRG primary diagnosis and length of stay (days) for index admission.

[a] Medical and surgical admissions determined from primary diagnosis from index admission.

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 the impact of a comorbid SMI diagnosis among medical and surgical inpatients 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 persons 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, community-based care options, and integrated health and behavioral health care [20,21].

The study also documented that rehospitalization among surgical inpatients 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, preparation 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 deficits and stigma, still may complicate postdischarge treatment in the context of a complex medical care system. As such, health systems should be open to practices that target interventions addressing the transitional care needs of this vulnerable population [4,10–13,22].

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. Development of tailored coordinated transitional care interventions between the hospital and community-based service settings may provide important opportunities for improvement [10,11,13,23]. In response to the ACA mandates, many health systems are examining various care coordination 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 encompass 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 insufficient 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, psychiatric consultation services, social work and nursing with a broad scope of expertise may stabilize medically fragile persons with a comorbid SMI diagnosis and a multiplicity of medical, behavioral health and social service needs.

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 administrative 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 depression 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 interventions that commence at admission and continue from discharge to home. Transitional care models shown to be effective with other vulnerable

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.

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