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Non-psychiatric hospitalization length-of-stay for patients with psychotic disorders: A mixed methods study

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Abstract

Objective: Patients with psychotic disorders experience higher rates of chronic and acute non-psychotic diseases and have frequent non-psychiatric hospitalizations which result in both longer and more varied length-of-stay (LoS) than other patients. This study seeks to use a patient-centered perspective to examine LoS.

Methods: This article reports Phase Two of a mixed methods, exploratory sequential study on non-psychiatric hospitalizations for individuals with psychotic disorders. Patients' experiences were used to guide a quantitative analysis of LoS using a general linear model.

Results: Medical comorbidities were the patient characteristics which had the largest effect on LoS. Certain processes of care highlighted by patients from Phase One were also associated with longer LoS, including: physical restraints (105%), psychiatric consults (20%) and continuous observation (133%). Only recent in-system outpatient appointments were associated with shorter LoS. Data integration highlighted that factors which were important to patients such as partner support, were not always quantitatively significant, while others like medical comorbidities and use of physical restraints were points of congruence.

Conclusions: Medical comorbidities were highly associated with LoS but processes relating to longer LoS are those that are used to manage symptoms of acute psychosis. Clinicians should develop policies and procedures that address psychosis symptoms effectively during non-psychiatric hospitalizations. Further research is needed to understand which patients with psychotic disorders are at highest risk of extended length-of-stay.

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Keywords

Psychotic Disorders; Hospitalization; Mixed Methods; Length-of-Stay

1. Introduction

In order to address the disparities in healthcare and reduce the cost of care we need to understand the factors associated with hospital outcomes. In a single year, 7% of Americans are hospitalized [1] and, on average, these inpatient hospitalizations account for 33% of the total medical costs in the United States, totaling up to \$3.75 billion per year. Over 30% of these costs are covered by public insurance and individuals [2]. Poor hospital outcomes such as adverse events, rehospitalization and extended length of stay (LoS) contribute greatly to both hospitalization costs and the wider economic impact on individuals and systems [3, 4]. Marginalized and underserved groups are at increased risk of poor hospital outcomes [5–7] and their negative sequelae.

There are more than 22 million people in the United States with a psychotic disorder [8–10], which are psychiatric diagnoses characterized by hallucinations, delusions and/or thought distortions [11], including schizophrenia spectrum disorders and select mood disorders [12]. These individuals also experience persistent health disparities with high rates of acute and chronic medical conditions [13–16] and this contributes to their increased risk of non-psychiatric hospitalizations [17, 18]. These individuals have an estimated life expectancy over 20 years lower than their cohort peers and the disparity continues even when accounting for other factors such as substance abuse and suicide [19, 20]. During non-psychiatric hospitalizations, these patients experience more adverse events [21, 22], have increased risk of readmission [18, 23, 24], and overall longer LoS in the hospital compared to other patients [25, 26]. Understanding their hospitalization experiences is vital to addressing the health disparities of this vulnerable population.

LoS in particular is important for understanding hospital care and patient outcomes. While meaningful, life-saving care is delivered in hospitals, the longer the LoS the more it creates problems for both patients and the healthcare system. Hospital LoS is positively related to an increased economic burden on both individuals and systems [27]. It is also linked to the risk of adverse events and medication errors [28] meaning that LoS care efficiency and patient safety [29]. The slower rate of patient discharge resulting from extended LoS is “reflecting either inefficiency of care or the development of complications that may slow the rate of discharge” (pg. 1191) [30].

Those with psychotic disorders have a LoS that is 0.8–2 day longer on median [22, 31] and 0.6–15.4 day on average longer compared to patients with similar medical conditions. [21, 32, 33]. Understanding what may contribute to this longer LoS and how these patients experience non-psychiatric hospitalization is vital. The literature on psychiatric hospitalization LoS for patients with psychotic disorders finds a clear relationship between LoS, patient characteristics and hospital processes [34–36]. However, the LoS for non-psychiatric hospitalization for those with psychotic disorders is understudied and to the

authors' knowledge, no studies have focused primarily on LoS for patients with psychotic disorders during non-psychiatric hospitalizations.

This paper reports the results of Phase Two of a mixed method study on patient experiences and hospital LoS for patients with psychotic disorders experiencing non-psychiatric hospitalizations. To better understand their hospitalizations and to generate information for creating risk profiles, this study uses a patient-centered approach to examine hospital experiences and factors associated with LoS for this population. Based on qualitative data from Phase One of this study, we hypothesized that the following factors would be associated with a longer LoS: (1) discharge to a psychiatric setting; (2) use of intramuscular chemical sedation or physical restraints; and (3) diagnosis of schizophrenia.

2 Methods

The Institutional Review Board of the University of Pennsylvania approved this exploratory sequential, mixed methods study. It consisted of two phases: (1) qualitative interviews with patients with psychotic disorders hospitalized on medical-surgical units; and (2) a quantitative analysis of non-psychiatric hospital LoS. Results from Phase One informed variable selection for Phase 2 and integration expanded understanding of outcomes through patient experiences.

Mixed methods research is a distinct methodology valued for understanding complex situations, especially health disparities [37]. Exploratory sequential designs begins with qualitative data collection to investigate a specific phenomenon and then transitions to quantitative analyses informed by the qualitative inquiry [37]. This design is particularly appropriate here because qualitative data illuminates the situation and the quantitative analysis provides more generalizable information on the phenomenon. The Quality Health Outcomes Model (QHOM) [38] served as the guiding framework, informing qualitative coding and structuring quantitative analyses and interpretation.

2.3 Phase One

Full details about Phase One can be found in Weissinger, Brooks Carthon, Ahmed and Brawner [39]. To better understand the experiences of non-psychiatric hospitalization for patients with psychotic disorders, the first author conducted interviews with 20 individuals diagnosed with a psychotic disorder hospitalized on medical-surgical units. Interviews were supplemented by setting notes, which detailed observed situations and conversations with hospital staff. The data analysis was conducted by a team consisting of a doctoral student in nursing, an advanced practice nurse with doctoral training (BM), and the first author (GW), a nurse and mental health counselor, and used a combined inductive-deductive thematic approach [40, 41].

2.4 Phase Two

Phase Two examined LoS of patients with psychotic disorders during non-psychiatric hospitalizations. The inductive and deductive codes generated from Phase One guided both the selection of quantitative variables and the generation of hypotheses. All the variables used were drawn from Phase One's interviews and field notes. Participants had discussed a

variety of factors that affected their hospital stay and experiences. The research team decided all identified variables would be included in a preliminary model but that a more parsimonious model would be constructed via backwards elimination. This kept the analysis grounded in the patient's experience while also eliminating variables not relevant to the study from the quantitative model.

Phase Two's data came from records of hospitalized patients with psychotic disorders at three urban hospitals. To be included, patients had to be: (1) admitted to any of the three hospitals from 2012 to 2017; (2) age 18 or older; (3) with a diagnosis of a psychotic disorder during index hospitalization; (4) a LoS of 1 day or more; and (5) not admitted to a psychiatric unit or by a psychiatric service. To avoid the problem of an individual having multiple hospitalizations during this period, the analysis only examined the first hospitalization which met inclusion criteria (index hospitalization). Only non-psychiatric hospitalizations were used for the index hospitalization and sample inclusion. The study excluded those with LoS less than 24 hours and those who died during their hospital stay because, as noted by Thomas, Lucke, Wueste, Weavind and Patel [42], patients who die before discharge are medically different and their data may interfere with certain statistical analysis or assumptions.

Phase One informed the development of Phase Two's quantitative hypotheses. Factors identified as particularly important in the qualitative analysis were chosen as hypotheses for the quantitative model. Participants described long waits associated with discharge to psychiatric institutions. They also described experiences of sedation and restraint associated with adverse events and delays in treatment. Finally, participants with a diagnosis of schizophrenia had more trouble communicating with providers and the interviewer, as well as more mental health symptoms. These findings lead to the quantitative hypotheses described previously.

2.4.2 Independent Variables and Outcome—The initial list of independent variables was drawn from the deductive coding and reviews of relevant literature. One variable identified was “marital or partner status” after participants in Phase One often spoke about the impact their partner had during hospitalization helping with tasks and provided emotional support. Conversely, participants without partners spoke about their loneliness and feelings of isolation. As a result, this qualitative data was matched to quantitative data on patient “marriage and partner status.” In another example, participants reported a desire to speak with someone who was knowledgeable about mental illness because they reported difficulty discussing and managing their psychiatric symptoms with non-psychiatric providers. In setting notes, nurses spoke about the rarity of psychiatric consults. This led to the inclusion of variables “consult with social worker” and “consult with psychiatrist.”

To capture the breadth of comorbidities, this study used the Elixhauser Comorbidity Index (ECI) which has 28 categories of medical comorbidities associated with poor hospital outcomes [44, 45]. Medical comorbidities were identified as critical by Phase One participants. Patients in Phase One highlighted general psychiatric comorbidity and substance use comorbidity and as a result the Elixhauser depression, alcohol abuse and drug abuse comorbidities were not used.

Major Diagnostic Categories (MDC) was used as a control variable. MDC organize hospital discharge diagnoses into categories based on physiology and severity of illness and are associated with LoS, resource usage and readmission [45]. Uncommon and low-effect MDC were collapsed into the single category of MDC-Other (i.e. Eye; Ear, Nose, Throat; Skin, Subcutaneous Tissue, Breast). Uncommon MDCs that had a large effect on LoS (e.g. Multiple Significant Trauma, Pre-MDC) remained as separate categories. In addition, the analyses also controlled for medical versus surgical hospitalization.

The outcome of interest was index hospitalization LoS, measured as time from hospital admission to discharge. LoS was automatically generated from electronic health record (EHR) data but was also validated by comparing admission and discharge times in patient records to LoS. No major discrepancies were identified.

2.4.3. Data Cleaning, Validation and Analysis—All data management and statistical analyses were conducted using the Statistical Analysis System (SAS; SAS Institute Inc., 2013). All variables were analyzed for appropriateness to statistical methods. As expected from previous research [47, 48], LoS was highly positively skewed so a log transformation, commonly used for LoS analyses [27, 49–51], reduced skewness from 11.16 to 0.55.

Univariate models determined variable suitability for inclusion in model building. Those with a significance at $p < .20$ were included in the preliminary model (see Supplemental Table). A general linear model was created via backwards elimination, excluding variables associated with hypotheses from elimination. The final model contained 26 independent variables and two control variables (MDC, medical vs. surgical hospitalization). Average intraclass correlation between independent variables was low (ICC = $-.003$). Fisher's exact test ($p < 0.05$) found three independent variables (psychiatric consult, physical restraints, and ICU care) covaried but their presence or absence did not influence the significance or effect size of other variables in the model and so were included in the final model [52]. G-power [53] found that with a sample size of 3900 and 26 predictive variables, there is a detectable effect size (f^2) of 0.0087 ($\alpha = 0.05$). The final model was evaluated for goodness-of-fit via adjusted r^2 [54].

2.6 Integration

Integration is fundamental to mixed methods research [55]. In this study, Phase One data guided variable selection for the Phase Two quantitative analysis, a common process in disparities and health services research [56] and an exemplar of mixed methods integration [57]. This approach centers patient experiences while operating within the limitations of available data. Secondly, a weaving approach combined data reporting of the qualitative and quantitative data [37]. For a study that uses primarily EHR and billing data, weaving provides human context, demonstrating that aggregated data represents individuals with experiences, thoughts and feelings [55].

3 Results

3.1 Phase One

More in-depth discussion of Phase One can be found elsewhere [58]. The twenty interviewed participants were predominantly Black or African American (60%), with eleven having a diagnosis of schizophrenia, eleven having a diagnosis of bipolar disorder with psychotic features and almost half (45%) having more than one psychotic disorder documented in the EHR. Twelve were on general medical-surgical units. The rest were on specialty units: surgery, orthopedic, or cardiac. Researchers identified five themes: (1) *managing through hard times*, (2) *ignored and treated unfairly*, (3) *actively involved in health*, (4) *appreciation of caring providers*, and (5) *violence: expected and enacted*.

3.2 Phase Two

A total of 3,900 individuals met inclusion criteria. Overall, 66.1% identified as Black, 29.1% as White, and 3.2% as Hispanic or Latino. The majority were female (53.1%) and 13.9% were married or partnered. Almost all (88.1%) used some form of public insurance for payment; only 4% had commercial insurance. The average age was 52.9 (SD=14.9). Almost all participants (92.3%) had at least one Elixhauser comorbidity, and 29.6% had four or more. Further demographics and clinical data for patients in Tables 1 and 2.

Schizophrenia was the most common psychotic disorder diagnosis (52.8%), but a substantial number of the participants had a mood disorder with psychotic features (36.2% Major Depressive Disorder with psychotic features, 28.3% bipolar disorder with psychotic features). Interestingly, 30.7% had two psychotic disorders in discharge diagnoses and 9% had three or more. For non-psychotic psychiatric diagnoses, the most common diagnoses were tobacco use disorders (28.9%), depressive disorders (23.4%), and bipolar disorders (21.6%).

The average LoS was 6.9 days (SD=11.3; range 1–289). Most hospitalizations were emergencies (67.4%), though almost a fourth were for elective procedures (22.7%). The most common MDC was Circulatory (12.95%), followed by Musculoskeletal (11.49%) and Nervous System (10.03%). Despite not being admitted to a psychiatric unit or by a psychiatric service, 157 (4.03%) of the hospitalized patients had an MDC in the Mental Disorders category.

Only 3.6% of the patients had a documented consult with psychiatry and 1.2% consult with social work or case management during LoS. Continuous observation, physical restraints, and IM sedative use were also uncommon (0.9%, 3.4% and 0.7%, respectively). Most patients were discharged to home (39.8% routine discharge to home, 25.7% with home health), but 11.7% went to psychiatric facilities and 13.9% to rehabilitation settings or skilled nursing facilities.

Fifteen comorbidities were associated with a longer LoS. Weight loss had the largest effect (92%), but HIV/AIDS, deficiency anemia, coagulopathy, diabetes with complications, fluid and electrolyte disorders, pulmonary circulation disorder and solid tumors were also all

associated with an increase in LoS of 20% or more. See Table 3 for the final quantitative model. The adjusted r^2 for the final model was 0.34.

Multiple care processes were significantly related to LoS. An order for continuous observation had the largest relationship with LoS (133%) but use of physical restraints (64%) and IM sedative use (41%) were also significant. For care processes, only outpatient appointment in the six months prior to admission was associated with shorter length of stay (−9.9%). Hospital of admission and admission type were also significantly related to LoS, with an ICU admission being 45% longer and surgical unit admission being 15% shorter than medical-surgical units. Our hypothesis that LoS would be related to the use of physical restraints or chemical sedation was supported but the hypotheses schizophrenia and discharge to a psychiatric facility are with LoS were not supported.

3.3 Integration

There are important convergences and divergences between the quantitative and qualitative results. First, participants in Phase One spoke of the importance of appropriate psychiatric care during hospitalization (theme: *managing through hard times*). Patients believed their medications were vital, as one participant noted “I don’t want to have hallucinations again, they were very scary and unlike me. I’m pretty much a gentle soul, but I don’t like that, and I don’t want anybody to see me like that either” (P3). After receiving their medications which had been discontinued upon admission, one participant stated, “I’m having my issues but not as much as I would without my medication” (P2). Others simply noted that they needed more mental health support as they felt, “It’s been a hard time for me...I just want somebody to talk to” (P14). Despite their need for medication continuity and mental health support, as well as 51.7% having another comorbid mental illness and 42.1% a substance use disorder, only 3.6% of participants had a psychiatry consult during their hospitalization.

Medical comorbidities related to LoS and multiple interviewed patients highlighted the burdens of multiple medical conditions that they had to manage (themes: *managing through hard times*, *actively involved in health*). One participant spoke about how they were given a list of new diagnoses, each with its own burdens and responsibilities: “„Pneumonia, both lungs’ and I said „Damn, I feel nothing. They said „emphysema’...I’m really not paying attention to my health. They tell me diabetes. I mean, „how the fuck did I get diabetes?’” (P19). Their comorbidities complicate treatment and recovery, as one participant, who was told to walk during her hospital stay, explained: “I broke my ankle in March and it’s still not getting better. I mean, I can put weight on it...but I have a boot that I have to wear I have a bone stimulator. But I feel like they don’t take it as serious” (P4). The high incidence of comorbidities experienced by these patients present logistical and treatment complications that contribute to longer LoS.

An interesting divergence in the data is IM sedation and physical restraints (themes: *ignored and treated unfairly*, *violence: expected and enacted*). Multiple participants in Phase One discussed their experiences of sedation and/or restraints, which colored interactions with hospital staff and contributed to feelings of isolation and abandonment. One participant felt staff “drug me up and tie me to the bed. Left me there. Now I’m ready to go home.” (P5). To multiple participants, these experiences defined their experience of hospitalization, but these

interventions were rare (3.4% physical restraint, 0.7% IM sedation) for patients in the sample. The presence of these interventions was associated with significantly longer LoS, but they had an outsized effect on patient experiences and expectations of hospitalization compared to their rarity.

Finally, participants in Phase One discussed choosing a specific hospital as critical (theme: *actively involved in health*) and this was supported by the model. Each of the hospitals included had significantly different LoS and those who had recent outpatient appointments had shorter LoS. In Phase One, participants described both preference for specific hospitals and healthcare systems due to prior outpatient and hospital experiences. One participant explained, “I like [this healthcare system] a lot better than I like [other] systems. Because they take good care of you here” (P13). A participant who received care in a different health system complained that, though they provided contact information for her psychiatrist, communication difficulties resulted in significant anxiety and delays receiving the correct medications. Patients knew that continuity-of-care would improve their outcomes and experience, and many explained that they had chosen this specific healthcare system and hospital.

4. Discussion

This study was the first to the authors’ knowledge that examined non-psychiatric hospital LoS and the factors related to it for individuals with psychotic disorders. It is also one of the few studies connecting the experiences of patients with psychotic disorders to their hospital outcomes. Overall, this study found significant relationships between some patient characteristics and processes with LoS which are important to both clinicians and researchers who work with patients with psychotic disorders in non-psychiatric hospital settings.

Confirming one hypothesis, this analysis identified IM sedatives and physical restraints as being related to longer LoS. Use of restraints is also associated with extended LoS during psychiatric hospitalizations [59] so the longer LoS may represent those who are experiencing acute psychotic episodes or a high psychiatric symptom burden. Management of acute psychosis may lead to the use of restraints for patient safety and thus be the cause of the longer LoS [60]. Psychiatric consultation was also associated with longer LoS as those experiencing acute psychosis may require this service to prevent interference with care or accidental harm, or to evaluate if the patient is psychiatrically stable for discharge. Additionally, patients who receive IM sedation and/or physical restraints are also more likely to experience adverse events [61], which often lead to longer LoS. Further research is needed to determine how severity of psychotic symptoms and need for psychiatric care during inpatient medical-surgical hospitalizations contributes to LoS and patient outcomes.

Other hypotheses such that a discharge to a psychiatric facility or diagnosis of schizophrenia would be associated with longer LoS were not supported by the model. Schizophrenia may have been related to poor communication and more mental health symptoms in Phase One, but it was not related to longer LoS. Though providers and patients discussed waiting for placement in a psychiatric facility increasing LoS, patients discharged to psychiatric

facilities did not have longer LoS overall. Potentially, some patients were perceived as being on a unit “too long” because they were no longer receiving acute medical care but simply awaiting placement. Alternatively, providers may have simply discharged individuals who could not be placed in psychiatric facilities after a period of waiting, which would not create a significantly longer or shorter LoS for these patients.

Individuals with psychotic disorders have higher prevalence of medical conditions than the general population [13, 62–66] so the high rate of multiple medical comorbidities found in this sample was unsurprising. Only 8.7% of the sample had no Elixhauser condition, and 29.6% had four or more. Despite the high prevalence of diabetes and obesity in this population [14, 67–72], the prevalence in this sample were closer to national averages for the general population than for people with psychotic disorders [73, 74]. It should be noted that some comorbidities, like obesity and diabetes, may not be recorded in discharge diagnoses unless they interfere with care or require treatment.

Overall, this study supports the general consensus that medical comorbidities are highly related to hospital LoS [75, 76] and that this relationship also exists for patients with psychotic disorders. Fifteen Elixhauser comorbidities related to longer LoS; eight with greater than 20% longer LoS. Weight loss and coagulopathy had the largest effect (73% and 35%) though studies of other populations found the largest effects in other diagnoses like congestive heart failure and diabetes [43, 77]. Patients in Phase One spoke almost exclusively on the comorbidities of diabetes, chronic pulmonary conditions, and traumatic injury. The loss of functional status and high symptom burden of these conditions [78, 79] may have made these more salient to patients, despite the smaller effect on LoS. Alternatively, participants with certain comorbidities may have been excluded from interviews as they were too ill (e.g. needing ICU care or unable to talk to the interviewer).

Though not a focus of this study, delirium may also be a factor in longer LoS experienced by patients with psychotic disorders. Delirium is highly related to LoS [80] and patients like those in this study may have been particularly vulnerable. Psychiatric diagnoses like psychotic disorders, medical comorbidity, and illness severity are all risk factors for delirium [81–83]. Patients with psychotic disorders are also more likely to be taking multiple medications [84], and polypharmacy is a notable risk for delirium [81, 83]. Multiple medical comorbidities put patients at risk for delirium, potentially because they need higher levels of care (e.g. ICU) and/or polypharmacy. Physical restraints and IM sedation may be used to manage delirium but are also risk factors for patients developing delirium, so the direction of this relationship is uncertain. Further research is necessary to determine how delirium relates to hospital outcomes for patients with psychotic disorders.

Finally, psychotic disorders and their symptom have been linked to inflammation, both of the central nervous system and generalized [85]. Patients in hospitals also have been found have elevated inflammation, either due to surgery or medical conditions [86, 87]. Patients with psychotic disorders may be more vulnerable to acute exacerbation of psychiatric symptoms to inflammation. Unfortunately, patients in Phase One interviews described missing antipsychotic medication doses, for medical reasons or due to poor continuity of care, which put them at further risk for an exacerbation of psychotic symptoms. Providers must work to

understand and address the interrelated psychiatric and medical needs of these patients and improve continuity of care, especially for medications, to better serve this vulnerable patient population.

Limitations to this study must be acknowledged. First, its cross-sectional nature limits causative inferences. The mixed methods approach highlighted the experiences of patients as critical but important factors may have been missed because they were not as salient to the study's participants. This study also relied on hospital data and discharge diagnoses intended for clinical and billing purposes [88] which focuses on usability rather than the reliability and validity for research purposes [89]. Another limitation is the variance in psychiatric diagnoses found between providers and across time [90, 91] and the inability to validate diagnoses as this is secondary data. Other diagnoses, like those used to identify the obesity and diabetes comorbidities, were not found at the expected level, and may indicate underreporting in the discharge diagnoses. Finally, the entire sample was drawn from three large teaching hospitals, part of a single healthcare system and patient/provider mix that may contrast with other hospitals.

Nonetheless, the results have utility for identifying patients who may be of particular risk of longer LoS. Patients with certain comorbidities are at risk for extended length of stay, as are those who are receive chemical or physical restraints. Clinicians and administrators should develop policies and procedures that address the needs of this population, especially in non-psychiatric settings. Psychiatric consultation should be a norm and may require education or brief trainings given to non-psychiatrist physicians, nurses, and other hospital staff. Extra effort should be made by providers to ensure continuity of services, when entering the hospital where some patients with psychotic disorders may be inadvertently taken off antipsychotic medications as well as at discharge. Finally, patients with psychotic disorders should be considered for case management programs that address their specific needs and more effectively prepare them for discharge [92].

Additionally, this mixed methods study demonstrates that there is value in examining the experiences of hospitalized patients and using their experiences to inform analyses. Previous research has used information from hospital outcomes for specific populations to inform qualitative interviews [93] but, to the authors' knowledge, this is the first paper that has used patient experiences of hospitalization to inform variable selection and analyses for quantitative model building. Further analyses of other outcomes like readmissions and adverse events are necessary to address disparities experienced by those with psychotic disorders and to create risk profiles for those at highest risk to create effective, ethical, and economically viable interventions.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Demographics, Diagnoses, Hospitalization Characteristics and Processes (n=3900)

Total		N=3900	
Variable	Mean (St. Dev)	Variable	Count (%)
Age	52.9 (14.9)	Psychotic Disorder Diagnoses	
Length-of-stay	6.9 (11.3)	Schizophrenia	2058 (52.8%)
Variable	Count (%)	Schizoaffective Disorder	568 (14.6%)
Gender (Female)	2163 (53.3%)	Schizophreniform Disorder	18 (0.5%)
Race		Delusional Disorder	268 (6.9%)
Asian	65 (1.7%)	Brief Psychotic Disorder	48 (1.2%)
Black	2574 (66.1%)	Psychotic Disorder NOS	383 (9.8%)
White	1133 (29.1%)	Major Depressive Disorder w/ Psychotic Features	1412 (36.2%)
Other	194 (4.7%)	Bipolar Disorder w/ Psychotic Features	1105 (28.3%)
Hispanic Ethnicity	123 (3.2%)	Number of Psychotic Disorder Diagnoses	
Married or Partnered	542 (13.9%)	1	2353 (60.3%)
Insurance		2	1198 (30.7%)
Commercial	157 (4%)	3	291 (7.5%)
Medicare	1541 (39.51%)	4	52 (1.3%)
Medicaid	1995 (48.99%)	5	5 (0.2%)
Uninsured	69 (1.76%)	Comorbid Psychiatric Disorders w/o Psychotic features	
Other	239 (6.1%)	Anxiety Disorder	366 (9.4%)
Elixhauser Comorbidities		PTSD	127 (3.3%)
0	342 (8.7%)	Bipolar Disorder	827 (21.2%)
1	768 (19.7%)	Depression	915 (23.5%)
2	859 (22%)	Other Mood Disorder	109 (2.8%)
3	771 (19.7%)	Dissociative Disorder	29 (0.7%)
4	1155 (29.62%)	Personality Disorder	33 (0.9%)
Type of Admission		Other Psychiatric Disorder	96 (2.5%)
Emergency	2642 (67.4%)	Substance Use Disorders	
Elective	888 (22.8%)	All Substance Use Disorders	1630 (41.8%)
Other	370 (9.49%)	Alcohol	432 (11.1%)
Admitting Unit Type		Cannabis	152 (3.9%)
Med-Surg	2267 (58.1%)	Cocaine	331 (8.5%)
ICU	250 (6.4%)	Opioids	151 (3.9%)
Oncology	178 (4.6%)	Sedatives	65 (1.7%)
Surgical	967 (24.8%)	Tobacco	1123 (28.8%)
Other	238 (6.1%)	Other	179 (4.6%)
Orders and Processes		Discharge Disposition	
IM Sedative or Antipsychotic	27 (0.7%)	Other Hospital	51 (1.3%)
Physical Restraint	132 (3.4%)	Correctional Facility	13 (0.3%)

Total		N=3900	
Variable	Mean (St. Dev)	Variable	Count (%)
Continuous Observation	35 (0.9%)	Home Health	1027 (26.3%)
Psychiatry or Behavioral Health Consult	144 (3.7%)	Hospice	34 (0.9%)
Social Work Consult	46 (1.2%)	Rehabilitation Facility	111 (2.9%)
Hospitalist Service	463 (11.9%)	Psychiatric Facility	435 (11.2%)
Outpatient Appointment Six Months Prior to Index Hospitalization	1967 (50.4%)	Skilled Nursing Facility	570 (14.6%)
		Left Against Medical Advice	89 (2.3%)
		Routine Discharge to Home	1519 (39.0%)
		Other	51 (1.3%)

Note. Not all percentages equal 100% in every category due to missing data or participants meeting criteria for multiple categories

Table 2.

Major Diagnostic Categories of sample (N=3900)

MDC	Count (%)
Circulatory	506 (13%)
Digestive	250 (6.6%)
Endocrine/Metabolic	220 (5.6%)
HIV	50 (1.3%)
Infectious Disease	184 (4.7%)
Injuries due to Drugs	209 (5.4%)
Kidney and Urinary	193 (5%)
Mental Disorders	157 (4%)
Musculoskeletal	448 (11.5%)
Nervous System	391 (10%)
Pre-MDC	53 (1.4%)
Pregnancy/Childbirth	201 (5.2%)
Respiratory	295 (7.6%)
Significant Trauma	36 (0.9%)
Skin and Breast	157 (4%)
All Other	542 (14%)

Table 3

Independent Variables, Exemplary Quotations and Multivariate Quantitative Model – Patient Characteristics (n=3900)

Variable	Exemplary quotations or rationale from Phase 1 ^b	Beta (CI)	p-value	Exp(R)	Percent effect on LoS ^c
Intercept		1.16423	0.043		
Diagnosis of Schizophrenia	Interviewer Notes: Patients with schizophrenia were more likely to struggle with communication during interviews	0.014 (−0.03, 0.058)	0.53	1.01	+1.4%
Deficiency Anemia	High Medical Comorbidity Described by Participants Led to Use of Comorbidity Measure	0.20 (0.15, 0.26)	<.001 *	1.22	+22%
Congestive Heart Failure		0.23 (0.15, 0.31)	<.001 *	1.26	+26%
Coagulopathy	"I have a broken ankle. I was in a rehabilitation hospital for about a month. It was very depressing" P4 , hospitalized for accidental drug overdose	0.30 (0.21, 0.39)	<.001 *	1.35	+35%
Diabetes wo/ Complications		0.12 (0.033, 0.21)	0.0067 *	1.13	+13%
Diabetes w/ Complications		0.21 (0.12, 0.30)	<.001 *	1.24	+24%
Hypothyroidism	"Well, no, my children called the ambulance for me, complained that I was mixed up and I was complaining of my bladder, going every hour. And I needed something, some medication or something." P7	0.091 (0.0092, 0.17)	0.029 *	1.10	+9.5%
Electrolyte Disorders		0.25 (0.20, 0.30)	<.001 *	1.28	+28%
Neurological Disorders		0.094 (0.034, 0.15)	0.0021 *	1.10	+9.8%
Paralysis	"What brought me here is that I can't breathe. I'm having problems breathing and I can't walk far, and I can't walk up and down steps." P10	0.26 (0.12, 0.41)	<0.001 *	1.30	+30%
Peripheral Vascular Disease		0.16 (0.043, 0.28)	0.0076 *	1.18	+18%
Pulmonary Circulation		0.27 (0.14, 0.40)	<.001 *	1.31	+31%
Renal Failure	"I started to get sick. I couldn't walk more than ten or 20 yards without being able to—I huffed and puffed, I couldn't breathe and then I had a cyst on top of my head, so. I combined both and came in." P12	0.082 (0.0087, 0.16)	0.028 *	1.09	+8.6%
Tumor		0.24 (0.15, 0.34)	<.001 *	1.28	+28%
Valve Disorders		0.17 (0.038, 0.30)	0.011 *	1.18	+18%
Weight Loss	"Sciatic nerve, my arthritis, my knee replacement...Um, well, I have COPD, I have asthma." P15 "They say, pneumonia, both lungs...They said, emphysema...They tell me diabetes. I mean, how the fuck did I get diabetes? But I'm glad al these things been picked up now, I know what I know, and I made them understand I know." P19 "Nauseous, diarrhea. Not being able to eat. My blood sugars were 300, 400s. And they couldn't tell me why my sugars were so high." P20	0.55 (0.46, 0.64)	<.001 *	1.73	+73%
In-System Outpatient Appointment Last Six Months	"The doctors that I've known for a while, across the street, they see that I'm here and they come into the room." P13	−0.104 (−0.15, −0.057)	<.0001 *	0.901	−9.9%

Variable	Exemplary quotations or rationale from Phase 1 ^b	Beta (CI)	p-value	Exp(R)	Percent effect on LoS ^c
Discharge to a Psychiatric Facility	"Now that I feel better physically, I want to go home, but when I came here, I wanted to go to the mental institution." P13	-0.0042 ^a (-0.081, 0.073)	0.9161 *	0.996	-0.41% ^c
Physical Restraints	"Drug me up and tie me to the bed. Left me there. Now I'm ready to go home." P5	0.49 (0.37, 0.62)	<0.001 *	2.05	+64%
IM Sedative or Antipsychotic		0.34 (0.076, 0.61)	0.012 *	1.41	+41%
Psychiatric Consult	"I have been able to, the aids and stuff have been able to talk to me and calm me down because I get excited so fast. All the times before they kept me heavily sedated but this time I'm wide awake." P12				
Psychiatric Consult	"It's really hard to get people seen by a psychiatrist, even when it's clear they need it." Staff Nurse	0.19 (0.068, 0.30)	0.002 *	1.20	+20%
Social Work Consult	[About social worker] "She's helping me get my psychiatrist. She's going to make an appointment for me, and she is also going to get me into a gym." P13	0.29 (0.091, 0.49)	0.004 *	1.34	+34%
Continuous Observation	"I haven't seen a social worker." P10				
Continuous Observation	"The young lady that I have as aide in here now explained it. When I got here she explained it all." P12	0.85 (0.61, 1.08)	<0.001 *	2.33	+1.33%
Admission Unit Type					
ICU		0.37 (0.31, 0.44)	<0.001 *	1.45	+45%
Surgical		-0.159 (-0.25, -0.063)	0.001 *	0.85	-15%
Oncology		0.14 (0.022, 0.25)	0.019 *	1.15	+15%
Other		0.14 (0.016, 0.27)	0.027 *	1.15	+15%
Med-Surg		Reference Unit Type			
Hospital					
Admit Hospital 1	"At every other hospital, I had a problem. But I come to this hospital and I don't have a problem at all. It boggles my mind." P2	0.17 (0.12, 0.23)	<0.001 *	1.19	+19%
Admit Hospital 2		-0.04 ^a (-0.1, -0.02)	0.19	0.96	-3.4% ^c
Admit Hospital 3		Reference Hospital			
	"My sister said well, why don't you go to [other hospital] or [other hospital]? My sister works at [other hospital] and she says, why don't you go there? I said, no, I can't go there because I like [this health system] a lot better than I like the [other health system]. Because they take real good care of you here" P13				

Note. Multivariate modeling used a general linear model. MDC and medical vs. surgical hospitalization were control variables;

* significant at the p<0.05 level;

^a the effect size is below the detectable limit of this analysis;

^b Source indicates source used in the determination of including each variable in the model, quotes were derived from participants in Phase 1;

^c Beta was transformed to percentage effect on length-of-stay via the formula: Percent Effect=((e^β)-1)*100) described by [94]. CI= Confidence interval, ICU= Intensive Care Unit, IM = intramuscular.