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ORIGINAL PAPER

Hospitalization Patterns over 30 Years Across a Statewide System of Public Mental Health Hospitals: Readmission Predictors, Optimal Follow-Up Period, Readmission Clusters and Individuals with Statistically Significant High Healthcare Utilization

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Abstract

Four related hospital utilization questions (optimal follow-up period, predictors of readmission, definition of individuals with statistically significant high healthcare utilization, and patterns of readmissions) were examined using data for 491,094 hospital discharges for 250,091 patients across a statewide public mental health hospital system for 30 years (1987 to 2016). Using survival analysis, the first quartile of the survival time, the time when 25% of the entire population of discharges had a readmission was 229 days. Using observed readmissions, rather than the population as in survival analysis, revealed that 50% of all observed readmissions occurred by 222 days. Both suggest that using a one year observation period for determining high utilization may be reasonable. Major predictors of readmission were diagnoses of schizophrenia (OR = 2.11) or bipolar disorder (OR = 1.57) as well as total number of previous discharges (OR = 1.23). Statistically significant z scores ($p < .01$) were used to determine annual (3 or more discharges) and lifetime (7 or more discharges) criteria for individuals with statistically significant high healthcare utilization that were somewhat lower than in previous research. Cluster analysis of all readmissions revealed four relatively distinct clusters of patients: short stay-quick readmission, extremely long stay, long time in community between readmissions and frequent readmissions. While no cluster corresponded exactly with the annual statistically significant high healthcare utilization criteria, the frequent readmission cluster was somewhat similar to the lifetime statistically significant high healthcare utilization criteria with 46% of this cluster's patients having 7 or more discharges.

Keywords Psychiatric hospital readmission · High healthcare utilization · Readmission patient clusters · Predictors of hospital readmission

The opinions expressed are the author's own and do not reflect any official government policy, position or view.

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This study explores patterns of psychiatric hospital utilization over 30 years across a statewide system of public mental health hospitals extending previous work in this area by using a longer observation period and a examining a statewide public hospital system. This large long term data set was used to determine useful follow up periods to assess readmission, predictors of readmission, to define criteria for defining individuals with statistically significant high healthcare utilization and to explore any distinct and different patterns that may exist among readmitted patients.

Individuals with High Healthcare Utilization

Individuals with high healthcare utilization are generally considered to be patients who use a disproportionate share of healthcare services in either terms of services or costs. Although an internet search on the term "super-utilizer" or "high utilizer" will produce a multitude of results, searches in PubMed or other academic databases reveal a much smaller number of empirical studies. Previous research also often termed this same phenomena "the revolving door" [1, 2]. The term high health care utilization avoids implications of provider ("revolving door") or patient ("super-utilizer") causes. The definition of high utilization is ambiguous, but reviews of the phenomena in related areas such as Soril et al.'s [3] review of emergency room individuals with high healthcare utilization find the most frequent definition (12 of 20 studies) used the criteria of four or more visits within a single year to define individuals with high healthcare utilization. Similarly, Scott et al.'s [4] review of utilization of both emergency rooms and ambulance services found five or more events was the most commonly used definition of frequent user. Tricco et al's [5] meta-analysis of high utilizers with mental health diagnoses examined strategies for care coordination designed to reduce the use of hospitalization and defined the highest level of utilization as five or more events in the past year.

Jiang et al. [6, 7] defined individuals with high healthcare utilization as Medicaid and Medicare patients with four or more hospital stays in a year. In their study of non-elderly individuals with high healthcare utilization [7] they found that mood disorders and schizophrenia were the two most frequent principal diagnoses among individuals with high healthcare utilization. Hadley and colleagues [8, 9] defined cost as the essential criterion for heavy use and used costs beyond the average to define heavy users which resulted in 35% of inpatient users accounting for 75% or 79% of inpatient costs.

Johnson et al's [10] study holds cautionary results in that while individuals with high healthcare utilization may be easily identified post hoc, the vast majority do not remain in the high utilization category over even the short term with most (50%) leaving the category at seven months and only a few (23%) remaining in the high utilization category a year later.

Hospitalization Patterns

Hudson [11] was unique in examining patterns of hospitalization with cluster analysis using a statewide multi-year database. Clusters of patients were identified based on the number and length of episodes, variety of institutions, length of stay, and time between stays. The majority of patients (74%) had only single short stay and used less than 20% of the total bed days. While a large group (18% of sample) of occasional long term users used the majority of bed days (70% of bed days), two small clusters of regular users (stable and transient) accounted for

less than 5% of patients but accounted for about 20% of admissions but only 10% of bed days. Although both the long term and regular users could potentially be described as individuals with high healthcare utilization the patterns of hospitalization indicate important distinctions exist between these groups.

Follow-Up Observation Period for Readmission

High hospital utilization is by definition associated with recidivism, so an important consideration is the length of the follow-up observation period used. Soeken et al.'s [12] earlier meta-analysis of hospital readmission revealed a wide variety in the readmission follow-up periods ranging from 1 to 24 months post discharge, with the most studies using 3 months (20%) or 6 months (40%). One goal of this study is to determine what an optimal time period for follow-up would be and to determine if the one-year timespan commonly used among high utilizer studies is adequate to capture sufficient readmissions.

Predictors of Readmission

Donisi et al.'s [13] meta-analysis revealed the single largest consistent pre-discharge predictor of hospital readmission was a history of previous hospitalization. Sfetcu et al.'s [14] related meta-analysis of post-discharge predictors of readmission revealed that medication adherence and compliance with follow-up appointments were protective factors decreasing likelihood of readmission.

Method

Data Source

Hospitalization records were extracted from a statewide hospital database. Only completed hospitalizations with discharges were included. Transfers (defined as subsequent admission to another hospital occurring the day of discharge or the day after discharge) between multiple hospitals were consolidated into a single hospitalization record based on the last hospital discharging the patient. The data included in the study covers 30 years of discharges from 1/1/1987 to 12/31/2016. The data available for the hospital records across all 30 years was relatively limited but included demographics, diagnoses, commitment information and basic information about the stay such as dates and hospital name and type.

The state of Texas operates a system of 10 public mental health hospitals and a number of contracted public and private hospitals that serve all individuals statewide in need of publicly funded mental health hospitalization. The five largest state hospitals served 58% of all discharges: Austin (15%), Terrell (13%), San Antonio (13%), Rusk (10%) and North Texas (8%). The sample also includes state funded community hospitalizations (which started in 2002) and private purchased beds (which stared in 2011) which provide additional capacity for serving public mental health patients. While both state funded community hospitals and private purchased beds served approximately 19% of all the discharges overall (95,710), the vast majority of these alternative placements were discharges from the University of Texas's

Harris County Psychiatric Center (67,291 or 14% of the overall total) which serves the greater Houston metro area and was the second largest hospital in the data set overall.

Sample

The sample included 491,094 hospital discharges for 250,091 patients. Only adults age 18 and over were included. The average age at first admission was 35.7 (SD = 13.2). The sample was 59% male and 41% female. The race/ethnicity of patients was 55% White, 22% Hispanic, 20% Black and 3% reporting other races and ethnicities. The top 8 diagnostic groups accounted for 93% of the diagnoses and were in order of frequency: schizophrenia (19.8%), bipolar disorders (19.6%), major depression (18.7%), drug related disorders (9.3%), other psychoses (7.3%), alcohol related disorders (7.2%), affective disorders – other (6.5%), and adjustments/other non-psychotic (4.4%).

Results

Overall Pattern of Psychiatric Hospital Utilization

On average patients had 1.96 (SD = 2.52) hospital discharges with an average length of stay of 66.9 days (SD = 375). The majority of patients had only a single discharge (67%). Patients with a single readmission (15.5%) or two readmissions (6.5%) accounted for the majority of those who were readmitted. However, hospital readmissions (241,003) accounted for approximately 49% of the total number of hospital discharges (491,094) indicating readmissions were distributed unequally across patients with the 33% of patients who were readmitted accounting for close to half of the discharges.

Two important trends to note are an overall decrease in average length of stay from 111 days in the first 10 years of the sample to 43 days in the last 10 years of the sample. However, a substantial portion this decrease was due to the addition of beds in state funded community hospital beds (mean stay = 9 days) and private purchased beds (mean stay = 18 days) over the last 10 years which have much shorter stays than state hospitals. State hospitals had an average stay of 64 days for the last 10 years when those additional types of beds were excluded. Similarly, voluntary admissions in state hospitals dropped from 16% in the first 10 years to 9% in the last 10 years. However, overall rates of voluntary admissions in the sample have risen to over 20% in the last 5 years because the majority of private purchased beds, which were added in the last 5 years, are voluntary admissions.

Optimal Follow up Periods to Assess Readmission

A survival analysis of hospital readmission was conducted using SAS. The survival start time was hospital discharge and the survival end time was the date of hospital readmission or the time of right censorship at the end of the observation period (12/31/2016). There were a total of 491,094 discharges with 241,003 readmissions. The median survival time, the time when half of all discharges had a readmission, was 3791 days (126 months or 10.4 years). The first quartile of the survival time, the time when 25% of the discharges had a readmission was 229 days (7.5 months). The survival curve also indicated that 8.6% of all discharges were readmitted in the first 30 days. Because slightly under 50% of discharges were readmitted or

censored by 30 years (the maximum observation period for those discharged at the beginning of the study) no estimate for the 75th percentile of survival time was available.

A hazard function curve was examined using SAS and it clearly indicated the highest hazard rates occurring immediately following discharge and the hazard rate dropped sharply over the first two years. The Nelson-Aalen cumulative hazard function was 9% in the first 30 days, 17% in the first 90 days, 25% in the first 180 days, 36% in the first year and 45% by year two. The cumulative hazard function indicated substantially reduced readmission risk as time from discharge increases with a very large reduction in risk from year one to year two (only a 9% increase) compared to the various commonly used time points during the first year after discharge (30 days, 90 days, 180 days and one year) each of which cumulatively produced about a 9% increase in readmissions over the previous interval, while the time period in each interval approximately doubled.

Turning to patients, rather than unique discharges, for the 82,862 patients (33%) who had a readmission, the average time to readmission was 642 days (SD = 1094). Across these 82,862 patients there were 241,003 readmissions. Analyzing the readmissions in terms of half-lives, the time for half of readmissions to occur, was 222 days (7.6 months), the time for 75% of readmissions to occur was 697 days (23 months), and the time for 87.5% of readmissions to occur was 1474 days (4.1 years). These averages for readmission time are biased downward because they only include the observed readmissions that have occurred (half in 222 days) rather than all patients discharged including those not readmitted as the survival analysis above examines (in which 25% of the discharged population had a readmission in 229 days), but they offer additional useful information.

Predication of Readmission

A logistic regression analysis was conducted using SAS logistic procedure with hospital readmission as the outcome (Table 1). The predictors available for inclusion were limited but included hospitalization (number of previous discharges, diagnosis, length of stay, voluntary admission) and demographic (sex, race-ethnicity, age) variables. The Likelihood Ratio and Wald tests indicated the entire model was statistically significant ($p < .0001$). The model was somewhat accurate and correctly classified 72% of the cases and incorrectly classified 28% of the cases with an overall Sommers' D of .43 and a pseudo R square of 0.13. While all the individual predictors except length of stay, male and Hispanic ethnicity were significant, only the largest six predictors were of practical interest and magnitude. A diagnosis of schizophrenia or other psychoses (OR = 2.11) was the largest predictor of readmission, followed by a diagnosis of bipolar disorder (OR = 1.57), followed by the number of previous discharges (OR = 1.23) and Black race (OR = 1.14). Protective factors predicting lower odds of readmission were voluntary admission to the hospital (OR = 0.89) and a diagnosis of major depression (OR = 0.94). The mean scores for each predictor by the groups readmitted and not readmitted are displayed in Table 1 to provide additional context for the logistic regression results.

Defining Individuals with Statistically Significant High Healthcare Utilization

Over the entire period of observation the median number of discharges per patient was 1.0 and the average number of discharges per patient was 1.96 (SD = 2.52). If the total number of hospital discharges per patient were calculated as z scores, six discharges was on the margin of significance with a z score of 1.6 ($p = .054$) and seven discharges had a significant z score of

Table 1 Logistic regression prediction of hospital readmission

	ML estimate	Odds ratio	OR LL	OR UL	Zero order correlation	Average no readmit	Average readmissions
Intercept	−0.08						
N previous admissions	0.21	**1.23**	1.22	1.23	0.26	1.0	3.27
LOS	0.00	1.00	1.00	1.00	−0.01	71.38	62.36
Voluntary	−0.11	**0.89**	0.88	0.91	−0.05	0.14	0.11
Male	0.00	1.00	0.99	1.01	0.03	0.59	0.61
Black	0.13	**1.14**	1.12	1.16	0.07	0.2	0.26
Hispanic	0.00	1.00	0.98	1.02	−0.01	0.22	0.22
Admission age	−0.02	0.98	0.98	0.98	−0.05	37.61	36.43
Schizophrenia	0.75	**2.11**	2.07	2.14	0.20	0.29	0.49
Depression	−0.06	**0.94**	0.92	0.96	−0.12	0.17	0.09
Bipolar disorder	0.45	**1.57**	1.54	1.60	0.02	0.2	0.21

Predictors significant at $p < .0001$ shown in boldface

ML Maximum Likelihood, *OR* odds ratio, *LL* and *UL* upper and lower limits

2.0 ($p = .0228$). If individuals with statistically significant high healthcare utilization are defined as having a total of 7 or more hospitalizations, then there were 10,147 patients (4% of all patients) who accounted for a total of 114,895 discharges (about 24% of all discharges).

However, most previous studies have used criteria based on the number of events within a single year for defining individuals with high healthcare utilization (typically four or five events within a year). Reanalyzing the data by patient and by year, the average number of discharges per year was 1.21 (SD = .61). A total of 3 discharges within a year was equal to a statistically significant z score of 2.93 ($p = .0018$). Using three hospital discharges in a year to define individuals with high healthcare utilization resulted in a total of 11,178 patients qualifying as individuals with statistically significant high healthcare utilization. Overall, this group of 11,178 patients (4.4% of all patients) accounted for 54,954 hospital discharges during their statistically significant high healthcare utilization years, which accounted for 11% of all discharges. Of these patients, 79% only qualified as individuals with statistically significant high healthcare utilization in a single year, while 21% had statistically significant high healthcare utilization across multiple years. Of the 21% (2371) of the patients with statistically significant high healthcare utilization in two or more years there were 880 individuals with statistically significant high healthcare utilization in three or more years. In addition, among those patients with 3 or more discharges in a single year 39.9% had 4 or more admissions within the same year. So while identification of high utilization in a single year may not be very predictive of determining future years of high utilization it may be somewhat useful in identifying likely further utilization within the current year, most likely because the patient is in the midst of an acute crisis. Using the more common definition from the literature of four or more discharges within a year to define high utilization severely reduces the number of patients who qualify as a individuals with statistically significant high utilization to only 3897 and of those only 728 patients (19%) qualify as individuals with statistically significant high healthcare utilization across two or more years.

Dimensions and Clusters among Re-Admitted Patients

Both cluster and factor analysis were used to exam the different dimensions of patient stays and patterns of hospitalization use. Both analyses were conducted using variables similar to

Hudson's [11] related to patient's hospitalizations. The analyses were limited to patients with two or more discharges in order to analyze different types of readmitted patients.

A factor analysis with direct oblimin rotation revealed four clear dimensions accounting for 81% of the variance and corresponded to clear combinations of variables that were used. The first factor, time in hospital was defined by average length of stay (LOS, .96), standard deviation of LOS (.96) and total LOS all discharges (.84). The second factor, hospital frequency was defined by the total number of discharges (.94) and number of years with discharges (.90). The third factor, time in community was defined by average time to readmission (.90) and the standard deviation of average time to readmission (.83). Total length of time from first to last discharge loaded approximately equally (.58) on the second and third factors (.51). The fourth and final factor was defined solely by the ratio of the number of discharges to the number of years with discharges (.69) with high ratios indicating many discharges in a short span of time and low ratios indicating fewer discharges across a long span of time.

SAS's fast cluster procedure was used for cluster analysis and between 3 and 8 clusters were extracted and examined. Cluster analysis was restricted to patients with two or more discharges since the purpose was to examine potential patterns and groups among readmitted patients. A four cluster solution was chosen which had some differences in the clusters that roughly corresponded to some of the four factors found in the factor analysis. Additional clusters seemed to split and narrow the first four clusters, but at the price of adding additional clusters that were more difficult to describe.

The clusters and mean scores for the variables defining them are summarized in Table 2. The first cluster, short stay quick readmission ($n = 62{,}312$) had on average 3.1 discharges over 2.2 distinct years with discharges, with a discharge to year ratio of 1.17, so these patients typically had several discharges relatively close to one another, and an average LOS of 46 days. The second cluster, long stayers ($n = 837$) had on average 5.9 discharges over 4.8 distinct years with discharges, with a discharge to year ratio of 0.51, and an average LOS of 1403 days and total LOS of 5093 days by far the longest of any cluster. The third cluster, long time in community ($n = 5845$) had on average 2.3 discharges over 2.2 distinct years with discharges, an average LOS of 54 days and total LOS of 128 days, but with an average time to readmission of 4232 days (11.5 years) the longest of any cluster. The fourth cluster, frequent readmissions ($n = 13{,}868$) had on average 8.0 discharges over 5.7 distinct years with discharges, with a discharge to year ratio of 0.51, and an average LOS of 69 days and total LOS of 543 days, with a length from first to last discharge of 16 years indicating relatively consistent repeat hospitalization over many years. This cluster also had the highest proportion of patients (26%) meeting the criteria for 1 year individuals with statistically significant high healthcare utilization criteria (3+ discharges in a single year) and 46% meeting lifetime criteria for individuals with statistically significant high healthcare utilization (7+ discharges).

Discussion

While the majority of patients (67%) had only a single hospitalization, multiple admission patients (33%) accounted for a disproportionate share (50%) of all hospital admissions. A substantial number of all readmissions occur quickly after discharge with patients risk for readmission decreasing rapidly over time. The largest number of readmissions occurs within the first 30 days (17% of all readmissions) followed by the first 6 months (cumulative 45% of

Table 2 Cluster analysis results for patients who were readmitted

	Cluster 1:	Cluster 2:	Cluster 3:	Cluster 4:
	Short stay, quick readmission	Long stay	Long time in community	Frequent readmission
Number of Patients	62,312	837	5845	13,868
Number of Discharges	3.11	5.99	2.32	8.05
Number of Years with Discharges	2.28	4.81	2.22	5.78
Discharge to Year Ratio	1.17	0.51	0.16	0.51
Average Length of Stay (LOS)	46.17	1403.81	54.97	69.32
Total LOS all discharges	140.03	5093.68	128.78	543.84
STD LOS	35.88	1739.28	48.70	75.09
Average time to readmission	494.92	471.68	4232.07	1083.90
STD time to readmission	372.08	405.78	3659.71	1156.20
Days - First to Last Discharge	897.91	2939.56	5213.04	5412.88
Percent annual individuals with statistically significant high healthcare utilization (3+ discharges)	12%	12%	1%	26%
Percent lifetime individuals with statistically significant high healthcare utilization (7+ discharges)	6%	25%	0%	46%

all readmissions) and one year after discharge (cumulative 61% of all readmissions). The optimal period of follow-up to determine readmission will differ depending on the sample, but in this study given that the survival analysis indicated that 25% of all population readmissions occurred within 229 days (and 50% of all observed readmissions occurred in 222 days) it appears that a one year observation period, commonly used by many previous high utilizer studies, is adequate for most program monitoring.

Predictors of readmission were limited in that no information on events that occurred outside of hospitalization were available for inclusion such as follow-up care in the community or medication. Despite limited predictors the model was somewhat accurate with 72% correct classification. As found in a previous meta-analyses [12–14] the number of previous hospitalizations was a major predictor, however, a diagnosis of schizophrenia was the largest predictor while voluntary admission and major depression diagnoses were protective factors.

Using a statistical criteria (z scores) to define individuals with high healthcare utilization within a single year resulted in three admissions within a year qualifying a patient as an individual with statistically significant high healthcare utilization. Interestingly, this annual statistical definition of individuals with statistically significant high healthcare utilization based on z scores is actually somewhat more inclusive than the commonly used definitions of four or five events in a year that many previous studies have used. However, as in Johnson et al. [10] the individuals with statistically significant high healthcare utilization in this study rarely had statistically significant high healthcare utilization across multiple years. Nevertheless, with almost 40% of statistically significant high utilizers within a single year being likely to have additional discharges beyond 3 within that same year identification of high utilization may be useful for determining where additional support services may be needed. This phenomenon of low rates of successive high utilization by patients across years but relatively high likelihood of additional discharges within a single year probably illustrates the acute rather than chronic nature of many patient's needs and interventions for individuals with statistically significant high healthcare utilization should be designed with this phenomenon in mind. Using either z score based definition (3+ admissions in a single year or 7+ admissions overall) appears reasonable depending on the particular analysis or program need. Both are statistically significant in terms of z scores and identify reasonably sized groups of patients who have a large number of admissions. In terms of providing services or designing interventions it seems preferable to use the annual definition of 3+ discharges in any particular year rather than a longer time period. An annual z score based definition could be developed locally by any program interested in doing so by using as little as a single year of data to identify individuals with statistically significant high healthcare utilization.

The cluster analysis of readmission patterns produced some interesting results. Although the largest cluster of patients consisted of quick frequent readmissions within a limited time span, the other three clusters showed distinct patterns of hospitalization and had timespans from first to last hospitalizations ranging from 8 to 15 years emphasizing the long term nature of some patient's patterns of need. However, for all patients the number of years with hospitalizations was substantially smaller than the time from the first to last hospitalization underscoring the fact that the vast majority of patient's time is spent living in the community, rather than being hospitalized, and that interventions and support services are best provided in the community. Two clusters accounted for a disproportionate number of bed days and discharges among the readmitted patients. Cluster 2, the long stayer group, although numbering only 837 patients accounted for 20% of all bed days among the readmitted. While Cluster 4 ($n = 13{,}868$) frequent admissions over a long time period, represented 17% of patients and

accounted for about 35% of days and discharges among the readmitted. With an average of 8 discharges, the patients in cluster 4 are somewhat similar to the group of individuals with statistically significant high healthcare utilization who had 7 or more admissions over the entire studies timespan ("lifetime") and might provide some converging evidence that a statistical criteria such as z scores may be a useful way to define individuals with statistically significant high healthcare utilization. However, no cluster corresponded to individuals with statistically significant high healthcare utilization using the annual definition of 3+ discharges within a year, cluster 4 came the closest with 26% of the patients meeting the annual individuals with statistically significant high healthcare utilization criteria. Although this cluster analysis, like Hudson [11], found distinct groups of patients, there were relatively few similarities between the two cluster analyses likely due to this study examining only multiple admission patients as well as the population consisting of state hospitals that Hudson's data did not include.

Although these results may be generalizable to other state hospital systems, they will be less applicable to private hospitals or managed care insurance programs. Further research looking at the patients patterns of utilization across the combined systems of Medicaid, indigent and state hospitals is needed as it is likely that some patients, particularly the individuals with statistically significant high healthcare utilization, may be receiving services through multiple funding streams and multiple systems of care.

Conclusions

As in previous studies, the total number of previous hospitalizations and diagnosis of schizophrenia were the strongest predictors of readmission. A one year follow-up window captures a substantial number of readmissions which should be adequate for most purposes. Utilizing a z score based on annual admissions to define individuals with statistically significant high healthcare utilization (rather than lifetime or some other multi-year extended observation period) provides an easily calculated objective measure to identify high healthcare utilization. Both are relatively straightforward and likely could be usefully applied across many different contexts.

Acknowledgements In memory of my colleague James Cooley who championed the analysis of high healthcare utilization.

Compliance with Ethical Standards

Conflict of Interest The author received no funding for this study and has no conflict of interest to declare.

Ethical Approval All research was conducted in accordance with the ethical standards of the institutional review board and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Data for this study was reviewed and approved by the Texas Department of State Health Services Institutional Review Board #2. Studies using only pre-existing administrative data do not require formal consent.

References

1. Lewis T, Joyce P. The new revolving-door patients: results from a national cohort of first admissions. Acta Psychiatr Scand. 1990;82:130–5.
2. Gastal F, Andreoli S, Quintana M, Almeida Gameiro M, Leite S, McGrath J. Predicting the revolving door phenomenon among patients with schizophrenic, affective disorders and non-organic psychoses. Rev Saude Publica. 2000;34:280–5.
3. Soril L, Leggett L, Lorenzetti D, Noseworthy T, Clement F. Characteristics of frequent users of the emergency department in the general adult population: a systematic review of international healthcare systems. Health Policy. 2016;120:452–61.
4. Scott J, Strickland A, Warner K, Dawson P. Frequent callers to and users of emergency medical systems: a systematic review. Emerg Med J. 2014;31:684–91.
5. Tricco A, Antony J, Ivers N, Ashoor H, Khan P, Blondal E, et al. Effectiveness of quality improvement strategies for coordination of care to reduce use of health care services: a systematic review and meta-analysis. CMAJ. 2014;186:E568–78.
6. Jiang H, Barrett M, Sheng M. Characteristics of hospital stays for nonelderly Medicaid super-utilizers, 2012: Healthcare Cost and Utilization Project (HCUP) statistical brief #184. Agency for Healthcare Research and Quality: Rockville; 2012.
7. Jiang H, Weiss A, Barrett M, Sheng M. Characteristics of hospital stays for super-utilizers by payer, 2012: Healthcare Cost and Utilization Project (HCUP) statistical brief #190. Rockville: Agency for Healthcare Research and Quality; 2012.
8. Hadley T, Culhane D, McGurrin M. Identifying and tracking “heavy users” of acute psychiatric inpatient services. Admin Pol Ment Health. 1992;19:279–90.
9. Hadley T, McGurrin M, Pulice R, Holohean E. Using fiscal data to identify heavy service users. Psychiatr Q. 1990;61:41–8.
10. Johnson T, Rinehart D, Durfee J, Brewer D, Batal H, Blum J, et al. For many patients who use large amounts of health care services, the need is intense yet temporary. Health Aff (Millwood). 2015;34:1312–9.
11. Hudson C. Patterns of acute psychiatric hospitalization in Massachusetts. Admin Pol Ment Health. 2005;32:221–40.
12. Soeken K, Prescott P, Herron D, Creasia J. Predictors of hospital readmission. A meta-analysis. Eval Health Prof. 1991;14:262–81.
13. Donisi V, Tedeschi F, Wahlbeck K, Haaramo P, Amaddeo F. Pre-discharge factors predicting readmissions of psychiatric patients: a systematic review of the literature. BMC Psychiatry. 2016;16:449.
14. Sfetcu R, Musat S, Haaramo P, Ciutan M, Scintee G, Vladescu C, et al. Overview of post-discharge predictors for psychiatric re-hospitalisations: a systematic review of the literature. BMC Psychiatry. 2017;17:227.

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