Risk Factors for Early Readmission to Acute Care for Persons With Schizophrenia Taking Antipsychotic Medications

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Objective: **The study examined risk factors for readmission to acute care among Florida Medicaid enrollees with schizophrenia treated with antipsychotics.** ***Methods:*** **Medicaid and service use data for 2004 to 2008 were used to identify adults with schizophrenia discharged from hospitals and crisis units who were taking antipsychotics. Data were extracted on demographic characteristics, service use before admission, psychopharmacologic treatment after discharge, and readmission to acute behavioral health care. Cox proportional hazards regression estimated readmission risk in the 30 days after discharge and in the period after 30 days for participants not readmitted in the first 30 days.** ***Results:*** **The mean±SD age of the 3,563 participants was 43.4±11.1; 61% were male, and 38% were white. Participants had 6,633 inpatient episodes; duration of hospitalization was 10.6± 7.0 days. Readmission occurred for 84% of episodes, 23% within 30 days. Variables associated with an increased readmission risk in the first 30 days were shorter hospitalization (hazard ratio [HR]=1.18, 95% confidence interval [CI]=1.10–1.27, p<.001), shorter time on medication before discharge (HR=1.19, CI=1.06–1.35, p=.003), greater prehospitalization use of acute care (HR=2.64, CI=2.29–3.05, p<.001), serious general medical comorbidity (HR=1.21, CI=1.06–1.38, p=.005), and prior substance abuse treatment (HR=1.58, CI=1.37–1.83, p<.001). After 30 days, hospitalization duration and time on medication were not significant risk factors.** ***Conclusions:*** **Short hospital stays for persons with schizophrenia may be associated with risk of early readmission, possibly because the person is insufficiently stabilized. More chronic risk factors include prior acute care, general medical comorbidity, and substance abuse. (*Psychiatric Services* 64:1225–1229, 2013; doi: 10.1176/appi.ps.003382012)**

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Early readmission is a potential indicator of poor quality of inpatient treatment for behavioral health disorders (1,2) and for general medical conditions (3–5). It is generally agreed that early readmission to inpatient treatment is a costly, disruptive, and undesired event (6). Unfortunately, risk of readmission is quite high for persons with a severe mental illness (7,8). Research has indicated that nonadherence to or discontinuation of medication treatment (9,10) and number of previous psychiatric hospitalizations (1,11) are the strongest predictors of risk of readmission to inpatient psychiatric treatment. Other studies have reported that shorter hospital stays are associated with increased risk of readmission (12). Because continuity of care after discharge is a modifiable risk factor, several studies have looked at interventions, such as medication management coordinators (13), hospital-based case management programs (14), and other interventions (15), to improve continuity of treatment and reduce risk of readmission. These interventions have had mixed results regarding risk of readmission (13).

Further work to understand the risk factors for early rehospitalization among persons with schizophrenia is warranted. The role of medication nonadherence and discontinuation with regard to readmission risk is well established. In this study, we examined several other factors associated with

Table 1

Characteristics of 3,563 Florida Medicaid enrollees with schizophrenia

Characteristic	N	%
Sex		
Male	2,178	61
Female	1,385	39
Race-ethnicity		
Black	1,156	32
Hispanic	687	19
White	1,369	38
Other	351	10
Age		
18–30	544	15
31–45	1,379	39
46–65	1,640	46

risk of early readmission (within 30 days of discharge) to behavioral health acute care for Medicaid-enrolled persons with schizophrenia discharged from community hospitals and crisis units in Florida. We also assessed more sustained risk of readmission (more than 30 days after discharge). The factors included person-level variables, such as previous inpatient treatment, history of substance abuse treatment, general medical status, and demographic characteristics, and treatment-level variables, such as length of stay and time on antipsychotic medication before discharge. We sought to minimize confounding of these results that was due to medication nonadherence and discontinuation by restricting our sample to persons who were receiving antipsychotic medications at discharge and throughout the observation period.

Methods

Medicaid enrollment and claims data (inpatient, outpatient, and pharmacy) and data on use of community services (inpatient and outpatient) from the Florida state mental health authority from 2004 to 2008 were used. Demographic characteristics were obtained from Medicaid enrollment data. Medicaid claims data and state data on use of community services were used to identify treatment episodes in behavioral health acute care settings (inpatient hospitals and crisis stabilization units) for individuals age 18 to 64 with schizophrenia (discharge diagnosis, 295.xx, except 295.7x). Episodes were further limited to those for which the person had continuous Medicaid enrollment of at least one year before and one year after the index acute care episode.

Medicaid pharmacy claims were used to identify ongoing antipsychotic medication treatment episodes after discharge from inpatient treatment. Persons were considered to be receiving antipsychotic polypharmacy if they received two or more antipsychotics concurrently for more than 60 days during which there were no periods greater than 15 days with fewer than two antipsychotics. Episodes of polypharmacy were considered terminated when the person had more than 15 days with less than two antipsychotics. Polypharmacy episodes were not considered to be terminated when the specific medications changed as long as the person was still receiving at least two antipsychotics. Monotherapy episodes were considered terminated when there were no more claims for that medication, when there was a gap in coverage for that medication that exceeded 15 days, or when polypharmacy was initiated. Monotherapy episodes for risperidone, haloperidol, and fluphenazine that involved one form of the drug (oral or injectable) were not considered polypharmacy when the other form of the same drug was added.

Service history for the year before admission to acute care was extracted from Medicaid claims and community services data. For the year before admission to acute care, the number of days of behavioral health acute care and claims for or episodes of substance abuse treatment were counted. The presence of significant general medical comorbidity was assessed with the Charlson Index (16).

Cox proportional hazards regression was used to estimate risk of readmission to behavioral health acute care (hospital or crisis stabilization unit). We treated each successive acute care treatment episode for an individual as a separate observation, and all available observations were pooled into one analysis. Therefore, each individual could contribute multiple observations. To account for the correlation across multiple observations of the same participant, we used cluster-correlated robust estimates of variance (17) to calculate robust standard error estimates. The control variables were antipsychotic therapy received (polypharmacy versus monotherapy), demographic characteristics (gender, race-ethnicity, and age), preadmission service history (above or below the median days of prior acute care treatment, presence of substance abuse treatment, presence of significant general medical comorbidity indicated by a score of ≥1 on the Charlson Index), length of stay in acute care (in weeks), and length of time that the person was receiving the discharge medication before discharge (in years). Data were right-censored at 30 days after the end of treatment with the discharge medication, end of Medicaid enrollment, end of data availability, or death. Risk of readmission was estimated for the 30 days after discharge and for the period after the first 30 days for participants who were not readmitted within 30 days.

Results

Characteristics of the 3,563 participants are presented in Table 1. The mean±SD age was 43.4±11.1, and 61% were male. In all, 38% of participants were white, 32% were black, 19% were Hispanic, and 10% were of other backgrounds. The participants had 6,633 episodes of inpatient treatment that were selected for inclusion in the study. The mean length of inpatient treatment episodes was 10.6± 7.0 days, and in 46% of the episodes, the participant was receiving antipsychotic polypharmacy on discharge.

Readmission data are presented in Table 2. Overall, 84% of episodes (N=5,557) resulted in participants being readmitted to acute care during the study period; 23% (N=1,490 episodes) occurred within 30 days, and 72% (N=4,754) occurred within one year. Median length of time until readmission for those who were readmitted was 86 days.

Results of Cox proportional hazards regression for the first 30 days after discharge are presented in Table 3. The mean number of days until readmission or censoring in this analysis was 26.3±7.9 days (median= 30 days). Variables associated with reduced risk of readmission in the first

30 days after discharge were longer length (in weeks) of the inpatient treatment episode (hazard ratio [HR]=.85, p<.001) and more time (in years) taking the discharge medication before discharge (HR=.84, p=.003). Variables associated with increased risk of readmission in the first 30 days were greater use (at or above the median number of days) of behavioral health acute care services before hospitalization (HR=2.64, p<.001), serious general medical comorbidity (HR=1.21, p=.005), and a history of substance abuse treatment (HR=1.58, p<.001). A less significant effect was found for age, with younger participants having a higher risk of readmission; the other demographic variables were not associated with risk of readmission in the first 30 days. Type of antipsychotic treatment (polypharmacy versus monotherapy) was not significantly associated with risk of readmission in the first 30 days.

Results of Cox proportional hazards regression for the period beginning 30 days after discharge for participants who were not readmitted in the first 30 days are presented in Table 4. The mean number of days from discharge until readmission or censoring in this analysis was 99.0±130.9 days (median=59 days). In this analysis, length of inpatient treatment episode and length of time on the discharge medication before discharge were no longer significantly associated with risk of readmission; however, the preadmission service use variables all remained strongly associated with risk of readmission. Greater use of behavioral health acute care services before hospitalization (HR=2.34, p<.001), serious general medical comorbidity (HR=1.28, p<.001), and history of substance abuse treatment (HR=1.53, p<.001) were associated with increased risk of early readmission. Again, a less significant effect for age was found, with younger participants having a higher risk of readmission (HR=.93 for age in decades, p=.009); other demographic variables were not associated with risk of readmission after the first 30 days, and the effect of polypharmacy versus monotherapy was again not significant.

Discussion

The results of this study are consistent with and extend a growing body of research showing that persons with a history of multiple inpatient treatment episodes and persons with a history of substance abuse treatment are at increased risk of readmission to behavioral health acute care (1). This was true for both risk of early readmission and sustained risk of readmission, suggesting that these variables are chronic influences on a person's vulnerability to exacerbation of a disorder. The findings make a unique contribution to this literature by showing that the risk was present even among persons who were receiving ongoing treatment with antipsychotic medication.

Further, we found no prior studies documenting the association in this population between significant general medical comorbidity and increased risk of readmission to acute behavioral health care, although this is perhaps not a surprising finding given that significant co-occurring general medical problems have been shown to complicate treatment and add to a person's overall vulnerability (18). Research shows that team-based interventions and integrated care that includes shared treatment decision making, qualified care managers, systematic screening, and colocation of primary care and behavioral health specialists can lead to improved outcomes for patients with multiple co-occurring behavioral and general medical conditions (19). Studies of persons who have a co-occurring substance use disorder and a severe psychiatric disorder have similarly supported the use of integrated treatment for these disorders (20,21)

In contrast to these person-level variables, duration of hospital treatment and length of time a patient was receiving a medication are both variables that may be influenced by the treatment facility. Our finding that shorter stays were associated with increased risk of readmission within 30 days is consistent with several previous studies (12,22). Such a finding suggests that some patients are discharged before they are sufficiently stabilized. Although it is probably economically infeasible for hospitals to keep persons in inpatient treatment solely to ensure that their medication regimen is fully stabilized, the findings

Table 2

Acute care readmissions (N=5,557) among 2,767 Florida Medicaid enrollees with schizophrenia

Days from discharge to readmission	Episodes	
	N	%
1–30	1,490	23
31–90	1,351	20
91–180	1,016	15
181–365	897	14
>365	803	12

Table 3

Cox proportional hazards analysis of risk of readmission within 30 days among Florida Medicaid enrollees with schizophrenia[a]

Variable	Hazard ratio	95% CI	p
Discharge age (in decades)	.93	.87–.98	.010
Female (reference: male)	1.01	.88–1.16	.894
Race-ethnicity (reference: white)			
Black	1.12	.95–1.32	.164
Hispanic	1.16	.97–1.39	.112
Other	1.14	.90–1.43	.272
Polypharmacy (reference: monotherapy)	1.02	.90–1.14	.798
Length of antipsychotic treatment before discharge (in years)	.84	.74–.94	.003
Length of inpatient stay (in weeks)	.85	.79–.91	<.001
Preadmission days of acute care at or above median (reference: below median)	2.64	2.29–3.05	<.001
Charlson Index score ≥1 (reference: 0)	1.21	1.06–1.38	.005
Preadmission substance abuse treatment (reference: none)	1.58	1.37–1.83	<.001

[a] All 6,633 episodes of acute care were included in the analysis.

Table 4

Cox proportional hazards analysis of risk of readmission after 30 days among Florida Medicaid enrollees with schizophrenia[a]

Variable	Hazard ratio	95% CI	p
Discharge age (in decades)	.93	.89–.98	.009
Female (reference: male)	.98	.88–1.10	.760
Race-ethnicity (reference: white)			
Black	.97	.85–1.11	.663
Hispanic	1.11	.97–1.26	.134
Other	.97	.80–1.17	.728
Polypharmacy (reference: monotherapy)	.98	.88–1.08	.655
Length of antipsychotic treatment before discharge (in years)	1.02	.95–1.08	.629
Length of inpatient stay (in weeks)	.99	.94–1.04	.675
Preadmission days of acute care at or above median (reference: below median)	2.34	2.09–2.61	<.001
Charlson Index score ≥1 (reference: 0)	1.28	1.14–1.43	<.001
Preadmission substance abuse treatment (reference: none)	1.53	1.34–1.75	<.001

[a] The 1,490 episodes in which the person was readmitted within 30 days were excluded from this analysis. The remaining 5,143 episodes of acute care were included.

may suggest that persons who have been switched to a different medication should receive more vigorous discharge planning and follow-up care to ensure smoother transition to treatment in the community. In addition, as noted above, integration of treatment for persons with co-occurring disorders (either a general medical illness or a substance use disorder in addition to schizophrenia) should be initiated within the inpatient unit.

Several limitations of this study should be considered. The analysis was censored at the end of medication treatment; therefore, differences in time to discontinuation of medication were not considered. This study relied on administrative data, which can suffer from imperfect record keeping, data coding errors, and incompleteness, although it has the advantage of eliminating self-selection with respect to participation and dropout. We also utilized an observational design that may allow important, unmeasured differences between groups receiving the various treatments, which may have affected the results. Despite some drawbacks, this research approach provided detailed information on participants and facilities not otherwise available while also minimizing selective attrition and maintaining low study costs.

Conclusions

Shorter inpatient stays and a shorter time receiving medication before discharge were both associated with increased risk of early readmission to acute care for persons with schizophrenia who were treated with antipsychotic medication. This finding suggests that some patients may have been discharged before they were sufficiently stabilized. Patients with shorter stays and those not sufficiently stabilized on their medication should receive more vigorous discharge planning and follow-up care to ensure smoother transition to treatment in the community. Further, patients with more extensive acute care history, those with general medical comorbidity, and those with a history of substance abuse treatment were at longer-term risk of readmission. For these vulnerable populations, integrated care models of treatment may be particularly important.

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