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The effects of state psychiatric hospital waitlist policies on length of stay and time to readmission

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Abstract

This study examined the effects of a waitlist policy for state psychiatric hospitals on length of stay and time to readmission using data from North Carolina for 2004–2010. Cox proportional hazards models tested the hypothesis that patients were discharged “quicker-but-sicker” post-waitlist, as hospitals struggled to manage admission delays and quickly admit waitlisted patients. Results refute this hypothesis, indicating that waitlists were associated with increased length of stay and time to readmission. Further research is needed to evaluate patients’ clinical outcomes directly and to examine the impact of state hospital waitlists in other areas, such as state hospital case mix, local emergency departments, and outpatient mental health agencies.

Keywords

State psychiatric hospitals; waitlist; patterns of utilization; policy analysis

INTRODUCTION

Between 1955 and 2005, the number of public (state- and county-operated) psychiatric hospital beds in the U.S. declined 95% from a peak of 340 per 100,000 population to 17 per 100,000 (Torrey et al. 2008). Increases in psychiatric bed capacity at other locations such as private psychiatric hospitals and general hospitals did not offset these reductions. As a result, the overall number of psychiatric beds decreased by nearly 60% between 1970 and 2002 (Center for Mental Health Services 2006).

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Many observers now believe that there is a shortage of psychiatric beds. The New Freedom Commission on Mental Health's Subcommittee on Acute Care reported that the shortage of psychiatric acute care beds in some communities had “risen to crisis proportions” (New Freedom Commission on Mental Health 2004). More recently, 25 state mental health agency directors reported shortages of psychiatric beds (National Association of State Mental Health Program Directors Research Institute, Inc. 2012). In two national reports, the Treatment Advocacy Center estimated that an additional 95,820 public psychiatric beds were needed to provide a minimum level of care in 2005, and that this shortfall was even greater in 2010 (Torrey et al. 2008; Torrey et al. 2012).

By 2008, public psychiatric hospitals accounted for only 16% of the available psychiatric bed capacity in the U.S. (Substance Abuse and Mental Health Services Administration 2012). States and counties have taken diverse approaches to the financing and management of these hospitals and to the organization of community-based alternatives. This diversity has resulted in substantial between-state variation in public psychiatric hospital bed capacity and in the role these hospitals play in broader mental health service systems. In 2005, for example, the number of public psychiatric hospital beds per 100,000 population ranged from 5.1 in Nevada to 49.7 in Mississippi (Torrey et al. 2008). States such as North Carolina and Georgia have continued to rely on public hospitals for acute psychiatric care (Center for Mental Health Services 2008). However, with vigorous enforcement of Olmstead policies aimed at caring for people with psychiatric disorders in the least restrictive setting and resulting efforts to shift expenditures from hospitals to communities, both states downsized their public psychiatric hospitals even while demand for inpatient care remained high (Rash 2012; Swartz and Morrissey 2003; Vicario 2012; North Carolina Division of Mental Health, Developmental Disabilities and Substance Abuse Services 2008; North Carolina Division of Mental Health, Developmental Disabilities and Substance Abuse Services 2005; Nichols 2011; National Association of State Mental Health Program Directors Research Institute, Inc. 2010).

In this context of limited public hospital capacity, waitlists are increasingly used to manage inpatient demand at state psychiatric hospitals by delaying admissions until beds become available. Even in the absence of explicit bed closures, waitlists are often coupled with patient census reductions, as they allow hospitals to adhere to staffed-bed capacity constraints and to avoid operating overcrowded treatment units. In 2012, mental health authority directors in 21 states reported maintaining waitlists for inpatient psychiatric services (National Association of State Mental Health Program Directors Research Institute, Inc. 2012). To date, little research has been directed at the impact of these waitlist policies, especially regarding their impact on patterns of care within state hospitals. One strategy, for example, that state hospital administrators might employ to deal with a growing backlog of admissions is to discharge patients as soon as possible, thereby freeing up beds that can be earmarked for persons on the waitlist. If patients are not fully stabilized during their hospitalization, or if inadequate time is spent on discharge planning, one possible consequence is that patients may cycle back to the hospital with shorter times between discharges and subsequent readmissions, signaling important quality of care concerns. We sought to test the hypothesis that waitlists negatively affected quality of care, with patients being discharged “quicker-but-sicker” as evidenced both by shorter lengths of stay and

shorter times to readmission. In effect, shorter inpatient stays (quicker) may result in rapid readmissions (an indicator of sicker).

The "quicker-but-sicker" hypothesis has been studied extensively in general medicine (Qian et al. 2010; Moore et al. 2007; Halm et al. 2002; Kosecoff et al. 1990) and inpatient psychiatry (McFarland et al. 2002; Lyons et al. 1997; Ellis and McGuire 1996; Appleby et al. 1993). However, no prior study has evaluated whether state psychiatric hospital waitlist policies are producing this effect. The objective of this study was to test the "quicker-but-sicker" hypothesis by estimating the effects of North Carolina's state hospital waitlist policy on length of stay and time to readmission.

Implementation of North Carolina's Waitlist Policy

The policy context for North Carolina's state hospital waitlist included the state's 2001 Mental Health Reform Bill (House Bill 381 2001), which called for downsizing state-operated psychiatric hospitals and shifting care to community-based settings (Swartz and Morrissey 2003; Vicario 2012). At that time there were 1,755 beds in four state psychiatric hospitals (White 2012). State hospital capacity decreased by more than 30% between fiscal years 2001 and 2006 to 1,180 beds (White 2012). The state continued to rely on its psychiatric hospitals for acute care even after the capacity reductions. In fiscal year 2007, North Carolina had the most state hospital admissions nationally (17,419), one of the highest admission rates (196.7 per 100,000 population), and one of the lowest values of median length of stay (7 days for adult stays) (author calculations using Center for Mental Health Services 2006; United States Census Bureau 2006).

On February 6, 2007, in response to concerns for staff and patient safety in overcrowded treatment units, the state initiated a waitlist policy for all non-forensic admissions to state psychiatric hospitals (Moseley 2007). Following the declaration of the waitlist policy, state hospital staffed-bed capacity remained stable at around 1,180 beds through fiscal year 2008 (White 2012). Additional statewide bed reductions were later achieved in July 2008 and December 2010 by merging two hospitals and replacing their separate physical plants with a new, smaller, 432-bed facility (Biesecker 2008). In 2013, the capacity of the three remaining state hospitals was 866 beds, including only 84 forensic beds and 36 children's beds (Joint Legislative Committee on Health and Human Services, Mental Health Subcommittee 2013; meeting with state hospital administrators March 20, 2013).

The waitlists generally function as first-in, first-out queues by patient sex, where the patient who has waited the longest is admitted when a bed becomes available. However, according to conversations with state hospital administrators (meeting September 1, 2010), patients with the most acute needs can be prioritized for admission. Specific rules for prioritization are based on referral location (with priority given to patients waiting in emergency departments and crisis centers over patients already in inpatient psychiatric units) and acuity (with priority given to patients who limit the ability of their referral source to admit additional patients). In order to assess whether North Carolina's waitlist implementation conformed to the quicker-but-sicker hypothesis, we tracked lengths of stay, admissions, and readmissions during the seven-year period from 2004 through 2010.

METHODS

Data Sources

North Carolina's Division of State Operated Healthcare Facilities, the administrative unit that oversees state hospitals, monitors waitlists based on a monthly report from each hospital documenting the number of days operating on a waitlist and the number of patients placed on the waitlist. These monthly waitlist data were collected prospectively by each state hospital and reported to the Division beginning in February 2007. We used these data to define the date of waitlist implementation for each hospital.

We analyzed admission and discharge data (2004–2010) from North Carolina's Healthcare Enterprise Accounts Receivable Tracking System (HEARTS). HEARTS is a billing system maintained by the Division of State Operated Healthcare Facilities. The waitlist data and our HEARTS data extract were not linked, so we were not able to determine which state hospital admissions originated from the waitlists.

Sample

Unlike in other states where forensic admissions dominate state hospital use, forensic cases represent a small minority (less than 5%) of admissions to North Carolina state psychiatric hospitals (National Association of State Mental Health Program Directors Research Institute, Inc. 2012; Torrey et al. 2012; North Carolina Division of Mental Health, Developmental Disabilities and Substance Abuse Services 2012). For this study, we examined an admission sample and a discharge sample of all non-forensic visits to general adult short-term and long-term treatment units between January 1, 2004 and November 30, 2010. Most patients on North Carolina state hospital waitlists were referred to these units rather than to child, adolescent, geriatric, or forensic units. Patients may have received care in multiple treatment units during a given hospital stay. However, to capture all use of adult treatment units, we included visits with patient service codes corresponding to the selected short-term or long-term units at any point in the visit record. We excluded data from December 2010 because of the consolidation from a four- to a three-hospital system during that month.

The admission sample included all state hospital admissions during the study period of patients who were between the ages of 18 and 64 at the time of admission. We used this sample to evaluate the effect of the waitlist policy on length of stay. The discharge sample included all state hospital discharges of patients who were between the ages of 18 and 64 at both admission and discharge during the study period. We used the discharge sample to evaluate the effect of the waitlist policy on time to readmission to any state hospital in North Carolina.

Measures

Dependent variables were length of stay in days (calculated by subtracting admission date from discharge date) and time to readmission in days (calculated by subtracting discharge date from the next date of admission, if any, to any of the four state hospitals). We coded

length of stay and time to readmission as 0.5 days for patients discharged on the date of admission or readmitted on the date of discharge, respectively.

The key independent variable was a time-dependent covariate equal to zero before waitlist implementation and equal to one after implementation. To account for differential take-up of the waitlist policy across hospitals, we defined the implementation date for each hospital as the first day of the first month during which the hospital operated a waitlist for at least five days (or on February 6, 2007, for hospitals operating on a waitlist for at least five days during this first month of the policy).

In adjusted analyses, we included three sets of interaction terms to test for differential impacts of the waitlist, focusing on sex, diagnosis type, and individual hospital. Here, we wanted to explore the hypotheses that post-waitlist decreases in length of stay and time to readmission might be greater for male patients as compared to female patients (since male treatment units operated on waitlists more often than female treatment units, potentially leading hospitals to discharge male patients "quicker-but-sicker" on a more frequent basis). Patient diagnoses were categorized into five mutually exclusive groups using all International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes listed in each visit record. The five diagnosis types included (1) severe mental illness (SMI) without substance abuse (SA), (2) SMI with SA, (3) non-SMI without SA, (4) non-SMI with SA, or (5) SA alone (see Table 1). Individuals classified into the "non-SMI" diagnosis groups had at least one non-SMI mental health diagnosis, but no SMI diagnosis; individuals classified into the "SA alone" diagnosis group had at least one SA diagnosis, but no SMI or non-SMI mental health diagnosis. Interaction terms between the post-waitlist indicator and diagnosis type were included in analyses to test the hypothesis that patients in less severe diagnosis categories (such as SA alone or non-SMI with or without SA) might be prioritized for quicker discharge over patients with more severe diagnoses in the post-waitlist time period. If hospital stays for these patients with less severe illness were cut too short, we might expect to see them cycle back to the hospital more quickly than patients with more severe illness. Last, we wanted to begin to examine post-waitlist changes in length of stay and time to readmission by individual hospital, given actual or potential differences in the initial uptake of waitlists, waitlist management strategies, patient populations, and regional alternatives to state hospitalization.

Analysis

We first generated descriptive statistics summarizing our admission and discharge samples, overall and separately for the pre-waitlist and post-waitlist cohorts. We used the admission sample to compare state hospital length of stay for patients admitted pre- and post-waitlist, including a small number of right-censored values for patients not discharged by the end of the study period (466 of 72,035, or 0.65%). This comparison allowed us to use all available data, but it failed to adjust for patients admitted pre-waitlist but discharged post-waitlist or for patients admitted in the pre-waitlist period who ended up having longer follow-up times than patients admitted in the post-waitlist period.

To begin to address these issues while accurately characterizing utilization, we computed length of stay and time to readmission overall and by diagnosis type for a comparable pre-

and post-waitlist patient cohort. The pre-waitlist length of stay and readmission cohorts included all admissions and discharges, respectively, between February 1, 2005 and January 31, 2006, allowing us to track each patient in the data for one year pre-intervention. Similarly, the post-waitlist cohorts included all admissions and discharges, respectively, for one year starting on the date of waitlist implementation for each hospital.

For length of stay, we compared the proportion of patients in the pre- and post-waitlist cohorts who were discharged within clinically relevant time periods (0.5 to 3 days, 4 to 7 days, 8 to 14 days, 15 to 30 days, 31 to 90 days, 91 to 365 days, or not yet discharged in one-year follow-up). We calculated the pre- and post-waitlist mean and median length of stay, truncating length of stay at 365 days for patients not yet discharged. For time to readmission, we similarly compared the proportion of people readmitted to a state hospital within the same time periods as used for length of stay.

To leverage the complete admission and discharge samples while testing the “quicker-but-sicker” hypothesis, we then used Cox proportional hazards models with time-dependent covariates (Fisher and Lin 1999) to analyze the effects of waitlist policy implementation on hospital length of stay and time to readmission, controlling for patient demographic, clinical, and visit-specific characteristics. Patient demographics included age (in years), sex, race, and insurance status. We used binary indicators for marital status, veteran status, legally declared incompetence, and patient report of having an occupation. We controlled for residential arrangement at admission in the length of stay model and discharge location in the readmission model. In the readmission model we also included a measure of housing instability, indicating whether the patient’s type of living arrangement changed between admission and discharge (for example, from a private residence to a homeless shelter). Type of psychiatric diagnosis for the current visit was included as a categorical variable as described above. Other visit-specific control variables included a set of dummy variables for state hospitals, a categorical measure of the number of previous state hospitalizations during the study period, commitment status (voluntary, involuntary mental health, involuntary SA), criminal involvement (capturing current involvement with the criminal justice system, including presence of legal charges; arrival by correctional officer; referral from court, law enforcement, or correctional facility; or discharge to a correctional facility), and whether state hospital arrival occurred through established avenues for admission (e.g., referral from a local mental health agency) as opposed to walk-ins.

The Cox models allowed us to account for right-censoring when a patient experienced an event (discharge or readmission) or reached the end of the administrative data (November 30, 2010). We compared the hazard of discharge (or readmission) before and after waitlist implementation, where implementation date varied by hospital. We used robust sandwich estimation of the covariance matrix (Lin and Wei 1989) to account for multiple visits from the same patients. We modeled interactions based on a priori expectations, explained above, that post-waitlist changes in patterns of care would vary by sex, diagnosis type, and hospital region. Data analysis was performed using SAS version 9.3 (SAS Institute, Cary, North Carolina) and R version 2.14 (R Foundation for Statistical Computing, Vienna, Austria). To accommodate the large sample size, we used a conservative alpha level of 0.01 to identify

statistical significance. This study was approved by the University of North Carolina's Institutional Review Board.

RESULTS

Based on monthly reports, waitlist implementation varied substantially across the four hospitals. The first three hospitals began operating waitlists in February, May, and June 2007, and the last hospital began operating a waitlist over a year later in April 2008. In the following year (i.e., between April 2008 and March 2009), an average of 373 patients were placed on a waitlist for state hospital admission each month. On average, fewer than 45% of these patients were ultimately admitted each month. State hospitals reported an average monthly wait time of over 20 hours, although in extreme cases, patients waited for over a week for admission.

Our samples included 72,035 non-forensic admissions to, and 71,562 discharges from, North Carolina's state psychiatric hospitals between January 2004 and November 2010 (Table 2). The total number of admissions was similar across hospitals (not shown). Nearly two-thirds of admissions (n=47,539) occurred during the pre-period before the admitting hospital implemented its waitlist. Most patient admissions were male (63.1%), aged 30 to 54 (62.5%), were white (57.1%), had an insurance status of self-pay or uninsured (54.9%), lived in a private residence (81.8%), arrived at the hospital through established avenues for admission (96.4%) as opposed to walk-ins, and had no previous hospitalization between January 2004 and November 2010 (61.6%). Patients diagnosed with SMI represented 62.2% of admissions. Few admissions involved patients who were married (15.5%), were criminally involved (9.8%), were deemed incompetent (4.3%), self-identified with an occupation (26.3%), were veterans (3.7%), or were admitted voluntarily (9.9%). The pre-waitlist and post-waitlist admission cohorts were similar with regard to age, sex, and race, with differences in proportions of less than three percentage points. However, larger shares of post-waitlist admissions involved patients with public insurance and patients diagnosed with SMI and SA (offset by decreases in the share of admissions involving self-pay/uninsured patients and patients diagnosed with SA alone, respectively). Characteristics of discharged patients (not shown) were similar to those of admitted patients.

Unadjusted analyses for the complete admissions samples showed that, overall, mean length of stay was 37% higher post-waitlist, having increased from 16.9 days to 23.1 days (log rank test p-value <.001). Median length of stay increased by 40%, from 5 to 7 days. Our cohort analyses revealed slightly smaller increases in length of stay post-waitlist (mean 12.0 days pre-waitlist vs. 14.2 days post-waitlist; median 5 days pre-waitlist vs. 6 days post-waitlist). Pre- and post-waitlist length of stay distributions for the admission cohorts are provided in Figure 1. The top left panel in the figure highlights a general post-waitlist shift away from short hospitalizations, with increased probabilities of stays greater than two weeks. From the remaining five panels in the figure, we can note differences in the original length of stay distributions and magnitude of post-waitlist shifts by diagnosis type. For example, the mean length of stay increased by 3.6 days for people with SMI and no SA (19.5 days pre-waitlist vs. 23.1 days post-waitlist), as compared to only 0.3 days for people with SA alone (4.8 days pre-waitlist vs. 5.1 days post-waitlist).

As for time to readmission, a total of 27,379 discharges (38.3%) were followed by readmission within the study period. Among pre-waitlist discharges, 32.4% were followed by readmission within one year, as compared to 28.7% post-waitlist, a relative decline of about 11%. Results from our cohort analyses (Figure 2) indicate very similar pre- and post-waitlist time to readmission distributions, overall and by diagnosis type. For example, the overall percentage of discharges with 30-day readmission decreased from 10.5% pre-waitlist to 9.3% post-waitlist. Similar subtle differences can be viewed by diagnosis type.

Results from the Cox models confirmed that length of stay and time to readmission both increased with implementation of the waitlist policy. Table 3 shows parameter estimates (log hazard ratios) for discharge and readmission. In the length of stay model, the parameter estimate for the main effect of the waitlist indicator was −0.26 ($p<0.001$). The corresponding hazard ratio is 0.77, indicating that the waitlist main effect was associated with a 23% decrease in the hazard of discharge. The waitlist effect varied by diagnosis type and hospital. Based on our conservative Type I error threshold, the post-waitlist × sex interaction effect ($p=0.02$) was not statistically significant.

We observed an interaction between waitlist implementation and diagnosis type ($p<0.001$). In the pre-waitlist period, patients diagnosed with SA alone had the shortest length of stay (followed by patients with non-SMI diagnoses with SA, non-SMI without SA, SMI with SA, and SMI without SA). The increase in length of stay was smallest for patients with SA alone and greatest for patients with non-SMI diagnoses without SA. The increase in expected length of stay (with all other covariates set to their mean/modal values) ranged from 0.5 days to 6.5 days across diagnosis types, with the relative increase ranging from 9.8% to 47.7% of the pre-waitlist expected value.

The waitlist effect also varied by hospital ($p<0.001$). The hospital with the shortest pre-waitlist length of stay (Hospital D) had the largest increase in length of stay. Similarly, the hospital with the longest pre-waitlist length of stay (Hospital B) had the smallest increase in length of stay. With all other covariates set to their mean/modal values, the increase in expected length of stay ranged between 2.3 and 4.6 days across hospitals, with the relative increase ranging from 21.7% to 46.8% of the pre-waitlist expected value.

In the readmission model, the main effect parameter estimate for the waitlist covariate (−0.63, $p<0.001$) indicated an increase in time to readmission. The increase was greater for male patients than for female patients, although this interaction effect ($p=0.02$) did not meet our conservative statistical significance criterion. The post-waitlist interaction with diagnosis type was not statistically significant ($p=0.24$). Parameter estimates for all post-waitlist × hospital interaction terms were negative, indicating that time to readmission increased at all hospitals but the size of the increase varied across hospitals.

DISCUSSION

Overall, our results do not support the hypothesis that introduction of waitlists led to patients being discharged “quicker-but-sicker” in the post-waitlist period, either overall or stratified by diagnosis. On the contrary, waitlists were associated with increases in length of stay and

time to readmission, suggesting that state hospital clinicians and/or administrators were not hastily reacting to the waitlist policy by reducing patient length of stay in an effort to admit additional patients. In unadjusted results, waitlist implementation was associated with increases of 40% (2 days) and 37% (6.2 days) in the median and mean length of stay, respectively. These measured effects of the waitlist policy on admitted and discharged patients imply that the policy also had unobserved effects on patients awaiting admission. Specifically, with sustained demand for hospital admissions, increased length of stay and decreased admissions imply that patients on the waitlist spent more time in emergency departments, crisis centers, and general hospitals while awaiting transfer to state hospitals.

Although the shift in (unadjusted) mean length of stay from 16.9 days to 23.1 days may seem trivial at the individual patient level, it translates to a sizeable decrease in the number of patients served in state hospitals each year. If n represents the original number of patients served per year, then the number of available bed days is $16.9n$ and the number of patients served per year after waitlist implementation is $16.9n/23.1$, or $0.73n$, signifying a 27% reduction in the annual number of patients served.

Our results are more consistent with the hypothesis that the waitlist is “squeezing out,” or diverting, patients whose illnesses are relatively less difficult to treat/stabilize. For example, patients with diagnosis types consistent with shorter lengths of stay (e.g., SA with no MH) or patients with less challenging problems among those with a given diagnosis type (e.g., patients without violent behavior, among those with SMI) may be less likely to be admitted to state hospitals in the post-waitlist period. These patients may be admitted to local community hospitals or have their psychiatric crisis stabilize while still on the waitlist for state hospital admission. In the first nine months of 2010, hundreds of patients on state hospital waitlists experienced waits of over 6 days (Akland and Akland, 2010), suggesting that conditions were ripe for the attrition of some patients from waitlists. Findings from other areas of medicine have suggested that patients with less severe problems may be more likely to disappear from waitlists. For example, couples trying to conceive through in vitro fertilization commonly drop out of waitlists due to spontaneous pregnancy (van Dongen et al., 2010), and among patients scheduled for coronary artery surgery, those scheduled for non-urgent surgery have longer wait times and may therefore be at greater risk for dropping out of waitlists due to death, compared to patients scheduled for semi-urgent surgery (Sobolev et al., 2006).

The findings that led to this “squeezing out” hypothesis suggest a qualitative shift in the types of patients cared for in state psychiatric hospitals, of which administrators must be mindful. However, our data do not allow us to explain definitively the differences between our pre- and post-waitlist cohorts in diagnosis type and length of stay. Additional research is needed to determine whether, how much, and by what mechanisms the waitlist policy has resulted in a changed case mix of admissions to state hospitals, potentially helping to explain the increase in length of stay post-waitlist.

The longer time to readmission post-waitlist can be explained, at least in part, by the greater delay of admissions in this more resource-constrained system. For example, in fiscal year 2012, the average wait time to state psychiatric hospital admission was 2.7 days for people

referred from a general hospital emergency department (North Carolina Division of State Operated Healthcare Facilities 2012). We would expect the post-waitlist time to readmission to be higher by at least this amount, as patients are no longer admitted immediately after referral. As patients with less challenging problems are "squeezed out" of the state psychiatric hospital, it is also possible that increased readmissions to other facilities or programs may reduce the hazard of readmission to state hospitals. Similarly, longer time to readmission may indicate that, once their symptoms are stabilized, patients are more likely to receive needed services outside of the state hospitals.

The effects of the waitlists on patterns of state hospital use varied to some extent by hospital and patient diagnosis type. The hospital with the shortest pre-waitlist length of stay had the largest increase in length of stay, and the hospital with the longest pre-waitlist length of stay had the smallest increase, indicating that differences in the effects of the waitlist policy may have been associated with pre-waitlist differences in how the hospitals were used by the counties in their service areas. A more thorough ecological analysis may be warranted to investigate differences in effects of the waitlist policy across hospitals, taking into account regional differences in the populations served by state hospitals as well as availability of alternative community-based mental health services.

The effects of the waitlist policy on length of stay varied by patient diagnosis type, although increases in length of stay occurred for all patients. Length of stay increased by the smallest amount for patients diagnosed with SA alone. One explanation is that in the post-waitlist era, state hospitals may discharge or transfer SA patients sooner (relative to other patients) to make room for patients more appropriate for state hospitalization. The effects of the waitlist policy on time to readmission did not vary by diagnosis type.

The current study has several limitations. First, it is based upon the experiences of a single state and might not generalize to all states that continue to rely on state hospitals for acute psychiatric care. However, the consistency of our findings across four state hospitals suggests that the length of stay and readmission effects of waitlists may be generalizable across a range of hospitals. Second, historical events other than the waitlist may have contributed to changes in patterns of use (e.g., an expansion of community-based care that allowed patients to function in the community without state hospital stays, or a shift in philosophy of care towards longer visits). To minimize this risk, we defined the post-waitlist period based on the month of waitlist uptake within each hospital, rather than the date of the statewide policy announcement. Third, because utilization data from non-state psychiatric facilities were not available, our analysis of time to readmission examined readmission to state hospitals only. Last, we tested the "quicker-but-sicker" hypothesis using length of stay and time to readmission as proxy outcome measures because we lacked data on patient functional status at time of discharge.

CONCLUSION

Despite the limitations discussed, the current study provides several insights about how state hospital waitlists can potentially impact patterns of utilization. State hospital waitlist implementation was associated with increases in length of stay and time to readmission.

These effects varied by patient diagnosis type (for length of stay) and individual hospital characteristics. Although additional metrics should be used to examine clinical outcomes at the time of discharge, our results do not support the idea that hospitals are discharging patients "quicker-but-sicker" in an effort to admit additional patients and manage admission delays. Nonetheless, changes in patterns of care should be taken into account when implementing waitlists. In addition to reducing hospital patient census by prohibiting overcrowded treatment units, waitlists also may reduce the number of patients able to be served annually by increasing length of stay and thus slowing bed turnover. Additional research is needed to determine whether and how waitlist policies affect other aspects of state psychiatric hospitals, such as case mix. The wider impacts of these policies on local hospital emergency departments and outpatient mental health agencies also need to be examined.

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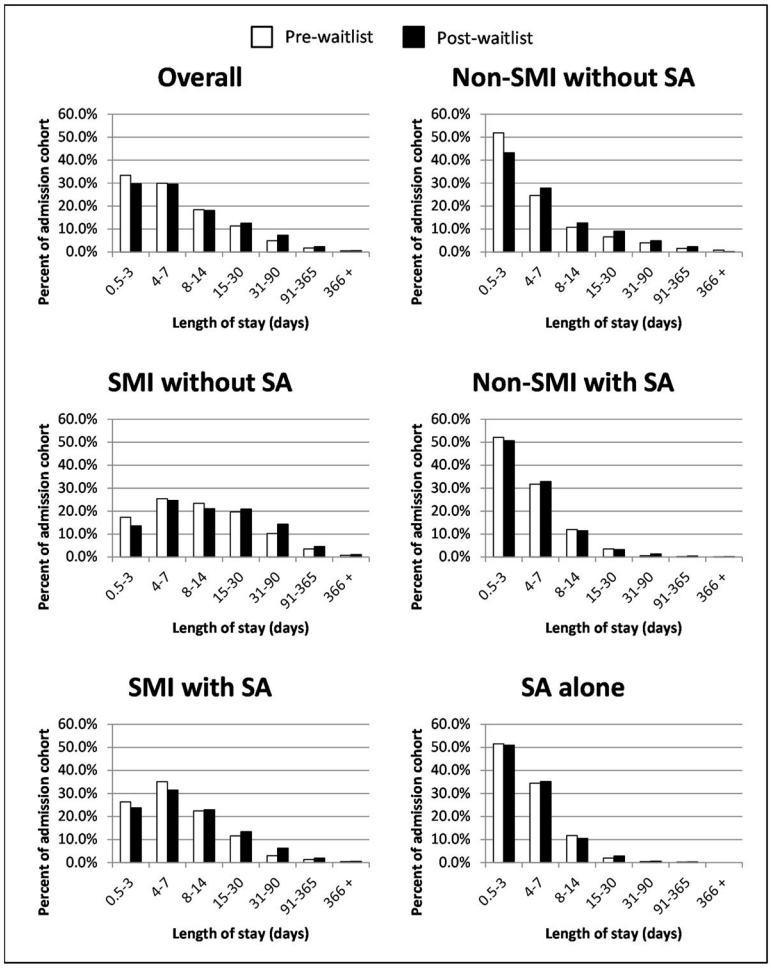

Figure 1.

Percent of admission cohorts[a] discharged within given time periods (overall and by diagnosis type)

[a]Admission cohorts included all admissions between February 1, 2005 and January 31, 2006 (pre-waitlist cohort) and all admissions occurring within one year of each hospital operating on a waitlist for at least five days of the month (post-waitlist cohort).

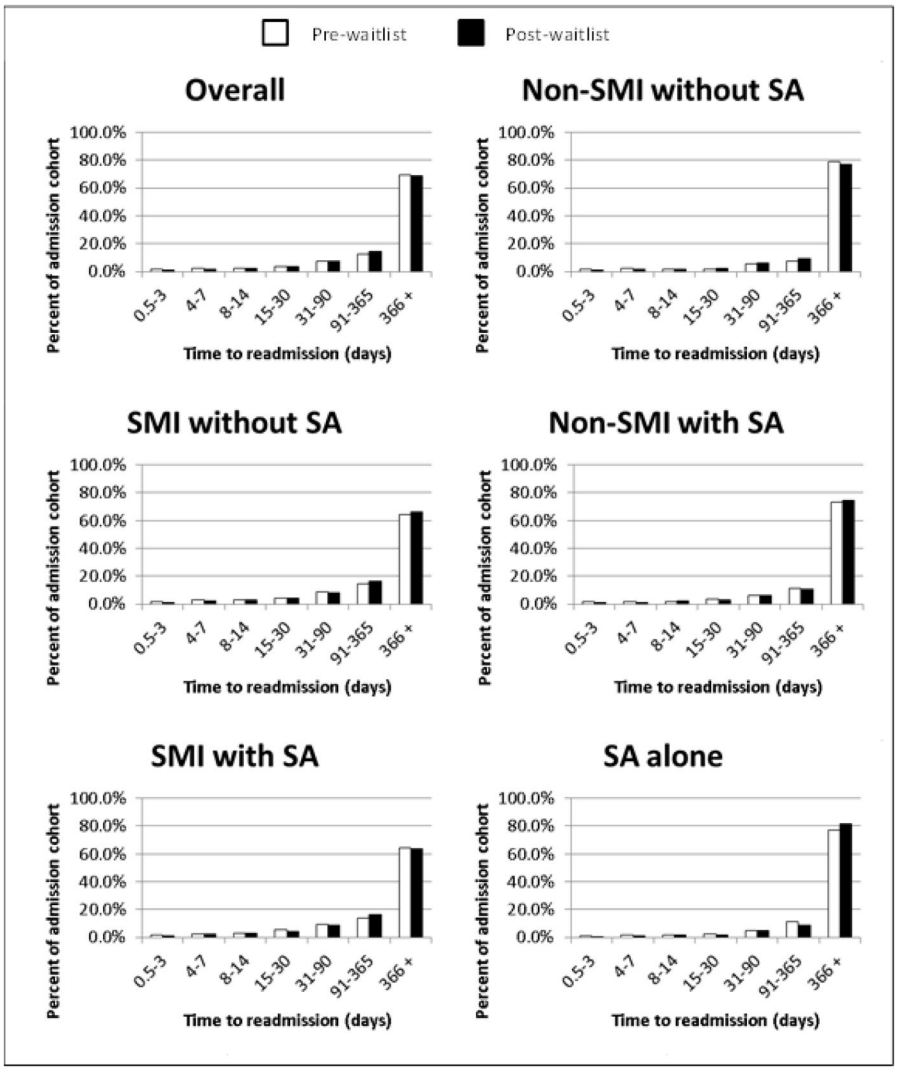

Figure 2.

Percent of discharge cohorts [a] readmitted within given time periods (overall and by diagnosis type)

[a]Discharge cohorts included all discharges between February 1, 2005 and January 31, 2006 (pre-waitlist cohort) and all discharges occurring within one year of each hospital operating on a waitlist for at least five days of the month (post-waitlist cohort).

Table 1

Diagnosis types with corresponding ICD-9-CM codes

Diagnosis Type	ICD-9-CM Codes
Severe mental illness (SMI) without substance abuse (SA)	At least one of [295, 296, 298.0, 298.1, 298.3-298.9] AND none of [291, 292, or 303-305]
SMI with SA	At least one of [295, 296, 298.0, 298.1, 298.3-298.9] AND at least one of [291, 292, or 303-305]
Non-SMI without SA	At least one of [290, 293-294, 297, 298.2, 299-302, 306-316] AND none of [291, 292, 295, 296, 298.0, 298.1, 298.3-298.9, or 303-305]
Non-SMI with SA	At least one of [290, 293-294, 297, 298.2, 299-302, 306-316] AND at least one of [291, 292, or 303-305] AND none of [295, 296, 298.0, 298.1, 298.3-298.9]
SA alone	At least one of [291, 292, or 303-305] and none of [290, 293-302, 306-316]

Table 2

Descriptive statistics for North Carolina state psychiatric hospital admissions overall and by admission cohort, 2004–2010

Variable	All admissions, N (%)	Pre-waitlist cohort, N (%)	Post-waitlist cohort, N (%)
Full sample	72,035 (100.0)	47,539 (66.0)	24,496 (34.0)
Sex			
Male	45,454 (63.1)	30,224 (63.6)	15,230 (62.2)
Female	26,581 (36.9)	17,315 (36.4)	9,266 (37.8)
Age[a]			
18–29	22,527 (31.3)	14,872 (31.3)	7,655 (31.3)
30–54	45,026 (62.5)	30,074 (63.3)	14,952 (61.0)
55–64	4,482 (6.2)	2,593 (5.5)	1,889 (7.7)
Race			
White	41,100 (57.1)	27,331 (57.5)	13,769 (56.2)
Black	27,852 (38.7)	18,293 (38.5)	9,559 (39.0)
Other	3,083 (4.3)	1,915 (4.0)	1,168 (4.8)
Insurance			
Private	4,996 (6.9)	3,062 (6.4)	1,934 (7.9)
Public	27,482 (38.2)	16,992 (35.7)	10,490 (42.8)
Self-pay/Uninsured	39,557 (54.9)	27,485 (57.8)	12,072(49.3)
Diagnosis type			
Severe mental illness (SMI) without substance abuse (SA)	24,740 (34.3)	16,216 (34.1)	8,524 (34.8)
SMI with SA	20,068 (27.9)	12,040 (25.3)	8,028 (32.8)
Non- SMI without SA	6,720 (9.3)	4,750 (10.0)	1,970 (8.0)
Non-SMI with SA	12,251 (17.0)	8,187 (17.2)	4,064 (16.6)
SA with no mental health diagnosis	8,256 (11.5)	6,346 (13.4)	1,910 (7.8)

[a]Average age of admission sample was 36.8 years, increasing from 36.6 years pre-waitlist to 37.3 years post-waitlist.

Table 3

Cox proportional hazards model parameter estimates (log hazard ratios) for state psychiatric hospital discharge and readmission

Variable	Discharge parameter estimate	Readmission parameter estimate
Post-waitlist (reference: pre-waitlist)	−0.26**	−0.63**
Female (reference: male)	−0.03*	−0.16**
Diagnosis type (reference: severe mental illness (SMI) without substance abuse (SA))		
SMI with SA	0.30**	−0.03
Non-SMI without SA	0.69**	−0.32**
Non-SMI with SA	0.89**	−0.19**
SA with no mental health diagnosis	0.95**	−0.37**
Hospital (reference: hospital A)		
Hospital B	−0.17**	−0.08*
Hospital C	0.08**	0.06*
Hospital D	0.45**	0.05
Post-waitlist interaction effects		
Post-waitlist × female	0.04	0.06
Post-waitlist × diagnosis type		
Post-waitlist × SMI with SA	−0.07**	−0.04
Post-waitlist × non-SMI without SA	−0.16**	0.00
Post-waitlist × non-SMI with SA	−0.06	−0.08
Post-waitlist × SA with no mental health diagnosis	0.09*	0.01
Post-waitlist × hospital		
Post-waitlist × hospital B	0.14**	0.22**
Post-waitlist × hospital C	0.05	0.13**
Post-waitlist × hospital D	−0.03	0.20**

* p<0.01

** p<0.001

Notes:

1. Positive parameter estimates reflect increases in the hazard of discharge or readmission (i.e., decreases in the length of stay or time to readmission). Negative parameter estimates reflect increases in length of stay or time to readmission. For example, in the length of stay model, the main effect parameter estimate for the waitlist (−0.26, p<0.001) indicates an increase in length of stay.

2. Other control variables included age, race, insurance status, marital status, veteran status, legally declared incompetence, patient report of having an occupation, residential arrangement at admission (in length of stay model), discharge location (in readmission model), change in living arrangement between admission and discharge (in readmission model), repeat visits during the study period, involuntary commitment status, criminal involvement, and whether state hospital arrival occurred through established avenues for admission.