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## Routine patient reported outcomes as predictors of psychiatric rehospitalization

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### ABSTRACT

**Objective:** Patient reported outcome measures (PROMs) are increasingly used to measure psychiatric service consumers' progress and to provide feedback to consumers and providers. We tested whether PROMs can predict and be used to identify groups at high risk for future hospitalization.

**Methods:** A total of 2842 Israeli users of psychiatric rehabilitation services reported on their quality of life (QoL) and the effect of symptoms on their daily functioning. Survey data were linked with information on psychiatric hospitalization 6 and 12 months after survey completion. Variables associated with each of the outcomes were tested for significance and entered into a multivariate logistic regression model. Prediction scores were developed to identify the highest-risk groups according to each model.

**Results:** QoL was found to be a significant predictor of future hospitalization within 6 months (odds ratio [OR] = 0.71, 95% CI: 0.59–0.86), and self-report of the impact of symptoms on functioning significantly predicted 12-month hospitalization (OR = 0.83, 95% CI: 0.74–0.93), controlling for known risk factors. Positive predictive values for the 6- and 12-month risk scores were 31.1 and 40.4, respectively, for the 10% highest risk categories. **Conclusions:** Reports of psychiatric service consumers on their QoL and on the effect of symptoms on their functioning significantly predict of future hospitalization risk, beyond other well-known risk factors. PROMs can identify consumers at high risk for future hospitalization and thus direct interventions for those at highest risk.

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### 1. Introduction

Psychiatric rehospitalization has been among the most serious and persistent challenges for deinstitutionalization, community tenure, and recovery of individuals with schizophrenia. It is associated with a host of negative outcomes, including worse prognosis, caretaker burden, and costs (Ascher-Svanum et al., 2010; Millier et al., 2014; Pletscher et al., 2015). Although rates of rehospitalization vary in their definitions and in their follow-up periods, settings, and diagnoses, they are generally high, with reports of about 40% readmission within a 12-month period (Wheeler et al., 2011; Zhang et al., 2011).

While research consistently shows that clinical and sociodemographic factors are important for predicting recurrent psychiatric hospitalizations, recent efforts have begun to explore the role of factors that reflect personal recovery. Recovery, which emphasizes

efforts to live a full, satisfying life despite symptoms, has become a growing emphasis in psychiatry (Kukla et al., 2014). Consequently, the range of domains to assess progress toward recovery has been expanding to include, not only the more traditional clinical characteristics that examine symptom severity and functional outcomes, but also those that reflect being “in recovery” (Davidson et al., 2010). These include domains such as quality of life (QoL) and a person's ability to manage dysfunctional impact of symptoms, which have been recently acknowledged as part of a wide range of patient reported outcome measures (PROMs). PROMs are viewed as central to the recovery process, increasingly recognized as reflecting the partnership role that mental health consumers should have in care processes and in their evaluation (Sartorius, 2014). PROMs have indeed shown to be independent predictors of sustained favorable long-term outcomes in schizophrenia as measured by improvements in functioning and reduced symptom severity (Cuyún Carter et al., 2011).

To the best of our knowledge, however, neither QoL nor consumer-reported impact of symptoms on functioning have been used, as part of PROMs, to predict and detect people with schizophrenia who are at particularly high risk for rehospitalization (Chi et al., 2016). To advance

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the current body of knowledge we uniquely examined, within a prospective design and a large sample of persons with schizophrenia who reported PROMs, two central aspects of recovery, namely QoL and the impact of symptoms on daily functioning, and tested whether they predict rehospitalization, while controlling for well-known risk factors.

## 2. Methods

The current study cohort comprises a large subgroup of people diagnosed with schizophrenia who are consuming psychiatric rehabilitation services in Israel. Data collection was part of the Psychiatric Rehabilitation PROM (PR-PROM) project (Roe et al., 2015), in which consumer-reported outcomes on a range of domains are collected once a year. These data were then linked to other clinical and administrative data from the Ministry of Health (MoH).

### 2.1. Setting

Eligibility for psychiatric rehabilitation services in Israel is contingent upon having been diagnosed with a mental illness that has caused at least a 40% psychiatric disability as determined by a professional committee and recognized by the National Insurance regulations (Roe et al., 2015). Psychiatric rehabilitation services help consumers identify and progress toward their recovery goals and assist in the areas of housing, vocation, education, recreation, and social life (Roe et al., 2015). The PR-PROM project assesses whether these goals are met, and whether consumers are progressing toward their personal goals of QoL, functioning, and recovery. PROMs are then linked at the service level and at the individual consumer level with other demographic, clinical, and administrative data to inform policy and practice.

### 2.2. Subjects and sampling

All psychiatric rehabilitation service users in all surveyed regions (at the time of the study, the northern and central regions of Israel) were approached to partake in the PR-PROM project. Those who signed a consent form were offered a range of options to complete the PROMs, depending on the level of support needed (Gelkopf et al., 2015). Upon completion (in paper or computer format), the data was coded into a central data warehouse and analyzed to create summarized scale scores and feedback reports to consumers and providers.

Of a total of 13,264 service users, 55% ( $n = 7292$ ) signed informed consent and 63% ( $n = 4584$ ) completed the self-report questionnaires. Non-consenting service users differed from study participants on the following characteristics: they were on average 3 years older (46.5 vs. 43.7, respectively), more predominately men (57.5% vs. 53.8%, respectively), and had a longer history of hospitalizations (prior hospitalization in past 7 years: 4.6 months vs. 4.0 months, respectively). Of all respondents, 62% ( $n = 2842$ ) had information that could be linked to the diagnoses data-file and a case-record diagnosis determined by a psychiatrist of schizophrenia. Demographic characteristics of survey respondents with missing diagnoses data were not significantly different from those of respondents for whom diagnoses data were available.

### 2.3. Procedure

A prospective study design was used. We linked data on PROMs with information from the MoH on psychiatric hospitalization prior to the completion of the survey and until 12 months thereafter. Data were de-identified upon merging. The study was approved by the MoH Helsinki committee.

## 2.4. Measures

### 2.4.1. Hospitalization outcomes

The main dependent variables were being hospitalized (dichotomized as having 1 or more hospitalizations versus 0) within 6 months and within 12 months after questionnaires were completed.

### 2.4.2. Predictors

**2.4.2.1. PROMs.** The following PROMs were used in this study. (1) QoL (9 items;  $\alpha = 0.779$ ) assessed using a shortened version of the Manchester Short Assessment of Quality of Life (MANSA; Pribe et al., 1999). This measure includes an assessment of consumers' satisfaction with their QoL across nine domains, such as work, leisure activity, and mental health, scored on a 5-point Likert-type scale from 1 (*completely unsatisfied*) to 5 (*completely satisfied*). The MANSA was previously translated into and validated in Hebrew and was found to have good psychometric properties (Roe et al., 2014; Roe et al., 2011). (2) Effects of Symptoms on Daily Functioning (3 items;  $\alpha = 0.829$ ), based on the Sheehan Disability Scale (SDS-3) (Sheehan, 1983; Sheehan and Sheehan, 2008). This measure evaluates the effect of symptoms on three life domains: work and/or study, social activity and leisure, and family relations, rated on 4-point Likert-type scales from 1 (*interferes strongly*) to 4 (*does not interfere*).

**2.4.2.2. Prior hospitalization.** As prior hospitalization is one of the strongest predictors of future hospitalization (Chi et al., 2016), we categorized past hospitalization history as: (1) All prior hospitalization days during the previous 7 years were, grouped as <6 months, 6–12 months, 12–24 months, 24–48 months, or >48 months; (2) A dummy indicator for whether the consumer had been hospitalized within the previous 6 months or not. As all consumers of rehabilitation services have had a previous hospitalization we did not include a “no hospitalization” category.

Data on a secondary diagnosis of substance abuse were merged from the MoH registry. All diagnoses were part of the last diagnostic assessment obtained by a psychiatrist when last treated either at a psychiatric hospital or at a mental health clinic. In addition, basic demographic data were obtained from participants.

## 2.5. Statistical analysis

Descriptive statistics were performed for all study variables. We examined the correlation between the consumer-reported outcome variables to determine the degree to which collinearity exists. We examined the association between all predictors and covariates and the hospitalization outcomes using chi-square and *t*-tests for categorical and continuous variables, respectively. Variables that were statistically significantly associated with either of the outcomes ( $p < 0.05$ ) were then entered into a multivariate logistic regression model. Multivariate logistic regression was used as it allows to detect the relative contribution of factors (e.g., whether PROMs are significantly associated with the dichotomous outcome after controlling for other well known risk factors), and as it allows for examination of the accuracy of prediction and identification (according to cut-points) of high-risk groups.

To assess the degree to which the predictive models accurately identify consumers at high risk for 6- or 12-month hospitalization, we assigned the predicted model score to each study participant and calculated the sensitivity, specificity, and positive predictive value (Fletcher and Fletcher, 2005, p. 45) for various risk categories for each of the models. We then examined the characteristics of the highest-risk groups in comparison to all other consumers in each of the models (6- and 12-month hospitalization).

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