



The Optimal Length of Hospitalization for Functional Recovery of Schizophrenia Patients, a Real-World Study in Chinese People

Yun Bian¹ · Chen Lin^{1,2} · Fude Yang¹ · Xiaole Han¹ · Jing Zhang^{1,2} · Botao Ma¹ · Yu Zhu¹ · Zhixiong Wang^{1,2,3} 

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Abstract

This study investigated the relationship between the activities of daily living and the length of hospitalization to determine the optimal length of hospitalization for patients with schizophrenia. We collected information from all schizophrenia patients discharged in Peking University Huilongguan Clinical Medical School from January 1, 2015 to December 31, 2015. A total of 1967 patients were enrolled in this study. The Chinese version of the modified Barthel index (MBI-C) was used to assess patients' actual performance on activities of daily living. We used the paired samples t-test to compare MBI-C scores at admission and discharge and performed correlation analysis to find the trend of MBI-C change with length of hospitalization. The average length of hospitalization was 73.3 ± 42.2 days. There were significant differences between the MBI-C scores at the time of discharge from hospital compared with those at the time of admission to the hospital (93.4 ± 11.2 vs. 88.7 ± 11.8 ; $P < 0.001$). Taking the length of hospitalization as the grouping boundary value, the correlation analysis of the subgroup found that below a minimum of 20 days, the improvement in the MBI-C scores increased with the increase of length of hospitalization, and above a maximum of 50 days, the improvement in the MBI-C scores decreased with the increase of length of hospitalization. The optimal length of hospitalization for patients with schizophrenia may lie between 20 and 50 days, with regard to the recovery of daily living function.

Keywords Schizophrenia · Activities of daily living · Length of hospitalization · Disability adjusted of life years

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✉ Zhixiong Wang
azxsdcvf123@126.com

Extended author information available on the last page of the article

Background

Schizophrenia is a chronic, severe and disabling disorder, which causes impairments in everyday functioning, and involves major functional domains of independence in residence, productive activities and social interactions [1, 2]. This disorder can reduce the ability of self-care and functioning, and may lead to disability [3]. The role of inpatient care in the management of people with schizophrenia has considerably changed throughout the past decades [4]. Traditionally, there have been significant restrictions on the freedom of choice of persons with long-term hospitalizations in big psychiatric institutions. The stay of an individual often begins involuntarily. Deinstitutionalization has been especially driven by humanitarian concerns since the middle of the twentieth Century.

Taking into account the “revolving door” phenomenon of schizophrenia, which means short but frequent admissions, there is still some doubt about whether short-term hospitalizations are good [5]. Although extended periods in long-term hospitalization are not conducive to functional recovery and reduced duration of readmission, patients with severe mental illness when acutely ill need to be treated in psychiatric hospitals. Despite the rapid development of community rehabilitation, psychiatric hospitals are still an important part of the mental health service system in many places. In addition, the researchers found that there was no significant difference in the quality of life between community services and hospital services in schizophrenic patients after controlling for gender, age, duration of disease, total IQ and total score of the brief psychiatric rating scale [6]. Grace’s research found that compared to hospital-based services, community-based treatment settings had a positive impact on objective quality of life indices but not on subjective well-being which contrary to findings in western countries. It is possible that cultural influences play an important part [7]. Therefore, the effect of hospitalization on the functional recovery of schizophrenic patients remains controversial. Length of hospitalization may be a critical impact factor. There is not enough evidence to date to suggest exactly how long for a schizophrenic patient should be hospitalized. This study examined the relationship between the activities of daily living (ADL) and the length of hospitalization to determine the optimal length of hospitalization for patients with schizophrenia.

Methods

Subjects

We collected information of all patients discharged from January 1, 2015 to December 31, 2015 from Peking University Huilongguan Clinical Medical School, which is a large psychiatric institution located in Beijing city. A total of 2051 were diagnosed with schizophrenia according to the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision criteria by two senior psychiatrists. Six subjects were excluded due to missing data for key variables. For repeated admissions, we included only the first admission in the analysis throughout the study period. Finally, 1967 patients with schizophrenia were enrolled in this study.

Material Collection and Clinical Assessment

All the records of the patients were reviewed. The demographic data (age, sex, marital status, and race) and clinical information (schizophrenia classification, admission date, discharge date, and length

of hospitalization) were collected. To assess actual performance of the patients on ADL, the Chinese version of the modified Barthel index (MBI-C), developed by Leung et al. [8] was used. This version consists of 10 items including feeding, bathing, grooming, dressing, bowel control, bladder control, toileting, chair transfer, flat walk of 45 m, and stair climbing. Each item is rated based on the amount of assistance required to complete each activity. The independence score of each items between 5 and 15 points, totaling 100 points for the complete independence score. In this study, the MBI-C scores of each patient were evaluated by nurses at the time of admission and discharge.

Statistical Analysis

Data were imported into the 21st version of SPSS software. We used paired samples t-test to compare MBI-C at admission and discharge. According to the change of MBI-C score, the patients were divided into three groups. Group differences were compared using one-way analysis of variance (ANOVA) for continuous variables and χ^2 for categorical variables. Post-hoc comparisons between subgroups were made using the Fisher's least significant difference procedure rather than the more conservative Bonferroni corrections for multiple comparisons. After that, analysis of covariance (ANCOVA) was constructed with the three genotypes as the independent variable; the length of hospitalization as dependent variables; and age, sex, marital status, races the covariates. Furthermore, we used Gaussian fitting algorithm and correlation analysis to find the trend of MBI-C change with length of hospitalization. A two-sided 5% level of significance was considered statistically significant.

Results

Demographic and Clinical Characteristics

We examined the demographic and clinical characteristics of the subjects enrolled in this study, as shown in Table 1. The average length of hospitalization was 73.3 ± 42.2 (range: 1 to 387) days. There were significant differences between the MBI-C scores at the time of discharge from the hospital compared with those at the time of admission to the hospital (93.4 ± 11.2 vs. 88.7 ± 11.8 ; $P < 0.001$).

The Change of MBI-C Scores and Grouping

The differences between MBI-C scores at the time of discharge and admission (discharge-admission) were 4.6 ± 8.5 (range: -95 to 80). The patients were divided into three groups, according to the change of the MBI-C scores, namely A: the increase group ($n = 914$, accounting for 46.5%), B: the constant group ($n = 1019$, accounting for 51.8%) and C: the decrease group ($n = 34$, accounting for 1.7%), as shown in Fig. 1. The differences between MBI-C scores at the time of discharge and admission showed a specific change trend with the length of hospitalization. According to the fitting curve in Fig. 1, the improvement of MBI-C scores reached a peak value at which the length of hospitalization was about 40 days.

Comparison between Groups of MBI-C Changes

By comparing the various parameters in the three groups of MBI-C change, significant differences were found in length of hospitalization, age, sex, and race. The parameters, marital

Table 1 Demographic and clinical characteristics

| Item | Mean \pm standard deviation (range) |
|----------------------------------|---------------------------------------|
| | n (percentage) median (IQR) |
| | Total number of subjects =1967 |
| Age (years) | 46.7 \pm 16.7(11–89) |
| Male sex | 1038 (52.8) |
| Marital status | |
| Unmarried | 1012(51.4) |
| Married | 524(26.6) |
| Divorce | 353(17.9) |
| Widowed | 77(3.9) |
| Unknown | 1(0.1) |
| Race | |
| Han | 1913(97.3) |
| Others | 54(2.7) |
| Schizophrenia classification | |
| Undifferentiated | 1155(58.7) |
| Paranoid | 695(35.3) |
| Catatonic | 4(0.2) |
| Hebephrenic | 3(0.2) |
| Simple | 2(0.1) |
| Restzustand | 108(5.5) |
| Length of hospitalization (days) | 73.3 \pm 42.2(1–387) |
| MBI-C at admission | 88.8 \pm 11.8(0–100) |
| MBI-C at discharge | 93.4 \pm 11.2(0–100) |

MBI-C the Chinese version of the modified Barthel index

status and schizophrenia classification were excluded because the sample size was too small in some subgroup. The length of hospitalization between the MBI-C increase group and the MBI-C constant group was significantly different, but no significant difference between other groups was found. Additionally, the results of covariance analysis showed that the difference of length of hospitalization between groups remained significant after controlling for age, sex, and race, as shown in Table 2.

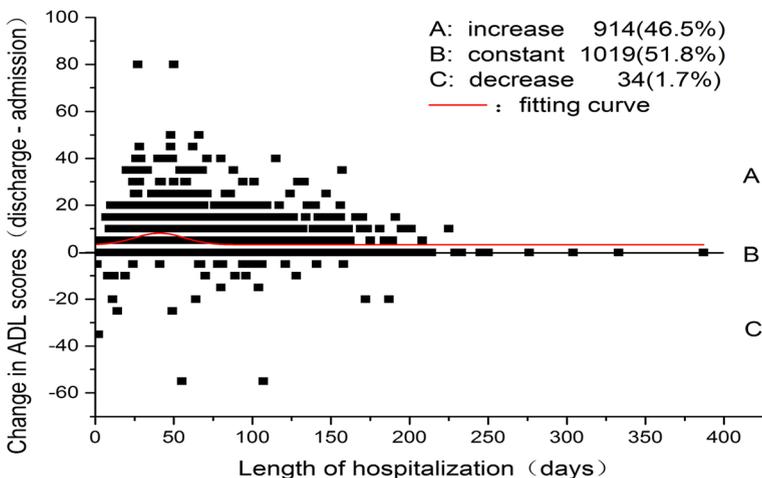


Fig. 1 The trend of MBI-C scores change with length of hospitalization. MBI-C: the Chinese version of the modified Barthel index. ADL: Activities of Daily Living

Table 2 Comparison between groups of MBI-C change

| | Group A (n = 914) | Group B (n = 1019) | Group C (n = 34) | F χ^2 | p | ANOVA-Post hoc | | | ANCOVA | |
|----------|----------------------|-----------------------|------------------|------------|-------|----------------|-------|--------|--------|---|
| | | | | | | p(I) | p(II) | p(III) | F | p |
| Days | 66.2 ± 38.5 | 79.7 ± 44.2 | 75.7 ± 49.0 | 25.39 | <.001 | 0.189 | 0.587 | 3.65 | 0.026 | |
| Age | 33.9 ± 15.5 | 52.1 ± 15.5 | 62.3 ± 14.8 | 165.25 | <.001 | <.001 | <.001 | 156.26 | <.001 | |
| Male sex | 416(45.5) | 600(58.9) | 22(64.7) | 36.52 | <.001 | – | – | 0.25 | 0.619 | |
| Han race | 892(97.6) | 989(97.1) | 32(94.1) | 1.80 | 0.407 | – | – | 0.22 | 0.643 | |

Continuous variables are expressed as the mean ± standard deviation. Categorical variables are expressed as n(%)

ANOVA one-way analysis of variance; ANCOVA analysis of covariance; Group A the increase group; Group B the constant group; Group C the decrease group; I Group A vs. Group B; II Group A vs. Group C, III Group B vs. Group C

Correlation between the Length of Hospitalization and MBI-C Change in the Subgroup

Taking length of hospitalization as a grouping boundary value, the correlation analysis in the subgroup revealed that below a minimum of 20 days, the improvement in the MBI-C scores increased with the increase of the length of hospitalization, and above a maximum of 50 days, the improvement in the MBI-C scores decreased with the increase of the length of hospitalization, as shown in Fig. 2.

Discussion

In this study, we linked length of hospitalization and the improvement of the MBI-C scores during the hospitalization period to determine the influence of the length of hospitalization on ADL in patients with schizophrenia and the optimal length of hospitalization for patients with schizophrenia.

The study data were derived from the complete database of the hospital registration system, and only a small number of subjects were excluded due to missing data and repeated admissions. The demographic and clinical characteristics of the subjects in the study broadly reflected the current status of schizophrenia in the patients. The average age of the 1967 patients enrolled was 46.7 ± 16.7 (range: 11–89), and the proportion of male was 52%. Only 26.6% of the subjects were married and 17.9% of them were divorce, while more than half were not married. Such a marital status profile of these schizophrenia patients implied that their family support system was very poor. There was strong evidence showing that family psychosocial interventions were effective in improving the clinical and social course of schizophrenia [9–11]. On the other hand, patients with schizophrenia who cannot perform ADL independently become a significant burden to their family members and show poor

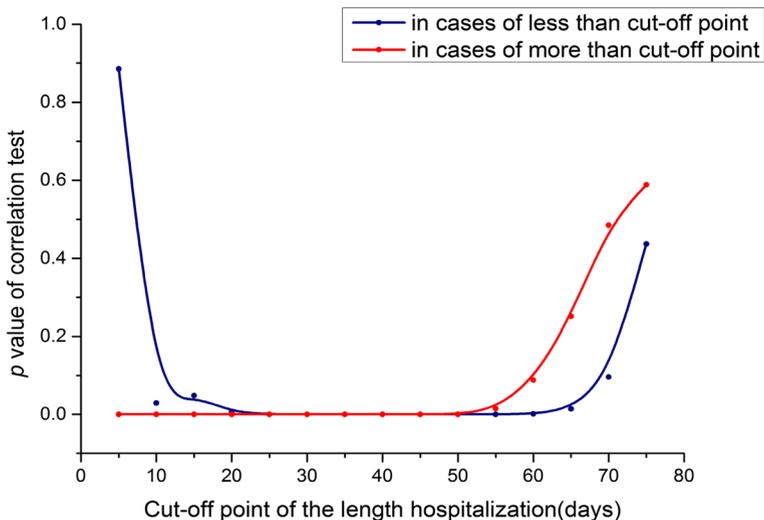


Fig. 2 Correlation between the length of hospitalization and MBI-C change in the subgroup. MBI-C: the Chinese version of the modified Barthel index. Note: Source of data of Fig. 2 in the supplementary material

integration into the community [12]. A large body of research has demonstrated that caregivers may have substantial disruption and distress in coping with the disruptive behavior and thinking of their family member, including psychological distress, financial hardships, and impediment to employment [13, 14].

Our study revealed that the average MBI-C score was 88.7 when they were admitted to the hospital. In contrast, the average MBI-C score was 93.4 when they were discharge from the hospital, which experiences a significant increase after hospitalization. Many previous studies have described memory and executive function deficits in patients with schizophrenia, these the cognitive deficits can directly affect daily living [15, 16]. The negative symptoms of patients can also influence the ADL functions in patients with schizophrenia [17, 18], and negative symptoms have been found to be involved in the relationship between neurocognitive impairment and functioning [19]. Hospitalization may improve the ability of daily life through the treatment of symptoms and cognitive impairment.

Age was indeed an important factor affecting the ability of daily life, but certainly not the only one. In this study, the average length of hospitalization was 66.2 days in the MBI-C increase group, 79.7 days in the MBI-C constant group and 75.7 days in the MBI-C decrease group. The difference between groups remained significant after controlling for age, sex, and race. This finding was consistent with some previous reports. An earlier study found that treating a cognitive impairment associated with schizophrenia could improve the functioning of the individuals independently of their age [20]. Another study found that in patients with schizophrenia, cognition predicted functional competence after adjusting for age, education, gender, clinical symptoms, and the anticholinergic burden of medications [21].

One of the important results of this study demonstrated that schizophrenia patients do not benefit from long-term hospitalization. Previously institutionalized older patients with schizophrenia show changes in cognitive and functional capacity over time [22]. Some health risk behaviors, such as tobacco use and weight gain/obesity may be associated with decreased level of functioning [23]. Since the 1960s many government policies focus on providing care in a variety of non-hospital settings, including outpatient clinics, day care centers or community mental health centers [24]. These changes are consistent with the growing shift from hospital-based care towards a more community-based approach [25].

Although schizophrenia patients cannot benefit from long-term hospitalization, short-term hospitalization intervention could still play a key role in promoting the recovery of function and improving the ADL in patients with schizophrenia. The optimal length of hospitalization for patients with schizophrenia may lie between 20 and 50 days, with regard to the recovery of daily living function. A large survey in four European countries, namely Germany, Greece, Italy and Spain, identified nine independent factors that are associated with hospitalization, including positive symptom, insufficient disease insight, not living with family [26]. Hospitalization may be conducive to the rapid control of symptoms and management of risk behavior, but social functioning and quality of life are only partially connected with symptomatic remission. Patients with schizophrenia had higher levels of medical burden, cognitive deficits, and functional impairments. Reasonable hospitalization management and allocation of medical resources can help to improve the functional outcome and reduce the medical burden.

These data presented in this study were derived from the complete database of the hospital registration system. The demographic and clinical characteristics of the subjects broadly reflect the real-world status of schizophrenia patients. Nonetheless, this study had a few limitations. First, we excluded six subjects for lack of key information and encountered 78 cases of hospitalization information for repeated admissions, the results may be influenced by

hospitalization bias and selection bias. Second, it is a limitation because there is no assessment of the impact of clinical symptoms on function outcomes among our participants with schizophrenia, although we considered functional defects to be the cause of admission rather than symptoms in more cases. Accordingly, further research is needed in the future.

Conclusions

In conclusion, the results of this study demonstrated that schizophrenia patients do not benefit from long-term hospitalization, but short-term hospitalization intervention could play a key role in promoting ADL in patients with schizophrenia. The optimal length of hospitalization for patients with schizophrenia may lie between 20 and 50 days, with regard to the recovery of daily living function.

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Authors' Contributions ZW conceptualized and designed the study. CL and BM contributed to the data collection and take responsibility for the integrity of the data and the accuracy of the data analysis. JZ, XH and YZ helped in the analysis and interpretation of data. YB wrote the initial draft of the paper and FY edited the draft. The submitted manuscript reflects the contributions of all of the authors, who unanimously approved the final version.

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Data Availability The datasets used during the current study are available from the corresponding author on reasonable request.

Compliance with Ethical Standards

Consent for Publication Not applicable.

Conflict of Interest The authors declare that they have no competing interests.

Ethics Approval and Consent to Participate Ethical approval was obtained from the Ethics Committee of Peking University Huilongguan Clinical Medical School (ID NO: 03/02/15–2).

Abbreviations *ADL*, Activities of daily living; *MBI-C*, the Chinese version of the modified Barthel index; *ANOVA*, One-way analysis of variance; *ANCOVA*, Analysis of covariance

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Yun Bian is an associate chief physician at Peking University Huilongguan Clinical Medical School.

Chen Lin is medical doctor, major psychiatrist. She is studying for a master's degree at Peking University Sixth Hospital.

Fude Yang is a professor of Peking University and has worked as a chief physician in Peking University Huilongguan Clinical Medical School for decades.

Xiaole Han is an associate chief physician and the director of Department of Psychosomatic Medicine, Peking University Huilongguan Clinical Medical School.

Jing Zhang is medical doctor, major psychiatrist. She is studying for a master's degree at Peking University Sixth Hospital.

Botao Ma is the director of the Information Center and Medical Engineering Division, Peking University Huilongguan Clinical Medical School.

Yu Zhu is a psychiatrist and is studying for a master's degree at Peking University.

Zhixiong Wang is a psychologist of Department of Psychology, Peking University Huilongguan Clinical Medical School. He is studying for a master's degree at Peking University Sixth Hospital.

Affiliations

Yun Bian¹ · **Chen Lin**^{1,2} · **Fude Yang**¹ · **Xiaole Han**¹ · **Jing Zhang**^{1,2} · **Botao Ma**¹ · **Yu Zhu**¹ · **Zhixiong Wang**^{1,2,3}

Yun Bian
ihqihqajjq@163.com

Chen Lin
linchen0912@163.com

Fude Yang
yangfude200@163.com

Xiaole Han
13681480466@126.com

Jing Zhang
Zhangjing123@163.com

Botao Ma
18500088336@126.com

Yu Zhu
raynyn@126.com

¹ Peking University Huilongguan Clinical Medical School, Beijing Huilongguan Hospital, Beijing 100096, People's Republic of China

² Peking University Sixth Hospital, Peking University Institute of Mental Health, Key Laboratory of Mental Health, Ministry of Health (Peking University), Beijing 100191, People's Republic of China

³ Department of Psychology, Peking University Huilongguan Clinical Medical School, Beijing 100096, People's Republic of China