BMJ Open Comparison of hospital admission rates for psychiatric patients cared for by multidisciplinary outreach teams with and without peer specialist: a retrospective cohort study of Japanese Outreach Model Project 2011–2014

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ABSTRACT

Objective This study examined whether having peer specialists (PS) in psychiatric multidisciplinary outreach teams was associated with a lower risk of hospitalisation, improved social functioning and decreased problem behaviours.

Design and setting This study was a retrospective cohort study based on medical records. This study was conducted as a part of the Japanese Outreach Model Project 2011–2014, which provides services for persons diagnosed mainly as ICD-10 F0, F2 and F3, who have a high possibility of hospital admission/readmission with regular Japanese outpatient care.

Participants A total of 292 participants (clients) from 31 multidisciplinary outreach teams with and without PS (n=108 and 184, respectively) fulfilled the inclusion criteria and were included in the analysis.

Outcome measures The primary outcome measure was hospitalisation during follow-up. The difference in hospitalisation during the follow-up between teams with and without PS was analysed by Kaplan-Meier survival curves and a Cox proportional hazards model. The secondary outcome measures were social functioning (Global Assessment of Functioning, GAF) and problem behaviours (Social Behaviour Schedule, SBS) of clients, and were assessed at baseline and at 6-month follow-up. Changes in social functioning and problem behaviours were compared between clients cared for by the two team types. Amount and content of the service were also compared.

Results The clients cared by teams with PS had a significantly decreased probability of hospitalisation in Cox proportional hazards models adjusting for baseline characteristics (HR=0.53, 95% CI 0.31 to 0.89). The 6-month change in GAF or SBS was not significantly different between the two groups.

Conclusion This is an observational study in which the presence of a PS appeared to be associated with a reduced rate of hospitalisation. A randomised study would be required to demonstrate a causal relationship.

Strengths and limitations of this study

- This is the first epidemiological study about a psychiatric multidisciplinary outreach programme with peer specialists (PS) in Asian countries including Japan.
- This study contributes to international accumulation of evidence about whether having PS in psychiatric multidisciplinary outreach teams is associated with a lower risk of hospitalisation.
- The main limitation of this study is the possibility of unmeasured confounding variables, especially for team characteristics, structure and experiences.

INTRODUCTION

Among those with mental illness who live in the community, many are not connected to appropriate psychiatric services due to various factors. This has become a problem worldwide and also exists in Japan.^{1–4} For example, with schizophrenia, not having treatment during the first 2–5 years after onset is associated with a poor long-term prognosis.⁵ Shortening the duration of untreated psychosis is important for improving prognosis.^{6,7} Relapse is often seen among people who quit medication after the initial contact for treatment.⁸ Psychiatric symptoms and social impairment become chronic as a result of repeated relapses, with less probability of remission.⁹ Providing psychiatric services for patients with mental illness who were never treated or who have left treatment is important in order for people to continue their lives in the community.

In Western countries, as care for people with mental illness transitioned to community-based approaches, various community care programmes were developed and provided

according to each country's system.¹⁰ Multidisciplinary outreach programmes such as Assertive Community Treatment (ACT)^{11–15} and Assertive Outreach (AO)^{13 16–20} were effective approaches that reduced the rate of hospital admission and the cost of hospital care, and improved outcomes and patient satisfaction¹² in various countries, including Japan. The Dartmouth Assertive Community Treatment Scale which assesses treatment reliability in ACT clearly designates 'Peer Specialist (PS)' as necessary to the quality of programme.²¹ Many teams of ACT and AO employ them.¹⁷

Peer supporters, persons providing peer support to others, are referred to by various names depending on the form of their activity. When such persons are employed as workers, not volunteers, they are called 'Peer Specialist', 'Peer Provider', 'Consumer specialist', 'Consumer Provider', and so on. There are multiple studies regarding the effect of PS in psychiatric multidisciplinary teams since the 1990s.²² Two randomised controlled trials and one quasiexperimental study reported that participation of PS clients with severe mental illness in multidisciplinary outreach teams was associated with significant decreases in hospital admission and/or shorter hospital stays.^{23–26} In comparison, six other studies did not find a significant decrease in these hospital-related outcomes.^{22 27–31} Among five other studies, three found that the participation of PS increased engagement in services and social relationships among clients,^{27 28 32} but two studies failed to find significant differences.^{22 25} One study indicated a significantly positive association with client personal recovery,³¹ but many other studies found no statistically significant improvement of social function^{27–29} or psychiatric symptoms.^{29 33} Thus, it is still not clear if the participation of PS in psychiatric outreach programmes will decrease rate of hospital admissions.

Additionally, in Japan no study has tested whether the participation of PS in a psychiatric multidisciplinary outreach team is associated with a decrease in hospitalisation in clients with difficulties maintaining engagement with psychiatric services. The purpose and hypothesis of this retrospective cohort study was to examine whether psychiatric multidisciplinary outreach teams with PS were associated with a lower risk of hospital admission/readmission.

METHODS

Study design and setting

This study was a retrospective cohort study conducted in the Japanese Outreach Model Project (JOMP) led by the Ministry of Health, Labour and Welfare from October 2011 to the end of January 2014.^{34 35} The goal of the JOMP was to prevent hospitalisation of persons with severe mental illness who had a high possibility of hospital admission/readmission under regular Japanese outpatient care funded by public insurance. Thirty-two multidisciplinary outreach teams within the 21 prefectures agreed to participate in this study.

The Ministry of Health, Labour and Welfare prescribes JOMP team criteria, which hold that a team must include a psychiatrist and full-time nurse, psychiatric social worker or occupational therapist. Apart from these positions, each team leader could organise team members that include a clinical psychologist, pharmacist, nutritionist, medical clerk or PS, who were not funded by public insurance at that time in Japan.

PS in this study

Of the 32 teams that participated in this study, 10 teams added PS as team members, and a total of 17 PS were members of a multidisciplinary outreach team. In this model project, the government did not set written criteria for PS. The majority of PS were men in their 40s diagnosed with schizophrenia, schizotypal, delusional or other non-mood psychotic disorders (coded ICD-10 F2). Team psychiatrists or directors recruited PS based on a lengthy stable condition, experience with peer support activities and interest in working with a multidisciplinary team as a PS. This meant that PS had dual roles as peer supporter and client. At the time, they were not able to receive structured training as PS because the certified training programme was not available in Japan. The average amount of prior experience as a peer supporter was 34 months. Each team employed the PS through the project budget. Whether or not PS identified themselves to clients as a PS was up to the PS. More details regarding the PS in this study are given in a separate article.³⁶

Target populations and participant (client) criteria

JOMP provides services for persons diagnosed mainly as ICD-10 F0, F2 and F3, who have a high possibility of hospital admission/readmission under regular Japanese outpatient care. Clients were classified according to treatment condition: 'Treatment interrupted', 'Never treated' and 'Long-term or frequent admission'.

Requests for multidisciplinary team involvement were received mainly from health centres, medical institutions, welfare service providers, educational institutions and the police. After teams received requests, the Management Committee assessed the necessity of JOMP services in accordance with inclusion criteria. Management Committee members were composed of administrative officers of health centres and the local community, commissioned welfare volunteers, members of patient and family advocacy groups, other service providers and academic experts.

Data collection

Clients were recruited from October 2011 to July 2013, and followed up until January 2014. Hospital admission and other survey data were obtained during the follow-up based on medical records. At baseline, client clinical condition, sociodemographic data, social functioning and problem behaviours were assessed. Client treatment condition and outcomes including social functioning and problematic behaviour were assessed at baseline and

Figure 1 Flow chart of study participant selection: 541 candidates assessed for eligibility by the Management Committee, 415 clients accepted to the Model Project, 368 clients enrolled for 6 months or longer, 292 clients used for analysis. PS, peer specialist.

6 months of follow-up from medical records. Staff from each team anonymised participant data and entered the data into a computer database.

Measures

Age, marital status and living status were collected. Age was assessed as a continuous variable and analysed as a category (10–19, 20–29, and so on). Marital status was assessed using five categories ('Currently married', 'Never married', 'Separated', 'Widowed' and 'Divorced') and dichotomised ('Married' and 'Not married'). Living status was assessed using categories ('Living with father, mother, brother/sister, spouse, son/daughter, uncle/aunt, friend', 'Other' and 'Living alone') and dichotomised ('Living alone' and 'Not living alone').

Psychiatric diagnosis was assessed by a team psychiatrist using the ICD-10 classification of mental and behavioural disorders, diagnostic criteria for research.³⁷ Treatment status at baseline was assessed as 'Treatment interrupted', 'Never treated' or 'Long-term or frequent admission'. 'Treatment interrupted' means clients who

were in treatment in the past but are not in treatment now despite requiring treatment. 'Never treated' means clients who had never received any treatment. Thus, clients in these two categories were not in treatment before the launch of the service. In contrast, clients in the 'Long-term or frequent admission' category had been admitted to a psychiatric hospital and had been receiving treatment before the launch of the service. 'Long-term' denotes clients who had been hospitalised for a long period (1 year or longer) prior to receiving care from the team, while 'Frequent admission' refers to clients who had been in and out of hospital many times but had not been hospitalised continuously for 1 year or longer.

Social functioning was measured by the Global Assessment of Functioning (GAF) scale.³⁸ The GAF scale was developed for the overall assessment of psychological, social and occupational functioning on a hypothetical continuum of mental health/illness, with ratings from 1 (persistently and seriously impaired) to 100 (no symptoms, superior functioning). Problem behaviours were measured by the Social Behaviour Schedule (SBS).^{39,40} The SBS is scored using a Likert scale from 0 (no problems) to 4 (serious problems). It includes items relating to positive psychotic symptoms as well as negative behavioural items. A high score on the scale indicates increased behavioural difficulty (maximum is 78).

Client treatment condition and outcome were measured with service-start date, service-end date and current state/reason for service end. Termination of service use was recorded using the following categories: 'Still using the service', 'Terminating the service because he/she switched to regular outpatient care', 'Terminating the service because he/she became an inpatient', 'Terminating the service due to moving outside the service area' and 'Service terminated because of death'.

Team staff activity logs were recorded for each visit during the service period to assess the amount and content of care provided. Data included: date of visit, travel time for visit, service time (minutes), care categories, client ID and staff ID. If multiple team members dealt with a case at the same time, they recorded the IDs of all participating members. The total amount of service was assessed for each client. Care categories were created for the content of a psychiatric home visit following classifications in previous studies.^{41,42} The care categories were composed of 12 types of services: 'Case management with clients', 'Case management without clients', 'Assistance with daily living task', 'Development and maintenance of personal relationships', 'Family support', 'Medical support for psychiatric symptoms', 'Support for physical health', 'Social life and financial support', 'Housing services', 'Vocational and educational support', 'Empowerment' and 'Conference'. Each team recorded data in a computer database. Activity logs were analysed to describe service content and amount. Care content and amount (minutes) of provided services were integrated by month from service start to service end. Additionally, t-tests were performed to compare these variables in groups cared for

by teams with and without PS (see online supplementary tables 1 and 2).

Data analysis

The data set was considered as a two-level hierarchical structure, that is, 'client' (level 1) and 'teams providing services' (level 2). Clients of this study received services from a particular team in charge of their area of residence. Clients belonged to either a team with or without

PS ('care by team with PS' or 'care by team without PS', respectively).

Client length of stay in community was calculated based on service-start date and service-end date. Person-time was calculated from service-start date until service-end date including hospital admission or end of follow-up (31 January 2014). The Kaplan-Meier survival curve was calculated to examine the effect of receiving services provided by a team with PS on hospital

Table 1 Sociodemographic characteristics and clinical condition of clients at baseline (n=292)

	Clients cared for by teams with PS (n=108)		Clients cared for by teams without PS (n=184)		χ^2	P values
	n	%	n	%		
Treatment condition					14.59	<0.01**
Treatment interrupted	74	68.5	98	53.3		
Never treated	24	22.3	37	20.2		
Long-term or frequent admission	10	9.3	49	26.6		
Sex					1.67	0.20
Male	55	50.9	108	58.7		
Age					1.34	0.99
10s	2	1.9	2	1.1		
20s	7	6.5	13	7.1		
30s	21	19.4	40	21.7		
40s	22	20.4	33	17.9		
50s	21	19.4	42	22.8		
60s	16	14.8	26	14.1		
70s	12	11.1	18	9.8		
80s+	7	6.5	10	5.4		
Marital status					0.11	0.74
Married	10	9.3	15	8.2		
Living status					1.22	0.27
Living alone	41	38.0	82	44.6		
Diagnosis (ICD-10)					7.68	0.47
F0	7	6.5	10	5.4		
F1	0	0.0	4	2.2		
F2	85	78.7	136	73.9		
F3	5	4.6	17	9.2		
F4	3	2.8	5	2.7		
F6	1	0.9	0	0.0		
F7	1	0.9	1	0.5		
F8	0	0.0	2	1.1		
F99	6	5.6	9	4.9		
	Mean	SD	Mean	SD	t	P values
SBS score	25.9	12.0	22.1	11.3	-2.27	0.02*
GAF score	41.2	13.9	38.5	13.8	-1.60	0.11

Significant at *P<0.05; **P<0.01.

GAF, Global Assessment of Functioning; ICD-10, International Classification of Diseases 10th Revision; PS, peer specialist; SBS, Social Behaviour Schedule.

Figure 2 Kaplan-Meier survival curves of clients cared by teams with and without PS (n=292). Survival curves show that groups cared for by teams with PS had a lower rate of hospital admission. This difference was statistically significant (p=0.04). PS, peer specialist.

admission. Univariate (model 1) and multivariate (model 2) Cox proportional hazards regression models were also conducted, estimating HRs and 95% CIs, with number of days since service start as the timescale. The multivariate models (model 2) were adjusted for age category in increments of 10 years, sex, diagnosis, marital status, living status, problem behaviour (SBS score) and social functioning (GAF score) at baseline. These univariate and multivariate Cox proportional hazards models were also conducted by treatment condition (clients with a status of ‘Treatment interrupted’, ‘Never treated’ or ‘Long-term or frequent admission’) at baseline.

A paired t-test was performed to test for significant changes in social functioning and problem behaviours over time. Additionally, unpaired t-tests were conducted to test for any significant differences after 6 months from baseline between clients having care provided by teams with/without PS.

Data were analysed with the use of ‘ttest’, ‘stcox’ and procedures in STATA software, V.14.1. Statistical tests were two sided, with a significance level at 5%.

Ethical considerations

This study was conducted in accordance with the international standards for epidemiological studies, as established in the International Guideline for Ethical Review of Epidemiological Studies.

Patient and public involvement

Clients of this study were not involved in setting the research question, the outcome measures, or the design or implementation of the study.

RESULTS

Among 541 possible participants who were assessed by the Management Committee, 126 were excluded because they did not meet JOMP inclusion criteria. Additionally, 47 clients who received services for less than 6 months at the end of September 2014 were excluded from the analysis because their 6-month evaluations were not conducted. Finally, 76 persons who had missing values necessary for multivariate analysis were excluded. A total of 292 participants (clients) from 31 teams fulfilled the inclusion criteria and were included in the analysis. Of the 292 participants, 108 clients were cared for by a team with PS (10 teams) and 184 were cared for by a team without PS (21 teams) (figure 1).

Clients’ characteristics of sociodemographic and clinical condition at baseline

The largest number of clients in the group cared for by PS at baseline was ‘Treatment interrupted’ (68.5%). The proportion of ‘Treatment interrupted’ was significantly greater than for clients in the group cared for by teams without PS (53.3%). The average SBS scores in the group cared for by teams with PS (25.9, SD 12.0) at baseline were significantly higher than in the group cared for by teams without PS (22.1, SD 11.3). Other variables were not significantly different with clients of groups cared for by teams with and without PS (table 1).

Table 2 Log-rank test of hospital admissions in clients cared for by teams with and without PS (n=292)

	Clients cared for by teams with PS				Clients cared for by teams without PS				Log-rank test	
	No admission		Admission		No admission		Admission		χ^2	P values
	n	%	n	%	n	%	n	%		
All (n=292)	88	81.5	20	18.5	130	70.7	54	29.3	4.15	0.04*
Treatment interrupted/Never treated (n=233)	81	82.7	17	17.3	95	70.4	40	29.6	4.19	0.04*
Long term or frequent admission (n=59)	7	70.0	3	30.0	35	71.4	14	28.6	0.00	0.95

Significant at *P<0.05.
PS, peer specialist.

Table 3 Association between receiving services provided by multidisciplinary outreach team with PS and risk of hospital admission using univariate and multivariate Cox regression (n=292)

	Model 1			Model 2		
	HR	P values	95% CI	HR	P values	95% CI
All (n=292)						
Teams with PS	0.59	0.04*	0.35 to 0.99	0.53	0.02*	0.31 to 0.89
Sex				1.46	0.13	0.90 to 2.38
Age category (10-year interval)				1.06	0.47	0.90 to 1.26
Marital status (married or not)				0.81	0.66	0.31 to 2.10
Living status (living alone or not)				0.66	0.12	0.40 to 1.11
Diagnosis (F0–F9, F99)				0.76	0.02	0.61 to 0.96
Social functioning (GAF score)				0.99	0.25	0.96 to 1.01
Problem behaviours (SBS score)				1.02	0.09	1.00 to 1.05
Treatment interrupted/Never treated clients (n=233)						
Teams with PS	0.56	0.04*	0.32 to 0.98	0.48	0.02*	0.27 to 0.86
Sex				1.56	0.13	0.88 to 2.77
Age category (10-year interval)				1.13	0.23	0.93 to 1.38
Marital status (married or not)				0.78	0.61	0.29 to 2.06
Living status (living alone or not)				0.87	0.64	0.47 to 1.58
Diagnosis (F0–F9, F99)				0.75	0.02	0.58 to 0.96
Social functioning (GAF score)				0.98	0.12	0.95 to 1.01
Problem behaviours (SBS score)				1.02	0.13	0.99 to 1.05
Long-term or frequent admission clients (n=59)						
Teams with PS	0.96	0.95	0.28 to 3.35	0.64	0.56	0.14 to 2.87
Sex				0.98	0.96	0.35 to 2.75
Age category (10-year interval)				0.92	0.61	0.68 to 1.26
Marital status (married or not)				0.00	1.00	0.00
Living status (living alone or not)				0.19	0.05	0.04 to 0.97
Diagnosis (F0–F9, F99)				1.16	0.56	0.71 to 1.89
Social functioning (GAF score)				1.00	0.88	0.94 to 1.05
Problem behaviours (SBS score)				1.02	0.56	0.96 to 1.09

Significant at *P<0.05.

GAF, Global Assessment of Functioning; PS, peer specialist; SBS, Social Behaviour Schedule.

Association between receiving services provided by a multidisciplinary outreach team with PS and hospital admission

Average follow-up period of clients was 404.9 days (SD 201.8) and 396.7 days (SD 237.4) for the groups provided the service with and without PS, respectively. A total of 20 (18.5%) and 54 (29.3%) clients were admitted to hospital for teams with and without PS, respectively, during the follow-up. Survival analysis indicated that groups cared for by teams with PS had a lower rate of hospital admission (figure 2), a statistically significant difference (p=0.04) (table 2). This pattern was observed only among clients who were in 'Treatment interrupted' and 'Never treated' groups at baseline (p=0.04).

Cox proportional hazards regression with univariate analysis (model 1) indicated that the group cared for by teams with PS had a decreased risk of hospital admission,

in the total sample (HR=0.59; 95% CI 0.35 to 0.99) and in the subset of subjects in 'Treatment interrupted' or 'Never treated' group at baseline (HR=0.56; 95% CI 0.32 to 0.98). In multivariate analyses adjusted for the level 1 variables (model 2), the groups cared for by teams with PS had a decreased risk of hospital admission in the total sample (HR=0.53; 95% CI 0.31 to 0.89) and in the subset of subjects in 'Treatment interrupted' or 'Never treated' group at baseline (HR=0.48; 95% CI 0.27 to 0.86) (table 3).

Change in social functioning and problem behaviours

There was no significant difference in improvement of average GAF scores between baseline and 6 months of follow-up between the two groups in the total sample or in each of the subgroups (table 4).

Table 4 Change of social functioning and problem behaviours (n=292)

	GAF						SBS							
	Baseline		6 months		Δ (6 months–baseline)		Baseline		6 months		Δ (6 months–baseline)			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD		
All (n=292)														
Clients cared by teams with PS	41.2	13.9	46.4	16.8	5.2	11.7	25.9	12.0	22.2	12.8	–3.7	9.5		
	n=100, t=–4.45, df=99, p<0.01						n=95, t=0.78, df=98, p<0.01							
Clients cared by teams without PS	38.5	13.8	43.3	16.1	4.8	12.9	22.1	11.3	19.4	12.5	–2.7	9.1		
	n=173, t=–4.96, df=172, p<0.01						n=169, t=3.84, df=168, p<0.01							
							t=–0.22, p=0.83; Cohen's d=–0.27						t=0.84, p=0.40; Cohen's d=0.11	
Treatment interrupted/Never treated clients (n=233)														
Clients cared by teams with PS	40.8	14.2	45.5	16.8	4.6	11.3	25.6	12.2	22.5	13.0	–3.2	9.7		
	n=91, t=–3.93, df=90, p<0.01**						n=87, t=3.03, df=86, p<0.01**							
Clients cared by teams without PS	37.0	13.2	42.0	15.4	5.0	13.0	23.6	10.9	20.5	12.4	–3.0	9.5		
	n=128, t=–4.31, df=127, p<0.01**						n=122, t=3.54, df=121, p<0.01**							
							t=0.18, p=0.86; Cohen's d=–0.25						t=0.09, p=0.93; Cohen's d=0.13	
Long-term or frequent admission clients (n=59)														
Clients cared by teams with PS	44.7	9.8	55.3	15.4	10.7	14.6	29.1	9.1	19.8	10.7	–9.4	3.5		
	n=9, t=–2.19, df=8, p=0.06						n=8, t=7.57, df=7, p<0.01**							
Clients cared by teams without PS	42.6	14.7	47.2	17.6	4.6	12.5	18.4	11.5	16.6	12.2	–1.8	8.0		
	n=45, t=–2.44, df=44, p=0.02*						n=47, t=1.51, df=46, p<0.14							
							t=–1.30, p=0.20; Cohen's d=–0.47						t=0.63, p=0.01*; Cohen's d=1.00	

that high negative expressed emotion affects the relapse rate in schizophrenia in client families.⁴⁴ PS might reduce the risk of relapse by demonstrating appreciation to families about the hardships the families have endured and by conveying effective tips regarding instruction with a client. Additionally, having PS participate in team conferences might have a spillover effect on team members and other attendants. In this study, teams with PS provided a large amount of 'Conference' category services (see online supplementary table 1). A previous study indicated that peer support activities improve the quality of services,⁴⁵ and PS experiences and perspectives might promote staff understanding towards clients and might help develop more effective care procedures. The promotion of quality of service and respect for client experiences might earn client trust and decrease the risk of hospital admission.

There was significantly more improvement in problem behaviours at 6-month follow-ups among clients cared for by teams with PS than those without PS only in clients who were 'Long-term or frequent admission' status at baseline. This result is not consistent with any other previous study.^{27–29 33} The average SBS score at baseline in the group cared for by teams with PS was statistically higher than that in the group without PS, especially among clients who were 'Long-term or frequent admission'. The clients who were 'Long-term or frequent admission' who had chronic psychiatric symptoms and lack of daily living skills might have experienced a greater difficulty due to an environment change after the discharge from a hospital. Teams with PS provided services related to communication and coordination, case management and conference more than teams without PS (see online supplementary table 1), thus the service provided by the former teams may have filled the gaps in life between hospital and community, which may in turn have resulted in a reduction of problem behaviours. This result was statistically significant in a small group without adjustment for multiple comparison but we believe it is an interesting observation which should be investigated in a larger scale study.

Limitations

In addition to the above discussion, the present study has several limitations. First, pre-existing characteristics of the teams, such as the attitudes and personalities of team leaders and team members, might affect the results. We did not have data on whether the two groups had similar rates of hospitalisation prior to the use of PS. For this model project, each team leader was able to determine the number of team members and occupational composition of the team, including whether to include PS. At that time in Japan, visiting clients with PS was not common. The decision to hire and work with a PS might reflect team members' understanding of and respect for unique PS skills. Having a positive attitude about such psychosocial rehabilitation, not PS participation itself, may have led to the positive results. Second, this study is an observational study, so we cannot draw a causal inference that having PS in psychiatric multidisciplinary outreach

teams decreases hospitalisation. There is a possibility of existing unmeasured confounding variables, especially in team characteristics, structure and experience: a multivariate analysis can adjust for some of these factors not for the many potential unexamined factors. In order to generalise these findings, it will be necessary to conduct a randomised controlled trial. Third, PS in this study may have had a diverse level of knowledge and skills, which may have resulted in an underestimation of the true association, and such diversity also could lead to difficulty in generalisation of the findings. Fourth, GAF and SBS evaluators varied by occupation in some teams. Variations of team evaluation may also lead to an underestimation of the findings because of possibly decreased inter-rater reliability of the measures.

CONCLUSION

This study observed that receiving service from multidisciplinary outreach teams with PS was associated with approximately half the risk of hospitalisation among clients who were not in treatment compared with similar clients cared for by teams without PS. This is an observational study and a randomised study would be required to demonstrate a causal relationship.

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Contributors YK contributed whole process of this study. NK contributed acquisition and analysis of data and drafting the manuscript. MK contributed conception and design of the study and drafting the manuscript.

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Competing interests None declared.

Patient consent Obtained.

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Data sharing statement All available data can be obtained by contacting the corresponding author.

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