Introduction and geographic disparity of consultation-liaison psychiatry in Japan: Retrospective analysis of data from the Japanese National Inpatient database.

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Abstract

Background: Consultation-liaison psychiatry (CLP)—professional psychiatric care provided to coordinate with surgical or medical treatment of inpatients with psychiatric disorders—was included in universal health coverage in Japan in 2012. Despite evidence of benefits of CLP, basic data and geographic distribution information regarding CLP at the national level remain unclear. This study aimed to identify the clinical features and geographic disparity of CLP provided in Japan.

Methods: We retrospectively analyzed anonymized data retrieved from the Japanese administrative inpatient database regarding inpatients who were provided CLP between April 2012 and March 2017. Demographic characteristics were summarized and geographic disparity by prefecture was visualized for fiscal years 2012 and 2016; we also summarized the data with descriptive statistics according to region.

Results: Data from a total of 46,171 patients who received 138,866 CLP services were included. Results revealed more patients aged 75–84 years received CLPs than any other age group (29.7%) and the overall male/female ratio was 53:47 in 2016. In 2012 and 2016, 24.2% and 30.7% of CLP patients, respectively, were transferred to other hospitals; 9.7% and 8.8%, respectively, discharged due to the death. CLP services were provided in 14 prefectures in 2012 and 33 by 2016; 14 prefectures had no available CLP services.

Conclusions: Our study clarified the characteristics of patients in Japan who received CLPs and the geographic disparity in CLP services. Although five years had passed since CLP was introduced, the results imply wide availability of CLP nationally. The analysis data provided may inform future policies to improve CLP services.

Background

Across OECD (Organization for Economic Cooperation and Development) member countries, on average, the share of the population aged 65 and over is projected to continue increasing in the coming decades, which will likely lead to greater demand for labor-intensive long-term healthcare (1). As societies are progressively aging and healthcare technology is advancing, the number of medical or surgical patients with psychiatric comorbidities is increasing. This increase is due, in part, to the higher risk of mental disorders in elderly populations than other populations (2). Additionally, hospital inpatients with any psychiatric comorbidity are more likely to utilize health care resources (i.e. longer hospital stays) than those with medical conditions only (3-6). Indeed, psychological comorbidities commonly exacerbate physical illness-associated symptoms, contributing to increased healthcare utilization and costs. Psychiatric comorbidity is even associated with increasing excess mortality (7, 8) and the number of patient rehospitalizations (9).

Consultation-liaison psychiatry (CLP) is the discipline of providing professional psychiatric care to inpatients who are primarily admitted for medical or surgical (somatic) reasons in whom comorbid psychiatric symptoms are revealed after hospital admission. Previous studies show that CLP reduces medical complications, length of stay, and number of hospitalizations via early referral for psychiatric consultations, treatment of psychiatric presentation on medical and surgical units, and facilitating access to appropriate psychiatric treatment post-discharge (10-14).

In terms of implementing CLP services and in the application of CLP guidelines, there are several differences among countries (15). In Japan, the concept of CLP was introduced over 50 years ago, but was in preliminary stages of development for many years (15); CLP was included in the health insurance standards in 2012, thus it was finally covered by universal health coverage. In short, CLP care is to be provided by a multidisciplinary team (i.e. psychiatrists, nurses, pharmacists, and other professions) to improve quality of care and treatment in medical and

surgical patients who may benefit from coordinated, multi-discipline care. Previous studies have reported several aspects of CLP services in Japanese settings, such as in cancer cohorts, psychiatric diagnoses, and treating depression (14, 16, 17). However, neither basic data nor geographic disparity pertaining to the provision of CLP services in the national level remains unclear. It is essential to capture clinical features of patients who received CLP services and CLP distribution for achieving efficient CLP care under the limited healthcare resources available to the rapidly aging society.

The aim of this study was to use information from the Japanese Administrative Database to describe the clinical features of current CLP settings and to reveal the geographic distribution of CLP services in Japan.

Methods

Data source

This was a retrospective, observational study that used data from the Japanese Administrative Database; the Diagnosis Procedure Combination per-diem payment system (DPC/PDPS) (details of the DPC/PDPS have been described elsewhere) (18, 19). Briefly, the DPC/PDPS is a case-mix patient classification system that is linked to payments at acute-care and mixed-care hospitals in Japan. By 2016, the DPC/PDPS-based hospital reimbursement system had been adopted by more than 1600 hospitals, which accounted for more than half of the total 894,000 hospital beds nationwide.

Anonymous clinical and administrative claims data were collected annually for patients from the participating hospitals. Clinical data consists of baseline patient information, diagnosis (based on ICD-10), and detailed medical information such as all major or minor procedures, medication, and device use. The database also includes the purpose of admission, discharge destination, and outcome at the time of hospital discharge. Hospital information is also collected under the DPC/PDPS. We obtained population data according to prefectures from a national survey called Population Estimates (20). Each region consists of several prefectures.

This study was approved by the Institutional Review Board at the Tokyo Medical and Dental University and the National Center for Child Health and Development. The board waived off the requirement for patient informed consent because of the anonymous nature of the data.

Participants and variables

We identified patients who had received CLP (Japanese code: A230-4) between April 1, 2012, and March 31, 2017, from the DPC database. We excluded 224 patients with 397 CLP services from one hospital due to not having complete hospital information.

Data pertaining to individual-level characteristics were extracted. Individual variables included age, sex, admission status (planned, unplanned, or urgent), discharge settings, discharge outcome, and disease classification according to ICD-10. Age was categorized into six groups: 0–29, 30–49, 50–64, 65–74, 75–84, and 85+. Disease classification was categorized according to ICD-10 Chapter numbers from “I” (Certain infectious and parasitic diseases) to “XXII” (Codes for special purposes). Data regarding in-hospital psychotherapy were also obtained from the database. In-hospital psychiatry was recorded in the administrative database a maximum of three times per week due to the limitations of the payment system.

Statistical analysis

Continuous variables were summarized with the use of descriptive statistics (mean $\pm$ standard deviation for values with normal distribution, and the median with interquartile range (IQR) for values with non-normal distribution), and categorical variables were summarized as frequencies and proportions. All statistical analyses were performed using R statistical software, version 3.3.2 (R Foundation for Statistical Computing, Vienna, Austria), and data visualization were performed by Tableau Software version 2018.3 (Tableau software, Seattle, United States of America).

Results

Patient and hospital characteristics

A total of 46,171 patients who were provided CLP qualified based on the inclusion criteria. Table 1 shows the basic characteristics of those patients and hospitals. The age group who used the services the most included those patients aged 75–84 years (29.7% in 2016). About half of all patients were female (47.2% in 2016), and the proportion of patients whose CLP-related medical care was unplanned or urgent was 67.8% in 2016. Also in that year, 109 hospitals in Japan provided CLPs. The number of provided CLP services, patients who received CLP, and hospitals providing CLP increased almost three- to four-fold in between 2012, when CLP was introduced, and 2016 (428%, 406%, and 363%, respectively).

The characteristics of patients' discharge settings and outcomes as of discharge were also shown in Table 1. More than half of the patients were discharged and followed-up by outpatient services (53.3% in 2016), while about nearly one-third of the patients were transferred to other hospitals (30.7% in 2016) and 5.1% of were transferred to welfare facilities in 2016. Overall, the in-hospital mortality ratio for the patients who received CLP services was about 9 percent (8.8% in 2016).

Characteristics of disease classification by cost (in terms of all resources), or "most resource-consuming diagnosis," of study cohorts are summarized in Table 2. The highest proportion of disease classification was "neoplasm" (22.9% in 2016), followed by "disease of circulatory system" (16.7% in 2016), "injury, poisoning and certain other consequences of external causes" (13.7% in 2016) and "other" classifications.

The provision of in-hospital psychotherapy in the study cohort was summarized in Appendix 1. About three-tenth of the patients did not have in-hospital psychotherapy (31.9% in 2016), while about one-fifth of the patients had just one in-hospital psychotherapy (19.5% in 2016). Almost half of the patients had several in-hospital psychotherapy sessions, and 13.9% of the patients had more than six psychotherapy sessions in 2016.

The geographic distribution of CLP services in 2012 and 2016 are shown in Figure 1. Among the 47 prefectures in Japan, CLPs were provided in 14 prefectures (29.8%) at 30 hospitals in 2012. As of 2016, CLPs were provided in 33 prefectures (70.2%) at 109 hospitals; 14 prefectures have never offered CLPs. Table 3 also shows descriptive statistics of CLPs by region. There was no hospital providing CLP services in the Shikoku area until 2014 (data not shown), while more than one-third of the CLP services provided in 2016 were in the Kanto area. The provided CLP services per population ratio showed wide variation even in the regional area level (range: 0.19-0.54 CLP services per thousand population).

Discussion

The present retrospective study investigated the national-level CLP service in general hospitals in Japan, using a national inpatient database. The present study characterized (1) the key overview of patients who received CLP services and (2) the geographic disparity of these patients. To the best of our knowledge, this article is one of the first

reports revealing CLP disparity. In today's current health care climate of cost savings, limited allocation of resources, and expectations of demonstrations of the value of services and clinical productivity, it is important to clarify the current situation regarding CLP services to understand how to make for future improvements to the healthcare system.

After the introduction of CLP services in 2012, the provision of CLP was consistently increased (Table 1), implying the recognition of the need for CLP services in medical and surgical patients. Also, almost 70% of patients we studied who received CLP services were over the age of 65 in 2016, which was much higher than in recent studies in a Canadian setting (roughly 42% from two academic tertiary care hospitals) (21) and an Italian setting (mean and SD age was 57.9 ± 19.4 from one general hospital) which were in line with other reports from Europe in terms of demographic data (about 41%) (22). We speculated that this is due to the difference in the aging ratio of the study population, criteria for referral, priority/availability for CLP referral, and the healthcare system. Our results also showed that about 70 percent of CLP services were provided to patients whose admittance was unplanned or who were admitted due to an urgent condition. This is partly because such patients may not have been prepared for, or may be especially agitated about, their health problems compared with planned admission patients.

While data regarding discharge settings and outcomes were usually unavailable internationally, it was reasonable that about three out of every ten patients who received CLP were transferred to other hospitals (Table 1), which is much higher than the 5.8–7.5% overall average of acute-/mixed-care inpatients in a Japanese setting (23). We speculated that some of the patients with psychiatric comorbidities were transferred to psychiatric hospitals (detailed data about discharge settings were not available). It was surprising that about nine percent of patients who received CLP services were discharged as dead (Table 1), which was also much higher than the overall average of 1.7%–3.3% (24). We also speculated that some CLP services were provided for severe patients who needed psychiatric support for improving their mental condition as a part of end-of-life care. However, further studies are required to address this issue due to data unavailability.

It was reasonable that more than one-fifth of CLP services were provided to the cancer patients, considering both the number of cancer inpatients (13.4% in general hospitals) (25) and that approximately 29–43% of these patients fulfilled the diagnostic criteria for having a psychiatric disorder (26, 27) (Table 2). However, in terms of international comparisons of CLP data, it is not easy to compare in detail. For example, few data were available in the basic disease classifications of the study cohorts. Even if data were shown, as in the Canadian study (21), it may not be easy to compare with our data due to the absence of consensus in disease classifications for CLP cases. Another example is that our data pertaining to the reasons for CLP referrals (psychiatric diagnosis) are not available, as they were for a previous study (21, 28), because the DPC database was not designed for specific studies but various research fields. Further efforts for international collaborative research will help improve the quality of available evidence.

Almost 70% of patients who received CLP services used in-hospital psychotherapy; the rests did not use in-hospital psychotherapy (Appendix 1). This is partly because some CLP services were provided to patients with postoperative delirium which usually disappeared in a short period (i.e., a week), who usually did not need in-hospital psychotherapy. Although the distribution of the number of provided in-hospital psychotherapy sessions was right-skewed, there was another peak in “six and over” during hospitalization. These patients would be those with severe psychiatric conditions or longer lengths of stay. Another possibility is that there was a lack of in-hospital psychiatry in some cases, especially in hospitals where psychiatric healthcare resources are scarce. This is one of the further questions to be addressed.

CLP in Japan started from selected prefectures and gradually spread throughout Japan; however, there are still 14 prefectures where provided no CLP services with their own in 2016 (Figure 1). In addition, there is a variation in providing CLP services even in the regions (Table 3). Although 5 years had passed from the introduction of CLP, there is still geographical disparity of CLP services, which needs to be improved. It is similar in the United Kingdom, where studies identified widespread availability of liaison psychiatry services in acute care hospitals (29). Investigation in the current/future needs of CLPs and enhancing/expanding the delivery system of CLPs would be considerable. Further efforts for improving geographic disparity is needed for achieving efficient care in CLP services for those who needed care.

This study has major strengths: it is the largest reported study on this subject in terms of patient numbers in a Japanese setting based on a national administrative database. According to the National Database Open Data, the analysis covered more than 92% of the CLPs in Japan (30). Further, to our knowledge, this study was the first report which reveals fundamental information of CLP services and geographic disparity in CLP services in Japanese setting which were essential for enhancing the quality of life of patients and improving efficiency in the healthcare delivery system. Thus, our results could inform future interventions to improve medical services and the provision of healthcare.

Several limitations of the present study must be considered. First, this investigation was based on an administrative database (DPC). The database covers more than 93% of CLP services conducted across Japan; however, a few hospitals do not participate in the DPC/PDPS system and the exclusion of these hospitals may have introduced an element of sampling bias.

Second, data pertaining to several important variables are not available in the DPC database. Therefore, factors such as the difference in psychiatric diagnosis before and after CLP, reason for CLP referral, timing of CLP, detailed interventions in CLPs, and degree of psychiatrists' proficiency were not included in the analysis.

Third, the present study did not analyze patient outcomes. Although previous researches had reported the benefit of CLP services (10-14), further outcome studies based on a DPC database would be preferred.

Conclusions

Data regarding CLP services at the national level had not been analyzed and organized in a way that makes it usable for patients, health care providers, or policy administrators. Our present study revealed the fundamental information and geographical disparity in CLP services in Japan. These results can inform hospital administrators and health service providers improvement the equity of the provision, efficiency of service, and policies relating to healthcare involving CLP. Further research is also needed comparing outcomes of qualifying patients who receive CLP with those who qualify but do not receive these coordinated services and to compare availability, insurance coverage, and utilization of CLP in other countries.

Declarations

Ethics approval and consent to participate

This study was approved by the Institutional Review Board at the Tokyo Medical and Dental University and the National Center for Child Health and Development. The board waived off the requirement for patient informed consent because of the anonymous nature of the data.

Consent for publication

Not applicable.

Availability of data and materials

The data availability is not applicable due to an ethical restriction. However, data will be made available by the DPC research group for researchers who meet the criteria for access to these confidential data. Request to access the data should be submitted to the corresponding author.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions:

DS participated in study design, analysis and interpretation of data, drafting the article, and revising the article for intellectual content. NI, HT and KMS participated in study design, interpretation of data, drafting the article, and revising the article for intellectual content. KFj and KFs participated in study design, interpretation of data, and revising the article for intellectual content. All authors read and approved the final manuscript.

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Abbreviations

CLP: Consultation-liaison psychiatry DPC/PDPS: Diagnosis Procedure Combination per-diem payment system, ICD: International Classification of Diseases IQR: Interquartile Range OECD: Organization for Economic Cooperation and Development

References

1. OECD. Health at a Glance 2019: OECD Indicators. 2019. OECD Publishing, Paris.
<https://doi.org/10.1787/4dd50c09-en>
2. OECD. OECD Reviews of Health Care Quality: Japan 2015 (Raising Standards). 2015.
<https://www.oecd.org/publications/oecd-reviews-of-health-care-quality-japan-2015-9789264225817-en.htm>
3. Levenson JL, Hamer RM, Rossiter LF. Relation of psychopathology in general medical inpatients to use and cost of services. Am J Psychiatry 1990;147:1498–503. DOI: 10.1176/ajp.147.11.14984.

4. Furlanetto LM, da Silva RV, Bueno JR. The impact of psychiatric comorbidity on length of stay of medical inpatients. *Gen Hosp Psychiatry* 2003;25:14–9. DOI: 10.1016/s0163-8343(02)00236-0
5. Koopmans GT, Donker MC, Rutten FH. Length of hospital stay and health services use of medical inpatients with comorbid noncognitive mental disorders: a review of the literature. *Gen Hosp Psychiatry* 2005;27:44–56.t DOI: 10.1016/j.genhosppsych.2004.09.008
6. Bourgeois JA, Kremen WS, Servis ME, Wegelin JA, Hales RE. The impact of psychiatric diagnosis on length of stay in a university medical center in the managed care era. *Psychosomatics* 2005;46:431–9.
7. Abrams TE, Vaughan-Sarrazin M, Rosenthal GE. Influence of psychiatric comorbidity on surgical mortality. *Arch Surg* 2010;145:947–53. DOI: 10.1016/j.arth.2014.08.034
8. Davies SJC, Iwajomo T, de Oliveira C, Versloot J, Reid RJ, Kurdyak P. The impact of psychiatric and medical comorbidity on the risk of mortality: a population-based analysis. *Psychol Med* 2019;1–9. DOI: 10.1017/S003329171900326X
9. Hanrahan NP, Bressi S, Marcus SC, Solomon P. Examining the impact of comorbid serious mental illness on rehospitalization among medical and surgical inpatients. *Gen Hosp Psychiatry* 2016;42:36–40. DOI: 10.1016/j.genhosppsych.2016.06.002
10. de Jonge P, Latour CH, Huyse FJ. Implementing psychiatric interventions on a medical ward: effects on patients' quality of life and length of hospital stay. *Psychosom Med* 2003;65:997–1002. DOI: 10.1097/01.psy.0000097332.77685.c8
11. Ormont MA, Weisman HW, Heller SS, Najara JE, Shindeldecker RD. The timing of psychiatric consultation requests. Utilization, liaison, and diagnostic considerations. *Psychosomatics* 1997;38:38–44. DOI: 10.1016/S0033-3182(97)71502-0
12. Kishi Y, Meller WH, Kathol RG, Swigart SE. Factors affecting the relationship between the timing of psychiatric consultation and general hospital length of stay. *Psychosomatics* 2004;45:470–6. DOI: 10.1176/appi.psy.45.6.470
13. Desan PH, Zimbren PC, Weinstein AJ, Bozzo JE, Sledge WH. Proactive psychiatric consultation services reduce length of stay for admissions to an inpatient medical team. *Psychosomatics* 2011;52:513–20. DOI: 10.1016/j.psym.2011.06.002
14. Aoki T, Sato T, Hosaka T. Role of consultation-liaison psychiatry toward shortening of length of stay for medically ill patients with depression. *Int J Psychiatry Clin Pract* 2004;8:71–6. DOI: 10.1080/13651500310004957
15. Grassi L, Mitchell AJ, Otani M, Caruso R, Nanni MG, Hachizuka M, Takahashi K, Yamamoto S, Akiyama T, Riba M. Consultation-liaison psychiatry in the general hospital: the experience of UK, Italy, and Japan. *Curr Psychiatry Rep* 2015;17:44. DOI: 10.1007/s11920-015-0581-1
16. Yamada K, Hosoda M, Nakashima S, Furuta K, Awata S. Psychiatric diagnosis in the elderly referred to a consultation-liaison psychiatry service in a general geriatric hospital in Japan. *Geriatr Gerontol Int* 2012;12:304–9. DOI: 10.1111/j.1447-0594.2011.00771.x
17. Ogawa A, Nouno J, Shirai Y, Shibayama O, Kondo K, Yokoo M, Takei H, Koga H, Fujisawa D, Shimizu K, Uchitomi Y. Availability of psychiatric consultation-liaison services as an integral component of palliative care programs at Japanese cancer hospitals. *Jpn J Clin Oncol* 2012;42:42–52. DOI: 10.1093/jjco/hyr174
18. Yamana H, Moriwaki M, Horiguchi H, Kodan M, Fushimi K, Yasunaga H. Validity of diagnoses, procedures, and laboratory data in Japanese administrative data. *J Epidemiol* 2017;27:476–82. DOI: 10.1016/j.je.2016.09.009

19. Shinjo D, Tachimori H, Maruyama-Sakurai K, Ohnuma T, Fujimori K, Fushimi K. Risk factors for early unplanned readmission in patients with bipolar disorder: A retrospective observational study. *Gen Hosp Psychiatry* 2019;58:51–8. DOI: 10.1016/j.genhosppsych.2019.03.003
20. Ministry of Internal Affairs and Communications. Summary table of the Population Estimates in 2016, Table 11. Population by Age (3 Groups) and Sex for Prefectures. 2017. <https://www.stat.go.jp/data/jinsui/2016np/index.html>
21. Zhou C, Rajaratnam T, Abbey S, Hawa R, Sheehan K, Sockalingam S. Measuring quality of care in consultation liaison psychiatry: Outcomes from two Canadian hospitals. *Gen Hosp Psychiatry* 2018;54:54–56. DOI: 10.1016/j.genhosppsych.2018.01.010
22. De Giorgio G, Quartesan R, Sciarma T, Giuliotti M, Piazzoli A, Scarponi L, Ferrari S, Ferranti L, Moretti P, Piselli M. Consultation-Liaison Psychiatry—from theory to clinical practice: an observational study in a general hospital. *BMC Res Notes* 2015;8:475. doi: 10.1186/s13104-015-1375-6
23. Ministry of Health, Labour and Welfare. Summary table of the Diagnosis Procedure Combination database in 2016, (8) Admission and discharge setting. 2018.
24. Ministry of Health, Labour and Welfare. Summary table of the Diagnosis Procedure Combination database in 2016, (9) Discharge outcome. 2018. <https://www.mhlw.go.jp/file/06-Seisakujouhou-12400000-Hokenkyoku/0000188034.pdf>
25. Ministry of Health, Labour and Welfare. Summary table of the Patient Survey in 2017, Appendix 8. Estimated number of inpatients according to disease classification. 2019. <https://www.mhlw.go.jp/toukei/saikin/hw/kanja/10syoubu/>
26. Zabora J, BrintzenhofeSzoc K, Curbow B, Hooker C, Piantadosi S. The prevalence of psychological distress by cancer site. *Psychooncology* 2001;10:19–28. DOI: 10.1002/1099-1611(200101/02)10:1<19::aid-pon501>3.0.co;2-6
27. Mitchell AJ, Chan M, Bhatti H, Halton M, Grassi L, Johansen C, Meader N. Prevalence of depression, anxiety, and adjustment disorder in oncological, haematological, and palliative-care settings: a meta-analysis of 94 interview-based studies. *Lancet Oncol* 2011;12:160–74. doi: 10.1016/S1470-2045(11)70002-X
28. Lucke C, Gschossmann JM, Schmidt A, Gschossmann J, Lam AP, Schneider CE, Philipsen A, Muller HH. A comparison of two psychiatric service approaches: findings from the Consultation vs. Liaison Psychiatry-Study. *BMC Psychiatry* 2017;17:8. <https://doi.org/10.1186/s12888-016-1171-4>
29. Walker A, Barrett JR, Lee W, West RM, Guthrie E, Trigwell P, Quirk A, Crawford MJ, House A. Organisation and delivery of liaison psychiatry services in general hospitals in England: results of a national survey. *BMJ Open* 2018;8:e023091. <http://dx.doi.org/10.1136/bmjopen-2018-023091>
30. Ministry of Health, Labour and Welfare. Summary table of the 3rd NDB Open Data Japan, (A.Specific hospitalization fee, addition). 2018. https://www.mhlw.go.jp/stf/seisakunitsuite/bunya/0000177221_00002.html

Tables

Table 1. Characteristics of patients and hospitals cohorts in the study (Patients N = 46,170)

Variables	Fiscal year					Proportion (2012)	Proportion (2016)	Rate of increase (2016 vs. 2012)
	2012	2013	2014	2015	2016			
Patients	3,989	5,352	8,358	11,408	17,064			428%
Consultation-Liaison Psychiatry	11,800	17,807	26,283	35,084	47,912			406%
Hospitals	30	34	42	51	109			363%
Age group								
0-29	164	231	327	479	662	4.1%	3.9%	
30-49	542	796	1,193	1,299	2,019	13.6%	11.8%	
50-64	721	1,013	1,431	1,795	2,556	18.1%	15.0%	
65-74	778	1,127	1,746	2,536	3,527	19.5%	20.7%	
75-84	1,168	1,391	2,386	3,279	5,061	29.3%	29.7%	
85+	616	794	1,275	2,020	3,239	15.4%	19.0%	
Sex								
Male	2,026	2,651	4,290	6,023	9,015	50.8%	52.8%	
Female	1,963	2,701	4,068	5,385	8,049	49.2%	47.2%	
Admission setting								
Planned	1,451	1,887	3,023	4,051	5,497	36.4%	32.2%	
Unplanned or Urgent	2,538	3,465	5,335	7,357	11,567	63.6%	67.8%	
Discharge setting								
Outpatients follow up	2,413	3,209	4,730	6,255	9,100	60.5%	53.3%	
Transfer to other hospitals	966	1,311	2,231	3,334	5,238	24.2%	30.7%	
Transfer to other welfare facilities	139	173	486	611	876	3.5%	5.1%	
Others	471	659	911	1,208	1,850	11.8%	10.8%	
Discharge outcome								
Treated	3,177	4,331	6,709	9,370	14,025	79.6%	82.2%	
Unchanged or worsened	358	333	671	789	1,124	9.0%	6.6%	
Death	385	539	783	985	1,505	9.7%	8.8%	
Other	69	149	195	264	410	1.7%	2.4%	

Consultation-Liaison Psychiatry (CLP) services were recorded once a week regardless of multiple CLPs being providing in a week

Table 2. Disease classification of the study cohorts

Disease classification	Fiscal year					Proportion of patients (n) in 2012	Proportion of patients (n) in 2016
	2012	2013	2014	2015	2016		
1.Certain infectious and parasitic diseases	146	187	345	377	580	3.7%	3.4%
2.Neoplasms	1,083	1,333	2,036	2,795	3,906	27.1%	22.9%
3.Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	70	97	131	166	226	1.8%	1.3%
4.Endocrine, nutritional, and metabolic diseases	164	232	320	385	596	4.1%	3.5%
5.Mental and behavioral disorders	65	107	172	181	328	1.6%	1.9%
6.Diseases of the nervous system	141	189	325	393	609	3.5%	3.6%
7.Diseases of the eye and adnexa	25	26	41	38	71	0.6%	0.4%
8.Diseases of the ear and mastoid process	7	9	36	40	39	0.2%	0.2%
9.Diseases of the circulatory system	614	788	1,264	1,870	2,851	15.4%	16.7%
10.Diseases of the respiratory system	365	493	723	912	1,542	9.2%	9.0%
11.Diseases of the digestive system	352	499	782	1,046	1,666	8.8%	9.8%
12.Diseases of the skin and subcutaneous tissue	59	98	173	194	261	1.5%	1.5%
13.Diseases of the musculoskeletal system and connective tissue	171	302	517	727	1,085	4.3%	6.4%
14.Diseases of the genitourinary system	168	241	371	552	711	4.2%	4.2%
15.Pregnancy, childbirth, and the puerperium	52	67	120	131	213	1.3%	1.2%
17.Congenital malformations, deformations, and chromosomal abnormalities	10	13	21	31	40	0.3%	0.2%
18.Symptoms, signs, and abnormal clinical and laboratory findings, not elsewhere classified	1	2	3	8	6	0.0%	0.0%
19.Injury, poisoning, and certain other consequences of external causes	496	669	978	1,562	2,333	12.4%	13.7%
21.Factors influencing health status and contact with health services	0	0	0	0	1	0.0%	0.0%

Table 3. Cross tabulation for number of patients, provided CLP services, hospitals, and population data by region

	Number of patients		Number of CLP services		Number of hospitals		Regional data						CLP services per population
	Fiscal year		Fiscal year		Fiscal year		Number of prefectures		populations (2016) *				
Region	2012	2016	2012	2016	2012	2016	overall	CLP in 2012	CLP in 2016	overall	65+	aging ratio	2016
Hokkaido	202	939	673	2,772	1	4	1	1	1	5,352	1,602	29.9%	0.52
Tohoku	35	641	115	1,879	1	10	6	1	5	8,915	2,674	30.0%	0.21
Kanto	1,008	6,138	3,016	18,309	11	35	7	3	6	43,132	10,748	24.9%	0.42
Chubu	743	1,512	2,209	4,175	4	19	9	3	6	21,415	5,922	27.7%	0.19
Kinki	1,100	4,561	3,185	12,038	8	22	7	2	4	22,489	6,203	27.6%	0.54
Chugoku	268	774	900	2,007	3	6	5	2	4	7,406	2,218	29.9%	0.27
Shikoku		411		925		4	4	0	3	3,818	1,209	31.7%	0.24
Kyusyu, Okinawa	633	2,088	1,702	5,807	2	9	8	2	4	14,405	4,014	27.9%	0.40
Total	3,989	17,064	11,800	47,912	30	109	47	14	33	126,933	34,591	27.3%	0.38

CLP: Consultation-Liaison Psychiatry; * unit: thousands

Appendix

Appendix 1. Provision of in-hospital psychotherapy in the study cohort

	Fiscal year						
Variables	2012	2013	2014	2015	2016	Proportion of patients (n) in 2012	Proportion of patients (n) in 2016
Psychotherapy (in-hospital)							
0	941	1,397	2,802	3,629	5,445	23.6%	31.9%
1	829	1,305	1,721	2,317	3,331	20.8%	19.5%
2	551	793	1,032	1,586	2,328	13.8%	13.6%
3	418	497	710	1,036	1,670	10.5%	9.8%
4	297	343	492	705	1,129	7.4%	6.6%
5	209	225	375	509	791	5.2%	4.6%
6+	744	792	1,226	1,626	2,370	18.7%	13.9%

Figures

Figure 1

Geographic distribution of Consultation-liaison psychiatry in 2012 and 2016. The figure was drawn by using the Tableau software version 2018.3 with its built-in map of Japan.