

The importance of an eating disorder treatment support center in Japan: A survey from 2017 to 2020

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Abstract: We investigated the impact of medical collaboration between the Chiba Eating Disorder (ED) Treatment Support Center (CSC) in Chiba Prefecture and the ED treatment center at Kohnodai Hospital. We calculated the number of consultations performed by the CSC and referral rate to other medical facilities from October 2017 to March 2020, as well as the clinical characteristics of the patients treated at our hospital from April 2016 to March 2020. Data on duration of hospitalization and increase in body mass index (BMI) during hospitalization were recorded. Patients were divided into all of the Japan and Chiba Prefecture groups. Data were evaluated by Poisson's regression analysis or one-way analysis of variance. A p -value < 0.05 was considered significant. The 2019 data served as reference values. Our data demonstrated that while the number of CSC consultations increased (2017:201, 2018:547, 2019:552) annually, the number of hospitalizations for EDs decreased (197, 194, 134, respectively). In comparison, the number of outpatient consultations for EDs across all of Japan peaked in 2018 and decreased significantly thereafter (2016:110, 2017:139, 2018:193, 2019:142). After the CSC was established, the number of patients treated in our department decreased as expected. Patients with anorexia nervosa (AN) who were treated on an outpatient basis across all of Japan were younger in 2019 (27.0 ± 1.2) than in 2018 (31.9 ± 1.2). Severe cases had better outcomes, and there was a significant increase in BMI of inpatients with AN in both groups. Overall, the activities of such ED treatment support center promoted successful treatment of severe ED cases.

Keywords: eating disorder, anorexia nervosa, medical collaboration, support center

Introduction

Eating disorders (EDs) are serious psychiatric conditions characterized by abnormal eating or weight-control behaviors (1,2). The main EDs subcategories include anorexia nervosa (AN), which is characterized by a bodyweight below the lower limit of normal based on age and height, and bulimia nervosa (BN), which is characterized by a bodyweight within the normal range. The other subcategories under EDs include binge-eating disorder, other specified feeding and eating disorders, and avoidant/restrictive food intake disorders. In the studies in English or French published between 2000 and 2018, the weighted mean (ranges) of the lifetime of EDs were 8.4% (3.3-18.6%) for women and 2.2% (0.8-6.5%) for men (3). A meta-analysis estimated that mortality rate of AN over 10 years was approximately 5-6%, which is high compared with other psychiatric disorders (1-4). The 5-year clinical recovery rate was reportedly 66.8% (5). The causes of death in AN

include arrhythmia, infectious disease from extreme malnutrition, and suicide (6,7). Because of the potentially fatal complications of AN, a combination of medical treatment and psychotherapy is necessary. In 2009, the Mental and Disability Health Division of the Ministry of Mental Health and Welfare of Japan recorded 210,000 receipt claims for outpatient and inpatient treatment of EDs (8).

Unfortunately, Japan lacks independent specialized treatment facilities for EDs. Psychiatric hospitals and clinics without internal medicine departments, as well as a small number of general hospitals, are mainly responsible for providing ED treatment; however, many doctors in general hospitals lack training to treat these diseases. As a result, patients with severe malnutrition have difficulty getting adequate treatment. Many facilities are also concerned that publicity will result in an unmanageable number of patients with EDs. Ensuring cooperation between medical and psychiatric departments is a key issue in Japan. There are negative

stereotypes and prejudices (*e.g.*, weakness, laziness, carelessness) about ED among the general public and healthcare professionals, which have a negative impact on treatment desires (9).

To solve these problems, the government established four ED treatment support centers (Tohoku University Hospital in Miyagi Prefecture, Kohnodai Hospital of the National Center for Global Health and Medicine in Chiba Prefecture, Hamamatsu University Hospital in Shizuoka Prefecture, and Kyushu University Hospital in Fukuoka Prefecture) (10). These centers: *i*) provide medical care information for patients and their families, *ii*) educate therapists and train doctors from other medical institutions, and *iii*) promote medical cooperation. The National Center of Neurology and Psychiatry was designated as the National Core Center for Eating Disorders. It holds domestic meetings and collates the findings from each center (11).

Despite the presence of these programs, patients still have difficulty finding an institution that provides adequate treatment. To improve this situation, we investigated the change in clinical status of patients who visited Kohnodai Hospital after establishment of our treatment center.

We hypothesized that the Chiba Eating Disorder Treatment Support Center (CSC) would encourage cooperation between psychiatry and internal medicine physicians treating patients with EDs and solve the above problems. We also theorized that establishing a center would increase the number of treatment facilities for patients with EDs in Chiba and other prefectures. Patients will be able to visit the hospital more easily than before. Specialized treatment hospitals would lead to a gradual decrease in the total number of inpatients and concentrate specialized treatment for the most severely ill patients.

Materials and Methods

Study design and Data collection

We recorded the number and type of consultations done by the CSC and the percentage of patients who were

subsequently referred to our ED treatment center at Kohnodai Hospital for three years from October 2017 to March 2020 ((1) 2017.10-2018.3, (2) 2018.4-2019.3, (3) 2019.4-2020.3) (Figure 1). We also surveyed the number of patients who received outpatient or inpatient treatment at Kohnodai Hospital over a 4-year period from April 2016, before the CSC was established, until March 2020 (① 2016.4-2017.3, ② 2017.4-2018.3, ③ 2018.4-2019.3, ④ 2019.4-2020.3) (Figure 1). We recorded the data of patients who received outpatient or inpatient treatment at Kohnodai Hospital from one year prior to the opening of the CSC to show the effectiveness of the CSC activities more clearly.

For inpatients, we investigated the duration of hospitalization and body mass index (BMI) at the time of hospitalization and discharge. Patients who were treated for two weeks or less were excluded from this study because we could not adequately assess their weight gain over this duration. The data of patients from the Chiba prefecture and all of Japan, including Chiba residents, were analyzed separately.

Statistical analysis

Continuous variables were presented as mean \pm standard deviation, whereas categorical variables were expressed as numbers and percentages. To assess the differences in the number of consultations conducted by the CSC annually, a Poisson regression analysis was performed, where the number of consultations was defined as the dependent variable. A dummy variable corresponding to the year was used as the independent variable, and the year 2019 was used as the baseline for all dummy variables. The same Poisson regression analysis was performed for inpatients and outpatients with EDs and AN, respectively.

A one-way analysis of variance was performed to compare the age, duration of illness, BMI at admission and discharge, and increase in BMI during hospitalization for each year. If the effect of the year was significant, pairwise comparisons were performed using the Dunnett method with the year 2019 used as the baseline. The normality and homogeneity of

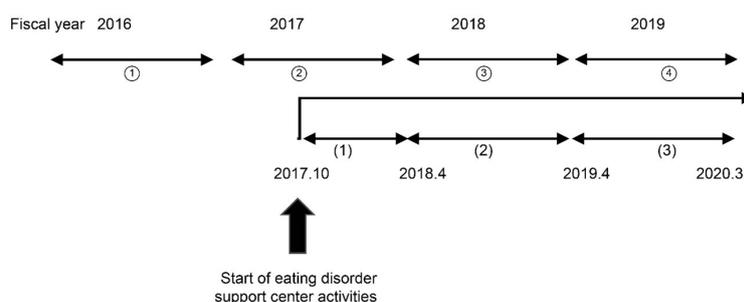


Figure 1. Research protocol. The horizontal axis shows the fiscal year and the date. The start of the support center is indicated by a vertical arrow. Data on hospital patients were collected one year before the start of Chiba Eating Disorder Support Treatment Center.

variance of the analyzed data were established.

All statistical analyses were conducted with SPSS version 26 (SPSS, Armonk, NY, USA). All tests were two-tailed, and a p -value < 0.05 was considered statistically significant. This study was approved by the Ethics Committee of Kohnodai Hospital (NCGM-G-003196-00, NCGM-G-003071-00). All patients provided informed consent.

Results

The total consultations in the CSC in 2017, 2018, and 2019 was 201, 547, and 552, respectively (Table 1). In comparison, the number of first-time consults during these periods numbered 129, 465, and 477, respectively. The proportions of the various people seeking consultation are shown in Table 1. The majority of the consults were conducted with the patients and their mothers. When a person requested information on the medical institutions that were appropriate for their individual needs, such information was carefully researched and presented by the staff. The total number of referrals to medical facilities, including Kohnodai Hospital, in 2017, 2018, and 2019 were 83, 402, and 586, respectively (Figure 2). The percentage of referrals made to Kohnodai Hospital decreased during the 3-year period. There were more referral facilities than the number of consultations because the medical cooperation system increased the number of referral options.

Change in the number of patients treated at Kohnodai Hospital

The number of outpatient medical examinations conducted for patients with an ED or AN and the basic data of the patients who came in for these examinations over the 4-year period are summarized in Table 2 and Figure 3. The data were evaluated by Poisson's regression model using the 2019 values as the baseline.

In the all-Japan group, the number of patients with EDs in 2019 (142 cases) was significantly different from that in 2016, 2017, and 2018 (110, $p = 0.00$; 139, $p = 0.001$; and 193, $p = 0.003$; respectively). Moreover,

the number of patients peaked in 2018 and declined thereafter. In comparison, in the Chiba Prefecture group, the number of patients with EDs in 2019 was significantly lower than that in 2018 (89 vs. 123, $p = 0.02$). Among the patients with AN, the number of patients in the Chiba Prefecture (56 vs. 80, $p = 0.022$) and all Japan groups (93 vs. 127, $p = 0.041$) was significantly lower in 2019 than in 2018. In general, the number of outpatient examinations increased until 2018 and decreased thereafter.

The number of inpatients with EDs in the Chiba Prefecture and all Japan groups was significantly higher in 2016 (133: $p = 0.000$; 211: $p = 0.000$), 2017 (115: $p = 0.003$; 197: $p = 0.001$), and 2018 (126: $p = 0.000$; 194: $p = 0.001$) than in 2019 (74,134). The number of inpatients with AN in the Chiba Prefecture and all Japan groups was significantly higher in 2016 (105: $p = 0.001$; 171: $p = 0.000$), 2017 (96: $p = 0.004$; 169: $p = 0.001$), and 2018 (102: $p = 0.001$; 160: $p = 0.003$) than in 2019 (60, 111).

Age at the first visit, BMI at admission, and duration of hospitalization

The age and duration of illness (mean \pm standard error) of the patients treated on an outpatient and inpatient basis are shown in Table 2 and Table 3, respectively. The factors that showed statistical significance in the one-way analysis of variance are summarized in Figure 3. There were no significant differences in the age or duration of disease between the all Japan and Chiba Prefecture groups for patients with ED (Table 2).

The age of the outpatients with AN in the all Japan group was significantly higher in 2018 than in 2019 (Table 2, $p = 0.019$). The BMI at admission among the inpatients with AN in the Chiba Prefecture group was significantly higher in 2018 than in 2019 (Table 3, $p = 0.025$). The inpatients with AN in the Chiba Prefecture group were hospitalized for a significantly shorter time in 2016 ($p = 0.008$), 2017 ($p = 0.027$), and 2018 ($p = 0.030$) than in 2019.

Table 1. Proportion of people seeking consultation in the Chiba Eating Disorder Treatment Support Center (CSC)

Person or affiliation (year)	2017	2018	2019
Total number	201	547	552
Patient (%)	32	29	33
Mother (%)	39	37	39
Father (%)	6	9	7
Husband/wife (%)	6	4	7
Administrative organization (%)	1	2	2
Educational institution (%)	2	1	1
Medical institution (%)	1	3	2
Other/unknown (%)	13	15	9

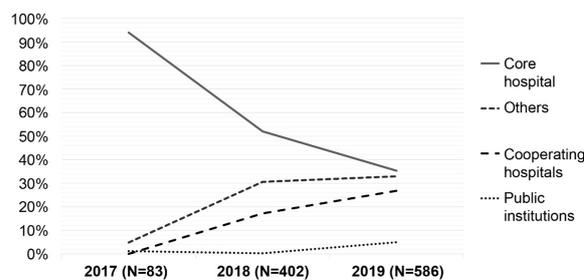


Figure 2. The total number of referrals to medical facilities, including Kohnodai Hospital, in 2017, 2018, and 2019 were 83, 402, and 586, respectively. Line graph shows the percentage of referrals made to Kohnodai Hospital decreased during the 3-year period. The referral rate to our hospital (Kohnodai Hospital) has been decreasing year by year.

Table 2. Basic data of ED and AN outpatients treated at Kohnodai Hospital

	2016	2017	2018	2019	<i>p</i>
Outpatient ED					
Number of patients					
All Japan group	110	139	193	142*	vs. 2016, 2017, 2018
Chiba Prefecture group	69	87	123	89*	vs. 2018
Age at first visit (years)					
All Japan group	28.3 ± 1.2	27.1 ± 0.9	29.9 ± 0.9	27.8 ± 0.9	n.p.
Chiba Prefecture group	27.7 ± 1.6	26.8 ± 1.2	29.9 ± 1.2	28.2 ± 1.2	n.p.
Duration of illness (days)					
All Japan group	3,384.9 ± 364.5	2,869.9 ± 254.7	3,217.2 ± 222.7	3,230.5 ± 277.8	n.p.
Chiba Prefecture group	3,183.6 ± 483	2,964.5 ± 331.4	3,327.9 ± 277.4	3,233.3 ± 363.4	n.p.
Outpatient AN					
Number of patients					
All Japan group	78	89	127	93*	vs. 2018
Chiba Prefecture group	47	54	80	56*	vs. 2018
Age at first visit (years)					
All Japan group	29.2 ± 1.5	28.4 ± 1.3	31.9 ± 1.2	27.0 ± 1.2*	vs. 2018
Chiba Prefecture group	29.1 ± 2.1	27.3 ± 1.6	31.8 ± 1.5	27.3 ± 1.7	n.p.
Duration of illness (days)					
All Japan group	3,554.1 ± 453.7	3,058.4 ± 345	3,556.5 ± 294.9	2,881.7 ± 337.5	n.p.
Chiba Prefecture group	3,485.4 ± 623.5	3,048.1 ± 459.3	3,721.5 ± 378.9	2,767.6 ± 435.7	n.p.
BMI at first visit (kg/m ²)					
All Japan group	14.1 ± 0.3	14.0 ± 0.3	14.5 ± 0.3	14.5 ± 0.3	n.p.
Chiba Prefecture group	14.0 ± 0.3	14.5 ± 0.4	14.7 ± 0.3	14.6 ± 0.4	n.p.

**p*-value < 0.05. ED, eating disorders; AN, anorexia nervosa; BMI, body mass index.

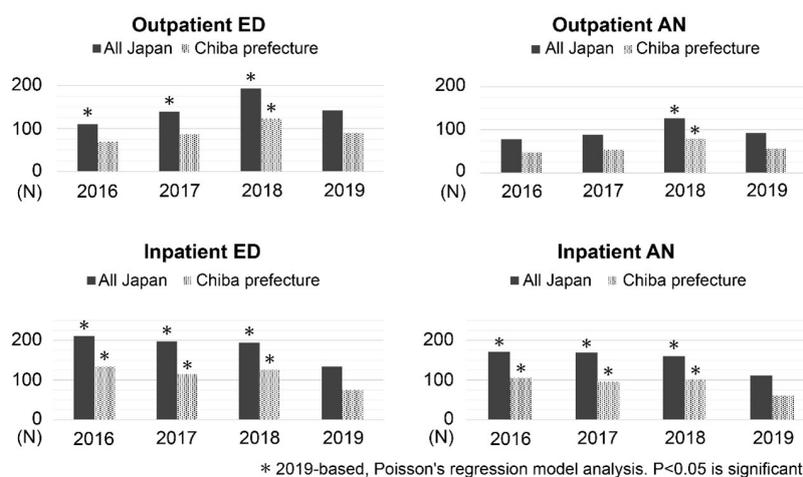


Figure 3. Changes in the number of outpatient and inpatient consultations at Kohnodai Hospital. Black bars indicate the patient number in all Japan groups. The striped bars indicate the patient number of Chiba prefecture group. Values for each year were compared using the 2019 data as the baseline. A *p*-value < 0.05 was considered significant.

Increase in BMI during hospitalization among patients with AN (Table 4, Figure 4)

Poisson's regression model did not demonstrate any significant difference in the number of inpatients with AN in the all-Japan and Chiba Prefecture groups during the 4-year time period. The BMI of the all Japan group increased significantly less during admission in 2016 ($p = 0.009$) and 2017 ($p = 0.05$) compared with that in 2019. There was no significant difference in the BMI during admission of the all-Japan group between 2018 and 2019. Similarly, the BMI of the Chiba Prefecture group increased

significantly less during admission in 2016 ($p = 0.011$) and 2018 ($p = 0.022$) compared with that in 2019. Although some factors demonstrated differences at the national and prefectural levels, the mean values showed similar patterns.

Discussion

The number of consultations provided by our support center has increased yearly. The referral rate to other hospitals has also increased because we promote medical cooperation. During the same time period, we also noted a decrease in the number of outpatients and inpatients

Table 3. Basic data of ED and AN inpatients treated at Kohnodai Hospital over two weeks

	2016	2017	2018	2019	<i>p</i>
Inpatient ED					
Number of patients					
All Japan group	211	197	194	134*	vs. 2016, 2017, 2018
Chiba Prefecture group	133	115	126	74*	vs. 2016, 2017, 2018
Age at first visit (years)					
All Japan group	31.6 ± 0.8	33.1 ± 0.9	30.6 ± 0.9	33.1 ± 1.1	n.p.
Chiba Prefecture group	30.8 ± 1.0	30.7 ± 1.1	29.7 ± 1.1	31.3 ± 1.4	n.p.
Duration of illness (days)					
All Japan group	3,902.1 ± 232.1	4,073.5 ± 261.9	3,780.1 ± 232.8	4,585.3 ± 327.2	n.p.
Chiba Prefecture group	4,073.6 ± 292	3,490.1 ± 255.9	3,470.9 ± 243.2	4,390 ± 373.1	n.p.
Duration of hospitalization					
All Japan group	25.7 ± 2.4	28.4 ± 2.6	26.1 ± 2.3	31.8 ± 2.9	n.p.
Chiba Prefecture group	23.6 ± 2.2	23.6 ± 2.8	22.5 ± 2.3	35.6 ± 4.4	n.p.
Inpatient AN					
Number of patients					
All Japan group	171	169	160	111*	vs. 2016, 2017, 2018
Chiba Prefecture group	105	96	102	60*	vs. 2016, 2017, 2018
Age at first visit (years)					
All Japan group	32.9 ± 0.9	33.2 ± 1.0	31.2 ± 1.0	32.6 ± 1.2	n.p.
Chiba Prefecture group	32.2 ± 1.2	30.8 ± 1.2	29.9 ± 1.2	30.7 ± 1.5	n.p.
Duration of illness (days)					
All Japan group	4,287.9 ± 257.7	3,996 ± 277.4	3,962.9 ± 255.7	4,664.0 ± 357.2	n.p.
Chiba Prefecture group	4,594.4 ± 335.1	3,561.0 ± 285.2	3,664.6 ± 276.1	4,625.5 ± 424.1	n.p.
BMI at admission (kg/m ²)					
All Japan group	12.9 ± 0.2	13.1 ± 0.2	13.3 ± 0.2	12.9 ± 0.3	n.p.
Chiba Prefecture group	13.1 ± 0.3	13.1 ± 0.3	13.8 ± 0.3	12.7 ± 0.3*	vs. 2018, 2019
BMI at discharge (kg/m ²)					
All Japan group	13.2 ± 0.2	13.4 ± 0.2	13.7 ± 0.2	13.6 ± 0.3	n.p.
Chiba Prefecture group	13.4 ± 0.3	13.4 ± 0.3	14.1 ± 0.3	13.5 ± 0.3	n.p.
Duration of hospitalization (days)					
All Japan group	25.5 ± 2.8	29.4 ± 2.9	28.8 ± 2.8	32.5 ± 3.2	n.p.
Chiba Prefecture group	22.8 ± 2.4	24.5 ± 3.3	24.9 ± 2.7	36.9 ± 4.7*	vs. 2016, 2017, 2018

**p*-value < 0.05.

Table 4. Increase in BMI among patients with AN during hospitalization at Kohnodai Hospital

Variables	2016	2017	2018	2019	<i>p</i>
Number of patients					
All Japan group	80	83	92	67	n.p.
Chiba Prefecture group	57	47	53	40	n.p.
Increase in BMI (kg/m²)					
All Japan group	0.49 ± 0.13	0.60 ± 0.12	0.68 ± 0.15	1.08 ± 0.15*	vs. 2016, 2017
Chiba Prefecture group	0.38 ± 0.2	0.55 ± 0.2	0.44 ± 0.2	1.14 ± 0.2*	vs. 2016, 2018

**p*-value < 0.05.

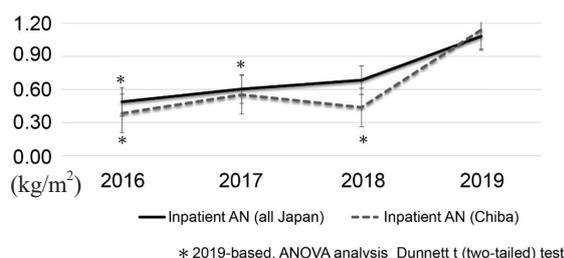


Figure 4. Increase in body mass index (BMI) over two weeks hospitalization at Kohnodai Hospital. This table summarizes the factors that showed significant differences over time. The horizontal axis indicates the fiscal year. Values for each year were compared using the 2019 data as the baseline. A *p*-value < 0.05 was considered significant.

treated for EDs in our hospital. Notably, patients with AN who were treated in our department demonstrated significant weight gain during hospitalization, which suggested that we were able to provide more effective treatment than previously possible.

This study analyzed the data of patients living in all regions of Japan and Chiba Prefecture separately. According to a survey conducted in 2016, Chiba Prefecture is a well-balanced metropolitan/rural area with a population of 6.23 million. It is the 6th most densely populated region in Japan. Chiba Prefecture boasts the 22nd highest per capita income, 10th highest total number of farms, and 9th highest number of

hospitals. The specialized treatment centers in Miyagi, Chiba, Shizuoka, and Fukuoka Prefectures had 169, 551, 208, and 227 consultations, ED outpatient visits, and inpatient admissions, respectively, between April 2018 and December 2018 (11). We considered Chiba Prefecture to be a useful metropolitan/rural model to evaluate the activities of the CSC in Japan.

Our results can be divided into three main categories: ED at the CSC, outpatient trends, and inpatient trends.

ED at the CSC

Before the CSC was established, there was a concern that ED centers would be regarded as special treatment facilities, which would result in an influx of patients with EDs and discourage other facilities from providing similar treatment. Our data suggested that while the number of consultations at the CSC increased annually, the total number of outpatients between 2018 to 2019 at Kohnodai Hospital decreased. These results clearly show that encouraging cooperation among the medical institutions in the prefecture led to good results. We did not examine the effectiveness of the various methods of medical cooperation we promoted in our prefecture, but we can presume that the visits to the medical institutions to promote medical cooperation and workshops on ED treatment were effective. Our publicity activities on social networking sites may have contributed to the success of the CSC. In the past, patients needed a referral from a clinician or an internet search to consult with our specialists or be treated at Kohnodai Hospital. Under the new program, patients were able to find us directly and get consultations easily, which could have been factors in the changes observed in this study. Further study will be necessary to confirm the relation of the above-mentioned factors to our results.

Outpatient trends in EDs and AN

While some years showed no significant statistical difference, the all Japan and Chiba Prefecture groups demonstrated similar outpatient trends. In the all Japan group, the number of outpatient consultations peaked in 2018 and decreased thereafter. In relation, the number of patients who presented at our department in 2019 decreased by 30%, which may be a result of the guidance service provided by the CSC. Among the EDs, AN presented as the most severe physically. It was also associated with the highest mortality rate (2). The age of the patients with AN in the all Japan group was significantly younger in 2019. The Chiba Prefecture group showed a similar trend, but it did not reach statistical significance. The activities of the support center may have contributed to the early detection and treatment of patients in the area. In long-term studies (> 20 years follow-up) that examined the prognosis

of patients with AN or BN, one-third of the patients were not cured, and the median duration of the disease in patients with AN was 10 years (1,2,12). These data were based on patients who received previous treatment. One report noted that EDs lasted 10 years on average among patients who did not receive psychiatric treatment (12). It is possible that proactive treatment with early intervention can improve this prognosis (1,2,12).

Inpatient trends in EDs and AN

The support center significantly reduced the number of hospitalized patients in 2019. In the Chiba Prefecture group, the BMI values from 2019 decreased significantly compared with that in the previous year, whereas the BMI values during hospitalization increased significantly compared with those in 2016 and 2018. Moreover, the duration of hospitalization increased significantly compared with the previous three years. It is assumed that the increased length of stay is due to the fact that it is now possible to treat patients with more robust weight gain. We assumed that patients living in Chiba Prefecture were more affected by our support center activities than those living in other prefectures because of the medical cooperation within Chiba Prefecture. However, we did not observe a younger age of admission or shorter duration of illness, which are indicators of early detection of EDs. It will take several years before fruitful results can be seen. In addition, it will be possible to divide the roles of specialist hospitals for the treatment of severe AN with other hospitals. This will be possible in the future. It may take some time before the results start appearing.

The all-Japan group demonstrated a similar trend. Instead of decreasing the number of inpatients, we found that our facility was able to accept more patients with severe AN and provide aggressive inpatient treatment.

To prevent relapse, inpatient treatment of severe AN requires nutritional status improvement, psychotherapy and counseling for the patient's caregivers (1,2). In terms of integrated treatment, facilities specializing in EDs need to offer an environment that can focus on treating severely ill patients. A program that promotes medical cooperation is one such environment. The risk factors for severe and enduring AN include the length of illness and previous treatment failures (13). About 10% of ANs and 20% of BNs will have a prolonged eating disorder (14). They may be conceptualized as Severe and Enduring Eating Disorders (SEED) (14). They are characterized by a long duration of illness and multiple unsuccessful treatment attempts. As such, it is important to detect and treat AN early, as well as promptly initiate specialized treatments for patients who do not improve with normal measures.

This study's limitations include the short follow-up period of four years. For the data and our interpretations

to be more meaningful, there needs to be a division of roles between specialist hospitals and general hospitals, which will take several years to implement. Additionally, the situation of patients after referral needs to be investigated further. Increasing the number of referrals is an important issue to improve medical cooperation.

We assumed that the changes seen in our outpatients and inpatients could be attributed to the activities of the support center; however, a long-term study may be necessary.

In conclusion, promoting medical cooperation among specialized hospitals allowed these institutions to provide better and more intensive care for patients with severe EDs.

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