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Involuntary treatment in patients with anorexia nervosa: utilization patterns and associated factors

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Abstract

Background. A subgroup of patients with anorexia nervosa (AN) undergoing involuntary treatment (IT) seems to account for most of the IT events. Little is known about these patients and their treatment including the temporal distribution of IT events and factors associated with subsequent utilization of IT. Hence, this study explores (1) utilization patterns of IT events, and (2) factors associated with subsequent utilization of IT in patients with AN.

Methods. In this nationwide Danish register-based retrospective exploratory cohort study patients were identified from their first (index) hospital admission with an AN diagnosis and followed up for 5 years. We explored data on IT events including estimated yearly and total 5-year rates, and factors associated with subsequent increased IT rates and restraint, using regression analyses and descriptive statistics.

Results. IT utilization peaked in the initial few years starting at or following the index admission. A small percentage (1.0%) of patients accounted for 67% of all IT events. The most frequent measures reported were mechanical and physical restraint. Factors associated with subsequent increased IT utilization were female sex, lower age, previous admissions with psychiatric disorders before index admission, and IT related to those admissions. Factors associated with subsequent restraint were lower age, previous admissions with psychiatric disorders, and IT related to these.

Conclusions. High IT utilization in a small percentage of individuals with AN is concerning and can lead to adverse treatment experiences. Exploring alternative approaches to treatment that reduce the need for IT is an important focus for future research.

Introduction

Anorexia nervosa (AN) is a serious psychiatric disorder with high psychiatric comorbidity (Halmi, 2018; Hudson, Hiripi, Pope, & Kessler, 2007), treatment dropout (Fassino, Pierò, Tomba, & Abbate-Daga, 2009; Wallier et al., 2009), post-treatment relapse (Khalsa, Portnoff, McCurdy-McKinnon, & Feusner, 2017), and mortality (Arcelus, Mitchell, Wales, & Nielsen, 2011; Chesney, Goodwin, & Fazel, 2014). Many individuals with AN require inpatient treatment for several reasons including medical stabilization, suicidality, self-harm, insufficient weight gain in outpatient treatment, interruption of entrenched binge-purge behaviors, and life-threatening somatic complications associated with underweight and malnutrition resulting from restrictive eating, excessive exercise, and purging behavior (Hay et al., 2014; Westmoreland, Krantz, & Mehler, 2016). Furthermore, a subgroup of severely ill hospitalized patients, ranging from 13% to 44% worldwide, refuse treatment and therefore undergo involuntary treatment (IT) (Clausen & Jones, 2014). These percentages were reported in studies between 1997 and 2009, and a review showed no influence of age or changes over time (Clausen & Jones, 2014). The studies were conducted across various countries with the lowest percentage found in Japan (Kondo, Takaoka, Ikawa, & Niwa, 2004) and the highest in Germany (Laakmann et al., 2006). In the USA, 16.2% of hospitalized patients with AN or eating disorders not otherwise specified were involuntarily admitted (Watson, Bowers, & Andersen, 2000). Similarly, approximately 18% of inpatients in Denmark were subject to IT, and 2% received more than 100 IT events each (Clausen, Larsen, Bulik, & Petersen, 2018). Moreover, 21 adolescent inpatients in Norway received a total of 1896 restraint events (Furre, Sandvik, Friis, Knutzen, & Hanssen-Bauer, 2016), and 11% of 38 adolescent inpatients

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accounted for 91% of physical restraint events (Blikshavn, Halvorsen, & Rø, 2020). Hence, these studies indicate that most IT events are accounted for by a small group of patients with AN. However, our knowledge on these patients is sparse. Information on types of IT measures involved and the temporal distribution of IT, including any high-risk periods for utilization of IT, could inform preventive interventions. However, to the best of our knowledge, no studies have explored the temporal distribution of IT events across the illness course or annual rates of IT.

Nasogastric tube feeding and involuntary admission have typically been the specific IT measures studied in patients with AN (Clausen & Jones, 2014) with a few recent studies addressing restraint use (Blikshavn et al., 2020; Clausen et al., 2018) – an IT experienced as particularly distressing to psychiatric patients (Akther et al., 2019; Seed, Fox, & Berry, 2016a, 2016b; Tingleff, Bradley, Gildberg, Munksgaard, & Hounsgaard, 2017). Factors associated with IT use in AN include psychiatric comorbidity and symptom level, previous hospital admissions, early and late onset, longer illness duration, lower IQ, self-harm, history of physical or sexual abuse, lower and higher socioeconomic status (SES), longer treatment duration, and AN symptom severity (Atti et al., 2021; Clausen & Jones, 2014; Clausen et al., 2018; Di Lodovico et al., 2021; Elzakkers, Danner, Hoek, Schmidt, & van Elburg, 2014; Griffiths, Beumont, Russell, Touyz, & Moore, 1997; Zohar-Beja, Latzer, Adatto, & Gur, 2015). Furthermore, previous admissions, older age at first diagnosis, and psychiatric comorbidity have been found to predict the first IT event (Clausen et al., 2018). The studies on factors associated with IT in AN are difficult to compare due to methodological differences including varying methodological quality, differences in populations regarding age and eating disorder diagnoses (Atti et al., 2021; Clausen & Jones, 2014; Elzakkers et al., 2014), and differences in designs including case control (Ramsay, Ward, Treasure, & Russell, 1999), longitudinal register-based (Clausen et al., 2018), and primarily cohort studies based on medical records (Clausen & Jones, 2014). Moreover, very little is known about factors associated with high utilization of IT or with restraint.

We here explore (1) IT utilization patterns over a 5-year period from the first hospital admission with AN by examining the distribution of IT events including estimated yearly rates of IT, and estimated rates for specific IT measures and (2) factors associated with subsequent increased IT event rates and with subsequently receiving mechanical or physical restraint.

Methods

Study group

This nationwide Danish register-based retrospective exploratory cohort study included all patients born after 1963 with a first admission with an AN diagnosis (index admission) between early 2000 and the end of 2011 (and an age of at least 6 years), enabling 5 years of follow-up until the end of 2016. ICD-10 diagnostic codes included were F50.0 (anorexia nervosa), F50.1 (atypical anorexia nervosa), F50.8 (other eating disorders), and F50.9 (unspecified eating disorders) (World Health Organization, 1992). We selected year 2000 as the study start due to inconsistencies in the first year of the Registry of Coercive Measures in Psychiatric Treatment, which was launched in 1999 (Sundhedsdatastyrelsen, 2020). We included both primary and secondary diagnoses, and excluded referral diagnoses. The diagnostic codes F50.8 and F50.9 were included as AN because, among other uses, they are registered at inpatient admissions due to AN but without prior psychiatric assessment at the reporting hospital. Patients were censored at emigration/disappearance or death.

The study was registered with the Danish Data Protection Agency and the Danish Health Data Authority, and conformed to the Helsinki Declaration (World Medical Association, 2013) with the exception of informed consent. Under Danish law, register-based studies require permission from the Danish Health Data Authority, not from patients.

Data sources

Data from the Danish registers were provided by the Danish Health Data Authority. Data were linked using the unique national Central Person Register number (Pedersen, 2011) which is present in each register. Demographic data were obtained from the Danish Civil Registration System (Pedersen, 2011), data on inpatient treatment from the Danish National Patient Register (Lynge, Sandegaard, & Rebolj, 2011) and the Danish Psychiatric Central Research Register (Mors, Perto, & Mortensen, 2011), and data on IT from the Registry of Coercive Measures in Psychiatric Treatment (Sundhedsdatastyrelsen, 2020). The Danish hospitals are obliged to register start and end dates for all outpatient contacts and inpatient admissions, related diagnoses, and time for starting and ending IT events. All these data are stored in the Danish registers and can be accessed with specific permission.

Variables

In addition to the index admission, all readmissions with a registered psychiatric diagnosis were examined, given the known uses of IT for conditions other than AN (Clausen et al., 2018). For each admission, we included additional psychiatric diagnoses such as bulimia nervosa; organic mental disorders; personality disorders; schizophrenia spectrum disorders; autism spectrum disorders; depression; mania and bipolar affective disorder; substance use disorders; mental retardation; neurotic, stress-related, and somatoform disorders including emotional disorders with childhood onset; and behavioral disorders with childhood onset (World Health Organization, 1992).

In Denmark, psychiatric hospital wards are generally open and the locking of wards is registered as IT. All types of treatment are registered as IT if administered against the patient's wishes. IT measures were grouped as involuntary admission; detention; medication and electroconvulsive therapy; nasogastric tube feeding; IT for somatic illness; mechanical restraint including belt, straps and gloves; physical restraint; locked wards; constant observation; and sedative medication. These groupings were based on the registrations of IT in the Danish registers and similar to those used by Clausen et al. (2018) except for our additional inclusion of IT for somatic illness and electroconvulsive therapy together with medication. The latter two were grouped because of low frequency of electroconvulsive therapy. IT events for different measures were registered as separate events. An IT event was identified by either a unique start date or a unique registered time of the day on a specific start date. If start dates overlapped for same measure IT events, we only counted the event with the longest duration.

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Potential factors associated with subsequent IT extracted from registers included sex; age at the time of index admission; previous admissions (at least one) with psychiatric disorders (at least one) other than AN; previous admissions (at least one) with IT (for reasons other than AN) within 1 year before index admission; parental psychiatric disorders (at least one parent); parental substance use disorders (at least one parent); and low (both parents with less than 10 years of education), medium (at least one parent with 10–15 years of education), and high parental educational level (at least one parent with more than 15 years of education) used as a proxy for SES. Parental psychiatric disorders and parental substance use disorders were measured as lifetime diagnoses preceding index admission.

Data analysis

We used descriptive statistics including Wilcoxon–Mann–Whitney *U* test. We defined a group with high IT utilization as individuals at or above the 90th percentile of reported IT events over the 5 years. We estimated annual IT rates across the five study years and total 5-year rates, acknowledging that some patients can have several IT events during an admission spanning only a few days, whereas others can have several IT events across several admissions spanning a long period. We calculated mean rates of IT events in general and for specific IT measures. Associations between factors associated with subsequent IT and IT events presented as rate ratios were estimated using negative binomial regression. Logistic regression was used to estimate associations between factors associated with subsequent IT and receiving mechanical or physical restraint (yes/no for the two variables combined) over the 5-year period. Data management and analysis were conducted using Stata 16 software (Statacorp, 2019). To protect individuals' identity, any result representing fewer than five individuals was excluded.

Results

Patient characteristics

Table 1 shows study population characteristics. Additionally, among a total of 13431 admissions, the most frequent comorbid diagnoses at the index admission were neurotic, stress-related, and somatoform disorders (32.1% of patients with comorbidity); depression (32.1%); and personality disorders (24.7%). The most frequent disorders recorded for admissions before the index admission were neurotic, stress-related, and somatoform disorders (39.9% of patients with previous admissions); personality disorders (28.1%); depression (24.9%); and substance use disorders (24.9%). Conditions for patients with reported IT episodes before the index admission were schizophrenia spectrum disorders (57.4% of patients with previous IT); personality disorders (46.3%); neurotic, stress-related, and somatoform disorders (35.2%); and behavioral disorders with childhood onset (31.5%).

Of patients readmitted after the index AN admission, 42.0% were always readmitted with an AN diagnosis, 14.5% had AN registered at some but not all readmissions (mixed readmissions), and 13.1% had only other psychiatric disorders registered at subsequent admissions.

IT utilization patterns

IT was registered in 2004 out of the total 13431 admissions. No significant difference in mean age at index admission was found

Table 1. Patient characteristics

	N	%	Mean	SD
Total population	3297	100		
Patients with readmissions	2295	69.6		
Female patients	2979	90.4		
Age (years)				
At first AN diagnosis			19.5	7.3
At index admission			20.1	7.6
At first IT event			20.6	7.1
Diagnoses at index admission				
F50.0: Anorexia nervosa	1648	50.0		
F50.1: Atypical anorexia nervosa	326	9.9		
F50.8: Other eating disorders	201	6.1		
F50.9: Unspecified eating disorders	1122	34.0		
Comorbid diagnoses	1112	33.7		
Time from (days)				
First AN diagnosis to index admission			217.3	606.2
First AN diagnosis to first IT event			530.1	713.1
Index admission to first IT event			324.0	461.3
Patients with IT	550	16.7		
Female patients	508	15.4		
Within the first year	371	11.3		
Below the 90th percentile	495	15.0		
Above the 90th percentile	55	1.7		
Female patients	55	1.7		
Previous admissions				
Patients with psychiatric disorders other than AN	722	21.9		
Patients with IT within 1 year before index admission	54	1.6		
Patients with parental				
Psychiatric disorders	531	16.1		
Substance use disorders	200	6.1		
Low-educational level	441[a]	13.8[b]		
Medium-educational level	1598[a]	50.1[b]		
High-educational level	1150[a]	36.1[b]		
Lost to follow-up	196	5.9		
Due to death	121	3.7		
Due to emigration or inability to trace	75	2.3		

AN, anorexia nervosa (ICD-10: F50.0, F50.1, F50.8, F50.9); IT, involuntary treatment.
[a]Data on parental education was missing for 3.3% of the population.
[b]Out of 3198 patients.

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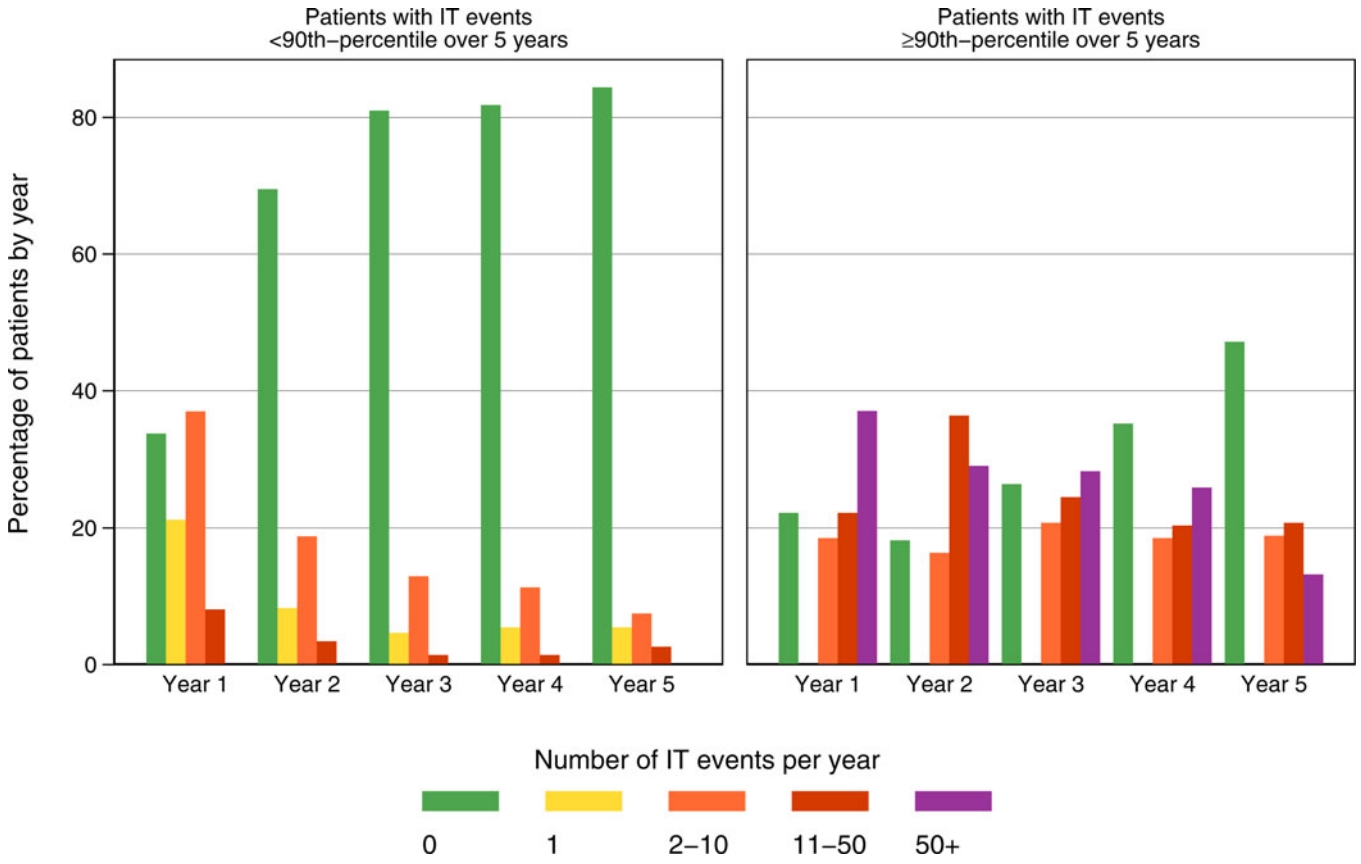

Fig. 1. Distribution of patients by yearly number of IT events and year of follow-up.

between patients with and without IT (19.6 ± 7.0 *v.* 20.2 ± 7.7, p = 0.11). During the 5-year follow-up period, patients with IT (n = 550) had a mean of 28.7 IT events, but the distribution was positively skewed. Of the total population 3.8% had only one IT event. Having 2–10 IT events was most common (7.9%), whereas 3.3% had 11–50 IT events, and 1.8% had more than 50 IT events. Of all patients, 2.2% only had IT events at the index admission. During the observation period, 7.6% (45.6% of the IT population) only had IT events at one admission. Conversely, 54.4% of the IT population had IT events across more than one admission. For patients with mixed readmissions, an AN diagnosis was registered in 59.0% of readmissions with IT.

Identification of the 55 patients at or above the 90th percentile for IT events yielded a cut-off of 57.5 IT events for the high utilization group. No significant difference in mean age at index admission was found between patients in the high utilization group and patients below the 90th percentile for IT events (18.0 ± 5.2 *v.* 19.8 ± 7.1, p = 0.25). A small percentage (1.0%) of the total population (n = 34) received more than 100 IT events each over the 5-year period and accounted for 67% of all IT events reported. Five patients (0.2%) each received more than 500 IT events and accounted for 28.5% of all IT events reported.

Figure 1 shows the distribution of patients by yearly number of IT events and year of follow-up for patients with IT below and at or above the 90th percentile. For the former, the percentage with 2–10 IT events decreased over the years, while the percentage with no IT increased. The percentages with either 1 IT event or 11–50 IT events were relatively constant after the first year. For the high utilization group, percentages with 11–50 IT events and more than 50 IT events tended to decrease after the first year of follow-up, while the percentage with no IT regularly increased after the first year. The percentage with 2–10 IT events remained relatively constant over the years. Table 2 shows mean IT rates for the total population and patients with IT below and at or above the 90th percentile. The yearly rates were highest in the early observation period, particularly in the first year of follow-up for patients below the 90th percentile for IT events and the second year of follow-up for the high utilization group, and then tended to decrease. Among the specific IT measures, the highest rates for the 5-year follow-up period were found for mechanical restraint, physical restraint, and constant observation in the high utilization group and physical restraint, mechanical restraint, and detention in patients below the 90th percentile.

The most common IT measures for patients with only one IT event were detention, involuntary admission, physical restraint, and tube feeding. In general, 72.8% of patients with either involuntary admission or detention (combining the two variables) also received other IT measures.

Factors associated with subsequent IT utilization

Potential factors associated with subsequent increased 5-year IT rates were explored in the total population and the IT population (see Table 3). In both, female sex and lower age at first admission were associated with an increased IT rate. In the total population, previous admissions with a psychiatric disorder other than AN and previous admissions with IT were associated with an increased IT rate. Restricting the analysis to patients with IT,

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Table 2. Mean rates of IT

	Total population ($n = 3297$)		Patients with IT <90th P ($n = 495$)		Patients with IT ⩾90th P ($n = 55$)	
Years of follow-up	Mean rate	95% CI	Mean rate	95% CI	Mean rate	95% CI
1	1.29	0.97–1.72	3.26	2.62–4.07	47.98	28.93–79.57
2	1.54	1.15–2.06	1.42	1.13–1.78	79.51	47.97–131.77
3	0.73	0.54–0.97	0.85	0.67–1.08	35.89	21.63–59.55
4	0.77	0.58–1.03	0.79	0.63–1.00	39.07	23.55–64.81
5	0.46	0.35–0.62	1.01	0.80–1.27	18.67	11.23–31.03
Mean 5-year rate	4.79	4.01–5.73	7.34	6.68–8.05	221.13	177.99–274.71
IT measure	Mean 5-year rate	95% CI	Mean 5-year rate	95% CI	Mean 5-year rate	95% CI
Admission	0.22	0.17–0.28	0.72	0.59–0.88	6.64	4.64–9.49
Detention	0.33	0.26–0.42	1.37	1.14–1.64	7.47	5.24–10.66
Medication + ECT	0.05	0.04–0.07	0.14	0.10–0.18	1.82	1.23–2.70
NGT	0.11	0.09–0.14	0.49	0.40–0.61	2.13	1.44–3.13
IT for somatic illness	0.05	0.04–0.07	0.12	0.09–0.16	2.13	1.44–3.13
Mechanical restraint	2.01	1.59–2.53	1.36	1.14–1.63	107.98	76.62–152.19
Physical restraint	0.96	0.76–1.22	1.81	1.52–2.16	41.29	29.25–58.28
Locked wards	0.12	0.09–0.15	0.45	0.36–0.55	3.15	2.17–4.57
Constant observation	0.92	0.73–1.16	0.79	0.65–0.95	48.07	34.07–67.83
Sedative medication	0.02	0.01–0.03	0.08	0.06–0.12	0.45	0.27–0.76

IT, involuntary treatment; P, percentile; ECT, electroconvulsive therapy; NGT, nasogastric tube feeding.

Table 3. Regression analysis for subsequent IT events

	Total population ($n = 3297$)			Patients with IT ($n = 550$)		
Variable	RR	95% CI	p value	RR	95% CI	p value
Female sex	3.32	1.62–6.80	0.001*	3.15	1.82–5.44	<0.001*
Age (continuous from index admission)	0.94	0.91–0.97	<0.001*	0.96	0.94–0.98	<0.001*
Previous admissions						
No psychiatric disorders (or previous admissions)	1 (ref.)					
Psychiatric disorders other than AN	2.20	1.40–3.46	0.001*	1.25	0.91–1.71	0.161
No IT within 1 year before the index admission	1 (ref.)					
IT within 1 year before the index admission	4.44	1.05–18.81	0.043*	1.39	0.77–2.50	0.275
Parental						
Absence of psychiatric disorders	1 (ref.)					
Psychiatric disorders	0.75	0.40–1.40	0.364	0.58	0.38–0.90	0.015*
Absence of substance use disorders	1 (ref.)					
Substance use disorders	1.75	0.74–4.17	0.203	1.59	0.89–2.84	0.116
Low-educational level	1 (ref.)					
Medium-educational level	0.74	0.40–1.38	0.349	0.43	0.27–0.70	0.001*
High-educational level	1.00	0.50–1.98	0.989	0.68	0.40–1.16	0.161
Calendar year	1.03	0.98–1.08	0.307	1.02	0.98–1.06	0.282

IT, involuntary treatment; RR, rate ratio; AN, anorexia nervosa (ICD-10: F50.0, F50.1, F50.8, F50.9).
*$p < 0.05$.

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Table 4. Regression analysis for subsequent mechanical and physical restraint

	Total population ($n = 3297$)			Patients with IT ($n = 550$)		
Variable	OR	95% CI	*p* value	OR	95% CI	*p* value
Female gender	1.47	0.96–2.25	0.076	0.81	0.41–1.61	0.552
Age (continuous from index admission)	0.95	0.93–0.97	<0.001*	0.94	0.91–0.97	<0.001*
Previous admissions						
No psychiatric disorders (or previous admissions)	1 (ref.)					
Psychiatric disorders other than AN	2.78	2.10–3.68	<0.001*	1.96	1.26–3.05	0.003*
No IT within 1 year before the index admission	1 (ref.)					
IT within 1 year before the index admission	5.51	3.00–10.11	<0.001*	1.66	0.68–4.06	0.269
Parental						
Absence of psychiatric disorders	1 (ref.)					
Psychiatric disorders	1.09	0.78–1.52	0.619	0.99	0.58–1.67	0.962
Absence of substance use disorders	1 (ref.)					
Substance use disorders	1.40	0.87–2.27	0.167	1.79	0.80–4.04	0.157
Low-educational level	1 (ref.)					
Medium-educational level	1.46	0.99–2.15	0.057	0.87	0.45–1.66	0.669
High-educational level	1.21	0.80–1.83	0.359	0.70	0.35–1.39	0.313
Calendar year	1.01	0.98–1.05	0.545	1.01	0.96–1.07	0.647

IT, involuntary treatment; OR, odds ratio; AN, anorexia nervosa (ICD-10: F50.0, F50.1, F50.8, F50.9).
*$p < 0.05$.

presence compared with absence of parental psychiatric disorders was associated with a lower IT rate, as was having parents with medium compared with low educational level. In the total population, postestimation comparison of a patient with an identical patient 10 years younger (i.e. all other variables were held constant) showed a lower rate ratio of 0.53 [95% confidence interval (CI) 0.39–0.71, $p < 0.001$]. In the IT population, this rate ratio was 0.65 (95% CI 0.52–0.82, $p < 0.001$).

Exploration of factors associated with subsequent mechanical or physical restraint in the total population and the IT population (see Table 4) showed that lower age at first admission and previous admissions with a psychiatric disorder other than AN were associated with increased odds of restraint in both populations. Additionally, in the total population, IT before index admission was also associated with increased odds of restraint. In the total population, comparison of a patient with an identical patient 10 years younger (i.e. again all other variables were held constant) showed a lower odds ratio (OR) of 0.58 (95% CI 0.48–0.70, $p < 0.001$). In the IT population, this OR was 0.55 (95% CI 0.41–0.74, $p < 0.001$).

Post hoc replication of regression analyses including only patients with a lifetime F50.0 or F50.1 diagnosis (at least one) until the end of follow-up ($n = 2421$) showed that female sex (rate ratio = 2.58, 95% CI 1.11–6.01, $p = 0.028$), lower age at first admission (rate ratio = 0.94, 95% CI 0.91–0.97, $p < 0.001$), and previous admissions with IT (rate ratio = 7.47, 95% CI 1.14–49.03, $p = 0.036$) were associated with an increased IT rate. In the subsample with IT ($n = 460$) female sex (rate ratio = 3.27, 95% CI 1.80–5.93, $p < 0.001$), lower age at first admission (rate ratio = 0.97, 95% CI 0.94–0.99, $p = 0.010$), and previous admissions with IT (rate ratio = 2.54, 95% CI 1.19–5.39, $p = 0.015$) were associated with an increased IT rate. Moreover, exploration of factors associated with subsequent mechanical or physical restraint in the sample with lifetime F50.0 or F50.1 showed that lower age at first admission (OR = 0.94, 95% CI 0.91–0.96, $p < 0.001$), previous admissions with IT (OR = 7.04, 95% CI 2.94–16.85, $p < 0.001$), and previous admissions with a psychiatric disorder other than AN (OR = 2.88, 95% CI 2.08–3.98, $p < 0.001$) were associated with increased odds of restraint. In the subsample with IT lower age at first admission (OR = 0.93, 95% CI 0.90–0.96, $p < 0.001$) and previous admissions with a psychiatric disorder other than AN (OR = 1.98, 95% CI 1.19–3.27, $p = 0.008$) were associated with increased odds of restraint.

Discussion

IT utilization patterns

The present study is one of the first to explore utilization of many IT events. It shows that, for patients with IT, receiving more than one IT event and IT across more than one admission was most common. Most patients with involuntary admission or detention had other IT measures. This adds legitimacy to studies treating involuntary admission as an indirect measure of other IT measures (Sashidharan, Mezzina, & Puras, 2019). However, in patients with only one IT event, utilization of IT measures other than involuntary admission and detention was also common. The high utilization group had more than 57.5 IT events each; 1% of the population accounted for 67% of all IT events. This echoes findings in a Norwegian study reporting that a small subsample of patients accounted for most of the physical restraint in patients with AN (Blikshavn et al., 2020).

We found a temporal distribution of IT, peaking in the initial few years of the observation period, especially the second year of

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follow-up for the group with high IT utilization. The percentage of patients with no IT regularly increased over the 5 years, while high-frequency IT decreased. We also found that mechanical restraint and physical restraint were the most frequent IT measures. The high 5-year rate of mechanical restraint and physical restraint is concerning and clinically important due to patients describing restraint as particularly distressing (Akther et al., 2019; Seed et al., 2016a, 2016b; Tingleff et al., 2017).

Factors associated with subsequent IT utilization

The present study is to the best of our knowledge the first to explore factors associated with subsequent increased IT event rates and restraint in patients with AN. It shows that female sex was associated with an increased IT rate and that patients had a decreasing IT rate with age. Previous studies have found no effect of sex (Clausen et al., 2018; Watson et al., 2000), and it may likely have been difficult to examine in many studies due to small proportions of male participants. The clinical relevance may be limited since most patients with AN are women; however, the lower rates of IT in males is notable.

Onset age has previously been both positively (Clausen et al., 2018) and negatively (Ayton, Keen, & Lask, 2009; Zohar-Beja et al., 2015) associated with IT in AN and no clear association between age at admission and IT has been found (Carney, Crim, Wakefield, Tait, & Touyz, 2006; Griffiths et al., 1997; Ramsay et al., 1999; Watson et al., 2000). We found that lower age at first admission with AN was associated with subsequent increased IT rates. Some speculative reasons for this association could be that staff persist more with treatment for adolescents than for adults and resort to IT because both they and adolescents' parents are more worried when patients are young. Another reason could be a high conflict level between adolescents and parents complicating treatment to such a degree that IT is used.

Previous admissions with a psychiatric disorder other than AN were associated with a subsequent increased IT rate in the total population, highlighting the importance of lifetime comorbidity for IT, which is in accordance with previous findings (Clausen et al., 2018). The result was, however, not confirmed in post hoc analysis for patients with a lifetime F50.0 or F50.1 diagnosis. The result that IT related to previous admissions was also associated with a subsequent increased IT rate for the total population indicates that an IT event is often followed by other events. Moreover, post hoc analyses for the patients with lifetime F50.0 or F50.1 confirmed the association, also in the subsample with IT. We also found several IT events both within and across admissions. A qualitative study suggests that IT breeds IT (Seed et al., 2016a), and this might be a hypothesis worth testing in future research.

In the IT population, parental psychiatric disorders and medium parental educational level were both associated with subsequent decreased IT rates. These findings are contradictory and complex. The reason for patients with parental psychiatric disorders having decreased IT rates is unknown. Low parental education was associated with higher IT rates than medium-educational level. Having parents with a low educational level may indicate a more challenged background and a more generally complex life situation. However, higher SES measured using fathers' occupation has been found to be positively associated with IT in AN in a study with a rather small sample size (Griffiths et al., 1997), whereas patients with IT have been found to have lower SES measured by employment status (Di Lodovico et al., 2021). Nevertheless, the two results indicate that social setting influences IT in complex ways that require further explication. On the contrary, their importance to IT in AN may be limited as the results regarding parental psychiatric disorders and medium parental educational level were not confirmed in post hoc analysis including only patients with IT and lifetime F50.0 or F50.1.

Our study showed that lower age at first admission and previous admissions with a psychiatric disorder other than AN were associated with subsequent mechanical or physical restraint, whereas female sex was not. This contrasts with the results of the regression analysis for subsequent IT events (Table 3). Indeed, a study of inpatients with psychiatric disorders found male sex to be a risk factor for IT and restraint (Thomsen et al., 2017), and male patients receiving more restraint than female patients could explain the disappearance of the sex difference when restraint is the outcome instead of IT events. In the total population, IT before index admission was also associated with restraint, further supporting our notion that one IT event is often followed by others. Moreover, these results were confirmed in post hoc analyses for the patients with lifetime F50.0 or F50.1.

Advantages and limitations

A main strength was that Danish registers made it possible to explore rare patients with many IT events. It also reduced selection bias, recall bias, and under-detection of IT, since in Denmark there is no IT for AN outside the hospitals.

A limitation was the inclusion of the diagnoses F50.8 and F50.9, which reduces the validity for the group of patients labeled as having AN, making the group more heterogeneous. However, we intentionally included these diagnoses because, among other uses, they are registered at inpatient admissions due to AN but without prior psychiatric assessment at the reporting hospital. A post hoc analysis showed that 7.1% of the total population have their first outpatient or inpatient hospital contact with F50.0 or F50.1 not at index admission, but in the period after the index admission and until the end of follow-up. Moreover, post hoc analyses discussed above, excluding patients without a lifetime F50.0 or F50.1 diagnosis, confirmed that the influence of the heterogeneity was limited. In these analyses we allowed ourselves to move forward in time, i.e. from the start of the follow-up period until the end of follow-up, because we knew patients may receive an initial diagnosis of F50.8 or F50.9 at first admission if they do not yet have a thorough assessment at the hospital.

Data management choices that may have affected the results were necessary because the Registry of Coercive Measures in Psychiatric Treatment (Sundhedsdatastyrelsen, 2020) had duplicate and overlapping registrations, and showed apparent differences in registration practices. Accordingly, we counted only one event in cases with nasogastric tube feeding or medication that were typically registered for a long time period, such as weeks or months, and could include either few or multiple IT events. This may explain why we did not confirm previous results that these specific IT measures were among the most frequent (Clausen et al., 2018).

Until June 2015, treatment under parental guardianship without the consent of patients below the age of 15 was not consistently registered in the Registry of Coercive Measures in Psychiatric Treatment. Hence, we could have fewer children and early adolescents with IT in our study, influencing the results.

We cannot know if any IT measures other than nasogastric tube feeding were administered in connection with AN, another

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diagnosis registered at admission, or an interplay between comorbid diagnoses. Obviously, they were not connected to AN at readmissions for patients with only other psychiatric disorders registered; however, they may be connected to AN in many of the cases where patients with mixed readmissions underwent IT. Finally, our results may not generalize entirely to other countries due to international differences in IT practices and legislation (Bak & Aggernæs, 2012).

Overall, the present study shows that IT event utilization peaks in the initial few years starting at or following the first admission with AN registered. Additionally, a small percentage of patients accounted for the majority of IT events. The high utilization of IT in a small percentage of individuals with AN is concerning and may lead to adverse treatment experiences. Indeed, clinical experience suggests that recurrent treatment efforts including IT measures can traumatize patients with AN (Wonderlich, Bulik, Schmidt, Steiger, & Hoek, 2020). However, further research on IT considering patients and their families' experience is needed. Ongoing worldwide societal efforts are underway to reduce IT (DeLacy et al., 2003; Finansministeriet, 2013; Gooding, McSherry, & Roper, 2020; National Mental Health Commission, 2012; Puras, 2017), and we are all obliged to explore ways of decreasing this intrusive and controversial treatment. Our results regarding the temporal distribution of IT point to the importance of early interventions as IT utilization peaked early on, and young age and previous IT were associated with subsequent IT. Hence, exploring alternative approaches to treatment that reduce the need for IT should be an important focus for future research. Indeed, special efforts tailored to reducing IT for patients at risk of high IT utilization are relevant. Helping clinicians identify patients at risk of IT events renders early preventive interventions possible. The most clinically important and early factor associated with subsequent IT utilization seems to be previous admissions due to other psychiatric disorders. Female sex and lower age were also statistically significant, although less clinically useful because these factors reflect the majority of patients. Future research on the importance of more personal, symptom-specific, and systemic risk factors is needed if we are to succeed in decreasing and understanding cases with high IT utilization.

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Conflict of interest. Dr Bulik reports: Shire (grant recipient, Scientific Advisory Board member); Idorsia (consultant); and Pearson (author, royalty recipient). Mr Mac Donald, Mr Carlsen, and Drs. Larsen, Clausen, and Petersen report no financial relationships with commercial interests.

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