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Causes of death in patients with a history of severe anorexia nervosa

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Abstract

Objective: This study reports causes of death for a cohort of 35 patients with severe anorexia nervosa (AN), who were treated between 2012 and 2020, and descriptive information on their medical and psychological comorbidities is provided.

Methods: Three hundred and seventy patient names were submitted to the National Death Index (NDI). The NDI reviewed whether a death certificate matching each patient's identifying information existed, and if it existed, specific causes of death were noted. The original group of 370 patients consisted of 229 individuals who had been treated voluntarily and 141 who had been treated involuntarily.

Results: Thirty-five patients, from the 370 (9.4%) submitted to the NDI, with an initial diagnosis of AN, were confirmed deceased. Most (83%) were female with an average age of 38.5 years (SD:12.7) and average body mass index (BMI) of 12.8 kg/m^2 (SD:2.4). The total number of patients, with AN listed as a cause of death, was 24 (69%). Two patients died as a result of suicide. Twenty-eight (80%) of the patients had a specific medical disease listed as a cause of death, with the most frequent being cardiovascular, metabolic, or gastrointestinal.

Conclusions: AN is associated with a substantial risk of death from many medical causes. However, two (5.7%) of our sample died by suicide, a rate considerably lower than previously reported.

Keywords: Death, Severe anorexia nervosa, National Death Index (NDI), Suicide

Plain English summary

This is a study reporting on causes of death in a cohort of 35 patients with severe anorexia nervosa (AN), who were treated between 2012 and 2020. Three hundred and seventy patient names were submitted to the National Death Index (NDI). The NDI reviewed whether a death certificate matching each patient's identifying information existed, and if it existed, specific causes of death were noted. The original group of 370 patients consisted of 229 individuals who had been treated voluntarily and 141 who had been treated involuntarily. Thirty-five of the 370 patients (9.4%) submitted to the NDI were confirmed deceased. Eighty-three percent were female with an average age of 38.5 years (SD:12.7) and average body mass index (BMI) of 12.8 kg/m^2 (SD:2.4). The total number of patients with AN listed as a cause of death was 24 (69%). Twenty-eight (80%) of the patients had a specific medical disease listed as a cause of death, with the most frequent being cardiovascular, metabolic, or gastrointestinal. Two patients died as a result of

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suicide. We concluded that AN is associated with a substantial risk of death from many medical causes. However, two (5.7%) of our sample died by suicide, a rate considerably lower than previously reported.

Introduction and aims

Anorexia Nervosa (AN) has long had the distinction of having one of the highest mortality rates of any psychiatric disorder, with more than 5% of patients dying within four years of initial diagnosis [1]. The teaching has been espoused that about half of the deaths in AN are attributable to suicide with the remaining causes of death in these patients being related to medical complications as a result of their eating disorder [2]. "Sudden cardiac death" has been the medical term often cited to explain premature death in patients with AN [3]. However, in over two decades, there has not been a large United States study of patients with AN that provides mortality data based on death certificates generated from a National Death Index (NDI) search. This would be of value because new information on causes of death can be used to inform prevention and treatment strategies and to improve outcomes for an illness that continues to have a high risk of relapse as well as cause excess mortality risk in a relatively young patient population [4, 5]. The aim of the current study is to add to the existing knowledge, about mortality in AN, by seeking definitive index-based mortality data from a recent cohort of inpatients with severe AN.

Methods

Treatment

Patients were treated for severe AN, defined here as adult patients with a Body Mass Index (BMI) < 15 kg/m^2 (mean BMI on admission of this cohort was 12.8 kg/m^2), at the ACUTE Center for Eating Disorders at Denver Health (ACUTE) before stepping down, once medically stable, to Eating Recovery Center (ERC), both located in the state of Colorado in the United States. ACUTE is a hospital-based medical stabilization unit that specializes in the treatment of patients with severe forms of eating disorders (EDs). ERC is an eating disorder treatment facility offering inpatient, residential and partial hospitalization levels of care. ACUTE patients, who were discharged to ERC once they were deemed medically stable, typically at a BMI of 14–15 kg/m^2, are the subject in this study.

Procedure

The names of a total of 370 patients treated at ACUTE, and then directly transferred to ERC between April 1, 2012, and December 31, 2020, were submitted to the National Death Index (NDI) at the United States Center for Disease Control (CDC). The NDI reviewed whether a death certificate matching each patient's identifying information existed. The cohort of 370 patients consisted of 229 individuals who had been treated voluntarily at ACUTE and ERC, and 141 patients treated involuntarily at ACUTE and/or ERC under Colorado (CO)'s involuntary treatment statute (C.R.S 27–65). Under CO law, the latter are initially placed on a 72-h involuntary mental health hold at ACUTE or ERC. During that 72-h period, psychiatrists may make an application to the Denver Probate Court for a 90-day short term certification of the patient to involuntary treatment, based on grave disability and danger to self or others, and a court hearing is scheduled. Many patients waive their right to a hearing. If the certification is approved, the patient then receives involuntary treatment at ACUTE or ERC for up to 90 days. Their status is assessed on a continuous basis, and at the earliest time the patient no longer meets criteria for certification, the treating psychiatrist petitions the court, requesting that the court terminate the certification.

The study was evaluated and approved by the Colorado Multiple Institutional Review Board. In addition, an exempt review was provided by Sterling Institutional Review Board for the transmission of these data to the NDI for research purposes. The details of the cohort were uploaded to the NDI by a secure file transfer protocol (sFTP) process, where the NDI ran a search of United States death certificates on file for the years 2012 to 2020. Results were returned to ERC by sFTP for review of the death certificate information on file, and confirmation of matches to the data submitted. On review, 35 patients, from the 370 submitted to the NDI, were confirmed as deceased and are the patients included in this series.

Once the cohort was received from the CDC, manual chart review was completed at both ACUTE and ERC to obtain demographic and anthropometric variables most proximate to time of death. Additionally, causes of death were analyzed and grouped based on body systems by the senior author, an internal medicine physician. AN subtype and psychological comorbidities had been determined during a clinical interview by a psychologist or psychiatrist, on an ongoing basis during their admission, using DSM 5 criteria [6].

Statistical analyses

Variables of interest were assessed for normality using the Shapiro–Wilk test. Continuous variables were described using means (M) and standard deviations (SD) or medians and interquartile ranges (IQR) based on normality.

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Length of stay was calculated by adding the number of days the patient spent at ACUTE and the number of days at ERC. To assess differences in these variables between the voluntary and involuntary cohorts, unpaired *t*-tests or Mann–Whitney *U* tests were performed. P values of < 0.05 were considered statistically significant, and all analyses were completed using SAS Enterprise Guide software version 7.1 (SAS Institute, Cary, NC).

Results

The majority of the cohort were female gender at birth (83%), and all were white, aside from one individual who was Native American. Of those 35 individuals, 10 (29%) were mandated into treatment and 25 (71%) voluntarily transferred into treatment at ERC. This cohort of 35 patients had a median duration of illness of 16 years (IQR 6–24; Range 1–49). The median number of days between the patient's index treatment and their death was 390 days (IQR 208–1,218; Range 32–2584). The median days from the last residential stay at ERC, to death for involuntary patients was 273 days (IQR 135–650) and for the voluntary patients it was 499 days (IQR 222–1,218). There was no significant difference in the number of days, from the last ERC treatment to death, between the voluntary and involuntary group ($p = 0.39$). During their treatment at ACUTE, the average age of the patients was 38.5 years (SD: 12.7; Range 20–64), the median length of their medical hospitalization was 18 days (IQR 14–28; Range 4–83), the average BMI on admission, was 12.8 kg/m^2 (SD: 2.4) and the average percent expected body weight (EBW) was 61.4% (SD: 10.9). The last recorded BMI and %IBW at the conclusion of the treatment at ERC was 17.9 kg/m^2 (SD:2.0) and 84.1% (SD:9.2) respectively. There were no significant differences in age, days of hospitalization, admission BMI to ACUTE or discharge BMI from ERC between the voluntary and involuntary cohorts (all *p*'s > 0.05) (Table 1).

Sixty-nine percent of the individuals were diagnosed with AN-R and 31% were diagnosed with AN-BP during their ACUTE and ERC treatments. On their death certificates, six of the involuntary patients (60%) had AN listed as their primary cause of death and 15 of the voluntary patients (43%) had AN listed as their primary cause of death. One additional voluntary and two additional involuntary patients had AN listed as a secondary cause of death. The total number of patients with AN listed as a cause of death was 24 (69%). Fifty-eight percent of deceased patients with AN-R had AN listed as a cause of death and 29% of deceased patients with AN-BP had AN listed as a cause of death. One voluntary patient was a homicide victim. One patient in each cohort (voluntary vs involuntary) died because of

suicide (hanging); that is, two of the 35 deaths, or 5.7% of the deaths, were suicide (Table 1). When these two suicide deaths are viewed as a proportion of the overall original study sample of 370 patients in our study the figure is 0.54%, which translated to the usual epidemiologic metric (i.e., number of deaths per 100,000 per year), equates to 67.5 suicides per 100,000 people per year.

Twenty-eight of the thirty-five patients (80%) had a comorbid medical disease listed as a cause of death, and seven did not. Medically, nine patients, (25.7%) (7 voluntary, 2 involuntary) died of a cardiovascular cause; eight, (22.8%) (7 voluntary, 1 involuntary) died of a gastrointestinal cause; ten, (28.5%) of an infection (9 involuntary, 1 involuntary); ten, (28.5%) (7 voluntary, 3 involuntary) of a metabolic cause; and five, (14.3%) (4 voluntary and 1 involuntary) of a pulmonary cause. Some deceased patients had more than a single medical cause of death listed. For AN-R patients, the top three causes of death were AN, followed by infections and gastrointestinal causes. For the patients with AN-BP, the top three causes were also AN, followed by metabolic and cardiovascular causes of death. Other miscellaneous causes of death included severe osteoporosis, end-stage renal disease, skull fracture, Huntington's Chorea, multiple sclerosis and scleroderma. Four patients had substance abuse listed as a cause of death, three in the AN-R subtypes and one in the AN-BP subtype.

Of the cardiovascular causes of death, congestive heart failure and tachyarrhythmias accounted for 55% of these deaths; of the gastrointestinal causes of death, liver cirrhosis accounted for 50% of the deaths; pneumonia accounted for 60% of the infectious disease causes of death; hypoglycemia and hypokalemia each accounted for 40% of the metabolic causes of death; and pulmonary embolism accounted for 80% of the pulmonary causes of death.

Psychiatrically, of the 35 patients who had died, 27 (77.1%) had at least one comorbid psychiatric or provisional psychiatric diagnosis (Table 1) on admission, in addition to their diagnosis of AN. For these 27 patients, a diagnosis of generalized anxiety disorder (GAD) was the most prevalent, with 18 patients (66.7%) receiving this diagnosis. Thirteen (48.1%) received a diagnosis of an affective disorder, with ten (76.9%) of the 13 being given a diagnosis of major depressive disorder (MDD), unspecified depressive disorder, or dysthymic disorder, and three (23.1%) of the 13 being given a diagnosis of bipolar disorder. Fifteen patients (42.9%) had more than one comorbid psychiatric diagnosis. Table 2 outlines the medical and psychological characteristics of the cohort.

Table 1 Patient demographics and causes of death for the whole cohort and a subset of the voluntarily and involuntarily treated cohorts (N = 35)

	Whole cohort (n = 35)	Voluntarily treated (n = 25)	Involuntarily treated (n = 10)	*t*-test	*p* value
	Mean (SD)	Mean (SD)	Mean (SD)		
Demographic parameters					
Age at death (yrs)	41.1 (13.2)	41.8 (14.4)	39.5 (10.4)	0.46	0.65
Age at ACUTE admission (yrs)	38.5 (12.7)	39.3 (13.8)	36.6 (9.7)	0.56	0.58
BMI (kg/m^2) at ACUTE admission	12.8 (2.4)	13.1 (2.6)	12.3 (1.9)	0.84	0.41
BMI (kg/m^2) at ERC discharge	17.9 (2.0)	18.2 (1.8)	17.0 (2.3)	1.62	0.12
LOS for ACUTE and ERC treatment (days)[a]	75 (48–105)	63 (48–105)	90 (55–103)	187[b]	0.81
Duration of illness (yrs)[a]	16 (6–24)	16 (6–25)	16 (5–23)	168[b]	0.38
	n (%)	**n (%)**	**n (%)**		
Causes of Death					
Mental Health					
AN/Malnutrition	21 (60)	15 (43)	6 (17)		
Suicide	2 (5.7)	1 (3)	1 (3)		
Substance Use	4 (11)	2 (5.7)	2 (5.7)		
Additional Medical Causes					
Cardiovascular	9 (26)	7 (20)	2 (5.7)		
Gastrointestinal	8 (23)	7 (20)	1 (3)		
Infection	10 (29)	9 (28)	1 (3)		
Metabolic	10 (29)	7 (20)	3 (9)		
Pulmonary	5 (14)	4 (11)	1 (3)		
Other Causes					
Homicide	1 (3)	1 (3)	0		
Severe Osteoporosis	1 (3)	0	1 (3)		
End-stage Renal Disease	1 (3)	1 (3)	0		
Skull fracture	1 (3)	1 (3)	0		
Huntington's Chorea	1 (3)	1 (3)	0		
Multiple Sclerosis	1 (3)	1 (3)	0		
Scleroderma	1 (3)	1 (3)	0		

BMI, body mass index; LOS, length of stay; AN, anorexia nervosa

[a] Median and Interquartile Range

[b] Mann-Whitney *U* test statistic

Discussion

This United States study of patients with severe AN, who had died within eight years after an initial admission to a hospital unit that is highly specialized to treat patients with severe medical instability, demonstrated unique and interesting results from several perspectives. It is the first such study wherein all patients initially entered the study period after an admission to a hospital inpatient medical stabilization unit due to their severe state of AN as defined by a BMI < 15 kg/m^2 and resultant medical complications. Moreover, this is also the first such study which includes a subset of patients who were then court ordered into ongoing ED treatment. Given the severity of medical problems at initial presentation in these patients, it is notable that their deaths ultimately were mostly caused by a medical issue. This study is also notable with regard to the number of deaths due to suicide; only two of the 35 deaths (5.7%), and these same two suicide deaths out of the original sample of 370 patients equated to 0.54% of all patients. In the general US population, 1.7% of all deaths are suicides. Thus, in our sample, suicide deaths were over-represented among deaths in general by a factor of over 3. The overall suicide rate in the general US population is 13.48 per 100,000 people per year. Among the 370 patients in our sample, in whom the corresponding figure was 540.5 per 100,000 over the course of 8 years, or 67.5 per 100,000 per year, the

Table 2 Medical and psychological characteristics of the cohort (N = 35)

ID	Mandated to treatment	Sex at Birth	BMI (kg/m²) at ACUTE admission	Age at ACUTE admission	Age at Death	Duration of AN (yrs)	AN Subtype during treatment	Days since last ERC treatment	BMI (kg/m²) at ERC discharge	Total LOS in Treatment (days)	Comorbid psychiatric diagnoses (excluding ED)	Medical comorbidities at death
1	No	M	10.8	20	22	10	AN-BP	646	18.6	105	MDD, GAD, OCD	None listed
2	Yes	F	8.5	36	37	23	AN-R	119	14.3	95	None listed	Severe osteoporosis
3	No	F	13.9	43	50	25	AN-BP	906	18.8	99	GAD	Cavitary lung disease, pneumonia-klebs
4	Yes	F	14.8	47	49	3	AN-R	570	19.0	103	Bipolar disorder II	Pancreatitis
5	No	F	10.7	32	34	8	AN-R	390	19.5	100	GAD	None listed
6	Yes	F	13.1	31	37	24	AN-BP	117	17.5	136	MDD, GAD, OCD	Supraventricular tachycardia
7	No	F	14.2	35	35	22	AN-R	39	18.0	41	GAD, alcohol related disorders	Pulmonary embolism, cirrhosis, hemoperitoneum, ESRD
8	No	F	11.9	61	62	47	AN-R	2062	18.7	142	GAD	Congestive heart failure, pulmonary embolism, bronchiectasis, cecal volvulus
9	Yes	F	13.1	53	54	3	AN-R	218	19.1	89	None listed	None listed
10	No	F	11.0	37	38	21	AN-R	374	14.5	54	None listed	Multiple fractures, skull fracture
11	No	F	9.8	23	24	6	AN-R	156	20.4	162	GAD, social anxiety	Pneumonia, sepsis
12	No	F	9.9	64	64	9	AN-R	1096	17.2	54	GAD, unspecified depressive disorder	Pericardial effusion, hypoglycemia, cardiac arrest-arrhythmia
13	No	M	14.2	59	64	1	AN-R	1784	17.4	57	None listed	HIV, cirrhosis
14	No	M	16.6	25	26	6	AN-R	282	19.5	59	GAD	None listed
15	No	F	14.8	38	38	2	AN-R	32	17.0	63	R/O GAD	Multiple sclerosis, Huntington's disease

Table 2 (continued)

ID	Mandated to treatment	Sex at Birth	BMI (kg/m²) at ACUTE admission	Age at ACUTE admission	Age at Death	Duration of AN (yrs)	AN Subtype during treatment	Days since last ERC treatment	BMI (kg/m²) at ERC discharge	Total LOS in Treatment (days)	Comorbid psychiatric diagnoses (excluding ED)	Medical comorbidities at death
16	Yes	F	12.9	33	38	15	AN-R	1583	13.4	37	MDD, GAD, OCD	PICC line infection
17	No	F	12.3	40	41	25	AN-R	328	16.3	58	OCD	Congestive heart failure, hypoglycemia
18	No	F	12.5	42	47	23	AN-R	1550	16.0	102	MDD, GAD	Prolonged QT, pneumonia, scleroderma
19	No	F	14.9	50	54	36	AN-BP	1450	18.4	48	None listed	Pneumonia, sepsis, adrenal insufficiency, bowel necrosis
20	No	F	12.9	33	34	17	AN-BP	499	18.3	68	None listed	Benzodiazepine abuse, CRD
21	No	F	10.6	20	24	4	AN-R	1207	17.0	89	Unspecified anxiety disorder, unspecified depressive disorder, OCD, PTSD	Lyme disease, SZ
22	Yes	F	10.9	30	32	16	AN-R	295	18.1	141	GAD, OCD	Bradycardia, hypoglycemia
23	No	F	14.2	36	38	21	AN-BP	744	16.1	22	Alcoholism	Hypokalemia
24	No	M	13.8	23	27	8	AN-BP	358	22.5	170	Bipolar disorder II	Lung abscess, hypokalemia, metabolic alkalosis
25	Yes	F	12.9	30	31	19	AN-R	251	14.8	26	None listed	Pulmonary embolism, hypoglycemia, hypokalemia, ETOH, substance abuse
26	Yes	F	14.4	31	34	10	AN-BP	650	20.4	55	GAD, Other specified depressive disorder	None listed

Table 2 (continued)

ID	Mandated to treatment	Sex at Birth	BMI (kg/m²) at ACUTE admission	Age at ACUTE admission	Age at Death	Duration of AN (yrs)	AN Subtype during treatment	Days since last ERC treatment	BMI (kg/ m²) at ERC discharge	Total LOS in Treatment (days)	Comorbid psychiatric diagnoses (excluding ED)	Medical comorbidities at death
27	No	M	17.8	37	41	5	AN-R	1332	19.8	32	Opioid use disorder, Other specified trauma and stressor related disorder, Alcohol use disorder	Sepsis, cirrhosis
28	No	F	18.2	32	35	16	AN-R	222	21.3	40	MDD, GAD, PTSD, R/O somatic symptom disorder	Cardiac arrest, pulmonary embolism
29	Yes	F	11.1	25	26	5	AN-BP	135	17.9	75	OCD, ADHD, learning disability	Hypophosphatemia, Multidrug use
30	No	F	9.7	25	26	11	AN-R	179	17.2	150	Anxiety disorder NOS	Mucormycosis, cirrhosis
31	No	F	17.0	53	56	41	AN-BP	1218	19.8	24	GAD, Bipolar disorder II	Supraventricular tachycardia
32	Yes	F	11.2	50	57	30	AN-R	2584	15.9	91	Dysthymic disorder, GAD	None listed
33	No	F	8.6	34	35	4	AN-BP	200	18.1	107	None listed	None listed
34	No	M	13.2	58	65	32	AN-R	2141	17.2	30	None listed	Congestive heart failure
35	No	F	13.1	62	64	49	AN-R	208	18.2	141	GAD	Pneumonia, hyponatremia, volvulus

ADHD, attention deficit hyperactivity disorder; AN, anorexia nervosa; AN-BP, anorexia nervosa—binge eating/purging subtype; AN-R, anorexia nervosa—restricting subtype; CRD, chronic renal disease; ED, eating disorder; ERC, Eating Recovery Center; ESRD, end stage renal disease; F, female; GAD, generalized anxiety disorder; M, male; NOS, not otherwise specified; OCD, obsessive–compulsive disorder; PICC, peripherally inserted central catheter; PTSD, posttraumatic stress disorder; R/O, rule out; SZ, seizure

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risk of death by suicide was approximately 5 times that found in the general population. On the one hand, therefore, both rates are elevated as compared to the general US population; on the other hand, only two of our sample died by suicide, a rate considerably lower than noted in other ED studies.

The heavy attribution of suicide deaths in patients with AN has been repeatedly reported in many other publications over the past decades, including a recent study by Auger and colleagues in which suicide was a leading cause of death [1]. A new study from China reported a 20% rate of suicide [7]. A different study reported an 18-fold increased risk of suicide [8]. A large longitudinal study demonstrated that suicide was associated with a shorter duration of time until death [9]. Why this was not so in the current cohort is intriguing. One possibility to explain this somewhat unexpected finding is that this study population was much younger than other mortality studies. For instance, in the study by Reas et al., the average age of the study population was 60.8 years [10], whereas in the present study it was 38 years. It is also necessary to state that the differences in our findings, and previously published work, could be due to the unique initial nature of our patient group.

With regard to the specific medical causes of death, most patients had multiple causes of death recorded on their death certificates. This is similar to what was reported in a recent French study of patients with AN, initially admitted to a medical unit and then followed after discharge [11]. This study is comparable to ours in terms of the severity of the patient population with both groups of study patients having very low BMIs and requiring an initial medical unit admission. However, the goals of the Guinhut et al. study were to define medical predictors of eventual mortality present during the index medical hospitalization, rather than the actual medical causes of death.

A Canadian study from 2020 examining mortality in a cohort of patients with EDs, after an emergency room or hospital visit, reported that 8.8% of these patients had died. But, in contrast to our study, this Canadian study looked at which medical conditions and comorbidities, such as congestive heart failure, diabetes and emphysema, the patients also had without any detailed look at the causes of death or the contribution by suicide [12].

In terms of comorbid psychiatric diagnoses, the majority (77.1%) of deceased patients in our study had at least one psychiatric diagnosis in addition to AN, with almost half of these patients (42.9%) having more than one comorbid diagnosis. This is in contrast with Papadopoulos et al. [2] in which 53% of their inpatient sample with AN did not have an additional psychiatric diagnosis. The discrepancy between the number of additional psychiatric diagnoses between our study and that of Papadopoulos may speak to the severity of illness in our study sample, and is also consistent with literature on the synergistic effect on mortality for women with comorbid AN and psychiatric disorders [13].

Strengths of this mortality study include the severity of the AN in the study cohort, a limited number of treatment centers (1), NDI-based data and the rich medical information available for these patients. The most significant limitation is the lack of follow-up data on subsequent treatment, in that we do not know if the patients in this cohort received additional eating disorder treatment after discharge from ERC up until their death. This lack of follow-up information is multifactorial, due in part to an absence of signed release of information forms, many of the patients initially being transferred to ACUTE from another hospital, via air ambulance, rather than from an identified ongoing provider and the many years between initial admission and the end of the study. An additional caveat may be concerns regarding the generalizability of these results since the data were collected from only one United States residential treatment center after their medical stabilization. It is also possible that their AN was quiescent at the time of their death for those minority who did not have AN listed as a cause of death. Also, although unique in the severity of AN and their age, our data do not reflect milder cases of AN, in an older population. Thus, the generalizability of our findings is an additional limitation. With respect to diagnoses listed on the death certificates, they cannot be taken as definite evidence for causality.

Conclusion

In conclusion, these data suggest that patients with AN may have several medical-based causes of death and that suicide may be less of a proximate cause than reported in prior studies. Why that is so for this cohort of patients may be unique to the rather atypical study population of medically severe patients. However, although caution is warranted, it could also represent a change in the leading causes of death in AN. Interestingly, suicide was not linked with compulsory eating disorder treatment in a follow-up mortality study [14]. Additional study in this topical area, in the form of a national registry, may help elucidate important trends, disparities and associations which might help improve AN prevention and treatment.

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Declarations

Ethics approval and consent to participate
Not applicable.

Consent for publication
Not applicable.

Competing interests
None of the authors have any competing interests to report.

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