

Medical Admissions Among Adolescents With Eating Disorders During the COVID-19 Pandemic

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abstract

BACKGROUND AND OBJECTIVES: Emerging data suggest the coronavirus disease 2019 (COVID-19) pandemic has been associated with worsening symptoms of eating disorders (EDs) among both adults and adolescents. With this study, we sought to determine if medical admission patterns among adolescents admitted to our institution for restrictive EDs changed during the pandemic, relative to prepandemic counts of admissions per month.

METHODS: We performed a chart review of patients aged 10 to 23 years admitted to our children's hospital for restrictive EDs from March 2017 through March 2021 and completed an interrupted time series analysis of admission counts per month. Demographic variables for admitted patients were compared by using χ^2 , Fisher's exact, and 2-sample *t* tests.

RESULTS: ED-related medical admissions at our institution increased significantly during the COVID-19 pandemic. The total number of admissions during the first 12 months of the COVID-19 pandemic (April 1, 2020, through March 31, 2021, *n* = 125) was more than double the mean number of admissions per year for the same time frame (April 1 through March 31) for the previous 3 years (mean = 56). Patient demographics were similar before and during the pandemic, with the exception that patients admitted during the COVID-19 pandemic were less likely than those admitted before the pandemic to have public insurance.

CONCLUSIONS: Medical admissions related to restrictive EDs among adolescents increased significantly during the COVID-19 pandemic. Pediatric providers in a variety of settings should be prepared to care for adolescents with restrictive EDs during the pandemic.

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WHAT'S KNOWN ON THIS SUBJECT: Limited data suggest the COVID-19 pandemic has been associated with worsening mental health outcomes, including worsening symptoms of eating disorders (EDs). Little is known about the potential effects of the pandemic on medical admission patterns among adolescents with EDs.

WHAT THIS STUDY ADDS: Medical admissions among adolescents with EDs at our institution increased significantly during the COVID-19 pandemic, with the number of admissions during the first 12 months of the pandemic more than double the mean for the previous 3 years.

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The coronavirus disease 2019 (COVID-19) pandemic and related public health precautions have been associated with negative psychological effects among adults^{1,2} as well as adolescents.^{3,4} Early in the pandemic, eating disorder (ED) experts hypothesized these effects could be particularly profound among individuals with EDs.⁵ Initial data suggest the pandemic has been associated with worsening symptoms, including increases in restriction, bingeing, and/or purging, among adults with EDs.⁶⁻⁹ Given the unique developmental context of adolescence, adolescents may be especially vulnerable to negative social consequences of the pandemic, including social isolation, and adolescents with EDs may be at risk for worsening symptoms as well. Indeed, emerging data indicate worsening restriction and compensatory behaviors aimed at losing weight among adolescents with EDs during the pandemic.¹⁰ Furthermore, there have been international reports of increases in both outpatient referrals to child and adolescent ED services¹¹ and inpatient admissions related to anorexia nervosa among adolescents¹² during the pandemic.

The COVID-19 pandemic has also been associated with delayed care for non-COVID-19 conditions.^{13,14} In many settings, in-person clinical care has been significantly disrupted and/or limited as a result of measures enacted to reduce the risk of transmission of COVID-19; such disruptions are likely to increase the long-standing unmet need for ED treatment among adolescents.^{15,16} Several centers have described efforts to rapidly transition from in-person to virtual care for adolescents with EDs as a result of the COVID-19 pandemic.¹⁷⁻¹⁹ Given the unique needs and risks of this population, adolescents with EDs may be particularly negatively

impacted by reduced availability of in-person care; for example, clinical assessment and management of patients with EDs and malnutrition generally require measurement of weight and vital signs, and in many cases, a full physical examination, laboratory studies, and/or electrocardiography may be indicated. Furthermore, confidentiality (a critical component of clinical care for adolescents) may be limited in virtual settings. Long-term outcomes among adolescents receiving virtual care for EDs remain largely unknown.

For adolescents with restrictive EDs, worsening symptoms, delayed diagnosis and/or treatment, limited access to evidence-based care, and/or disruptions to existing treatment because of the COVID-19 pandemic may result in worsening malnutrition and subsequent medical deterioration requiring hospital admission. With this study, we aimed to determine if admission patterns among adolescents with restrictive EDs at our institution changed during the pandemic.

METHODS

We completed a chart review of adolescents aged 10 to 23 years admitted to C.S. Mott Children's Hospital in Ann Arbor, Michigan, between March 1, 2017, and March 31, 2021, for medical complications of restrictive EDs, including anorexia nervosa, atypical anorexia nervosa, and avoidant or restrictive food intake disorder, as well as other specified feeding and EDs and unspecified feeding or EDs marked by restriction. Patients with EDs admitted for unrelated conditions, those admitted only to inpatient psychiatry, and those seen for weight loss without a diagnosis of ED were excluded. Patients with bulimia nervosa or other nonrestrictive EDs were also excluded because they are less likely

to develop malnutrition and medical complications thereof and more likely to be admitted for behavioral reasons.

Demographics (age at the time of first admission, gender, race and ethnicity, and insurance type) and specific ED diagnoses were extracted from the medical record. We included data on race and ethnicity in our analysis to evaluate whether any observed changes in counts of admissions over time varied by race or ethnicity because such changes may reflect inequities in access to care and/or differential effects of the pandemic on ED symptoms because of systemic racism. Race and ethnicity were categorized in the manner used in our electronic medical record by using the variables given in Table 1. To evaluate for potential changes in demographics over time before the onset of the COVID-19 pandemic, we used Fisher's exact and 2-sample *t* tests to determine if demographic variables differed between patients admitted each year before the pandemic. Because there were no significant differences between years, all data from March 2017 through March 2020 (before the COVID-19 pandemic) were pooled and compared with data from April 2020 through March 2021 (during the COVID-19 pandemic) by using χ^2 , Fisher's exact, and 2-sample *t* tests.

Sequential counts of admissions per month were compared before and after April 1, 2020, by using interrupted time series analysis.²⁰ We chose this date as the time point of interest because admissions were measured per month, and April was the first full month of the pandemic in our state after the first confirmed cases in the state were diagnosed on March 10. Schools across the state closed on March 16, 2021. Subsequently, a statewide stay-at-home order went into effect in

TABLE 1 Patient Demographics

	Pre-COVID-19 Pandemic, <i>n</i> = 146	During COVID-19 Pandemic, <i>n</i> = 102	<i>P</i>
Age, mean (SD), y	15.1 (2.8)	15.2 (2.5)	.63
Gender <i>n</i> (%)			.34
Male	14 (9.6)	8 (7.8)	
Female	129 (88.4)	92 (90.2)	
Transgender male	2 (1.4)	0	
Transgender female	1 (0.7)	0	
Nonbinary	0	2 (2.0)	
Race, <i>n</i> (%)			.18
White	124 (84.9)	92 (90.2)	
Asian American	9 (6.2)	5 (4.9)	
American Indian and Alaskan Native	0	0	
Black or African American	4 (2.7)	4 (3.9)	
Unknown	7 (4.8)	0	
Other	2 (1.4)	1 (1.0)	
Ethnicity, <i>n</i> (%)			.68
Non-Hispanic	136 (93.2)	97 (95.1)	
Hispanic	8 (5.5)	3 (2.9)	
Unknown	2 (1.4)	2 (2.0)	
Insurance type, <i>n</i> (%)			.005
Private	117 (80.1)	90 (88.2)	.12
Public	29 (19.9)	9 (8.8)	.02
None	0	3 (2.9)	.07
Diagnosis, <i>n</i> (%)			.52
Anorexia nervosa	102 (69.9)	75 (73.5)	
Atypical anorexia nervosa	27 (18.5)	16 (15.7)	
Avoidant restrictive food intake disorder	13 (8.9)	7 (6.9)	
Unspecified ED	4 (2.7)	2 (2.0)	
Other specified feeding or ED	0	2 (2.0)	

Michigan on March 24, 2020; the stay-at-home order lasted until June 1, 2020. We used Durbin-Watson tests to assess autocorrelation between months. We hypothesized that admissions would decrease precipitously in April 2020 because of stay-at-home orders and decreases in both clinic availability and patient demand for care, then increase over time during the COVID-19 pandemic; our impact model therefore proposed an immediate level change (ie, a change in the number of admissions per month) followed by a slope change (ie, a difference in the month-to-month rate of change in admissions per month). In our regression model, β_1 represents the underlying trend in admission counts per month before the COVID-19 pandemic, whereas β_2 indicates the level change between March and

April 2020, and β_3 indicates the slope change over time. All analyses were conducted in SAS software, version 9.4 (SAS Institute, Inc, Cary, NC).

This study was deemed exempt from review by the University of Michigan Institutional Review Boards as secondary research, for which consent is not required.

RESULTS

There were 297 ED-related admissions among 248 patients during the study period. Demographics at the time of each patient's first admission during the study period are summarized in Table 1. Demographics and specific diagnoses were similar before and during the COVID-19 pandemic, with the exception of insurance type (Table 1). There was a significant

change in the distribution of insurance types during the COVID-19 pandemic ($P = .005$), and the proportion of patients with public insurance decreased significantly ($P = .02$). The majority of patients, both before and during the pandemic, were female and white.

Results of the interrupted time series analysis are shown in Fig 1. Durbin-Watson tests indicated no autocorrelation. Counts of ED-related admissions per month were stable over time before the COVID-19 pandemic ($\beta_1 = 0.03$ [95% confidence interval (CI): -0.03 to 0.09]; $P = .37$). There was a significant level change when the pandemic began, with total admissions decreasing in April 2020 ($\beta_2 = -5.04$ [95% CI: -7.78 to -2.29]; $P < .001$). Counts of admissions per month then increased significantly over time during the COVID-19 pandemic ($\beta_1 + \beta_3 = 1.58$ [95% CI: 1.25 to 1.91]; $P < .001$). The total number of admissions between April 1, 2020, and March 31, 2021, ($n = 125$) was more than double (123% increase) the mean number of admissions for the same time frame (April 1 through March 31) for the previous 3 years (mean = 56).

DISCUSSION

Medical admissions among adolescents with EDs at our institution increased significantly during the COVID-19 pandemic. Notably, counts of ED-related admissions per month at our institution increased throughout the COVID-19 era, with the highest counts observed near the end of the study period, 9 to 12 months after the pandemic began. It is not clear whether this increase is a function of delayed care and/or an increase in incident cases; further study to determine the factor(s) driving this observation is needed. Although our findings reflect the

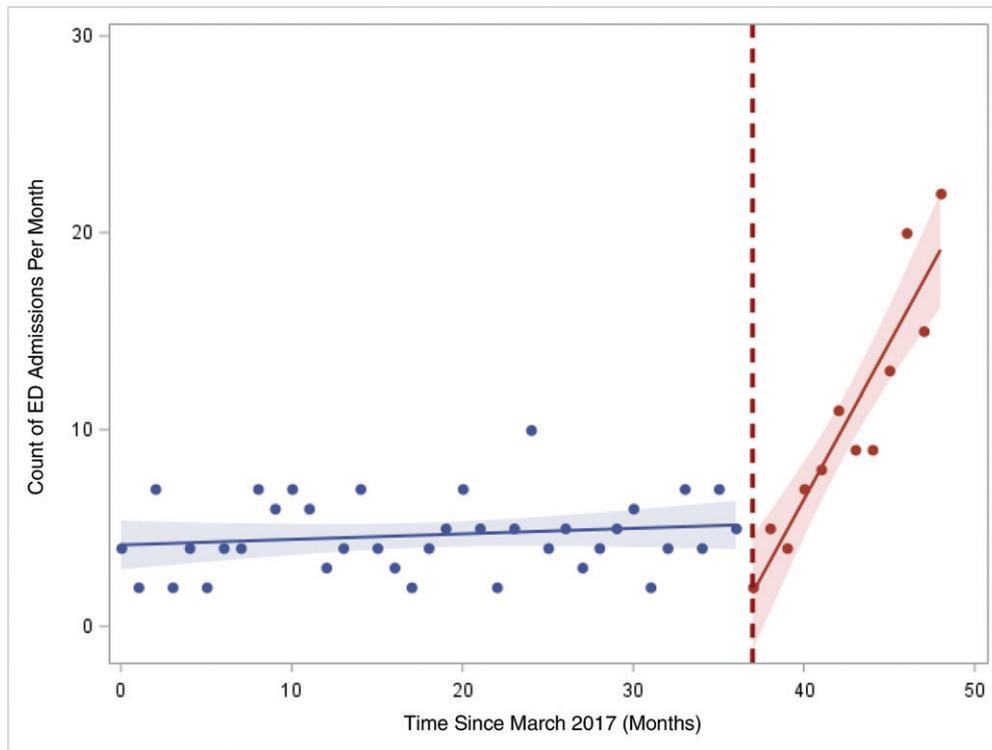


FIGURE 1

Interrupted time series analysis of monthly counts of ED-related admissions, March 1, 2017, through March 31, 2021. Solid line represents slopes; shaded areas represent 95% CIs for slopes; and dashed line represents onset of COVID-19 pandemic.

experience of a single institution, they are in keeping with emerging reports suggesting a developing epidemic within the pandemic, one with the potential to have profound negative effects on the mental and physical health of adolescents around the globe. This study, which examines patient-level data, both provides context to recent reports indicating an increase in the number of patients presenting for ED care^{11,12} and indicates a need for future larger-scale studies of the effects of the pandemic on adolescents with EDs.

Our findings suggest the COVID-19 pandemic and related precautions may be associated with worsening symptoms among adolescents with EDs or with the emergence of symptoms among adolescents at risk for these disorders. This is in keeping with our recent clinical

experience, in which ED patients seen in various clinical settings (inpatient units, outpatient clinics, and the ED partial hospitalization program) at our institution have described new or worsening symptoms associated with pandemic precautions. Although the pathogenesis of EDs is incompletely understood, current evidence suggests the development of EDs may be conceptualized through a biopsychosocial model, with influences of genetics, psychological factors, and social influences. Psychologically, adolescents with low self-esteem or depressive symptoms are more likely to develop EDs²¹ and many describe worsening of these factors during the pandemic. Additionally, changes to adolescents' day-to-day lives, such as school closures and cancellation of organized sports, may disrupt routines related to

eating and exercise, and such disruptions may be an impetus for the development of ED behaviors in those at risk for these disorders. Indeed, although anecdotal, our recent clinical experience suggests adolescents with new EDs frequently report their ED behaviors began when pandemic precautions were implemented because, for example, they found themselves with nothing else to do or with more time to engage in diet and/or exercise behaviors they had previously considered but not acted on. Furthermore, the pandemic has impacted social relationships among adolescents, who may be turning to social media in greater numbers to stay connected.²² Social media use itself has been suggested to contribute to the development of EDs.²¹

Profound changes to adolescents' day-to-day lives related to the

COVID-19 pandemic may also affect to the number of adolescents admitted for EDs independent of their direct effects on ED symptoms. For example, an adolescent with significant ED symptoms and severe malnutrition that predated the pandemic may have only come to medical attention when they moved back in with their parents after their college closed unexpectedly because of the pandemic. Thus, in some cases, although ED symptoms themselves may not have been related to the pandemic, *per se*, an increase in inpatient admissions may in part reflect changes in housing or access to medical care. On the other hand, many consequences of the pandemic, including large-scale job losses associated with loss of employer-sponsored health insurance, decreased availability of outpatient medical services, and increased social isolation, might limit adolescents' access to ED care, including emergency and/or inpatient care, suggesting our results, although significant, may be only a conservative estimate of the effects of the pandemic on adolescents with EDs.

In this study, the distribution of insurance types among adolescents admitted for restrictive EDs changed significantly during the COVID-19 era, with patients admitted during the pandemic less likely to have public insurance. The reason for this finding is not entirely clear. In our experience, patients with public insurance are less likely than those with private insurance to have insurance coverage for ED treatment, particularly psychotherapy, and may therefore experience delayed medical care or have no access to medical care because therapists are an important source of referrals for medical assessment. It is possible that health care system-level

changes during the COVID-19 pandemic, such as outpatient clinic closures and rapid widespread transitions to virtual care, as well as broader societal effects of the pandemic, including large-scale job losses, may have further limited access to medical care among adolescents with public insurance, meaning fewer adolescents with complications of restrictive EDs requiring admission came to medical attention during the pandemic. EDs affect adolescents of all socioeconomic statuses²³⁻²⁵; that the proportion of patients in this study with public insurance decreased during the COVID-19 pandemic again suggests our findings, although significant, may represent a conservative estimate of the number of adolescents experiencing severe medical illness related to EDs during the pandemic.

Early in the COVID-19 pandemic, some in-person outpatient services at our institution, including some types of ED care, were limited because of statewide restrictions; these services were largely transitioned to telehealth until restrictions were lifted. The effects of this transition to large-scale telehealth services on outcomes among adolescents with EDs receiving care at our institution are largely unknown. Restrictions on in-person outpatient clinic appointments ended in June 2020, whereas inpatient admissions continued to increase significantly through March 2021, suggesting these brief limitations in in-person outpatient appointments were not a significant driver of the increase in admissions. Our institution uses the indications for medical admission described by the Society for Adolescent Health and Medicine, including physiologic instability (eg, heart rate <50 beats per minute while awake,

blood pressure <90/40 mm Hg, and temperature <35.6°C), electrolyte derangements (eg, hypokalemia and hypophosphatemia), acute medical complications of malnutrition (eg, syncope), uncontrolled purging, BMI <75% of the median for age and sex, acute food refusal of ≥ 24 hours, and failure of outpatient treatment.²⁶ Our criteria for admission did not change during the pandemic.

Our findings suggest providers as well as health care systems who care for adolescents with EDs may need to rapidly adapt in response to increasing demands for care during the COVID-19 pandemic. Emerging data indicate some aspects of ED care, including psychotherapy, may be transitioned to telehealth, and others have described their experiences as well as lessons learned and best practices for such transitions^{10,17-19,24}; however, in-person medical evaluation to assess weight and nutrition status, vital signs, laboratories and other studies (eg, electrolytes and electrocardiography), and for signs of medical complications requiring admission remains critical.²⁷ Increasing cases of restrictive EDs among adolescents may lead to longer wait times for medical providers with expertise in EDs and move much of this care to the primary care setting; primary care pediatricians should therefore be familiar with the indications for medical admission among adolescents with EDs outlined by the Society for Adolescent Health and Medicine (eg, severe bradycardia with heart <50 beats per minute or other signs of physiologic instability).²⁶ Providers and health care systems should also be mindful of the potential for large-scale shifts to virtual care to perpetuate inequities in ED care (eg, among patients who are uninsured

or underinsured, those with limited access to the Internet, and non-English speakers).²⁷

This study is limited by its retrospective nature and small sample size. Findings reflect the experience of a single institution in which patients were admitted to a general pediatric hospitalist service with multidisciplinary team care, and generalizability may be limited to similar settings; however, emerging data, as well as anecdotal and lay media reports, suggest increases in adolescents presenting with EDs in a variety of clinical settings across the globe.^{11,12,28–30} With this study, we examined only severely ill patients admitted for medical stabilization and did not capture adolescents with EDs presenting in different settings. Ongoing study of the effects of the pandemic on adolescents with EDs in a variety of clinical settings will be critical, particularly if it becomes clear that the impacts of COVID-19 are long lasting.

CONCLUSIONS

With this study, we found a significant increase in medical admissions for restrictive EDs among adolescents at our institution during the COVID-19 pandemic. The increase in admissions appears to have occurred primarily among patients with private insurance. Our findings are consistent with emerging data suggesting the pandemic is associated with negative mental health outcomes, including worsening symptoms of EDs. Adolescents may be particularly vulnerable to negative effects of societal upheaval related to the pandemic and to developing EDs during the COVID-19 era. Providers who care for adolescents should be attuned to these risks and monitor patients for signs and symptoms of EDs. An increase in severely ill adolescents with EDs

during COVID-19 is likely to present challenges for patients, their families, and their providers because demand for treatment (access to which is already limited by pandemic precautions, as well as a lack of providers predated the pandemic) is likely to increase, perhaps dramatically. It is unclear how long these effects may last. Our findings suggest those who care for adolescents with EDs in the inpatient setting and beyond should be prepared to address challenges posed by increasing numbers of severely ill ED patients.

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ABBREVIATIONS

CI: confidence interval

COVID-19: coronavirus disease 2019

ED: eating disorder

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