Original article

Characterizing Medical Complications in Publicly Insured Youth With Eating Disorders

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A B S T R A C T

Purpose: The present study describes the occurrence of eating disorder (ED)−related medical diagnoses in a publicly insured sample of youth with EDs. The study also compares ED medical diagnoses with other psychiatric disorders and identifies high-risk demographic groups. Improved screening practices are needed in public mental health systems where treatment is critical for youth with EDs.
Methods: Medicaid claims data were obtained from the state of California, including beneficiaries ages 7−18 who had at least one service episode between January 1, 2014, and December 31, 2016. From this population we extracted demographic and claims data for those youth who received an ED diagnosis during the 3-year period as a primary or secondary diagnosis (n = 8,075). Random subsamples of youth with moderate/severe mental illness were drawn for comparison: primary or secondary diagnosis of mood/anxiety disorder (N = 8,000) or psychotic disorder (n = 8,000) were also extracted. Medical diagnoses were compared within youth with EDs (across diagnostic categories) and across psychiatric diagnoses (EDs, mood/anxiety disorders, psychotic disorders). Logistic regression analyses were used to adjust for demographic characteristics.
Results: Three-quarters of youth with EDs received no diagnosis of an ED-related medical complication. Bradycardia was the most prevalent diagnosis suggestive of medical instability. Odds of medical diagnosis were greater for ED than other psychiatric disorders but varied with age and gender. Across all diagnoses, Latinx youth were less likely to receive ED-related diagnoses suggesting medical instability.
Discussion: Most publicly insured youth with EDs received no ED-related medical diagnosis, underscoring the structural barriers to receiving expert medical care.
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IMPLICATIONS AND CONTRIBUTIONS

This is the largest study to characterize eating disorder−related medical complications in youth, and the first to examine medical complications a publicly insured sample of youth with eating disorders.

Eating disorders (EDs) are serious biopsychosocial disorders with profound medical and psychiatric sequelae and with significant, sometimes long-lasting, medical complications. They

present a substantial public health challenge due to multiple protracted hospitalizations often required and high rates of relapse, incurring a substantial cost burden [1,2]. Early specialized, evidence-based management (i.e., behavioral and medical treatment) is critical for rapid improvement and to prevent progression to severe and chronic impairment and reduce elevated mortality risk [3,4]. Indeed, unless evidence-based treatment is provided within 3 years of illness onset, medical and psychological outcomes are poor [5].

Medical complications are common in EDs as disrupted nutritional intake results in biological adaptations to starvation. Malnutrition is a common consequence across EDs and required for the diagnosis of anorexia nervosa (AN) [6]. Hematologic abnormalities occur in more than 20% of patients with AN [7,8], and symptoms indicating medical instability—bradycardia, hypotension, orthostasis, and electrolyte derangements, among others—occur often enough that one in five youth with AN require hospitalization and nearly 40% of those youth will require repeat hospitalizations [9]. However, medical diagnoses may be missed and treatment delayed due to scant screening practices and lack of specialized ED training in publicly funded primary care and mental health settings [10], and because of misconceptions about who develops an ED [11].

While all people with EDs are at risk for a wide range of physical complications, young people are at particular risk of suffering irreversible negative effects on growth and development [12]. Approximately 20% of adolescents with AN require a costly medical hospitalization with treatment costs comparable to those in schizophrenia [9,13]. Because publicly funded settings are less likely to provide evidence-based ED treatment [14], youth with public insurance may be particularly vulnerable to medical complications and hospitalizations. However, no study has characterized medical complications in a publicly funded population of youth with EDs. Understanding detection and the medical burden facing these youth will guide care reform, including widespread educational efforts for medical providers in parallel with expansion of publicly funded evidence-based ED services.

The present study describes rates of ED-related diagnoses suggesting medical instability and other medical complications for youth with AN, bulimia nervosa (BN), other specified feeding or eating disorder (OSFED), and unspecified ED and examines demographic correlates of ED-related medical complications. We hypothesize that, given the well-documented medical risks of AN compared to other ED diagnoses [1,15], youth with AN would have higher rates of diagnoses suggesting medical instability and that due to the under-recognition of EDs and lack of opportunities for care [14], racial and ethnic minority youth would have a higher burden of medical diagnoses. We then compared rates of medical complications between youth with EDs and those with mood/anxiety disorders and psychotic disorders, hypothesizing that youth with EDs would have significantly higher rates of ED-related medical diagnoses compared to youth with moderate and even severe mental health disorders. As the first study to characterize medical complications among publicly insured youth with EDs, these data can provide critical context for efforts to improve care in publicly funded settings.

Methods

Medicaid claims data were obtained from the state of California. Of all beneficiaries ages 7-18 who had at least one service episode between January 1, 2014 and December 31, 2016 (n = 4,819,221 unique beneficiaries), demographic and claims data were extracted for the population of youth who received a primary or secondary ED diagnosis at any point in that time period (N = 8,075), conservatively resulting in an annual prevalence of 0.2% [16]. Additional demographics of the study population have been described in detail elsewhere [16].

Random subsamples of youth with a primary or secondary mood/anxiety disorder (n = 8,000) or psychotic disorder diagnosis (n = 8,000) were also extracted for comparisons. Mood/anxiety disorders were chosen for comparison because of their high prevalence and likelihood of emergence during late childhood and adolescence [17,18]. Psychotic disorders were also chosen for comparison due to similar base rates as EDs in youth and similarly requiring highly specialized care. Any youth with co-occurring EDs in the other random subsamples were removed such that they were exclusively represented in the ED population.

Variables included birth month/year, gender, race and ethnicity (reported as a single variable), preferred spoken language (classified as English, Spanish, or Other), and claims data (i.e., date(s), type, code, and primary and secondary billing diagnoses in ICD-9 or ICD-10). ED diagnosis was categorized into exclusive groups based on earliest claim record in the data set, including AN, BN, OSFED, other EDs (pica, rumination disorder, binge eating disorder), or unspecified ED. Medical diagnoses commonly used to determine the need for inpatient medical hospitalization (e.g., electrolyte disturbances, bradycardia, orthostasis, and hypotension) [15] were categorized as "medical instability." While not exhaustive, these diagnoses represent the most common indications for hospital admission [16]. "Any medical" diagnoses represent common medical complications in youth with EDs, including both diagnoses indicative of medical instability as well as those observed and managed in the outpatient setting [17]. The appendix includes all ICD-9 and ICD-10 codes used to classify both diagnoses suggesting medical instability as well as other medical diagnoses. The institutional review board at the University of California, San Francisco and at the California Health and Human Services Committee for the Protection of Human Subjects approved all study procedures.

Analysis

Descriptive statistics and Chi-square tests compared AN, BN, OSFED, Other ED and Unspecified ED on conditions defining Medical Instability and Any Medical Complications.

Then, two logistic regression models were used to evaluate factors associated with receipt of 1) any medical diagnosis and 2) a diagnosis suggesting medical instability. Independent variables were diagnosis (AN, BN, OSFED, Other ED, unspecified ED), age, gender, and race/ethnicity. The second model examined whether primary psychiatric diagnosis of ED versus mood/anxiety disorder or psychotic disorder was associated with medical complications, after adjusting for age, gender, and race/ethnicity. Models were centered to participants of average age (14 years). Significant interactions between independent variables were included if significant. When multiple two-way interactions were identified, related three-way interactions were also tested. Models were rerun with alternative reference groups in order to ascertain confidence intervals for all pairwise comparisons of interest. Given this and multiple covariates, significance was conservatively evaluated at an adjusted alpha of 0.01. Analyses were performed in SAS 9.3.

Table 1
Comparison of medical diagnoses across youth with eating disorders

	AN	BN	OSFED	Other ED	Unspecified ED	X^2 or F-test	p
	N (%)	N (%)	N (%)	N (%)	N (%)		
All	1,161 (14.4%)	868 (10.7%)	1,399 (17.3%)	458 (5.7%)	4,189 (51.9%)		
Medical instability	189 (16.3%)[a]	51 (5.9%)[b]	64 (4.5%)[b]	8 (1.7%)[c]	263 (6.3%)[b]	187.48	<.001
Cardiovascular	135 (11.6%)[a]	28 (3.2%)[b]	34 (2.4%)[bd]	3 (0.7%)[cd]	149 (3.6%)[b]	154.75	<.001
Hypotension	30 (2.6%)[a]	4 (0.5%)[b]	8 (0.6%)[b]	0 (0.0%)[b]	31 (0.7%)[b]	33.26	<.001
Orthostasis	27 (2.3%)[a]	4 (0.5%)[b]	4 (0.3%)[b]	0 (0.0%)[b]	48 (1.1%)[b]	23.63	<.001
Electrolyte imbalance	45 (3.9%)[a]	21 (2.4%)[ab]	26 (1.9%)[b]	5 (1.1%)[b]	94 (2.2%)[b]	15.82	.003
Other medical complications	437 (37.6%)[a]	209 (24.1%)[b]	419 (29.9%)[c]	157 (34.3%)[ad]	1,084 (25.9%)[bd]	78.91	<.001
Malnutrition	92 (7.9%)[a]	16 (1.8%)[b]	26 (1.9%)[b]	1 (0.2%)[b]	151 (3.6%)[c]	80.41	<.001
Gastrointestinal	32 (2.8%)[a]	32 (3.7%)[a]	45 (3.2%)[a]	9 (2.0%)[a]	128 (3.1%)[a]	3.44	.487
Hematologic	158 (13.6%)[a]	95 (10.9%)[a]	149 (10.7%)[a]	96 (21%)[b]	466 (11.1%)[a]	42.71	<.001
Endocrinologic	78 (6.7%)[a]	20 (2.3%)[b]	20 (1.4%)[b]	6 (1.3%)[b]	111 (2.6%)[b]	68.50	<.001
Renal	10 (0.9%)[a]	6 (0.7%)[a]	131 (9.4%)[b]	36 (7.9%)[b]	59 (1.4%)[a]	216.86	<.001
Skeletal	61 (5.3%)[a]	35 (4.0%)[a]	114 (8.1%)[bc]	33 (7.2%)[ac]	190 (4.5%)[a]	32.31	<.001

Cells sharing the same superscript are not significantly different from each other ($p < .01$).
Abbreviations: AN = anorexia nervosa; BN = bulimia nervosa; ED = eating disorder; OSFED = other specified feeding or eating disorder.

Results

Of all unique beneficiaries, 0.18% received an ED diagnosis. The final study sample included 23,783 youth, including those with EDs (n = 8,075), mood/anxiety disorders (n = 7,904), and psychotic disorders (n = 7,804). Among youth with EDs, average age was 13.9 years (*standard deviation* = 3.3), 70.6% self-identified as female, and just over half identified as Latinx (54.5%, n = 4,398).

Descriptive statistics: medical complications in youth with EDs

Across the 3-year study period for youth with EDs, most (71.4%, n = 5,728) received no ED-related medical diagnosis. One quarter (25.0%, n = 2,306) experienced a common ED-related medical complication, and 7.1% (n = 575) received a diagnosis portending some degree of medical instability (see Table 1). Across all medical complications, hematologic abnormalities

(e.g., anemia) were the most common (11.9%, n = 964), followed by skeletal complications (5.4%, n = 433), and cardiovascular complications (4.3%, n = 349). Youth with AN had the highest rates of documented diagnoses suggesting medical instability (16.3%, n = 189), particularly cardiovascular complications (11.6%, n = 135).

Medical complications in youth with EDs

Any medical complication. In the multivariate logistic model (see Table 2), there was a significant effect of ED diagnosis ($X^2 = 90.62$, $p < .001$), such that youth with AN and "other" EDs had increased odds of diagnosed medical complications compared to youth with BN (AN: adjusted odds ratio (AOR) = 1.98, $p < .001$; other EDs: AOR = 2.10, $p < .001$) and youth with unspecified ED (AN: AOR = 1.66, $p < .001$; other EDs: AOR = 2.10, $p < .001$). There were significant effects for age ($X^2 = 13.08$, $p < .001$) and gender ($X^2 = 27.40$, $p < .001$), such that older age and female gender

Table 2
Logistic regression of factors associated with odds of receiving a diagnosis of any ED-related medical complication or medical instability across youth with eating disorders

	Any medical complication			Medical instability		
	AOR	95% CI	p	AOR	95% CI	p
Intercept	0.43	0.36, 0.51	**<.001**	0.20	0.15, 0.26	**<.001**
Age	1.03	1.01, 1.05	**<.001**	1.11	1.07, 1.14	**<.001**
Gender			**<.001**			ns
Male (ref)	1.00			1.00		
Female	1.36	1.21, 1.53	**<.001**	1.05	0.85, 1.30	ns
Race and ethnicity			0.07			**<.001**
White (ref)	1.00			1.00		
Asian/Pacific Islander	0.97	0.77, 1.22	ns	1.22	0.87, 1.72	ns
Black/African American	0.92	0.69, 1.23	ns	0.51	0.28, 0.94	ns
Latinx	1.08	0.95, 1.22	ns	0.64	0.52, 0.79	**<.001**
Unknown	1.24	1.05, 1.46	ns	1.05	0.80, 1.38	ns
ED Diagnosis			**<.001**			**<.001**
AN (ref)	1.00			1		
BN	0.50	0.41, 0.61	**<.001**	0.30	0.22, 0.42	**<.001**
OSFED	0.83	0.70, 0.98	ns	0.33	0.24, 0.45	**<.001**
Other ED	1.06	0.84, 1.34	ns	0.12	0.06, 0.26	**<.001**
Unspecified ED	0.60	0.53, 0.69	**<.001**	0.38	0.31, 0.46	**<.001**

Abbreviations: AOR = adjusted odds ratio; AN = anorexia nervosa; BN = bulimia nervosa; CI = confidence interval; ED = eating disorder; OSFED = other specified feeding or eating disorder

Table 3
Logistic regression of factors associated with odds of receiving a diagnosis of any ED-related medical complication or medical instability across youth with behavioral health diagnoses

	Any medical complication			Medical instability		
	AOR	95% CI	p	AOR	95% CI	p
Intercept	0.34	0.30, 0.38	**<.001**	0.08	0.07, 0.10	**<.001**
Age	1.02	1.00, 1.04	**ns**	1.11	1.09, 1.14	**<.001**
Gender	20.88		**<.001**	10.10		**.002**
Male (ref)	1.00			1.00		
Female	1.30	1.16, 1.46	**<.001**	1.24	1.09, 1.42	**.002**
Race and ethnicity			ns			**<.001**
White (ref)	1.00			1.00		
Asian/Pacific Islander	0.89	0.76, 1.04	ns	1.00	0.77, 1.30	ns
Black/African American	0.92	0.80, 1.07	ns	0.72	0.55, 0.96	ns
Latinx	0.97	0.90, 1.05	ns	0.63	0.54, 0.73	**<.001**
Unknown	1.07	0.96, 1.19	ns	0.85	0.70, 1.02	ns
Behavioral diagnosis			**<.001**			**<.001**
ED (ref)	1.00			1.00		
Mood/Anxiety	0.30	0.26, 0.35	**<.001**	0.25	0.21, 0.30	**<.001**
Psychosis	0.48	0.42, 0.55	**<.001**	0.66	0.58, 0.76	**<.001**
Interaction terms						
Anxiety*Female	1.51	1.26, 1.82	**<.001**			
Psychosis*Female	1.47	1.24, 1.73	**<.001**			
Age*Anxiety	0.92	0.88, 0.95	**<.001**			
Age*Psychosis	0.93	0.90, 0.96	**<.001**			
Age*Anxiety*Female	1.13	1.08, 1.17	**<.001**			
Age*Psychosis*Female	1.04	1.00, 1.08	ns			

Reference categories include the following: diagnosis (eating disorders), race (White), gender (male). Age is mean centered at 14 years.
Abbreviations: AOR = adjusted odds ratio, CI = confidence interval, F = female.
  * denotes interaction.

were associated with increased odds of receiving any ED-related medical complication diagnosis across youth with EDs.

Medical instability. In the multivariate logistic model, there was a significant effect of ED diagnosis ($X^2 = 126.95$, $p < .001$), such that youth with AN were at increased odds of a diagnosis suggesting medical instability compared to all other youth with EDs (AOR range = $2.63 - 8.33$, $p < .001$). Youth with OSFED were also at increased odds of a diagnosis medical instability compared to those with other EDs (AOR = 2.63, $p = .01$), who in turn, were at higher risk than those with un specified ED (AOR = 3.04, $p < .002$). There were also significant effects for age ($X^2 = 36.64$, $p < .001$) and race/ethnicity ($X^2 = 33.34$, $p < .001$), such that older age was associated with increased odds of receiving a diagnosis suggestive of medical instability and Latinx ethnicity was associated with decreased odds of receiving a diagnosis suggestive of medical instability. Compared to Latinx youth, White and Asian/Pacific Islander youth with EDs had significantly greater odds of receiving a diagnosis suggestive of medical instability.

Medical complications in youth with EDs compared to youth with mood/anxiety disorders and psychotic disorders

Any medical complication. In the multivariate logistic model (Table 3), there was a significant effect of diagnosis ($X^2 = 254.00$, $p < .001$), such that youth with EDs had highest odds of any medical complication compared to youth with mood/anxiety or psychotic disorders. There was also a significant three-way interaction between age, gender, and diagnosis ($X^2 = 35.94$, $p < .001$). At age 7, there were similar chances of medical concerns regardless of gender or diagnosis, except that 7-year-old females with EDs had a nearly three-fold higher likelihood of medical

complications than those with mood/anxiety disorders, which attenuated slightly to two-fold by age 18. For all others, as children grew older, youth with EDs were increasingly likely to have medical complications compared to those with other diagnoses, and these differences were even more pronounced for boys. The most significant change in odds ratio with age was observed among males with EDs compared to males with mood/anxiety disorders, whereby 7-year-old boys with EDs were nearly two times more likely to have medical complications compared to boys with mood/anxiety disorders, which increased to a near five-fold difference at age 18. Differences between diagnostic groups in the odds of receiving a medical complication diagnosis are demonstrated in Figure 1.

Medical instability. There was a significant effect of psychiatric diagnosis ($X^2 = 210.17$, $p < .001$), such that youth with EDs were at increased odds of a diagnosis suggestive of medical instability compared to youth with mood/anxiety (AOR = 4.0, $p < .001$) and psychotic disorders (AOR = 1.50, $p < .001$), after adjusting for significant effects of age race/ethnicity and gender. Older age and female gender were associated with increased odds of receiving a diagnosis suggestive of medical instability. Compared to White youth, Latinx youth were at decreased odds of receiving a diagnosis suggestive of medical instability (Table 3).

Discussion

This study found that only one-quarter of publicly insured youth with EDs in California were diagnosed with any ED-related medical complication. This figure is surprisingly low: EDs compromise health by well-documented biological mechanisms, and extraordinary factors would be necessary to bring patients to
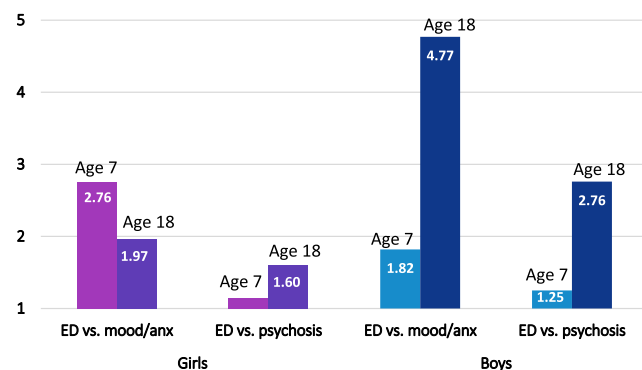
Figure 1. Differences in the odds of receiving an ED-related medical complication diagnosis by age, gender, and diagnosis across youth with behavioral health diagnoses. Abbreviations: eating disorder (ED), mood/anxiety (mood/anx).

ED care displaying such low rates of medical comorbidity. Despite the fact that many youth with EDs would meet criteria for malnutrition, this diagnosis was documented for less than 4% of the entire ED population. Further, diagnostic criteria for AN require malnutrition such that *all* youth with AN would have co-occurring malnutrition, and yet malnutrition was diagnosed in a mere 8% of youth with AN in this population. Hematologic abnormalities were the most commonly diagnosed medical complication in our sample with a 13.6% incidence across all youth with AN, significantly less than other samples of youth with AN where hematologic abnormalities were found in greater than 20% of patients [7,8].

Rates of documented diagnoses suggesting medical instability were also very low. Bradycardia, the most common diagnosis suggestive of medical instability, was documented for only 13% of youth with AN—all enrolled continuously across the 3-year period. Yet in a cross-sectional community-based sample of 60 adolescents with AN, 27% experienced bradycardia [7]. Further, inpatient hospitalization rates for youth with AN are consistently reported above 20% [9,19], implying higher true rates. These data strongly suggest that serious ED-related medical complications in publicly insured youth remain underrecognized and under-treated, with potentially fatal consequences, given that high mortality rates in AN have been ascribed to cardiovascular complications of the illness [20].

As expected, the odds of receiving any ED-related medical complication or diagnosis suggesting medical instability were greater in youth with EDs compared to youth with other psychiatric disorders, reinforcing ED's appreciable medical risk and a particular need for ED screening and treatment. While statistically significant, these differences were not of the expected magnitude, which strongly suggests that serious ED-related medical complications in publicly insured youth are missing detection.

Further, the disparity in identification of ED-related medical diagnoses, including those suggesting medical instability, was greater for Latinx youth than White youth, leaving Latinx youth—who comprise over half of the youth with ED and public insurance in California—especially vulnerable to poor outcomes. National data show that Latinx youth have lower inpatient and outpatient mental health utilization rates despite having higher

rates of mental health disorders [21] and the present data indicate that even when treated, Latinx youth are underserved.

Latinx and other racial and ethnic minority patients are significantly less likely than White patients to be screened by a healthcare provider for ED symptoms [22,23]. The United States Hispanic population is the fastest growing racial/ethnic group since 2010 and carries unique risk factors for disordered eating, including weight based teasing [24] and acculturative stress [25], the systemic barriers Latinx youth face in connecting with evidence-based care must be explored. Concurrently, providers must be equipped to provide evidence-based care that is culturally competent and addresses the unique circumstances which perpetuate the illness among this population.

Despite increasing recognition of disordered eating in all races/ethnicities, socioeconomic statuses, and gender and sexual minority youth [26–29], the longstanding stereotype of White, upper-middle class girls as the "prototypical" ED patient continues to bias healthcare providers and contributes to systemic inequity within the larger healthcare system [26–30]. As disordered eating behaviors are on the rise in households with below-median annual income [31] and publicly funded settings struggle to provide adequate evidence-based care to youth with EDs, youth are especially vulnerable to hospitalizations, longer duration of illness, and increased morbidity and mortality. Barriers to accessing evidence-based care must be further explored among publicly insured youth to improve their medical and psychological outcomes and to increase equity in ED care.

To our knowledge, this is the largest study to characterize ED-related medical complications in youth, and the first to examine ED-related medical complications in a publicly insured sample. Further, medical complications of EDs are typically described in adult samples or in adolescent samples confined to the inpatient hospital setting, rather than outpatient or community-based settings. Strengths of our study include providing an account of every patient with an ED who interfaced with the Medicaid system in California over the 3-year study period.

Study limitations include combined data on race and ethnicity, an absence of data on gender identity, and lack of context about the settings in which diagnoses were given. The specific practice setting in which diagnoses are made is likely to influence the specificity and accuracy of diagnostic practices; unfortunately, these claims data do not specify care setting (e.g., general pediatrics practice vs. adolescent medicine specialty clinic, with the latter likely to have more ED training and clinical experience). Indeed, over half of our ED sample was classified as "unspecified," suggesting provider limitation in precise diagnostic practices. We do not know true rates of ED-related medical conditions in our sample, thus we cannot assess differences between rates of diagnosed medical conditions observed and actual underlying rates. Several medical diagnoses included in our analysis are commonly occurring in youth irrespective of malnutrition or ED behaviors, such as anemia. As such, we cannot say with certainty that the diagnoses described here correlate exclusively to ED-related medical complications. Our data likely underrepresent gender minority youth, who are at higher risk of disordered eating, and they also fail to capture the ramifications of the COVID-19 pandemic on ED diagnoses and ED-related medical complications [32–34]. Medicaid claims data provide limited disease-specific characteristics, thus metrics like body mass index, weight, vital signs, and ED subtype (binge-purge vs. restricting) were not available. ED-related medical complications

in our population should be compared with a privately insured sample of youth with EDs to provide additional context for our results. Future studies should compare ED-related medical complications in a publicly insured sample of youth with EDs versus a privately insured sample of youth with EDs and examine hospitalization trends among these youth. Further investigation is needed to understand publicly funded service utilization to develop targeted interventions and to understand how to best adapt evidence-based treatments to real-world clinical settings while minimizing barriers to accessing care.

Conclusion

Most publicly insured youth with EDs received no ED-related medical diagnosis during the 3-year study period, which may underscore the structural barriers to receiving expert medical care for this disorder or highlight inherent biases of medical providers who perpetuate dangerous myths around who develops an ED. While likely under-recognized and undertreated, medical complications are highly prevalent in publicly insured youth with EDs and represent an ongoing threat to health and wellbeing on top of structural barriers to equitable medical and behavioral healthcare. Limited access to evidence-based ED treatments and specialized treatment providers further contributes to disparities in medical outcomes and worsening of the significant public health burden of these illnesses. Our data highlight the need to train community medical providers in the recognition and treatment of ED-related medical complications. Together, early and accessible psychotherapy with medical oversight from an ED-informed medical provider may help to prevent or reduce morbidity and mortality rates from these deadly disorders.

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Supplementary Data

Supplementary data related to this article can be found online at https://doi.org/10.1016/j.jadohealth.2023.12.010.

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