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Adolescent Eating Disorder Treatment Outcomes of an In-Person Partial Hospital Program versus a Virtual Intensive Outpatient Program

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Keywords
Family-based treatment; adolescent; eating disorders; virtual care; telehealth; videoconference; COVID

Author Contributions Statement
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Data Availability Statement
The data that support the findings of this study are available from the corresponding author upon reasonable request.

Funding Statement
This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of Interest Disclosure Statement
The authors have no conflicts of interest to disclose.

Abstract

Objective: Though virtual outpatient psychotherapy for eating disorders is likely effective, less is known about virtual higher levels of care. The current study examined clinical outcomes of a family-based virtual intensive outpatient program (vIOP) for youth with eating disorders which was developed in response to the COVID-19 pandemic, compared to the same institution's in-person partial hospital program (PHP). **Methods:** Treatment outcomes were assessed via chart review in 102 patients between the ages of 9-23 (M = 15.2, SD = 2.5) who were predominantly cisgender female (84.3%) and primarily diagnosed with anorexia nervosa (64.7%) or atypical anorexia (23.5%). Participants were either treated in the in-person PHP before the pandemic (n = 49) or the vIOP during the pandemic (n = 53). Percent expected body weight (%EBW) was examined at baseline, end of treatment, three-months post-treatment, and six-months post-treatment, as well as frequency of medical, psychiatric, and residential admissions before, during, and after vIOP or PHP participation. **Results:** Linear mixed models demonstrated no effect of treatment modality (in-person versus virtual) on %EBW over time. The duration of the vIOP was, on average, 12 calendar days longer, though the amount billed for the vIOP was lower. Survival analyses and Cox regression models did not suggest differences in frequency of hospital and residential treatment admissions during treatment (vIOP: 9.4%, PHP: 10.0%) or post- treatment (vIOP: 15.0%, PHP: 10.2%). **Discussion:** Findings support virtual family-based programs as suitable alternatives to in-person treatment and underscore the potential cost-effectiveness of a family-based IOP versus PHP.

Public Significance Statement: This study demonstrates that a virtual, family-based, intensive outpatient program for youth with eating disorders had similar treatment outcomes to an in-person partial hospitalization program. Specifically, the virtual and in-person programs had similar weight restoration outcomes and rates of medical, psychiatric, or residential treatment admissions during or after treatment initiation. Findings support the use of virtual treatment, even for youth requiring a high level of intervention.

Introduction

Eating disorders are serious psychiatric conditions with significant impacts on psychological and social functioning and associated medical problems (Klump et al., 2009). Unfortunately, the proportion of patients who have access to evidence-based treatment is low (Hart et al., 2011). One strategy for increasing access to treatment, especially for individuals living in geographical areas where evidence-based eating disorder care is unavailable, is the use of virtual care, where treatment is delivered via videoconferencing (Couturier et al., 2021). Prior to the onset of the COVID-19 pandemic, published literature on virtual treatment was limited, including primarily small case series or case studies. Most studies focused on the use of variations of cognitive behavioral therapy for eating disorders in adults (Abrahamsson et al., 2018; Bakke et al., 2001; Giel et al., 2015; Hamatani et al., 2019; Simpson et al., 2003; Simpson et al., 2006), or family-based interventions in adolescents (Goldfield & Boachie, 2003; Anderson et al., 2015, 2017). In one randomized trial of CBT for bulimia nervosa via face-to-face versus virtual treatment, similar improvements in eating disorder and depression symptoms were identified in the virtual versus in-person conditions (Mitchell et al., 2008). Together, the early literature on virtual psychotherapy for eating disorders supported the feasibility of virtual interventions and provided preliminary evidence of clinical improvements in eating disorder symptoms.

The transition to telehealth in the context of the COVID-19 pandemic led to more research on the effectiveness of eating disorder interventions delivered virtually. Non-randomized studies suggested that outcomes for youth and adults receiving outpatient interventions, including family-based treatment (FBT) and enhanced cognitive behavioral therapy (CBT-E) were similar in patients treated via telehealth compared to patient cohorts that received in-person treatment prior to the pandemic (Raykos et al., 2020, Steiger et al., 2021). Importantly, these studies were

observational, conducted in the context of COVID-19, and it is unknown how results were affected by the pandemic. Nonetheless, the findings provide encouraging support for virtual care.

Though it is recommended that individuals with eating disorders be treated in the least restrictive environment possible, such as outpatient therapy, some patients need an enhanced level of support or monitoring to promote symptom improvement. Intensive outpatient programs (IOP) and partial hospitalization programs (PHP) are examples of such higher levels of care (HLOC). These programs offer many hours of intervention on several days per week and are typically appropriate for patients who are not progressing in outpatient treatment, but do not require the 24/7 monitoring and medical support of inpatient or residential treatment programs (Derenne, 2019). Four studies have reported outcomes related to virtual HLOC programs, including a PHP for adults (Plumley et al., 2021), a PHP for youth (Brothwood et al., 2021), an IOP with both adolescents and adults (Levinson et al., 2021), and an IOP for adults (Blalock et al., 2020). Similar to findings in the literature on outpatient interventions, results were suggestive of a range of clinical improvements including body mass index (BMI; Levinson et al., 2021; Plumley et al., 2021), eating disorder symptoms (Blalock et al., 2021; Levinson et al., 2021; Plumley et al., 2021) and comorbid symptoms such as depression (Blalcok et al., 2021; Levinson et al., 2021; Plumley et al., 2021) and anxiety symptoms (Plumley et al., 2021). One study compared outcomes in the virtual IOP to a cohort who participated in the in-person IOP prior to the pandemic, and found that outcomes were comparable (Levinson et al., 2021). Despite the positive clinical outcomes observed, some challenges implementing the virtual HLOC were noted, including needing adaptations to meal support and challenges facilitating groups virtually (Plumley et al., 2021, Brothwood et al., 2021). Acceptability ratings of the virtual interventions were variable, with adults and parents rating satisfaction high in two studies (Blalock et al.,

2020; Brothwood et al., 2021), while youth in one study conducted early in the pandemic suggested that they would prefer in-person care (Brothwood et al., 2021).

Though outcomes related to virtual HLOC programs are encouraging, none of the studies included follow-up beyond treatment discharge, and most were completed in the first year of the COVID-19 pandemic, making it difficult to determine what impacts the pandemic may have had on outcomes. The only HLOC study to focus on a family-based modality with youth included a qualitative description of patient and family experiences with fourteen families who were part of the program during the early months of the COVID-19 pandemic (Brothwood et al., 2021). Given the growing use of family-based modalities in higher level of care, further investigation of outcomes in family-based HLOC virtual programs is indicated. It is especially important to consider that the involvement of parents/caregivers allows for direct intervention and support in the home environment despite interactions with the treatment team being virtual, which may make family-based interventions particularly adaptable to virtual HLOC. For example, lack of in-person meal support in patients who have severe enough illness that they may not be able to eat adequately without direct observation and support has been cited as a challenge in adult virtual HLOC programs (Plumley et al., 2021). In a family-based program, parents are guided to fulfill the role of meal preparation and supervision, and thus may be able to achieve meal completion and weight progress even in youth with severe illness.

The current study used a retrospective chart review design to investigate outcomes in one HLOC program that offered in-person care (pre-pandemic), and virtual care (during pandemic). Specifically, we compared clinical outcomes related to percent expected body weight (%EBW) at baseline, end of treatment, 3-months post-treatment, and 6-months post-treatment in patients receiving care in-person versus virtually. Additionally, we examined the frequency of admissions

for additional intensive interventions, including medical, psychiatric, or residential treatment admissions before, during, and after treatment. Given the previous literature suggesting that both outpatient and HLOC programs had similar outcomes in pre-pandemic in-person treatment compared to virtual interventions, we hypothesized that no differences in outcome by treatment modality would be detected.

Methods

Participants

This study was approved by the University of Michigan Institutional Review Board. Participants included 53 patients who were admitted to the virtual intensive outpatient program (vIOP) between October 2020 through October 2021, and 49 patients admitted to the in-person PHP between October 2018 through October 2019. Patient demographic and descriptive characteristics, including age, race and ethnicity, sex, gender identity, family status, and eating disorder diagnosis, are described in Table 1. All participants provided consent/assent to participate in the study. We chose October 2020-October 2021 for the vIOP data collection because this represented a time when the vIOP programming was consistent. The months earlier in the pandemic (i.e., March 2020-September 2020) were excluded, as rapidly changing circumstances altered the nature of services offered. To account for any potential seasonal variations in referrals, we examined the same time frame in the in-person PHP for the year prior to the onset of COVID-19 during corresponding months (October 2018-October 2019). For analyses related to EBW, patients were included if they were below their expected body weight (EBW) upon program enrollment (<95% EBW) and thus weight restoration was a treatment goal, since percent EBW was a primary outcome measure. Overall, 82% of the sample were <95% EBW at baseline and thus included in EBW analyses (PHP $n = 43$, vIOP $n = 41$). Frequency of

need for weight restoration did not differ between in-person and virtual care $X^2(1, N = 101) = 2.69$, $p = .10$. All patients were included in analyses related to frequency of requiring medical, psychiatric, or residential levels of care, regardless of need to weight restore.

Treatment

The HLOC in-person and virtual programs included in this study are built upon the principles of FBT. Although manualized FBT is designed to be an outpatient treatment, FBT principles are integrated into the HLOC setting by maintaining key tenets of FBT (Hoste, 2015). For example, all patients and families enter the program by completing standard introductory sessions, including a family meal, as occurs in manualized outpatient FBT (Lock & Le Grange, 2015), and families participate in weekly family sessions that aim to replicate the content and goals of family sessions in outpatient FBT throughout program enrollment. The program focuses on parental self-efficacy by placing the responsibility of renourishment on the parents. Patients participate in several therapy groups throughout the week that are aimed to provide additional support during the treatment process, including group content focused on cognitive-behavioral therapy, dialectical behavior therapy, body image, nutrition, and supportive psychotherapy. Patient groups focus on skill-building and coping, rather than patient-driven behavioral change, as behavioral changes related to eating are conceptualized as the task of the parents. Parents participate in twice weekly support and psychoeducational groups. Additionally, patients have regular medical and psychiatry visits throughout program participation. Admission criteria for the vIOP and PHP include that the patient is experiencing moderate to severe eating disorder symptoms with functional impairment, that they have a caregiver (most often a parent) available to participate in the treatment process, and that they have had an unsuccessful trial of outpatient treatment, and/or an acuity suggesting that outpatient treatment would be unsafe or unsuccessful,

and/or they are unable to access appropriate outpatient treatment. Most patients participating in the PHP had prior outpatient eating disorder care (n =32, 65%), including eating-disorder focused psychotherapy, dietitian, and/or an alternate eating disorder PHP/IOP program. A lower proportion of vIOP patients accessed prior outpatient care (n=21, 40%), which may be an indicator of lack of access due to high demand during the pandemic, especially given the high acuity of the vIOP group (e.g., 83% of vIOP patients medically hospitalized prior to treatment).

Though the core tenets and interventions were the same in the in-person versus virtual programs, it is important to acknowledge differences in treatment intensity (see Table 2). The in-person program is delivered as a partial hospital program (PHP) which offers treatment five days per week for six hours per day. In addition to in-person patient and parent groups, patients participate in daily breakfast, snack, and lunch in the program, with parents required to be present for at least one meal. Parents choose all the meals and snacks that the patient receives during the treatment day rather than staff. Parents are also tasked with choosing, portioning, plating, and supervising the meals and snacks completed outside of the program such as evenings and weekends.

The virtual program is delivered as a virtual intensive outpatient program (vIOP), which offers treatment on four days per week with the virtual appointments and groups conducted via videoconferencing. Specifically, on three days per week, patients attend three hours of virtual group therapy sessions, and on one day per week, patients attend medical and psychiatric appointments. Like the in-person program, parents also attend two weekly parent groups (one support and one psychoeducation group), but they are conducted virtually. The medical and psychiatric appointments are typically completed in-person for the initial weeks of treatment to assess medical stability, and transition to virtual appointments when deemed appropriate by

providers. Additionally, patients attend a weekly virtual family session. There are no virtual meal support groups offered as part of the vIOP, as the treatment team did not feel it was clinically indicated to involve multiple families in a combined virtual group session to complete their meals, and staffing was not available for every family to have individualized meal support. Instead, families were instructed to choose, portion, plate, and supervise meals at home, and there were breaks scheduled during group days to allow for maintaining needed meal/snack frequencies. Of note, the 13 hours of weekly interventions offered by this vIOP is more than the minimum of 9 hours of weekly intervention that is typically required by US-based insurance companies to reimburse the IOP level of care (Kantor, 2011).

Taken together, while the total hours of treatment per week varied across the PHP and vIOP (~32 hours over five days weekly versus ~13 hours over 4 days weekly, Table 2), the time involved in many key treatment interventions were similar. One of the primary differences driving the increased hours of care in the PHP included adjunct therapy groups such as relaxation and self-expression, which comprised 5 hours per week in the PHP and were not offered in the vIOP. Likewise, the PHP offered direct meal support for breakfast, snack, and lunch each day, resulting in 6.25 hours of meal support intervention per week in the PHP that did not occur in the vIOP. Given the global similarities across the programs, comparison was deemed appropriate despite the differences in intervention hours, especially given that our primary research question is whether the program offering fewer hours of care per week (the vIOP) was effective.

Measures

Measures included duration of treatment, medical, psychiatric, and residential admissions before, during, and after treatment, %EBW at baseline, end of treatment, as well as 3-months and 6-months following treatment discharge, and cost of treatment which was calculated based on

institutional billing rates for in-person PHP and vIOP treatment days and the number of treatment days each patient attended. Of note, cost was calculated based on raw billing amount, not accounting for actual insurance reimbursement rates or charity care. Our treatment team sets EBWs based on treatment team consensus when reviewing individual growth histories. All measures were assessed via chart review. For patient weights, clinic weights were recorded when available, though we accepted home weights reported by parents and recorded in the chart when a recent clinic weight check was unavailable (<7% of follow-up weights were home weights). Follow-up weights were obtained most often from in-person clinic appointments. Given that patients may not have had an appointment at exactly 3-months and 6-months post-discharge, we accepted weights within one month of these time points (i.e., 3-month post-discharge data include weights between 2-4 months; 6-month post-discharge data include weight measurements obtained between 5-7 months).

Statistical Analyses

Percent EBW Analyses

Prior to analyses, patterns of missing data were examined. Data on %EBW were nearly complete at baseline and end of treatment (1% missing). At 3-months post-treatment, 22% of patients were missing %EBW data, and at 6-months post-treatment, 35% were missing %EBW data. When comparing individuals with complete follow-up data to those with incomplete data, no group differences in %EBW at any time point were detected (p's = .37-.70) and no differences in treatment duration were detected (p = .72). We concluded that the follow-up data were most likely missing at random (MAR) and utilized multiple imputation for %EBW analyses. Multiple imputation was then completed using SAS Proc MI on the wide version of the dataset, with 15 imputations.

Linear mixed models were used to compare percent EBW in the vIOP and PHP at baseline, end of treatment, 3-months post-treatment, and 6-months post-treatment, covarying duration of treatment, age, baseline %EBW, and medical admission and psychiatric admission before treatment. We did not covary residential admissions prior to treatment because this only applied to one case. Given our hypothesis that we would not detect differences in EBW across groups, we adopted a noninferiority design, setting the margin at 5% of the 6-month %EBW (i.e., the between-group difference in 6-month EBW that would be considered equal was 5%). Under these assumptions, we calculated that a total sample size of 68 (34 per group) was required to have 0.8 power that the lower limit of a 2-sided 90% CI would be above the a priori non-inferiority limit. The dataset was transposed to the long version of the file before running the mixed models on each imputation dataset and then SAS Proc Mianalyze was used to combine the results from the mixed models. Age and baseline %EBW were mean-centered prior to modeling. Time from start of treatment (days) was included in the model as a continuous variable and was centered at 6 months so that the main effect of group in the model would be estimating the main effect at the end of follow-up. A mixed model was run with %EBW as the dependent variable and treatment group, time, group by time interaction, duration of treatment, age, baseline %EBW, medical admission, and psychiatric admission before treatment entry as predictors. Random intercepts and slopes were included in the model, to allow a unique trajectory for each individual.

Hospitalization Frequency

Patterns of admissions for medical, psychiatric, or residential treatment before, during, and after PHP/vIOP treatment were also examined, as these admissions were conceptualized as an indicator of symptom severity or worsening symptoms following discharge. Chi-square and

Fisher's exact tests were used to initially examine differences in admissions across groups at each time point (before, during, or within 6-months following discharge). Survival analyses were then used to examine the proportion of patients across groups that had a psychiatric, medical, or residential admission at any point after vIOP or PHP admission (i.e., during vIOP or PHP or after discharge), and frequency of these admission events across groups was compared using Kaplan-Meier estimates. We additionally utilized a Cox Regression Model to compare frequency of admissions during or after treatment while controlling for age, duration of treatment, previous medical admissions, previous psychiatric admissions, and baseline %EBW. As a sensitivity analysis, we ran the survival analysis and Cox Regression model while restricting all patients to six months of follow-up to account for the fact that the PHP group was followed longer than the vIOP group.

Results

Treatment Characteristics

Descriptive statistics related to treatment duration and cost are shown in Table 3. Treatment duration and time to post-treatment visits across groups differed significantly, with vIOP patients enrolled for 12 more calendar days, on average, compared to PHP patients, and vIOP post-treatment 3- and 6-month appointments occurring sooner. There was also a significant difference in treatment cost, with the amount billed for vIOP being less than the PHP.

Percent EBW Analyses

Descriptive statistics for %EBW at each time point are shown in Table 3, and mixed model results are shown in Table 4. There was no effect of treatment group on %EBW at 6-months post-treatment ($p = .40$) and no effect of group on the trajectory of %EBW over time

(group by time interaction term, p = .43). As expected, baseline %EBW significantly predicted outcome, with those starting treatment at higher %EBW being more likely to have a higher %EBW at follow-up ($p < .001$). Age was also a significant predictor ($p = .003$), with older participants experiencing lower %EBW at 6-months post-treatment.

Hospitalization Analyses

Descriptive data demonstrating frequencies of medical admission, psychiatric admission, or residential admission before, during, and within 6-months after treatment are shown in Table 3. Overall, results suggested high rates of medical hospitalization prior to treatment initiation, and a significantly greater proportion of vIOP patients (83%) were medically hospitalized compared to PHP patients (53%). Rates of psychiatric or residential admissions prior to vIOP and PHP were lower and did not significantly differ across groups. Likewise, there were no differences in the proportion of patients who had hospital or residential admissions during or within 6-months following discharge from vIOP/PHP. Overall, ten patients (9.8%) had a hospital or residential admission during vIOP/PHP participation, and 13 patients (12.7%) had a hospital or residential admission within 6-months of vIOP/PHP discharge.

Survival analysis results are depicted in Figure 1, where survival indicates no known medical or psychiatric hospitalizations or residential admissions following the start of vIOP or PHP treatment. There was no difference in need for hospital/residential admissions between treatment groups (p = .70, Log-Rank test of equality). A Cox regression model, controlling for age, duration of treatment, baseline %EBW, and pre-treatment medical and psychiatric admissions also suggested no treatment group difference in during/post-treatment medical, psychiatric, or residential admissions ($p = .22$). Of note, treatment duration was associated with the hazard rate, such that with each additional week of vIOP/PHP treatment, the hazard rate

increased by 27%, suggesting that requiring longer PHP or vIOP treatment may be an indicator of illness severity or risk of hospital/residential admissions. When restricting survival analysis to 6 months post-treatment for all patients, the results were similar (Figure 2), again suggesting no differences between treatment groups (p = .94 log-rank test of equality). Likewise, results for a Cox regression model that was restricted to 6-month follow up suggested no treatment group difference (p = .37).

Discussion

To our knowledge, this is the first quantitative study of treatment outcomes in a virtual HLOC program that is focused on family-based interventions. As hypothesized, similar outcomes were observed in the vIOP and the in-person PHP. In both groups, there were significant improvements in %EBW over time, with average %EBWs suggesting that participants were at or very close to weight restored at 3- and 6- month post-treatment. Outcomes related to need for higher levels of care following treatment were similar in the vIOP and in-person cohorts and suggested that overall rates of admission to a higher level of care were similar (see Figure 1). These findings add to the literature supporting the use of virtual HLOC programs (e.g., Levinson et al., 2021) and are consistent with prior research suggesting that virtual FBT is effective (Anderson et al., 2017). Importantly, the program investigated in the current study uses a specific intervention that utilizes the support of parents and caregivers, and these findings may not extend to programs that do not integrate families. Beyond the COVID-19 pandemic, virtual HLOC programs may be a promising, cost-effective strategy to allow patients to access intensive care while being able to stay in their home environment, even when they are not geographically close to treatment centers offering this level of care.

Though duration of admission to the vIOP was longer, the decreased intensity of care delivered by the vIOP resulted in lower costs (in terms of amount billed) for the vIOP compared to the PHP. Of note, the lower charges associated with the vIOP were not due to the virtual modality per se; instead, this was because the virtual program was an IOP level of care instead of a PHP; the cost difference at our institution would have been similar had both programs been in-person. Nonetheless, this finding suggests that a family-based IOP may be more cost-effective than a similar PHP. This pattern of results is an important reminder that treatment should be delivered in the lowest level of care that is appropriate to patient symptoms, and increased access to evidence-based outpatient treatments could potentially prevent the costs associated with escalation to IOP, PHP, or residential treatment.

The data on post-treatment medical, psychiatric, and residential admissions provided a unique examination of the rates of severe symptoms requiring high levels of intervention during or after involvement in the vIOP or PHP. Though rates of during and post-treatment HLOC admissions were similar across treatment groups, frequency of admissions were notable, with 9.8% of patients admitted to a higher level of care during vIOP/PHP participation, and 12.7% of participants admitted to a higher level of care within 6 months after vIOP/PHP. Combined, and counting cases who had admissions both during and after treatment only once, this amounts to 17% of patients experiencing at least one admission event during and/or within 6 months after vIOP/PHP. When follow-up time was extended to all known observations (not limiting to 6-month post-treatment), 25% of participants had known admissions to a higher level of care during or following vIOP/PHP. This is relatively consistent with prior literature, where 15% of patients with AN participating in outpatient FBT and 37% of participants receiving individual psychotherapy were hospitalized during the 12-month treatment period (Lock & LeGrange,

2010). The rate of higher level of care admissions highlights the challenge of managing severe or relapsing eating disorder symptoms in youth. Indeed, of the 26 youth who had known admissions during treatment or at any available follow-up observation, only 8 (30.8%) had just one "relapse" event (i.e., medical, psychiatric, or residential admission). Seven youth (26.9%) had two events, and 11 (42%) had between three and 10 known "relapse" events. These results point to the presence of persistent illness in a small cohort of youth, and the need for additional treatment strategies to support these patients, as little is known about early identification and management of persistent eating disorder symptoms that do not respond to repeated intervention in young patients (Kaplan & Strober, 2019). On a more promising note, the current findings do suggest that the frequency of admission events tended to stabilize over time, with the last observed admission event occurring 595 days (about 1.6 years) following PHP initiation (see Figure 1), though it remains possible that additional events will occur as more time elapses.

While overall results on the effectiveness of the vIOP are encouraging, there are important limitations to acknowledge. This was not a randomized study; our comparison group was a cohort of patients who were treated prior to the pandemic in our in-person PHP program. Though few treatment group differences were detected, the unknown impact of COVID-19 is important to acknowledge, given documented increases in eating disorder-related medical hospitalizations (Lin et al., 2021; Otto et al., 2021), increased challenges accessing care (Spigel et al., 2021), and overall declines in youth mental health (Racine et al., 2021) in the COVID-19 era. This context likely explains why an especially high proportion of patients enrolled in our virtual treatment program had been medically hospitalized (83%) prior to vIOP initiation, compared to 53% of the in-person program group (see Table 3). Though prior hospitalization was included as a covariate in analyses, there are many other variables that we could not account

for, some which may have advantaged treatment outcomes prior to the pandemic (e.g., improved access to treatment due to shorter waitlists) and some which may have potentially advantaged outcomes during the pandemic (e.g., some parents reporting that work from home options allowed for improved ability to provide meal support to their youth). We were also unable to assess patient or family variables that may predict when in-person versus virtual care may be specifically indicated. For example, though overall differences were not detected between groups, it is possible that certain patients and families may benefit from the increased structure and meal support offered by an in-person program. Future studies that randomize patients to virtual versus in-person conditions would help to clarify the effectiveness of telehealth interventions (Couturier et al., 2021).

Our outcome criteria were narrow, as we focused on %EBW and readmission rates. Certainly, %EBW is not the only meaningful outcome related to treatment progress, and lack of post-treatment admissions is a cursory indicator of illness severity. Indeed, lack of post-treatment admission does not imply recovery. We also may be unaware of admission events that occurred for patients who were lost to follow-up, and thus rates of admissions following discharge should be considered conservative estimates. Future studies should include more outcome assessments, including self- and parent- report measures of eating disorder and comorbid symptoms, as well as or overall well-being or psychological functioning and treatment satisfaction.

Nonetheless, these findings suggest that a virtual, family-based HLOC program was effective in promoting weight restoration, with similar improvements in %EBW and similar rates of post-treatment admissions when compared to a previously treated in-person cohort. Findings also demonstrated continued weight progress following treatment discharge, with patients discharging at about 94% EBW and then meeting and maintaining 98-100% EBW, on average, at

3- and 6- months post-treatment. Findings contribute to accumulating evidence suggesting that virtual care delivery may be an effective treatment modality in higher levels of care (e.g., Blalock et al., 2020, Levinson et al., 2021).

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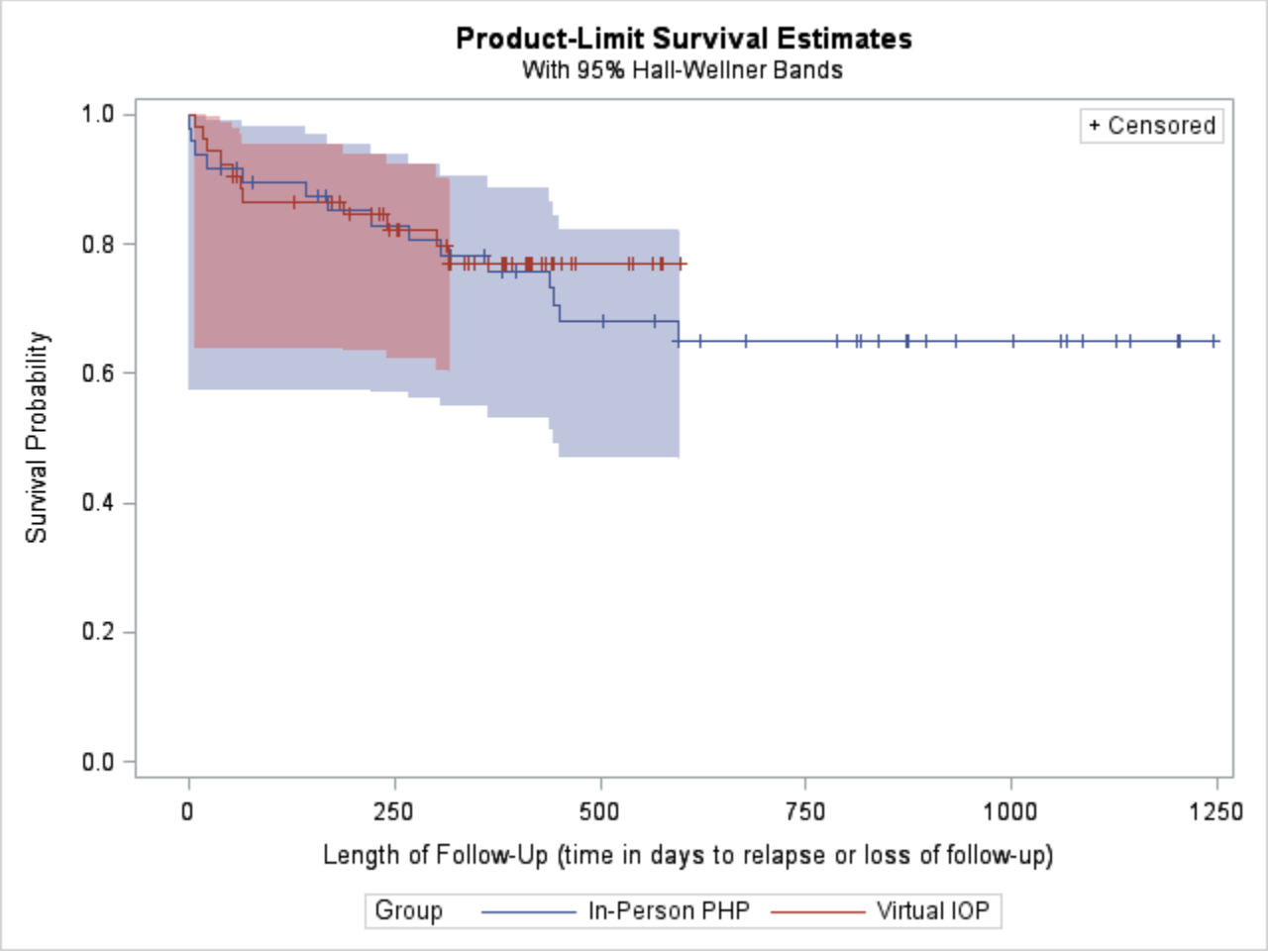
Figure 1.

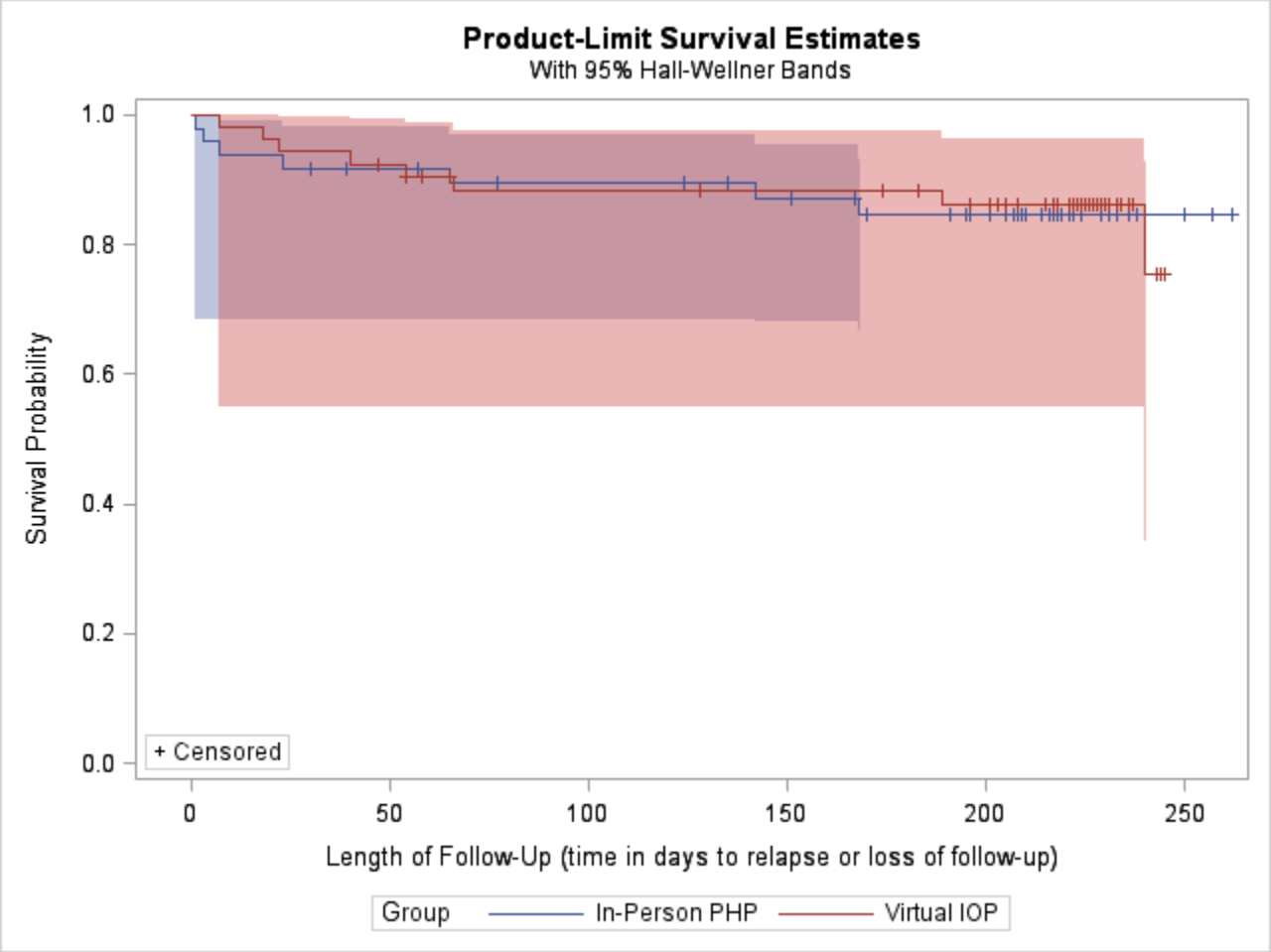
Survival Analysis Showing Probability of Medical, Psychiatric, or Residential Admission During or After vIOP/PHP Enrollment



Note. Longer follow-up time is available for in-person PHP since more chronological time has passed since these patients enrolled in treatment, given that their treatment occurred pre-COVID. X-axis indicates time, in days, from treatment initiation, with 0 representing the date of PHP/vIOP admission. Survival probability indicates probability of *not* having an admission event during or after virtual IOP or PHP treatment. Censoring (loss to follow-up) is indicated by a + mark on the lines. Loss-to-follow up was defined as the time at which a had a last appointment or other contact (e.g., phone call) within our institution. The shaded areas are Hall-Wellner confidence bands, which only extend to the last observed event (admission) for each group. At the point that the Hall-Wellner bands end, there are no further known admissions, but there are additional patients who were lost to follow-up.

Figure 2

Survival Analysis Showing Probability of Medical, Psychiatric, or Residential Admission During or After vIOP/PHP Enrollment, Constrained to 6-Months Post-Treatment



Note. Survival probability indicates probability of *not* having an admission event during or within 6 months following virtual IOP or PHP treatment. X-axis indicates time, in days, from treatment initiation, with 0 representing the date of PHP/vIOP admission. Censoring (loss to follow-up) is indicated by a + mark on the lines. Loss-to-follow up was defined as the time at which a had a last appointment or other contact (e.g., phone call) within our institution. The shaded areas are Hall-Wellner confidence bands, which only extend to the last observed event (admission) for each group. At the point that the Hall-Wellner bands end, there are no further known admissions, but there are additional patients who were lost to follow-up.

Table 1

Demographic and Descriptive Information for In-Person and Virtual Treatment

Variable	In-Person PHP *n* = 49	Virtual IOP *n* = 53	Difference test p-value
	n (%)	*n* (%)	Chi-Square or Fisher's Exact Test
Sex at Birth			
Male	8 (16%)	4 (8%)	.17
Female	41 (84%)	49 (93%)	
Gender Identity			
Cisgender Male	8 (16%)	4 (8%)	.39
Cisgender Female	39 (80%)	47 (89%)	
Transgender Male	1 (2%)	0 (0%)	
Transgender Female	0 (0%)	0 (0%)	
Nonbinary	1 (2%)	2 (4%)	
Other	0 (0%)	0 (0%)	
Race			
White	46 (94%)	50 (94%)	.90
Black or African American	1 (2%)	1 (2%)	
"Other" or Unknown	2 (2%)	2 (4%)	
Ethnicity			
Hispanic or Latinx	5 (10%)	2 (4%)	.26
Not Hispanic or Latinx	44 (90%)	51 (96%)	
Family Status			
Intact – Biological Parents	36 (73.5%)	38 (71.7%)	1.00
Intact – Adoptive Parents	1 (2%)	2 (3.8%)	
Divorced/Separated	11 (22.4%)	12 (22.6%)	
Widowed	1 (2%)	1 (1.9%)	
Eating Disorder Diagnosis			
AN - R	26 (53.1%)	31 (58.5%)	.34
AN – B/P	4 (8.2%)	5 (9.4%)	
BN	4 (8.2%)	1 (1.9%)	
ARFID	4 (8.2%)	1 (1.9%)	
OSFED – Atypical AN	11 (22.4%)	13 (24.5%)	
OSFED – Other	0 (0%)	2 (3.8%)	
	M (SD)	*M (SD)*	T-Test
Age	15.00 (2.67)	15.28 (2.26)	.57

Note: AN – R = Anorexia nervosa, restricting type, AN – B/P = Anorexia nervosa, binge/purge type, BN = bulimia nervosa, ARFID = avoidant/restrictive food intake disorder, OSFED = other specified feeding or eating disorder. Chi-square test was used for sex at birth, Fisher's exact test was used for gender identity, race, ethnicity, family status, and eating disorder diagnosis.

Table 2

Components of In-Person Partial Hospitalization Program (PHP) versus Virtual Intensive Outpatient Program (vIOP)

Intervention Component	In-Person PHP	Virtual IOP
Total hours of intervention per week	32	13
Total days of scheduled treatment contact per week	5	4
Family sessions per week	1	1
Patient psychotherapy groups per week	9-10	6
Patient nutrition groups per week	1-5[a]	3
Patient school sessions per week	0-5[a]	As needed[b]
Patient adjunct therapy groups per week (e.g., self-expression, relaxation groups)	5	0
Parent groups per week	2	2
Medical visits per week	1	1
Psychiatry visits per week	2	1
Meals/Snacks with staff per week	15	0

Note: Both the in-person and virtual programs are FBT-informed. Family sessions, patient groups, and parent groups are 60 minutes in duration. Medical and psychiatry visits are approximately 30 minutes in duration, but may be shorter or longer depending on individual patient needs. The 15 in-person PHP meals/snacks comprise 6.25 total hours throughout the week.

[a] Number of nutrition versus school sessions in the PHP varies based on patient age and needs. Children and adolescents who have not yet graduated high school attend 5 school sessions per week and 1 nutrition group per week. Young adults who are not enrolled in school attend 0 school sessions and 5 nutrition groups per week. Young adults who are enrolled in school (e.g., college) typically attend 2-3 school sessions per week and 2-3 nutrition sessions per week, depending on treatment needs.

[b] There are not scheduled group school sessions for the vIOP. However, an educational specialist completes an intake with all families to assess patient school needs and provides appropriate interventions as needed (e.g., coordinating accommodations with the school, virtual tutoring sessions).

Table 3.

Treatment Characteristics and Outcomes for In-Person and Virtual Treatment

Variable		In-Person PHP	Virtual IOP	Difference test p-value
		M (SD)	*M (SD)*	t-test
%EBW Baseline		86% (7%)	84% (7%)	.19
%EBW EOT		94% (5%)	94% (7%)	.71
% EBW 3 Mo FU		100% (5%)	98% (7%)	.20
% EBW 6 Mo FU		101% (9%)	98% (7%)	.12
Amount Billed (US Dollars)		$64,854 ($30,202)	$30,296 ($7,564)	<.001*
Duration of Treatment, Days		38.67 (17.19)	50.83 (13.83)	<.001*
Days to 3-Month Post-Treatment Appointment		92.05 (12.98)	85.74 (16.08)	.05*
Days to 6-Month Post-Treatment Appointment		182.24 (16.07)	173.67 (18.18)	.04*
		n (%)	*n* (%)	Chi-Square or Fisher's Exact Test
Medical Hospitalization	Before Treatment	26 (53.1%)	44 (83.0%)	.001*
	During Treatment	0 (0.0%)	4 (7.5%)	.12
	After Treatment[a]	3 (6.1%)	2 (3.8%)	.67
Psychiatric Hospitalization	Before Treatment	9 (18.4%)	13 (24.5%)	.45
	During Treatment	5 (10.2%)	4 (7.5%)	.74
	After Treatment[a]	3 (6.1%)	4 (7.5%)	1.00
Residential Admission	Before Treatment	2 (4.1%)	3 (5.7%)	1.00
	During Treatment	1 (2.0%)	0 (0.0%)	.48
	After Treatment[a]	2 (4.1%)	4 (7.5%)	.68
Any HLOC	Before Treatment	32 (65.3%)	49 (92.5%)	.001*
	During Treatment	5 (10.2%)	5 (9.4%)	1.00
	After Treatment[a]	5 (10.2%)	8 (15.0%)	.46

Note. EBW = Expected body weight. HLOC = higher level of care. PHP = partial hospitalization program. IOP = intensive outpatient program. Sample size for analyses involving %EBW were

PHP $n = 43$, vIOP $n = 41$. Sample sizes for all other analyses were PHP $n = 49$, virtual IOP $n = 53$. Duration of treatment includes calendar days from treatment initiation to discharge. Medical hospitalization, psychiatric hospitalization, and residential admission could have occurred within the same patient (i.e., some cases had multiple types of admissions), whereas the "Any HLOC" cells show the number of patients who had at least one type of admission at each time point (i.e., patients with one *or* multiple admission types within a time point are coded yes; patients with no admissions within a time point are coded no). For admission frequency data, chi-square test was used for medical hospitalization before treatment, psychiatric hospitalization before treatment, any HLOC before treatment, and any HLOC after treatment. All other frequency data utilized Fisher's Exact Tests due to low cell counts.

[a]After treatment includes follow-up data for 6 months following treatment discharge

* = $p < .01$

Table 4.
Mixed Models Predicting %EBW by Treatment Group and Time

Variable	Estimate	Standard Error	*t*	*p*
Treatment Group	1.36	1.36	0.83	.40
Treatment Duration	-0.01	0.02	-0.62	0.54
Age	-0.23	0.08	-2.90	<.01*
Baseline %EBW	0.82	0.04	21.82	<.001*
Medical Admission Before Treatment	0.55	0.50	1.11	0.27
Psychiatric Admission Before Treatment	0.99	0.63	1.57	0.12
Time Since Treatment Admission	0.05	0.01	7.70	<.001*
Time Since Admission * Treatment Group	0.01	0.01	0.79	0.43

Note: Mixed models utilized multiple imputation data. Time since admission * treatment group indicates interaction between group and time on %EBW.
*= $p < .01$