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EXAMINING MOTIVATIONAL INTERVIEWING ADDRESSING ADOLESCENT SUBSTANCE USE DURING PSYCHIATRIC HOSPITALIZATION

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EXAMINING MOTIVATIONAL INTERVIEWING ADDRESSING ADOLESCENT
SUBSTANCE USE DURING PSYCHIATRIC HOSPITALIZATION

BY

DANIELLE HILL

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE
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OF

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ABSTRACT

Adolescent suicide is a serious public health issue, given that it is the second most common cause of death among individuals aged 10 to 24 years in the United States. Substance use is among the major risk factors for continued adolescent suicidal behavior and having a substance use disorder (SUD), has been identified as a risk factor for adolescents being readmitted to acute psychiatric care. However, adolescents often do not receive treatment that adequately addresses substance use in the same setting. The primary purpose of this study was to examine whether or not adding a Brief Motivational Interviewing intervention (BMI) addressing adolescent substance use (e.g., alcohol and marijuana use) in an adolescent acute psychiatric setting was associated with lowered prospective risk of rehospitalization. A retrospective cohort study design was used, and patients (N=158), admitted between July 2016 and October 2017, were 16 years old on average and were 66.7% White, 13.2% Black, and 19.5% other; ethnic makeup included 22.0% Hispanic adolescents. Cox proportional hazard regression (survival) analyses revealed that BMI completion did not significantly predict days to rehospitalization, nor did declining the BMI significantly predict hospital readmission, however, some of the sociodemographic and treatment factors did significantly predict higher risk of rehospitalization (i.e., greater severity of diagnosis, being male, older age, and greater length of stay). It is crucial for there to be more aggressive outreach and follow-up, following psychiatric hospitalizations, particularly for high-risk youth with prior suicidal behavior. More research is needed to examine the effectiveness of substance use interventions such as BMI in acute psychiatric settings in order to reduce substance use among adolescents.

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CHAPTER 1

INTRODUCTION

Adolescent suicide is a serious public health priority as it is the second most common cause of death among individuals aged 10 to 24 years in the United States (Centers for Disease Control [CDC], 2014). Substance use is among the major risk factors for continued adolescent suicidal behavior (Darvishi et al., 2015) as substance use has been found to increase the likelihood of suicide attempts by nearly 25-fold (Wu et al., 2004). Moreover, suicide attempts are the main cause for referral to adolescent inpatient psychiatric care (Dawes et al., 2008). Having a substance use disorder (SUD) in particular has been identified as a risk factor for adolescents being readmitted to acute psychiatric care (Fontanella, 2008). Perhaps one reason for the association between having an SUD and rehospitalization is that adolescents with comorbid disorders, such as those with a substance use disorder, often do not receive treatment that adequately addresses substance use in the same setting (Hawkins, 2009). Therefore, the purpose of the current study is to investigate whether the implementation of a brief motivational interviewing intervention addressing adolescent substance use in an adolescent acute psychiatric setting will be associated with lowered prospective risk of rehospitalization.

CHAPTER 2

REVIEW OF LITERATURE

Increased rates of suicide completion and attempts, and readmissions to acute psychiatric care in the weeks following the discharge of adolescents who have attempted suicide have been noted (Knesper, 2010). Research has indicated that adolescent substance use may be a factor that predicts or precipitates the progression from suicidal ideation to a suicide attempt (O'Brien, 2014). Although there is a strong link between adolescent substance use and suicidal behaviors, there are limited studies that have examined the effectiveness of an integrated intervention that focuses on both of these concerns (Conason et al., 2006). Therefore, incorporating substance use interventions into psychiatric treatment for adolescents who attempt suicide could be beneficial in reducing adolescents suicide risk later (O'Brien, 2014).

Adolescent substance use (i.e., alcohol use and marijuana use) has been shown to significantly increase risk for depressive symptoms, suicidal ideation, and suicide attempts (Buckner et al., 2011; Clarke et al., 2014; Galaif et al., 2007; Schilling et al., 2009; Serafini et al., 2013). In fact, research has found that teens are nine times more likely to attempt suicide if they also have an alcohol use disorder (Wu et al., 2004). Depression among adolescents can often co-occur with an alcohol use disorder, and if left untreated, may result in higher rates of suicidality (Fuller-Thomson et al., 2013; Miranda et al., 2008; Rosenberg et al., 2005). Severe effects of alcohol intoxication may lead to impaired judgment, increased disinhibition, increased negative affectivity,

increased aggression, and poor impulse control which can ultimately increase the possibility of attempting suicide (Bridge et al., 2006; Schilling et al., 2009; Sher, 2006). Studies have also shown that marijuana is the most common illicit drug found in toxicology reports among persons who died by suicide (Darke et al., 2009). One study that examined marijuana use and mental health found that female adolescents who endorsed daily marijuana use were five times more likely to report depressive symptoms compared to individuals who did not smoke marijuana (Patton et al., 2002), which is particularly alarming given increasing legalization in many jurisdictions. Findings from another study indicated that adolescents were seven times more likely to attempt suicide if they engaged in marijuana use (Clarke et al., 2014). Additionally, a longitudinal study found that intensive marijuana use (i.e., at least several times a week) predicted later suicidal ideation (Van Ours et al., 2013). Adolescents with depressive symptoms may also utilize such substances as tools to self-medicate (Hyman et al., 2009; Kuntsche et al., 2005). Researchers have suggested that some adolescents engage in maladaptive coping mechanisms, such as substance use, in order to temporarily deal with emotional and social issues; however, these coping strategies are likely to be ineffective and even worsen the problem (Leonard et al., 2015).

An empirically supported intervention that is brief and feasible to implement, such as Motivational Interviewing (MI), is ideal for addressing substance use in primary care and inpatient psychiatric settings (Brown et al., 2003; Brown et al., 2009). MI has been successfully implemented in these types of settings with adults (Lundahl et al., 2010). MI is a client-centered counseling style that is a collaborative method for strengthening personal motivation and commitment to change by eliciting,

exploring, and resolving ambivalence (Miller & Rollnick, 2013). More specifically, MI can address current discrepancies between an individual's values, behaviors, and their future goals (Miller & Rollnick, 2013). MI can be considered a useful tool for addressing adolescent substance use because it offers a therapeutic environment that is non-judgmental and non-confrontational (Miller & Rollnick, 2013). Furthermore, some researchers have emphasized the significance of capitalizing on a teachable moment or window of opportunity, which offers a good reason to provide interventions in medical settings such as in primary care, emergency rooms, or acute psychiatric settings (Baker et al., 2002; Barnett et al., 2003). Short therapeutic consultations that abide by MI principles have been developed, more specifically also known as brief motivational interviewing (BMI) interventions (Baker et al., 2002). These interventions often consist 1-5, 45 minute sessions that involve assessment, feedback, information, advice, and offering self-help resources (Baker et al., 2002).

An abundance of literature has explored the effectiveness of various MI interventions for adolescent substance use (Godley et al., 2010; Jensen, Cushing, Aylward, Craig, and Steele, 2011; Spirito et al., 2011; Walker et al., 2011). One meta-analysis, examining MI interventions, revealed a reduction in substance use among adolescents which yielded a small, but significant effect size ($d = .17$) (Jensen et al., 2011). The majority of the studies examined were brief interventions consisting of only one session of MI in the treatment and impressively, the interventions had a sustained effect over time (i.e., at 6 month follow-up) (Jensen et al., 2011).

Numerous studies comparing MI to treatment as usual and no-treatment control groups have found MI to reduce adolescent alcohol use and related

consequences (Bailey et al., 2004; D'Amico et al., 2008; Grenard et al., 2007; Spirito et al., 2011; Winters et al., 2007) and adolescent marijuana use and related problems (D'Amico et al., 2008; Godley et al., 2010; Martin & Copeland, 2008; Mason et al., 2011; Walker et al., 2011). However, very few studies to date have implemented an MI intervention focusing on adolescent substance use in an inpatient psychiatric setting (Brown et al., 2015, Brown et al., 2009). One study in particular incorporated a brief MI intervention focused on smoking cessation among adolescents in a psychiatric hospital setting (Brown et al., 2009). The investigators found that the brief MI intervention, compared to the control group where adolescent smokers received brief advice for smoking cessation, was significantly related to better substance use outcomes during the first six months following psychiatric hospitalization (Brown et al., 2009). Another study that examined the effectiveness of a BMI (i.e., two, 45 minute sessions) geared towards reducing substance use in an inpatient setting found that the BMI, compared to treatment as usual, was significantly related to better substance use outcomes (i.e., alcohol, marijuana, and any substance) during the first six months following psychiatric hospitalization (Brown et al., 2015). The MI group was abstinent longer from any substance use following hospital discharge compared to treatment as usual (36 days versus 11 days) (Brown et al., 2015). However, the investigators did not examine rehospitalization as an outcome.

Current Study

In sum, there is a clear relationship between adolescent substance use (i.e., alcohol and marijuana use), depression, and suicidality (Clarke et al., 2014; Darvishi et al., 2015; Fuller-Thomson et al., 2013). Prior studies have also indicated that the

existence of a substance use disorder is significantly associated with rehospitalization to acute psychiatric care (Fontanella, 2008; Hawkins, 2009). Based on this prior research, it is crucial for substance use problems to be addressed when adolescents are admitted for suicidal behavior (Fontanella, 2008). Although an abundance of literature has examined the effects of MI interventions on adolescent substance use in other settings, there is limited research examining MI interventions in adolescent inpatient unit settings in terms of rehospitalization (Brown et al., 2015; Brown et al., 2009). There are few studies that have examined the implementation of an MI intervention for substance use in an acute adolescent psychiatric setting, while statistically controlling for relevant factors that may be linked to readmission (e.g., sociodemographic, treatment, and psychosocial factors) (Fontanella, 2008; van Alphen, 2016). Additionally, MI interventions addressing substance use, in some hospitals, are given as part of standard hospital procedures, however, these interventions are not being completed.

Therefore, the purpose of this study was to examine whether or not adding a BMI intervention (i.e., one 45- minute manually guided individual session), addressing adolescent substance use (e.g., alcohol and marijuana use) in an adolescent acute psychiatric setting was associated with lowered prospective risk of rehospitalization. Additionally, among youth who were readmitted into one particular hospital, differences in adolescent's substance use were examined in order to assess the effect of the BMI.

CHAPTER 3

METHODOLOGY

Research Design

A retrospective cohort study design was used to determine whether the implementation of a BMI intervention addressing adolescent substance use in an adolescent acute psychiatric setting was associated with a lowered prospective risk in rehospitalization, after controlling for covariates. The current study is a retrospective cohort study due to the non-randomized nature of the study that still includes comparison groups (Grimes & Schulz, 2002a). Cohort studies can often assess incidence rates, relative risks, and attributable risks (Grimes & Schulz, 2002a; Song et al., 2010), which in the present study involves prospective risk for rehospitalization. Retrospective cohort studies in particular are implemented at the present time and examine past medical events or outcomes (Song et al., 2010). They can also provide rich information that could otherwise be unethical or infeasible if conducted using a randomized experiment design (Mann, 2003; Song et al., 2010; West, 2009). The predictor variables for the present retrospective cohort study included whether or not the BMI intervention was completed (coded as 1=yes; 0=no) and whether or not a BMI was offered but declined (1=yes; 0=no). The outcome variable consisted of number of days to rehospitalization and visits to the emergency room. Covariates included sociodemographic (e.g., age, sex), treatment (e.g., length of stay), and psychosocial factors (e.g., trauma).

Participants

The sample consisted of 158 patients admitted between July 2016 and October 2017 to an adolescent inpatient facility in the northeast with two 17-bed inpatient units (34 beds) due to imminent threat to themselves or others. Inclusion criteria included whether patients were elevated on the CRAFFT substance use screener (i.e., a score $\geq$ 2) and if patients were diagnosed with Major Depressive Disorder, based on a structured interview (see below for descriptions). Exclusion criteria consisted of those that exhibited psychosis at a severity of interference with completing questionnaires. More than half of the participants included females (54.1%) and the sample had a mean age of 16 years old (SD = 1.24). Racial composition of the sample included 66.7% White, 13.2% Black, and 19.5% other; ethnic makeup included 22.0% Hispanic adolescents. The average length of stay was approximately 13 days.

Treatment as Usual (TAU)

All patients were assigned a psychiatrist and a psychologist who coordinated treatment-planning activities with a multidisciplinary team. Treatment included pharmacotherapy, individual and family therapy sessions, and psychoeducational groups on a variety of topics using cognitive behavioral (CBT) and dialectical behavior (DBT) therapy techniques.

Motivational Interviewing Intervention

Adolescents who received the MI intervention also received TAU, which did not interfere with the patient's care on the unit. The brief intervention in the present study consisted of one 45- minute manually guided individual session, delivered by a trained therapist that occurred during the patient's hospitalization. The therapists

consisted of a total of twelve psychologists, psychiatrists, and social workers. The content of the session involved exploring the patient's ambivalence about substance use (i.e., pros and cons of drugs use). The session also entailed a conversation about the patient's friends' and parents' attitudes towards the patient's substance use. Additionally, the discussion involved examining the relationship between patient's substance use and suicidal thoughts/behavior. Personal feedback included information pertaining to how much they used and how their use compared to others. The second part of the session included exploring patient's intrinsic motivation to change, focusing on patient's actual readiness to change and commitment to change, and concluded with the discussion of creating an action plan (e.g., establishing goals, identifying strategies and steps to change, exploring barriers to change, and enhancing self-efficacy).

Measures and Relevant Variables

Major Depressive Disorder. The Childhood Inventory of Psychiatric Syndromes (ChIPS) (Weller et al., 2000) was included as part of standard unit procedures to diagnose patients with major depressive disorder based directly on DSM-IV-TR criteria. The ChIPS is a highly structured diagnostic interview covering 20 Axis-I psychiatric disorders designed for 6-18 year old children and adolescents and the response format involves yes/no answers (Swenson et al., 2007). Reliability and validity studies of the ChIPS reveal sound psychometric properties with youth in both inpatient and outpatient settings ($\kappa = .26 - .60$; Swenson et al., 2007; Teare et al., 1998a; Teare et al., 1998b; Weller et al., 2000).

Substance use. The CRAFFT (Knight et al., 2002; Knight et al., 1999) is a screening instrument and assessed whether a BMI would be offered during a patients' hospitalization. The CRAFFT entails a series of six questions created to screen adolescents for high-risk alcohol and other drug use involvement. It determined whether a longer conversation about the context of use, frequency, and other risks and consequences of alcohol and other drug use is warranted. CRAFFT is a mnemonic acronym of first letters of key words in the six screening questions. All six items include yes or no responses: a) "Have you ever ridden in a **Car** driven by someone (including yourself) who was "high" or had been using alcohol or drugs?", b) "Do you ever use alcohol or drugs to **Relax**, feel better about yourself, or fit in?", c) "Do you ever use alcohol or drugs while you are by yourself **Alone**?", d) "Do you ever **Forget** things you did while using alcohol or drugs?", e) "Do your family or **Friends** ever tell you that you should cut down on your drinking or drug use?", f) "Have you ever gotten into **Trouble** while you were using alcohol or drugs?" ($\alpha = .68$; Knight et al., 2002; Knight et al., 1999). A score ≥ 2 indicates a positive screen (Knight et al., 2002; Knight et al., 1999).

Emotional and Behavioral Problems. The Youth Self-Report (YSR)(Achenbach & Rescorla, 2001) will be used to measure the severity of emotional and behavioral concerns among adolescents. The YSR captures internalizing and externalizing problems in addition to psychosocial functioning. All 119 items on the YSR were rated on a 3-point Likert-type scale ranging from not true (0) to very true or often true (2) ($\alpha = .88$) (Achenbach & Rescorla, 2001; Ebesutani et al., 2011). More specifically a Total Problems on the YSR score calculated the

severity of emotional and behavioral concerns among adolescents. A Total Problems score comprising the sum of all the scores on the behavior items was obtained from each checklist. The internalizing score rates fearful, inhibited, or over-controlled behavior while the externalizing score rates aggressive, antisocial, or under-controlled behavior. The eight syndrome scores include Withdrawn, Somatic Complaints, Anxious/Depressed, Social Problems, Thought Problems, Attention Problems, Delinquent Behavior and Aggressive Behavior. A t-score ≥ 65 indicates a positive screen (Achenbach & Rescorla, 2001).

Predictor Variable. The two predictor variables for included whether or not the BMI intervention was completed in addition to whether they were offered a BMI and declined or not.

Outcome Variable. The outcome variable defined as rehospitalization on the inpatient unit or had an emergency room visit for psychiatric reasons, was measured by time (in days) to rehospitalization. The outcome variable for the secondary analysis included the second admission CRAFFT score. This data was derived from an electronic medical record system called LifeChart, using Epic software. LifeChart includes information throughout a northeastern state's health care system, from hospitals and clinics, to ambulatory centers and community partners. The system includes all emergency rooms in the state, which enables the ability to track patient movement through the vast majority of the mental healthcare system in the state.

Covariates. All covariates were based on LifeChart data. Sociodemographic data included age, sex (male/female), and race/ethnicity (White, Black, Other, and Hispanic). Treatment related variables included diagnosis (number of diagnoses

including depression), length of stay during first hospitalization (number of days), and insurance coverage (yes/no). Psychosocial risk factors included abuse/violence or abandonment history (yes/no). The YSR total score was also incorporated to reflect the severity of behavioral and emotional problems of an adolescent.

Procedures

Following approval from the Institutional Review Board (IRB) of the hospital and University, data was obtained through LifeChart. All data was obtained through a retrospective chart review in Epic. As part of standard intake procedures, patients were administered the CHIPs, which was administered by a psychology research assistant within 72 hours of hospital admission. Patients were also administered the CRAFFT also given as part of standard hospital procedures. If the patients were elevated on the CRAFFT, patients were offered the BMI intervention within the first three days of admission or when the patient was stabilized. Subjects were compared across two different groups: subjects elevated on the CRAFFT who agreed to and received the MI intervention in addition to standard level of care and subjects elevated on the CRAFFT who did not agree to or receive the MI intervention, who also received standard level of care. Follow-up data were collected following index hospitalization for each patient for the time period between index hospitalization and September 2017.

Analytic Approach

Prior to performing analyses, variables were checked for distributional assumptions and transformed or recoded as warranted. Descriptive statistics and bivariate correlations were calculated for continuous predictor and outcome variables and frequency counts were calculated for the dichotomized variables. A cox

proportional hazard regression (survival) analyses was conducted to assess the relationship between the completion of the BMI intervention and time (in days) to rehospitalization (defined as rehospitalization on the inpatient unit or emergency room visit). Another cox proportional hazard regression (survival) analyses was conducted to assess the relationship between those who were offered the BMI intervention but declined and time (in days) to rehospitalization (defined as rehospitalization on the inpatient unit or emergency room visit). The time to rehospitalization (inpatient admission or emergency room visit) was the primary outcome measure. Covariates included sociodemographic, treatment, and psychosocial factors. Additionally, a repeated measures analysis of covariance (ANCOVA) was performed to determine whether there were any significant differences in CRAFFT scores of patients who were readmitted to the hospital between individuals who received the BMI and those who did not, after controlling for time and the sociodemographic, treatment, and psychosocial factors. The readmission CRAFFT score was identified as the secondary outcome.

CHAPTER 4

FINDINGS

Descriptives

Descriptive statistics for the predictor variables and outcome variables are shown in Table 1. The average initial CRAFFT score was 3.34 ($SD = 1.26$) at time 1. The average number of rehospitalizations was approximately two times ($M = 2.19$, $SD = 2.38$), over a 15 month period (i.e., July 2016 and October 2017). The average length of stay was roughly 13 days ($M = 13.53$, $SD = 19.83$). The average number of days to rehospitalization for adolescents was approximately 33.35 days ($SD = 71.86$). The average age of adolescents who were hospitalized was 15.81 years of age ($SD = 1.24$). The average number of comorbid diagnoses included approximately 2.97 ($SD = 1.13$). The average T-score of Total Problems, measuring the severity of emotional and behavioral concerns among adolescents was 65.88 ($SD = 17.01$), which fell within the clinically significant range (>65). There were 65 (41.1%) adolescents who reported being physically or sexually abused. The majority of patients reported having insurance 158 (99.4%), which included insurances such as United Health, Blue Cross, Medicaid, or Neighborhood Health. A total of 45 adolescents in the sample were offered a BMI, in which 30 (18.9 %) of those adolescents actually received the BMI, and 15 (9.4 %) of those adolescents were offered the BMI, but declined. There were a total of 67 (42.4%) adolescents who were rehospitalized on the inpatient unit or had an emergency room visit for psychiatric reasons.

Correlations

Bivariate correlations for the predictor variables and outcome variables are displayed in Table 2. Completing a BMI was positively associated with longer length of stay, however negatively correlated with declining the BMI when offered and being a female. Longer length of stay was associated with being female and Black. Longer time until next rehospitalization after first discharge was associated with younger age, being a female, greater number of diagnoses, and reporting being physically or sexually abused. Younger age was related to greater severity of emotional and behavioral concerns. Greater number of diagnoses was also associated with greater severity of emotional and behavioral concerns and reporting being physically or sexually abused. Greater severity of emotional and behavioral concerns was significantly related to being a female, White, and reporting being physically or sexually abused.

Main Analyses

Association between completing BMI and Time to rehospitalization.

A cox proportional hazard regression (survival) analysis was conducted to assess the relationship between the completion of the BMI intervention and time (in days) to rehospitalization (defined as rehospitalization on the inpatient unit or emergency room visit), after controlling for time and the sociodemographic, treatment, and psychosocial factors. The results of these analyses including the estimated hazard ratios and significance levels for variable are shown in Table 2. The results of the cox proportional hazard regression indicated that the completion of the BMI intervention did not significantly predict the time to subsequent intensive service utilization after

controlling for time and the sociodemographic, treatment, and psychosocial factors. Although not significant, the hazard proportion of adolescent patients who were rehospitalized over a 15-month period is displayed in Figure 1. The inclusion of the sociodemographic, treatment, and psychosocial factors however significantly improved the ability of the model to predict readmission over the model with only the BMI intervention as the predictor ($\chi^2 = 19.45$, $df = 9$ $p < .05$). More specifically, higher risk of readmission was associated with being male, (HR = 0.50, $p < .05$), older age (HR = 1.37, $p < .05$), greater length of stay, (HR = 1.01, $p < .05$), and greater severity of diagnosis (i.e., more diagnoses), (HR = 0.75, $p < .05$).

Association between offered a BMI and time to rehospitalization.

A cox proportional hazard regression (survival) analyses was conducted to assess the relationship between declining a BMI intervention and time (in days) to rehospitalization (defined as rehospitalization on the inpatient unit or emergency room visit), after controlling for the sociodemographic, treatment, and psychosocial factors. The results of these analyses including the estimated hazard ratios and significance levels for each variable are shown in Table 3. The results of the cox proportional hazard regression indicated that whether adolescents declined a BMI intervention did not significantly predict the time to subsequent intensive service utilization after the sociodemographic, treatment, and psychosocial factors. Although not significant, the proportion of adolescent patients who were rehospitalized over 15-month period is displayed in Figure 2. Similarly, the inclusion of the sociodemographic, treatment, and psychosocial factors also significantly improved the ability of the model to predict readmission over the model with only declining the BMI intervention as the predictor

($\chi^2 = 19.66$, $df = 9$ $p < .05$). More specifically, lower risk of readmission was associated with being female, (HR = 0.51, $p < .05$), older age (HR = 1.38, $p < .05$), greater length of stay, (HR = 1.01, $p < .05$), and greater severity of diagnosis (i.e., more diagnoses), (HR = 0.75, $p < .05$).

Differences in CRAFFT scores among those readmitted versus those that were not.

Lastly, a repeated measures analysis of covariance (ANCOVA) was performed to determine whether there were any significant differences in CRAFFT scores of patients who were readmitted to the hospital, after controlling for the sociodemographic, treatment, and psychosocial factors. The readmission CRAFFT score was identified as the secondary outcome. There was no significant difference in CRAFFT scores of patients who were readmitted ($M_{T1} = 3.19$ versus $M_{T2} = 3.19$) to the hospital, Wilks' Lambda = .691, $F(1, 8) = 3.58$, $p = .095$.

CHAPTER 5

CONCLUSION

The current study examined whether the implementation of a BMI intervention addressing adolescent substance use (e.g., alcohol and marijuana use) in an adolescent acute psychiatric setting predicted time to rehospitalization, while taking into consideration other predictors of readmission (e.g., sociodemographic, treatment, and psychosocial factors). The current study also assessed whether declining the BMI predicted time to rehospitalization after controlling the sociodemographic, treatment, and psychosocial factors. Results indicated that BMI completion did not significantly predict days to rehospitalization, nor did declining the BMI significantly predict hospital readmission. One possible explanation for these non-significant findings may be the small sample size. There were small samples of both those who were offered the BMI ($n = 45$; 28.45 %) and those who actually received the BMI ($n = 30$; 18.9 %). There was also a small sample of adolescents ($n = 15$, 9.4 %) who were offered the BMI, but declined. Therefore, these non-significant findings may be partially attributed to difficulties with the sample size and the limitations with power. Non-randomized studies, similar to the present study, often need 20% more participants relative to a randomized study in order to compensate for potential confounding variables (Suresh & Chandrashekhara, 2012). Despite our efforts to control for confounding variables, not all variables could be accounted for or measured. Power analyses using G*Power indicated that with a medium effect size, a power level of

0.80, and an alpha level of 0.05, suggested a sample size of 109 (Faul et al., 2009). Although our total sample ($N = 158$) exceeded that suggested sample size number, many fewer were offered the BMI ($n=45$).

Despite these findings, some of the sociodemographic and treatment factors that were also included in the analyses as covariates did significantly predict higher risk of rehospitalization. Higher risk of hospital readmission was significantly associated with greater severity of diagnosis, being male, older age, and greater length of stay. These significant results are consistent with previous literature that has examined various predictors of hospital readmissions among adolescents (Arnold et al. 2003; Blader 2004; Fontanella, 2008; Romansky et al. 2003; van Alphen, 2016). Some of the most common factors related to psychiatric rehospitalization among adolescents include diagnosis, symptom severity, co-morbidity, and self-injurious and suicidal behaviors (Blader 2004; Fontanella, 2008; van Alphen, 2016). More specifically, adolescents with severe mood and behavioral disorders, were more likely to be readmitted to the hospital (Arnold et al. 2003; Blader 2004), which was consistent with the current findings. These results suggest a sample that consists of more severe mood disorders, therefore engaging in a BMI during an acute psychiatric stay may have not been enough to have an effect on the outcome (i.e., number of days until subsequent rehospitalization).

Other risk factors for rehospitalization involve demographic characteristics; however, previous research has demonstrated that race, age, and gender does not consistently predict hospital readmission (Arnold et al. 2003; Fontanella, 2008). The differences in results across studies could potentially be due to the differences in the

demographic make-up of each sample, which therefore makes it difficult to replicate or generalize. Fontanella and colleagues (2008) found that females were more likely to be readmitted to the hospital compared to males, which was inconsistent with the current findings. However, other findings are consistent with our findings that suggest that lower rates for adolescent males seeking mental health care has led to higher male suicide rates as compared to females (Chandra & Minkovitz, 2006; Rice et al., 2018). Essentially, males more often postpone treatment, waiting until their symptoms are more severe before seeking treatment, thus leading to their higher suicide rates. Similar to the current study, other treatment related factors have also been associated with higher rehospitalization rates, including longer length of stay in hospital (Fontanella et al., 2008). Some investigators suggested that length of stay might be considered an indicator of symptom severity, which has also been associated with readmission (James et al., 2010).

Additionally, among youth readmitted into one particular hospital, differences in adolescent's substance use were examined in order to assess the impact the BMI had on reports of substance use, using first admission and second admission CRAFFT score. Results indicated that there were no significant differences between first and second admission CRAFFT scores among patients who were readmitted to the hospital. It is important to note that there were a very limited number of patients ($n = 16$) included in this analysis due to not having access to readmission CRAFFT scores of subsequent psychiatric rehospitalizations and visits to the emergency room in other hospitals in the northeastern state's health care system. Additionally, since the timeframe was not assessed on the CRAFFT, it was difficult to determine whether that

impacted scores on readmission. More specifically, differences in CRAFFT scores would not be observed if patients were referring to the same timeframe during their readmission. The CRAFFT is also a substance use screening instrument and not a diagnostic assessment, therefore the frequency and amount consumed was not obtained, which could also have limited the results.

Several additional limitations should be considered when interpreting the results. Due to the nature of the retrospective cohort study design, subsequent marijuana and alcohol use was not obtained or measured once adolescents were discharged from the hospital, in order to assess the effectiveness of the BMI on adolescent substance use. Although a second admission CRAFFT score was obtained from some patients re-admitted to a particular hospital, the amount of second admission CRAFFT scores retrieved from patients was limited and likely covered the same reference time period, failing to capture new problems. Another large limitation of the study was the inadequate number of patients with an initially elevated CRAFFT score who were actually offered the BMI ($n = 30$; 18.9 %). There were also several unmeasured confounding factors that are associated to general readmission (Blader 2004; Foster et al., 1999) and readmissions to hospitals outside of the selected northeastern state's health care system that we simply did not have access to. Some of these factors included psychosocial factors (e.g., family history of mental health or substance use, parental involvement) and intervening factors such as death after discharge (either due to suicide or due to other causes). These instances could either lead to biased results by underestimating the numbers of readmissions or unintentionally increase the number of adolescents not at risk for readmission (Aston

& Wray, 1996). Data were also collected from a select number of hospitals and emergency rooms from a northeastern state's health care system, which could also affect the generalizability of results to other regions of the United States (i.e., western or southern regions). Lastly, like many studies examining readmission, data was derived from an electronic medical record, which can provide a wealth of information on clinical factors, however measures based on medical records can be compromised due to differences in the completeness and accuracy of the recorded information, interpretations of clinical events, and documentation patterns across hospitals (Iezzoni, 1997).

Despite the limitations and the primary non-significant findings, the current study still found a number of factors (e.g., sociodemographic and treatment) that were associated with psychiatric hospital readmission among adolescents. One implication of the current findings is the strong need to develop discharge planning guidelines and standards of care that are linked to appropriate services that best match their level of clinical need. Almost half (42.4%) of the adolescents in the current study were readmitted on the inpatient unit or had an emergency room visit for psychiatric reasons. Adolescents, especially adolescents with more severe symptomatology similar to those in the current sample, are at high risk of suicide completion and attempts, and readmissions to acute psychiatric care in the weeks following the discharge of adolescents who have attempted suicide have been noted (Knesper, 2010). Therefore, it is imperative for there to be more aggressive outreach and follow-up, particularly for high-risk youth with prior suicidal behavior. Given that there continues to be a strong relationship between adolescent substance use (i.e., alcohol

and marijuana use), depression, and suicidality (Clarke et al., 2014; Darvishi et al., 2015; Fuller-Thomson et al., 2013), it is critical for substance use problems to be addressed in psychiatric settings (Fontanella, 2008). A 45-minute BMI may simply not be enough to have a significant effect, particularly for such a severe clinical population. More research is needed to examine the effectiveness of substance use interventions such as BMI in acute psychiatric settings in order to reduce substance use among adolescents particularly with psychiatric comorbidity.

Table 1

Means, and standard deviations of predictor and outcome variables

	<u>Whole</u> <u>Sample (N =</u> <u>158)</u> % or M (SD)	<u>Received MI</u> <u>(n = 30)</u> M (SD)	<u>Declined MI</u> <u>(n = 15)</u> M (SD)	<u>Not Offered</u> <u>MI</u> <u>(n = 113)</u> M (SD)
Rehosp.	2.19 (2.38)	1.80 (1.40)	1.86 (1.57)	2.32 (2.63)
Los.	13.53 (19.83)	24.27 (39.35)	12.13 (5.2)	10.86 (10.37)
Days Rehos.	33.35 (71.86)	18.60 (36.94)	30.07 (56.17)	37.71 (80.08)
Age	15.81 (1.24)	15.63 (1.12)	16.07 (1.10)	15.82 (1.28)
Num. Diag.	2.58 (1.28)	2.70 (1.20)	2.60 (1.24)	2.55 (1.31)
Diag Sev.	65.88 (17.01)	64.80 (12.31)	67.93 (18.69)	65.89 (18.44)
CRAFFT	3.34 (1.26)	3.80 (1.13)	3.53 (1.41)	3.19 (1.24)
	N (%)	n (%)	n (%)	n (%)
Sex (Female)	86 (54.4%)	10 (33.3)	10 (66.7)	66 (58.4)
Phy./Sex.Ab.	65 (41.1%)	12 (40.0)	9 (60.0)	44 (38.9)
Race (Black)	21 (13.3%)	3 (10.0)	2 (13.3)	16 (14.2)
Race (Other)	28 (17.7%)	6 (20.0)	3 (20.0)	19 (16.8)
Eth.(Hispani	35 (22.2%)	9 (30.0)	5 (33.3)	21 (18.6)

c)

Note: SD = Standard Deviation, Rehos. = Number of Rehospitalizations, Los. = Length of Stay, Days Rehos. = Number of days until next Rehospitalization after first discharge, Num. Diag. = Number of Diagnoses, Diag Sev = Severity of Diagnosis, Phy. /Sex. Abuse = Physical or Sexual Abuse, Eth. = Ethnicity.

Table 2

Correlations of predictor and outcome variables (N=158)

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. MI	-												
2. Declined MI	-.16*	-											
3. <u>Rehosp.</u>	-.07	-.05	-										
4. Los.	.26**	-.02	-.01	-									
5. Days <u>Rehosp.</u>	-.10	-.02	-.10	-.04	-								
6. Age	-.07	.07	-.12	-.13	-.17*	-							
7. Sex (Female)	-.21*	.08	-.12	.16*	.21**	.05	-						
8. Num. Diag.	.05	.01	-.01	.09	.17*	-.11	.15	-					
9. <u>Diag</u> Severity.	-.03	.04	.06	.01	.01	-.24**	.16*	.48**	-				
10. <u>Phy.</u> /Sex. Ab.	-.01	.12	.08	.03	.22**	-.08	.07	.42**	.20*	-			
11. Race (Black)	-.05	.00	-.03	.25**	.15	-.05	.10	-.08	-.14	-.06	-		
12. Race (Other)	.03	.02	.18	.05	.05	-.04	-.14	-.03	-.17*	.08	-.18*	-	
13. <u>Eth.</u> (Hispanic)	.09	.09	.14	.03	-.10	.07	.07	-.03	-.22*	.05	-.03	.75**	-

Note: *p<.05, **p<.01, ***p<.001. SD = Standard Deviation, Rehosp. = Number of Rehospitalizations, Los. = Length of Stay, Days Rehosp. = Number of days until next Rehospitalization after first discharge, Num. Diag. = Number of Diagnoses, Severity of Diagnosis, Phy. /Sex. Abuse = Physical or Sexual Abuse, Eth. = Ethnicity.

Table 3.

Summary of Cox regression models predicting time to intensive psychiatric services

Predictor	β	SE	Wald	<i>P</i>	HR	95% CI
Completion of BMI						
<i>BMI Intervention</i>	-.128	0.422	0.092	.762	0.880	0.384 – 2.014
Sex						
<i>Female</i>	-.686	0.323	4.507	.034*	0.503	0.267 – 0.949
Age	0.316	0.138	5.230	.022*	1.372	1.046 – 1.799
Race						
<i>Black</i>	-.275	0.356	0.598	.439	0.760	0.378 – 1.525
<i>Other</i>	-.509	0.510	0.996	.318	0.601	0.221 – 1.633
Ethnicity						
<i>Hispanic</i>	0.809	0.524	2.390	.122	2.247	0.805 – 6.270
Length of Stay	0.014	0.006	5.172	.023*	1.014	1.001 – 1.026
Number of Diagnoses	-.287	0.138	4.323	.038*	0.750	0.572 – 0.984
Severity of Diagnoses	0.023	0.013	3.008	.083	1.023	0.997 – 1.050
Physical/Sexual Abuse	-.186	0.310	0.360	.549	0.830	0.452 – 1.525
Declined BMI						
<i>Declined BMI</i>	0.089	0.457	0.038	.846	1.093	0.446 – 2.675
Sex						
<i>Female</i>	-.666	0.314	4.503	.034*	0.514	0.278 – 0.950
Age	0.319	0.139	5.303	.021*	1.376	1.049 – 1.806
Race						
<i>Black</i>	-.268	0.357	0.565	.452	0.765	0.380 – 1.539
<i>Other</i>	-.469	0.551	0.727	.394	0.625	0.213 – 1.840
Ethnicity						
<i>Hispanic</i>	0.763	0.560	1.852	.174	2.144	0.715 – 6.430
Length of Stay	0.013	0.005	5.720	.017*	1.013	1.002 – 1.024
Number of Diagnoses	-.286	0.140	4.179	.041*	0.751	0.571 – 0.988
Severity of Diagnoses	0.022	0.014	2.707	.100	1.023	0.996 – 1.050
Physical/Sexual Abuse	-.195	0.313	0.389	.533	0.823	0.445 – 1.520

p* <.05, *p* <.01

Figure 1.

Hazard Proportion of Adolescent Patients Who Were Rehospitalized Over 15 a Month Period after First Discharge, Stratified by Whether They Received MI or Not (N=158)

Figure 2.

Hazard Proportion of Adolescent Patients Who Were Rehospitalized Over 15 a Month Period after First Discharge, Stratified by Whether They Were Offered MI and Declined (N=158)

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