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DNP Final Project Report

An Evaluation of Depression in Adolescents with Type 1 Diabetes Mellitus

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College of Nursing

Spring 2019

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Dedication

My DNP project is dedicated to my family, friends, and fiancé. I would not have been able to complete this program without their constant love and support. The help and encouragement I received from my parents through these three years is something I will forever be grateful for. I want to thank my friends for always being my there for me when I needed an extra smile or laugh to keep me going. I could not have done this without any of them. Lastly, I want to also dedicate this work to my fluffy fur child Winston, thanks for always sitting next to me as I work tirelessly on the computer, sitting with me up at coffee shops when it's nice out, and being the best companion a girl could ask for

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Introduction

One in seven youth with type 1 diabetes (T1DM) meets clinical cut-off for depression (Ducat et al., 2015). Depression in adolescents with type 1 diabetes is often a concern for pediatric health care providers. Adolescence is filled with endless physical, psychosocial, cognitive, and emotional changes that confounds their ability to self-manage a very complex, chronic disease. Research has found that the prevalence of depression is as much as three times higher in people with T1DM (Roy & Lloyd, 2012). The American Diabetes Association (2018) recommends that providers screen adolescents with T1DM for depression at least annually, as part of routine diabetes care. Unfortunately, many providers are not appropriately screening for depression. The lack of screening may contribute to adolescents struggling with depression undiagnosed and untreated. Currently, only half of all adolescents with depression are identified prior to adulthood (Ducat et al., 2015). With early detection and appropriate treatment of depression, adolescents may better cope and develop appropriate skills to self-manage their diabetes.

The goal of this study was to explore current depression screening practices for adolescents with T1DM within a pediatric diabetes education center. The study also explored many common demographics or clinical characteristics found among the patients that screened at least moderately depressed (PHQ-A score >9) on the Patient Health Questionnaire-9, modified for adolescents (PHQ-A) depression screening tool.

Abstract

Depression can significantly affect how adolescents with T1DM self-manage their disease. The combination of depression and diabetes is closely linked to reduction in self-care behaviors, poor treatment adherence, and sub-optimal metabolic control.

PURPOSE: The purpose of this study was to evaluate current screening for depression in adolescents with T1DM and determine the need for additional support or services to improve the quality of routine, follow-up diabetes care.

METHODS: A cross-sectional, retrospective review of electronic medical records was used to evaluate current practice of depression screening for adolescents with T1DM (11-21years) bring followed at a local pediatric diabetes center between April 1, 2018 and September 20, 2018. A Depression Screening Information Sheet was used to collect demographic and diabetes treatment information from the electronic medical records meeting inclusion criteria for enrollment into the study. The data were analyzed to explore relationships between demographic information, treatment information, and Patient Health Questionnaire-9, modified for adolescents (PHQ-A) depression scores. Descriptive and correlational statistics were used to analyze collected data.

RESULTS: Diabetes center staff reviewed 528 medical records for inclusion into the study. Eighty-four of the electronic medical records reviewed met inclusion criteria for enrollment in the study. Data analysis showed several findings. The age at diagnosis was significant to the PHQ-A depression scores. The older the age at diagnosis (mean=9.46), the more likely the score of at least moderately depressed (PHQ-A >9; $p=0.02$). Higher HgbA1C levels (mean=10.54) related to higher depression scores on the PHQ-A ($p=0.02$). Patients who did not utilize the continuous-glucose monitoring (CGM) were more likely to be depressed; 95.7% of patients with a PHQ-A score >9 did not wear a CGM device. High school patients were significantly more

moderately depressed ($p=0.006$) than younger patients. These findings highlight the importance of screening for depression as part of routine diabetes care.

CONCLUSION: Screening for depression is a very important part of routine care for adolescents with T1DM. The American Academy of Pediatrics (AAP) and American Diabetes Association (ADA) recommend adolescent screening for depression at least annually. This study supports the need for incorporating routine depression screening of adolescents with T1DM as a part of on-going diabetes care. Several clinical indicators were found that could assist providers in identifying those adolescents with T1DM at greatest risk for depression.

Background

Adolescence is a time where mental health issues often arise (Hillege et al., 2011). In the U.S., 49.5% of young people aged 13-18 years suffer from any form of mental illness (National Institute of Mental Health, 2017b). Depression is one of the most common mental illnesses among adolescents. It is defined by the National Institute of Mental Health (2016) as “a common but serious mood disorder. It causes severe symptoms that affect how you feel, think, and handle daily activities” (para. I). Depression is a condition that can affect anyone, but 1 in 7 youth with T1DM meet clinical cut-offs for depression (Ducat et al., 2015). Nationally, depression affects 3.1 million adolescents aged 12-17 years, roughly 12.8% of the adolescent population (National Institute of Mental Health, 2017a). In 2016, 19.4% of females in the U.S. suffered from a major depressive episode compared to 6.4% of males (National Institute of Mental Health, 2017a). These statistics demonstrate the prevalence of this disease and the impact it has on adolescents in general.

Depression can be linked to many serious health risks. The most prominent comorbidity associated with depression is suicide. The World Health Organization (2018) reports that around 800,000 people commit suicide each year, and suicide is the leading cause of death between the ages of 15-29 years. Individuals with T1DM are at an increased risk of suicide compared to the general population, although the extent of suicide risk is unknown (Pompili et al., 2014).

In adolescents with T1DM, depression can exacerbate and complicate the existing disease. Depression and T1DM has been linked to hyperglycemia, poor self-care, and suboptimal metabolic control which can contribute to higher rates of complications such as cardiovascular disease, neuropathy, retinopathy, etc. (Ducat et al., 2015; Gendelman et al., 2009). It is crucial to

identify adolescents who are experiencing depression comorbid with their T1DM and initiate treatment as soon as possible.

Currently, the American Diabetes Association (2018) recommends all children diagnosed with diabetes be screened for depression at diagnosis and yearly as part of their follow-up care. The American Diabetes Association further recommends providers address all psychosocial and mental health issues early to prevent complications in diabetes management (American Diabetes Association, 2018). By increasing the number of adolescents with T1DM being screened for depression at routine diabetes appointments, improved glycemic control, and improvement in quality of life may occur (Dever, 2016). By detecting, treating, and managing depression in adolescents with T1DM that screen positive for depression, providers may be able to help teens get back on track and live healthier, happier lives.

This study will evaluate depressive symptoms identified through use of the PHQ-A, depression screening form, completed by all adolescents aged 11-21 years who presented for routine, follow-up care of T1DM. The PHQ-A is described by Kroenke, Spitzer, and Williams (2001) as an “instrument for making criteria-based diagnoses of depressive and other mental disorders commonly encountered in primary care” (p. 1). They further described that this screening form is much shorter and quicker to complete than other screening tools while still being capable of diagnosing depression based on the DSM-IV criteria (Kroenke et al., 2001). The PHQ-A screening tool has been modified for adolescents and is reliable, valid, and easy to score; therefore, it is a recommended tool for use in diabetes clinics (Dever, 2016). It is one of the more commonly used tools in children and has a sensitivity of 94.7% and a specificity of 86.5% (Libby et al., 2014). The PHQ-A has shown a great capability to help providers identify depression in adolescents early.

While there are a multitude of studies that have used the PHQ-A to screen for adolescent depression, the frequency in how often adolescents with type 1 diabetes should be screened varies. In one study by Corathers et al. (2013), a questionnaire revealed that 33% of patients and providers think screening for depression every three months is appropriate for this age group. This data along with the ease of screening all adolescents each time they arrive for their appointment (3 month intervals) increases the chances of diagnosing and treating depression early. Increasing depression screenings in the diabetes clinics could decrease the chance of improper glycemic control and increase patients' self-confidence in diabetes care. Screening is important because a diagnosis of T1DM increases the risk of having depression by two to three times that of someone without diabetes (Korbel et al., 2007). Again, depression in diabetes can lead to hyperglycemia, poor self-care, increased disease complications, and increased mortality (Gendelman et al., 2009).

The Pediatric Diabetes Clinic at the Barnstable-Brown Diabetes Center, University of Kentucky specializes in type 1 diabetes. The providers in this clinic work with many complex adolescent patients, many of whom show classic signs of diabetes resistance due to anxiety and depressive symptoms. This study will help providers to better identify adolescents with depression and implement strategies to manage or refer for further mental health treatment, to improve overall diabetes care.

Purpose

The Purpose of this study is to evaluate depression screening of adolescents with type 1 diabetes and explore any common risks associated with positive screenings to determine the need for additional support or services to be implemented/provided as part of routine follow-up

diabetes care. The expectation of this study is that risk factors and common demographics of adolescents will be identified in relation to patients with mild to moderate depression, which can facilitate early intervention to create a plan for improved glycemic control and possibly prevent worsening depression and/or complications. The objectives of this project are as follows:

1. To determine the relationship between PHQ-A scores, HgbA1c levels, age, age at diagnosis, duration of diabetes, CGM use, school level, and type of therapy among those who were screened for depression during routine follow-up diabetes visit.
2. To evaluate differences in age, gender, age at diagnosis, duration of diabetes, HgbA1c levels, and type of therapy in adolescents with diabetes on insulin therapy with negative depression screening scores and positive scores using the PHQ-A screening form.
3. To identify risk factors that may contribute to depressive symptoms in adolescents with diabetes to determine additional support needs for follow-up clinic visits.

Methods

Study Design

A retrospective, cross-sectional review of AEHR records was used to evaluate the findings from depression screening practices in adolescents with diabetes, on insulin therapy being seen for routine, follow-up diabetes care between April 1, 2018 to September 30, 2018 at the Barnstable-Brown Diabetes Center at the University of Kentucky. Only records obtained during this period were reviewed following IRB approval.

Setting

The setting of this study took place at the Pediatric Diabetes Clinic at the Barnstable-Brown Diabetes Center at the University of Kentucky in Lexington, KY. The study also included the regional travel clinics providers attend. This clinic sees patients 0-21 who are seen by endocrinology providers for diagnoses such as type 1 diabetes mellitus.

Sample/Participants

A review of 528 AEHR records of adolescents with diabetes on insulin therapy seen in the pediatric diabetes clinic at the Barnstable-Brown Diabetes Center, University of Kentucky during the research period was conducted. All AEHR records of adolescents seen for routine, follow-up diabetes care between April 1, 2018 and September 30, 2018 were eligible for enrollment. The inclusion criteria required for enrollment include the following: 1) 11-21 years of age, 2) type 1 diabetes diagnosis and use of insulin therapy, 3) documentation of completed PHQ-A screening form in AEHR, and 4) English as primary language. Exclusion criteria include the following: 1) Not on insulin therapy 2) Ages 0-10 years or greater than 21 years. 3) No evidence of completed PHQ-A available in AEHR, 4) Not capable of completing the PHQ-A for themselves due to impairment from other disabilities, 5) emancipated minors, 6) those who are ward of the state, or 7) non-English as primary language. No exclusions based on gender, ethnicity, HgbA1c level, or duration of diabetes will be made. Of the 528 AEHR records, 84 patient records met all criteria to be included in the study.

Data Collection

Approval from the University of Kentucky Institutional Review Board (IRB) was obtained November 2018 before the initiation of data collection. Prior to study initiation, patients are seen in clinic for routine follow up visits for type 1 diabetes mellitus management. Patients will periodically be screened for depression with the PHQ-A screening form. There are no set guidelines for how to screen adolescents with type 1 diabetes for depression, for this reason not all patients are screened with the PHQ-A. This limitation in patient care is the reasoning for this study and showing the increased need of screening this age group for depression.

The study was conducted based off of a retrospective chart review. Patient records were obtained from the Barnstable-Brown Diabetes Center at the University of Kentucky database by providers at the clinic. Charts were enrolled according to the inclusion and exclusion criteria listed above. Once enrollment was confirmed, providers in the clinic would remove all patient identifiers and abstract the data needed to fill out the Depression Screening Information Worksheet shown below in Figure A. Once the worksheets were filled out, data was then transferred onto an excel spreadsheet by the primary investigator.

Data Analysis

Data Analysis was conducted on the program Statistical Package for the Social Sciences (SPSS) version 23 provided by the University of Kentucky. Descriptive statistics, such as frequency distributions, means, and standard deviations were used to describe the demographic characteristics of the patients included in this study. Each of the demographic categories was compared to the PHQ-A scores obtained to find common trends. Continuous variables were compared using independent sample *t*-tests. Categorical variables were compared using a chi-

squared test. The p value of 0.05 was measured with each test to determine statistical significance.

Results

Sample Characteristics

There were 528 medical charts reviewed during the period of April 1 2018 through September 30, 2018 for inclusion and exclusion criteria. 240 of those charts were from a Medical Doctor and 288 were from Nurse Practitioners. Of those charts, 84 patient records fit all the criteria to be included in this study. The demographics of the charts included in the study are laid out in Table 1. The demographics did not show anything too significant for the study other than laying out how common each category was. The mean age of the adolescents was 15.86 years. Majority of patients utilized multiple daily injections (67.9%) compared to those patients using the pump (32.1%). 60.1% of the patients included in this study were in high school, which is to be expected in the age group included.

When looking at the characteristics of the PHQ-A scores without comparison to the patient demographics, it shows that majority (48.8%) of the patients were considered mildly depressed. Mild Depression on the PHQ-A scale is supposed to be monitored closely and is left up to the provider to decide if further action is necessary (New York Department of Health, 2016). This category is one that needs to be watched very closely since adolescence can bring about major changes in mood and can worsen suddenly.

Demographic and PHQ-A Score Analysis

An analysis of all the patient demographics in relation to the patient's PHQ-A scores was conducted to see if there were any common patterns in understanding adolescent depression in patients with type 1 diabetes. The PHQ-A scores were categorized into "at least moderately depressed" (PHQ-A score >9) or "none or mildly depressed" (PHQ-A score <9) for this analysis. There were 24 patients who were at least moderately depressed and 60 patients who were none or mildly depressed as seen in Table 2. Descriptive statistics, including means, standard deviations, and frequencies, and chi square results were used to determine if there were relationships among demographical categories.

In the comparison of demographics and PHQ-A results, males and females did not show a significant difference in relation to their depression scores, but the descriptive statistics yielded more information. When looking closely at the frequencies, of the moderately depressed patients, 62.5% were female and 37.5% were male (Table 2). While not a large difference, this does not stray far from common themes that females are often more depressed than males (Gendelman et al., 2009). The age the patient was diagnosed showed a significant risk factor for whether they were moderately depressed or not ($p=0.02$). Patients who were at least moderately depressed were older with a mean age of 9.46.

When looking at clinical characteristics, there was a statistical significance in patients who were at least moderately depressed having a HgbA1C that was higher than those with none or mild depressed ($p=0.02$). Patients' with at least moderate depression averaged a HgbA1C of 10.54 (Table 2). There was a clinically significant difference in patients who used the CGM or not. Patients who did not utilize the CGM were more likely to be at least moderately depressed ($p=0.005$). Lastly, when looking at the categories for depression in relation to the grade level of

the patient, there was a statistical significance in how many high school patients were moderately depressed compared to other grades ($p=0.002$).

Discussion

The goal of this study was to better understand causes and factors that could lead to depression in the adolescent population with type 1 diabetes mellitus. As depression in adolescents continues to be a problem, it is extremely important to understand why these adolescents struggle to stay healthy mentally while managing their diabetes. Type 1 diabetes is a time-consuming disease that requires constant attention to keep the patients' healthy throughout their life.

If nothing else, the results of this study show that there is a need to increase the amount of screenings done for patients with type 1 diabetes. Out of 528 medical charts only 84 patients fit the inclusion criteria, mostly due to the fact that there were no PHQ-A depression screenings on file. Of the 84 patients screened, 65 screened anywhere from mild to severe depression (Table 1). Every adolescent patient should be screened for depression at least yearly, if not more frequently based on the personal decision of the medical provider (American Diabetes Association, 2018). By increasing screenings, providers can look for worsening depression. Mild depression is often not treated and just indicates monitoring, but in this study, we took a deeper look to see what patients scored on question 9 of the PHQ-A which states "Thoughts you would be better off dead, or of hurting yourself?". Figure B shows that even patients who scored mild or moderate have serious thoughts of suicide or self-harm. For this reason, the PHQ-A scores should be reviewed in depth by the provider even if the score is low.

This study found there are many risk factors that providers can look for in adolescents with type 1 diabetes in order to monitor for depression. To no surprise, high school patients with type 1 diabetes are the most at risk for depression and should be monitored even closer for signs of worsening mood changes or uncontrolled diabetes (Table 2). High school goes hand in hand with the identity crisis most teens go through. With this identity search, many teens battle depression or periods of sadness. Adolescents with type 1 diabetes and their parents who are entering high school should be educated and accepting of the close monitoring for depression that will come along with their diabetes management. The study did not find that females were at any more risk than males, but with the slight increase in frequency, females should still be screened routinely and observed closely.

Along with that, looking at when the patient was diagnosed could be a strong indicator of depression. Majority of patients who were diagnosed closer to their teenage years seem to struggle with depression more than those diagnosed at a young age. This could be due to struggle with change and identity that accompanies being an adolescent. Patients who grew up with type 1 diabetes may be more accepting of the disease requirements.

The continuous glucose monitor (CGM) is used to help patients with diabetes view their glucose at any given time, this means less finger sticks and less wondering about what their glucose might be. This study showed that those patients that did not use the CGM were far more likely to be at least moderately depressed (Table 2). When discussing uncontrolled diabetes with adolescents, the idea of using a CGM would be a great tool to help them better control their blood glucose as well as their anxiety about managing their sugars.

The last major finding was how significant the HgbA1C was in comparison to the severity of depression in these teens. The mean HgbA1C for the entire study was 9.73 which is

already very high and considered uncontrolled (Table 1). When you consider the patients who were at least moderately depressed, their mean was 10.54 (Table 2). This is an indication that depression screening is warranted when an adolescent with type 1 diabetes presents with an uncontrolled HgbA1C. Overall, this study showed that all teens with type 1 diabetes need to be screened routinely in order to keep them healthy and safe, especially when looking at these certain demographics.

Limitations

There were a few limitations during this research that could be improved in follow up studies in the future. The first limitation noticed was sample size of the study. Many providers did not screen adolescents during this time frame and therefore could not be included in the study. If the sample size was larger, it would be easier to generalize to the entire population. By increasing screenings rates from all providers managing adolescents with type 1 diabetes, the information would be more beneficial.

The second limitation has to do with some of the patients being on antidepressant medications. While obtaining the data from the providers, they noticed that there were many patients on antidepressant medications but did not have PHQ-A screenings in their charts. If these patients were to be screened with the PHQ-A and included in this study, it would have been interesting to see how they affected the results.

Another limitation in this study is that it was conducted at one site. This study was only conducted at the University of Kentucky Barnstable Brown Diabetes Center. In order to generalize to other populations, it would need to be conducted at multiple different facilities to

make sure all demographics are covered. Due to this, the results of this study can only be generalized to the University of Kentucky pediatric population.

Recommendations for Future Studies

For future studies that look at adolescents with type 1 diabetes and depression it is recommended to obtain a larger sample size from multiple different sites. This would provide more information on depression in this population and see if there are any common factors among all demographics. This is a very simple chart review that could be done across multiple sites, as long as other sites are screening for depression as well.

This study focused on retrospective chart review, which showed how screenings have been obtained in the past. It would be beneficial to do a current study that has all providers screen every patient seen in a certain period to see if increased screening rates bring to light more depression or help to control depression better in certain patients. There were many patients who were not screened at all in this one clinic site, which brings the question of how many patients are being missed who might need help. Increasing screening rates will help to improve patient outcomes including living an overall happier and healthier life.

Conclusion

The overall goal of this study was to evaluate common demographics and clinical characteristics of adolescents with type 1 diabetes mellitus. Diabetes is very often correlated with depression in this age group. This study aimed to point out any risk factors that providers could look for when assessing patients in routine clinic visits. The major takeaways from this study were that all adolescents need to be screened and at this point in time, many are not. Adolescents

with higher and uncontrolled HgbA1Cs, diagnosed at an age closer to adolescence, and those who are enrolled in high school are at a higher risk for becoming depressed. Further studies need to be conducted on how to help and prevent depression in this population in order to keep them healthy and their diabetes controlled.

Table 1. Demographic and clinical characteristics of Adolescents with Type I Diabetes Mellitus (N = 84)

Variable	Mean (SD) or n (%)
Age (Years)	15.86 (2.31)
Sex	
Female	41 (48.8%)
Male	43 (51.2%)
Age at Diagnosis	8.24 (3.61)
Years with Diabetes	6.95 (4.26)
Hgb A1C	9.73 (1.96)
Type of Therapy	
Multiple Daily Injections	57 (67.9%)
Pump	27 (32.1%)
Use of CGM	
Yes	22 (26.2%)
No	61 (72.6%)
Grade in School	
Middle	17 (20.2%)
HS	51 (60.1%)
Beyond HS	11 (13.1%)
PHQ-A Score	
None	19 (22.6%)
Mild	41 (48.8%)
Moderate	11 (13.1%)
Moderately Severe	10 (11.9%)
Severe	3 (3.6%)

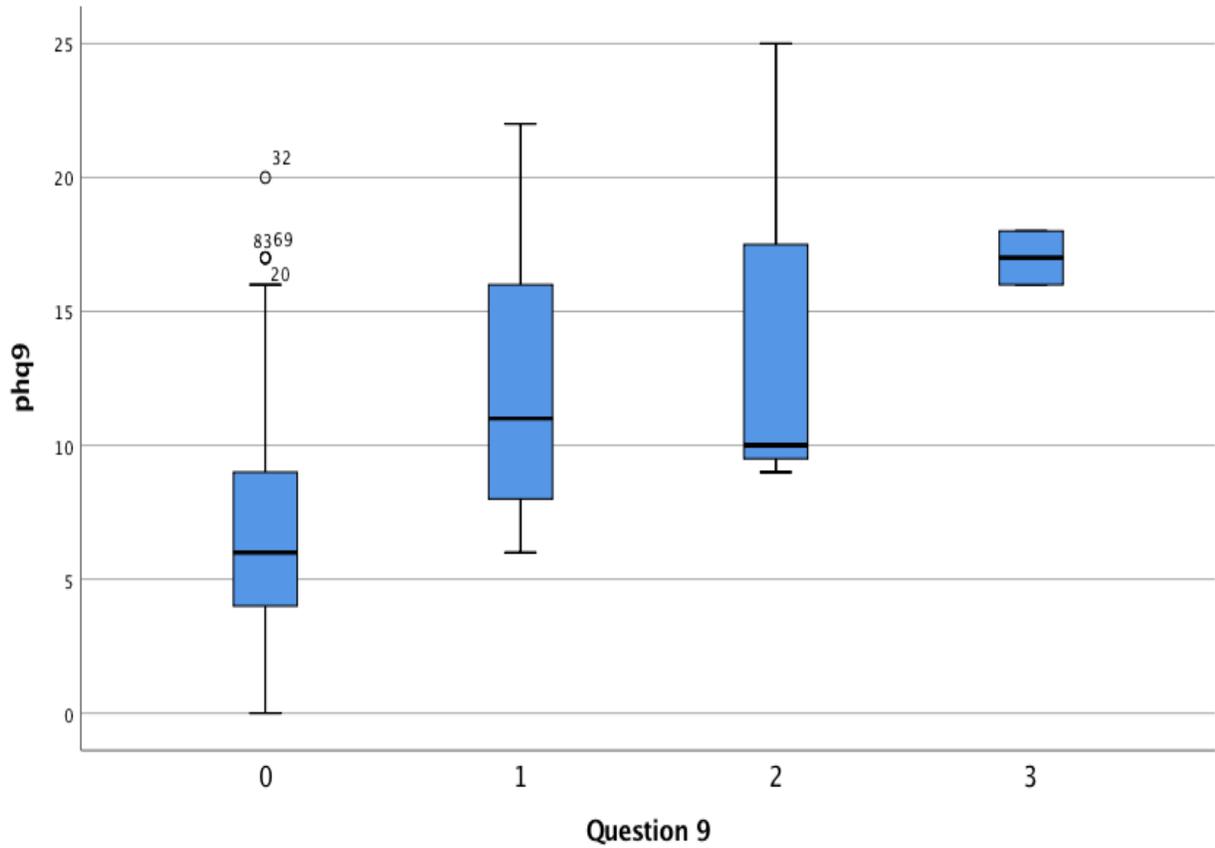
Table 2. Associations between demographic and clinical characteristics and PHQ-A scores

	At Least Moderately Depressed (<i>n</i> = 24)	None or Mildly Depressed (<i>n</i> = 60)	<i>p</i>
	<i>Mean (SD) or n (%)</i>	<i>Mean (SD) or n (%)</i>	
Age (Years)	16.13 (1.73)	15.75 (2.25)	0.44
Sex			
Male	9 (37.5%)	34 (56.1%)	0.11
Female	15 (62.5%)	26 (43.3%)	
Age at diagnosis	9.46 (2.36)	7.75 (3.92)	0.02
Years with Diabetes	6.33 (3.43)	8.07 (3.36)	0.24
Hgb A1C	10.54 (1.92)	9.42 (1.90)	0.02
Therapy			
MDI	17 (70.8%)	40 (66.7%)	0.71
Pump	7 (29.2%)	20 (33.3%)	
Use of CGM			
Yes	1 (4.3%)	21 (35%)	0.005
No	22 (95.7%)	39 (65%)	
Grade			
Middle	1 (4.3%)	16 (28.6%)	0.006
High School	21 (91.3%)	30 (53.6%)	
High School Graduate	1 (4.3%)	10 (17.9%)	

Figure A. Depression Screening Information Sheet

Depression Screening in Adolescents	
Subject #	_____
Age (Yrs of age):	_____
Gender (M/F):	_____
Date of Diagnosis (mm/YYYY):	_____
Age at diagnosis (years):	_____
Years with Diabetes:	_____
Most recent A1C:	_____
Type of therapy (MDI Vs. Pump):	_____
Use of CGM (Continuous glucose monitor):	_____ Yes _____ NO
Medications other than insulin (ie. Anxiety; ADHD; Depression):	_____
Enrolled in School:	_____ Public _____ Pvt. _____ Homeschooled/homebound

Figure B. PHQ-A Score and responses to Question 9*



*Note: Question 9 states “Thoughts you would be better off dead, or of hurting yourself”.

0=not at all; 1=several days; 2=more than half of the days; 3=nearly every day

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