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Patient-Centered Medical Homes and Parental Attention-Deficit Hyperactivity Disorder Medication Beliefs and Adherence

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This is to certify that the doctoral dissertation by

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Abstract

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Abstract

As many as 87% of children discontinue ADHD medication, which can lead to clinically significant academic, cognitive, and social impairment. ADHD costs billions of dollars to the healthcare and educational systems, and previous attempts to stem these costs and increase ADHD medication adherence have been unsuccessful. The purpose of this study was to determine if patient-centered medical homes (PCMH), which have been shown to improve patient health outcomes, impact parental beliefs (benefits vs. risks) about ADHD medication and adherence to ADHD medication. The theory of planned behavior was the theoretical framework for this study. There were 294 parents of children between the ages of 5 and 12 who had been prescribed ADHD medication who participated in a quantitative self-administered survey. Parental beliefs were assessed using the Beliefs About Medicines Questionnaire–Specific, and medication adherence was assessed using the Morisky Medication Adherence Scale–8. The 2007 National Survey of Children's Health was used to determine group assignment. A MANCOVA was used to analyze the data and found parents in the PCMH group scored significantly higher in their beliefs that the benefits outweighed the risks of ADHD medication. However, no significant differences were found between groups related to parental adherence to ADHD medication. More research is recommended to learn how PCMHs can change positive ADHD medication beliefs into better ADHD medication adherence. This study has social change implications as it increases what is known about PCMHs and how they impact health outcomes. It also supports previous literature in the need to deliver all PCMH services, which is required to realize the full benefit of PCMHs.

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Dedication

This research is dedicated to my parents, Joan and Robert Watkins, who instilled in me the value of education and always encouraged and supported me to do my best. Mom and Dad in heaven, for all of your sacrifices that allowed me to have the things that you did not, for all of the times that you cheered me on to support my dreams, and for all of the love that you poured into me, I thank you and love you more than I could ever express! I did it Dad! I hope you are proud!

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Chapter 1: Introduction to the Study

In this study I evaluated the impact of patient-centered medical homes (PCMHs) on parental beliefs about attention-deficit hyperactivity disorder (ADHD) medication and ADHD medication adherence. Adherence to medication is a critical element related to pharmacological effectiveness, and it is especially important for people with chronic conditions (Brown & Bussell, 2011). Recent literature showed as many as 21% of children with ADHD stopped taking their medication during the first year, and of those children who discontinued, 75% stopped taking their medication within the first 3 months of initiating pharmacotherapy (Toomey, Sox, Rusinak, & Finkelstein, 2012). The consequences of nonadherence to medication were an increased likelihood of social and academic impairment, substance use, unsafe driving, and decreased quality of life. Adler and Nierenberg (2015) reported up to 64% of individuals are nonadherent to their ADHD medication and indicated nonadherence occured more frequently with the use of immediate release stimulant medications. However, Ahmed and Aslani (2013) reported nonadherence to ADHD medication is as high as 87%. ADHD can lead to significant academic and social impairment, risky behaviors, and diminished quality of life.

The PCMHs have been reported to improve health outcomes (Homer et al., 2008, Patient-Centered Primary Care Collaborative, 2015) and may decrease ADHD medication nonadherence among children. Although there is a plethora of literature available on PCMHs and treatment outcomes (An, 2016; Brown & Bussell, 2011; Domino, Wells, & Morrissey, 2015; and DeVries et al., 2012), there is no current research that examines the impact of PCMHs on ADHD medication adherence and

parental ADHD medication beliefs. This study has positive social change implications as PCMHs demonstrated they increase parental beliefs about adherence to ADHD medication, which could lead to the increased parental adherence in the future. This would potentially decrease the economic burden associated with increased healthcare and education resource utilization and improve the quality of life of children with ADHD. Additionally, this study extends the knowledge base of what is known about the impact of PCMHs on treatment outcomes, particularly as it relates to parental medication adherence and beliefs related to children with ADHD. Finally, this research may impact healthcare policy created by agencies such as the Centers for Medicare and Medicaid and the American Academy of Pediatrics that support PCMH enrollment for children with ADHD and lead to increased patient access to PCMHs.

In Chapter 1, I discuss the background of the study, the major areas of research related to the study, and the problem statement, and provide the research questions and hypotheses**.** I elaborate on the theoretical framework and nature of the study in Chapters 2 and 3. I also discuss the study methodology, assumptions, scope and delimitations, and limitations. The chapter concludes with the significance of the study and a summary of the chapter.

Background of the Study

ADHD is a neurodevelopmental disorder that involves the inability to control impulsive behaviors and includes difficulty with paying attention (CDC, 2013). Feldman and Reiff (2014) reported that ADHD is most prevalent in boys, with boys also having a greater proclivity to be diagnosed with combined type versus inattention only. The

disorder is generally diagnosed during childhood, however researchers have asserted it can also persist into adulthood (Feldman & Reiff, 2014). The *Diagnostic and Statistical Manual of Mental Disorders–5* (DSM-5) required that no fewer than five symptoms be present in one or both domains prior to the age of 12 in order to receive an ADHD diagnosis (American Psychiatric Association, 2013). At the point of diagnosis, treatment such as behavior therapy and/or pharmacotherapy is generally prescribed.

Pharmacotherapy, particularly using stimulant medication, can be very effective and is first-line pharmacotherapy for the treatment of ADHD (Weyandt et al., 2014). Medication may provide children and adolescents with ADHD with a significant opportunity to achieve long-term treatment success, including improved academic performance, decreased deviant behavior related to poor peer and family relationships, and fewer unintended injuries, if they adhere to the treatment regimen (Chacko, Newcorn, Feirsen, & Uderman, 2010; McConaughy, Volpe, Antshel, Gordon, & Eiraldi, 2011; Murray-Close et al., 2010; Klein et al., 2012). Some side effects associated with pharmacotherapy include changes in mood and personality, depression, and irritability (Toomey et al., 2012).

Members of the medical community have generally categorized medication adherence as patient related, medication related, and environment related (Ferrin & Taylor, 2011). Key contributors to low medication adherence include parental attitudes about medication, presence of side effects, perceived effectiveness, age, gender, race, and socioeconomic status (SES; Brown & Bussell, 2011; Malaysia, 2010; Toomey et al., 2012). Parental attitudes are an environmental factor on which this study will also focus.

Brown and Bussell (2011) additionally reported that factors related to nonadherence of urban and low socioeconomic patients are high medication costs as well as problems with insurance and insurance coverage.

Ferrin et al. (2012) reported there is a difference between nonintentional nonadherence and intentional nonadherence, stating factors such as low IQ, adverse effects, and challenging drug regimens contribute to nonintentional nonadherence, while environmental factors such as family or personal attitudes contribute to intentional nonadherence. I focused this research more on intentional nonadherence to ADHD medication and how parental attitudes and beliefs may impact their adherence to ADHD medication in both PCMHs and non-PCMHs.

Parental perceptions toward ADHD medication are important, as parents are the ones primarily responsible for making treatment and healthcare decisions for their children (Charach & Fernandez, 2013). However, the amount of influence parents have on their child's decisions regarding medication adherence often diminishes as the child ages (Chacko et al., 2010). Chacko et al. (2010) further posited that both the parent's and the child's beliefs and attitudes around medication moderate medication adherence, although it is the parent's understanding of ADHD that determines whether the child originally accepts stimulant medication. It is important for practitioners to focus their efforts on helping parents understand ADHD, medication treatment options, and how their child may benefit from adhering to the prescribed treatment regimen. Emphasis in this area could potentially reduce the economic burden on the healthcare system and diminish the social and academic impairment experienced by this population.

The introduction of the PCMH in 1967 was designed to reduce resource utilization and to address some of the above issues that affect children with special health care needs (Sia, Tonniges, Osterhus, & Taba, 2004). PCMHs are pediatric or primary care physician offices that approach care delivery through the provision of the following: (a) patient-centered care, which includes compassionate and culturally sensitive care; (b) comprehensive care, which includes services for mental health and chronic care; (c) coordinated care, which includes communication between multiple providers and services; (d) accessible care, which includes 24-hour, 7-day-a-week access to phone and/or electronic records; and (e) care that is committed to quality, which includes medication management (Patient-Centered Primary Care Collaborative, 2013). Health care providers in PCMHs emphasize the patient as a whole and integrate other medical and pharmacy personnel into the decision-making process of patient care. Additional services offered in a PCMH include medication review, coaching and advice, and peer support and encouragement to assist patients with their overall care experience.

The passage of the Patient Protection and Affordable Care Act in 2010 mandated the implementation of PCMHs, which have been widely adopted throughout the United States (Fields, Leshen, & Patel, 2010). Currently, there is no requirement for PCMHs to be accredited by any organization. However the National Committee for Quality Assurance (NCQA; 2014) recognized over 10% of primary care practices in the United States as PCMHs. The increase in support of PCMHs and accreditation by these organizations should lead to expansion of these types of medical practices, thus providing more access to these valuable services. The five primary components of a PCMH may

also prove to be an important way to address poor medication adherence in children with ADHD, as there is no current literature that speaks to the impact of PCMHs on parental beliefs about ADHD medication and parental medication adherence in this population. This research may demonstrate that PCMHs improve parental attitudes and adherence to ADHD medication and thus provide an effective model to improve patient outcomes and decrease the health-related, academic, and social costs associated with ADHD.

Problem Statement

ADHD can lead to clinically significant academic impairment (e.g., low standardized testing scores), decreased cognitive ability (e.g., low scores on full-scale IQ testing), social impairment (e.g. poor family and peer relationships; Bussing, et al., 2012; Express Scripts, 2014; McConaughy et al., 2011; Visser et al., 2014), an increased occurrence of grade retention and failure to graduate (Robb et al., 2011), increased emergency room visits, unintended injuries (Merrill, Lyon, Baker, & Gren, 2009; Schwebel et al., 2011), parenthood at an early age (Barkley, Fischer, Smallish, & Fletcher, 2006; Reimer, Mehler, D'Ambrosio, & Fried, 2010), poor peer and family relationships that can lead to delinquent behavior, and greater likelihood to have substance use disorder (Klassen, Miller, & Fine, 2004; Wilens et al. 2011). Additionally, because ADHD can persist into adulthood, poorly managed ADHD symptoms can adversely impact gainful employment due to the poor development of social skills required for success, the inability to stay focused on tasks, and decreased cognitive abilities.

Medication may provide children and adolescents diagnosed with ADHD with a significant opportunity to achieve long-term treatment success through symptom management, including impulse control, increased concentration, decreased aggression, and reduced hyperactivity and social withdrawal (Nijmeijer et al., 2008, Prasad et al., 2013) if they adhere to the treatment regimen (Chacko et al., 2010). Reasons attributed to medication adherence are patient-related (e.g. SES; Brown & Bussell, 2011), medication-related (e.g., efficacy; Barner, Khoza, & Oladapo, 2011), and environment-related (e.g., parental beliefs; Ferrin & Taylor, 2011, Garbe et al., 2012; Zetterqvist, Asherson, Halldner, Långström, & Larsson, 2013). Dawood, Isham, Ibrahim, and Palaian (2010) contended that for those children with chronic illness, the lack of parental understanding of their child's illness, reticence around therapy efficacy, and concern about adverse effects of medication impact children's adherence. Thus**,** parents have the largest impact on their child's medication initiation and adherence (Bai, Wang, Yang, & Niu, 2015).

Attempts to increase medication adherence include enhancing parental knowledge and information regarding ADHD, educating parents on the safety and the social acceptability of medication, behavior therapy, and psychoeducation (Bussing et al., 2012). The literature reveals that while some of these interventions (psychoeducation and behavior therapy) may have some incremental impact on increased medication adherence in the short term, substantial increases in medication adherence remain a challenge (Dean, Walters, & Hall, 2010; Hébert, Polotskaia, Joober, & Grizenko, 2013, Sitholey, Agarwal, & Chamoli, 2011). Methods to reduce the economic loss, social impairment, and poor clinical outcomes related to inadequate ADHD medication

adherence is of significant importance to healthcare professionals and researchers (Bussing, et al., 2012, Lehmann et al., 2014, Schwebel et al., 2011).

Brown and Bussell (2011) suggest that PCMHs should contribute to increased medication adherence due to the type of patient-centered care delivered in a PCMH. However, parental beliefs and attitudes can be a barrier to adherence and persistence. Corkum, Bessey, McGonnell and Dorbeck (2015) argue parental perceptions of ADHD as well as their acceptability of treatment options are the central barriers to medication adherence. Researchers found when parents are provided with relevant information around ADHD treatment, adherence to medication can be increased (Bai et al., 2015; Corkum, Rimer, & Schachar, 1999). Current research indicates lack of knowledge about ADHD and its treatment and poor emotional support are the primary obstacles for medication initiation and persistence (Bai et al., 2015).

PCMHs have been shown to reduce pediatric resource utilization (DeVries et al., 2012) and place emphasis on the patient as a whole. PCMHs also integrate other medical and pharmacy personnel into the decision-making process of patient care and offer services such as medication review, coaching and advice, and peer support and encouragement to patients, which assist with their overall care experience. PCMHs can provide improvements to health outcomes for those children with challenging medical conditions such as ADHD, where care coordination is recommended (Knapp et al., 2012). Fragmented health care, such as poor care coordination, limited access to care, limited amount of time available for providers to spend with the patients, and inadequate medication reconciliation of prescriptions from multiple providers create barriers to

medication adherence (Brown & Bussell, 2011; Croghan & Brown, 2010). Knapp et al. (2013) asserted that PCMHs are critical for children with mental health conditions, which can impact the entire family. Toomey, Homer, and Finkelstein (2010) not only found disparities related to the diagnosis and treatment of children with mental health disorders, they also reported disparities between mental health disorders and medical home attainment. The investigators found the likelihood of children with ADHD to have a PCMH was lower than that of children with asthma; which is a chronic medical condition. This finding indicates children with mental health conditions, such as ADHD, may be missing out on the benefits of PCMHs and the potential for improved outcomes. Therefore, PCMHs were evaluated in this study to assess their influence on parental beliefs about ADHD medication (benefits vs. risks) and their adherence to ADHD medication.

Purpose of the Study

The purpose of this quantitative study was to determine if PCMHs have a significant impact on parental beliefs related to ADHD medication and parental ADHD medication adherence. To address this gap, I conducted a quantitative study to survey parents of children with ADHD who do and do not have a PCMH and assess parental beliefs regarding ADHD medication (risks vs. benefits) and their adherence to prescribed ADHD medication. I utilized questions from 2007 National Survey of Children's Health (NSCH; Toomey, Chan, Ratner, & Schuster, 2011) to determine what type of provider the parent has chosen for their child's care (PCMH or non-PCMH). The Beliefs About Medicines Questionnaire (BMQ; Horne, Weinman, & Hankins, 1999) and the Morisky

Medication Adherence Scale (MMAS–8; Morisky, Ang, Krousel-Wood & Ward, 2008)) were utilized in this study to assess parental beliefs about ADHD medication and their adherence to ADHD to medication. The following covariates were evaluated for inclusion in the study: age, ethnicity, gender, SES, education, geographic location, and parent's own experience with taking ADHD medication.

Research Questions and Hypothesis

RQ1: Is there a difference in parental beliefs about ADHD medications (benefits vs. risks) as measured by the BMQ–Specific between PCMH and non- PCMH groups?

$H_0$1: There is no significant difference in parental beliefs about ADHD medication (benefits vs. risks) between PCMH and non-PCMH groups.

H_a1: There is a significant difference in parental beliefs about ADHD medication (benefits vs. risks) between PCMH and non-PCMH groups.

RQ2: Is there a difference in parental adherence to ADHD medication as measured by the MMAS−8, between PCMHs and non-PCMH groups?

$H_0$2: There is no significant difference in parental adherence to ADHD medication between PCMH and non-PCMH groups.

H_a2: There is a significant difference in parental adherence to ADHD medication between PCMH and non-PCMH groups.

Theoretical Framework

I used the theory of planned behavior (TPB; Ajzen, 1991) as a theoretical framework for this study because parental beliefs and attitudes around ADHD and its

treatment directly impact their children's medication-taking behavior. When parents perceive there are positive psychosocial benefits to stimulant medication, their children also perceive greater psychosocial benefits to medication (Hebert et al. 2013). This may impact children's beliefs around ADHD medication, which have been shown to directly impact how they choose to manage their illness (Ferrin & Taylor, 2011).

I used the TPB, an extension of the theory of reasoned action (Fishbein & Ajzen, 1975), to better understand parent's beliefs and attitudes toward ADHD and how those beliefs may impact their child's intention to adhere to medication. The theory asserts the intention of a person to perform a specific behavior is a reflection of the motivational influences on that behavior (Ajzen, 1991). The three components that influence behavioral intention are: a) attitude, b) subjective norm, and c) perceived behavioral control. Ajzen (1991) posits that the stronger a person's intention to engage in a behavior, the higher the probability that the behavior will occur. Subjective norms are indicative of a person's beliefs related to how individuals in their social network perceive the behavior in question. A person's belief in their ability is referred to as their perceived behavioral control (Azjen, 1991). Therefore, the more positive a person's attitude and subjective norm, the greater that person's perceived control and the higher the likelihood of the person's intention to perform the targeted behavior. This theory helped to explain the effectiveness of PCMH's to impact parental beliefs and attitudes around ADHD and it's treatment, which can lead to positive medication-taking intention of their children. This theory helped to provide context for the research questions from the BMQ–Specific, which are directly related to parent's beliefs/attitudes about ADHD medication and are

linked to behavioral intention. It also provides context for the MMAS–8, which queries parent's actual adherence to ADHD medication for their children and is the targeted behavior for this research.

Several other theories have been used in the literature to explain medication taking behavior that were considered for this study: the illness career model (Biddle, Donovan, Sharp, & Gunnell, 2007), the trans-theoretical model of change (Prochaska & DiClemente, 1984), the health belief model (Hochbaum, Rosenstock, & Kegels, 1952), social exchange theory (Hamrin, McCarthy, & Tyson, 2010), and the unified theory of behavior change (UTB; Jaccard, Dodge, & Dittus, 2002). Each of these theories suggests different factors that contribute to medication adherence; however, the TPB was the best fit for this research. I discuss the theoretical framework further in Chapter 2.

Nature of Study

The nature of this study was quantitative and utilized a self-report survey administered via Qualtrics to determine if PCHMs influenced parental beliefs about ADHD medication (benefits vs. risks) and their adherence to ADHD medication. I chose this design because only a quantitative design can test statistical differences between groups. I had one subject variable **(**PCMH**)** and two dependent variables **(**parental beliefs about ADHD medication and parental ADHD medication adherence**)**. A multivariate analysis of variance (MANOVA) was used to analyze the data using the SPSS 24.0 software package. A quantitative survey was the most effective method to obtain this data because it allowed me to capture data from a large representative sample of parents who have children with ADHD while also allowing the participants to remain

anonymous. The target population was parents with children between the ages of 5 and 12 who had been diagnosed with ADHD and who had been prescribed ADHD medication for at least three months. This age range was selected because parents are largely responsible for administering medication to their children up to age 12. As children age, they tend to have more influence on their own medication taking behavior. Prior to age 5, behavior therapy is recommended as the first-line approach according to the American Academy of Pediatrics.

Definition of Terms

Medication adherence: The degree to which a person's behavior matches the agreed recommendations from a health care practitioner, including following diet and lifestyle changes as well as taking medication (World Health Organization, 2003).

Patient-centered medical home (PCMH): A pediatrician's or primary care provider's office that provides the following care components: (a) patient-centered care, (b) comprehensive care, (c) coordinated care, (d) accessible care, and (e) commitment to quality and safety (Patient-Centered Primary Care Collaborative, 2015).

Benefits: Refers to necessity as described in the BMQ–Specific scale.

Risks: Refers to concerns as described in the BMQ–Specific scale.

Attention deficit/hyperactivity disorder (ADHD): A continued pattern of hyperactivity-impulsivity and/or inattention that impedes a person's ability to function or develop, with symptoms that present in at least two settings (e.g. school, home, with friends or family) and adversely impacts occupational, school, or social functioning.

Multiple symptoms must be evident before the age of 12 (American Psychiatric Association, 2013).

Assumptions

This study was based on several assumptions. Firstly, I assumed that the parents who participated in the survey would answer the questions honestly and accurately. Secondly, I assumed the questions from the BMQ, which were used to assess parent's beliefs and attitudes around ADHD, were a valid and reliable measure of parental beliefs and attitudes. Thirdly, I assumed the questions utilized from the MMAS-8, which were used to assess parents' adherence to ADHD to medication, were a valid and reliable measure of children's intention to adhere to medication. Additionally, I assumed that the parent's responses accurately reflected their beliefs about ADHD medication and their adherence to their child's prescribed ADHD medication. I also assumed that the parent's responses to the questions from the 2007 NSCH survey accurately depicted the type of medical provider they utilized for their child's healthcare. Lastly, I assumed that the survey participants reflected an ample sample size for both parents with a PCMH and parents without a PCMH. The above assumptions increased the study reliability and external validity. In the following section I discuss the scope and delimitations of the study.

Scope and Delimitations

The scope of this quasi-experimental research included parental responses to survey questions related whether or not they utilized a PCMH for their child's healthcare, questions related to their own beliefs and attitudes around ADHD medication, and

parent's responses to questions related to their adherence to their child's ADHD medication. To be included in the survey, parents must have had a child with ADHD, between the ages of 5 and 12 for whom ADHD medication had been prescribed for the previous 3 months. Potential generalizability may be impacted based on the variation in the sample of parents on the demographic variables in both groups.

I utilized the TPB, which was the theoretical framework for this study, to provide context to the two research questions around parental beliefs and attitudes and the influence of these beliefs on the parent's adherence to medication. The TPB also served as the basis to analyze the survey results and represented the motivational influences that impacted the parent's intention to follow the medication-taking regimen prescribed by a healthcare practitioner.

I chose the focus of this study because it could possibly demonstrate that PCMHs positively impact parental beliefs/attitudes related to ADHD medication and improve parental adherence to ADHD medication for their children. These findings may support the belief that PCMHs improve ADHD treatment outcomes for children and thus advance the role of PCMHs as a viable option to improve medication adherence for this population. Increased medication adherence for children with ADHD could potentially decrease academic and social impairment, healthcare utilization, substance use, and risky behaviors, all of which are detrimental to children's long-term success.

Limitations

Limitations for this study were that self-report scales fundamentally have some level of inaccuracy as a result of self-report bias, such as inaccurate participant memory

recall and social desirability bias, or the desire of participants to give the "right" answer versus the true answer (Voils, Hoyle, Thorpe, Maciejewski, & Yancy, 2011). Voils et al. (2011) further reported measures that utilize self-report could have inadequate reliability, with up to 20% lower rates than those obtained by other means. However, this research provided an opening statement for both the MMAS–8 and BMQ–Specific scales that explained that there was no right or wrong answer and other people have reported the listed responses. That may have quelled some of participants' desire to provide a particular answer, but it would not likely have impacted memory recall. To address this bias, most of survey questions asked participants to only think back as far as the last two weeks, which should help reduce the issue of memory recall. Researcher bias, such as leading questions or wording bias, was not likely be a factor in this research because the survey was administered online, it was anonymous, and it utilized two validated instruments to obtain the research data.

Race/ethnicity can also impact the accuracy of the results (Ramírez, Ford, & Stewart, 2005), as different ethnic groups may vary in their interpretation of questions, leading to survey misclassification (Ramírez et al., 2005). The consent form indicated that participant responses were3 anonymous, which may have contributed to more accurate parental responses and reduced social desirability bias. The subject variable (PCMH) was not randomly assigned, as each group self-selected based on their responses to the PCMH survey questions. This nonrandom assignment can impact internal validity as a result of nonequivalent groups in the study. Participant ethnicity was captured on the demographic questionnaire, which helped to isolate the potential impact of this factor in

participant responses. Using the validated instruments (BMQ–Specific and MMAS–8) to assess parental beliefs and medication adherence, as well as appropriate participant selection via inclusion criteria, minimized potential researcher bias.

Some of the questions utilized in the 2007 NSCH to determine whether the child has a PCMH may not apply, therefore, it may be difficult to accurately determine PCMH status. For example, some parents may not have had the need for a referral; therefore, they would respond to the question as "not applicable." Although the survey questions utilized to determine PCMH status have some gaps and may impact accurate selection of PCMH status by the parent, this is the current and most widely used method in other national studies (Boudreau, Goodman, Kurowski, Perrin, & Cooley, 2014; DuPaul, Carson, & Fu, 2013; Knapp et al., 2012; Knapp et al., 2013; Raphael et al., 2015; Strickland, Jones, Ghandour, Kogan, & Newacheck, 2011; Toomey et al., 2011) to determine PCMH status. The use of the 2007 NSCH survey questions also allow for study comparison and mirrors the American Academy of Pediatrics determination of a PCMH status.

Clustering may be a limitation if significant portions of data are derived from the same part of the country where large PCMH medical groups are more or less prevalent. Clustering refers to the idea that a large group of respondents utilize the same medical provider, provider group, or reside in a part of the country where there are a high number of PCMHs or there are very few medical homes. This factor can impact external validity, leading to the inability to generalize the results to the greater population. The demographic questionnaire (see Appendix A) asked parents to identify the state in which

they live, thus making it easier to identify if responses are clustered in a specific state or region. In addition to the above potential geographical confounder, other possible confounders include age, ethnicity, gender, and parent's own previous experience with ADHD medication. Each of these factors was controlled for and contained in the demographic questionnaire in the event the data revealed they needed to be considered in the analysis.

Significance of the Study and Implications for Social Change

This research contributes to the scholarly literature available on PCMHs and will fill a gap in literature by determining if PCMHs positively impact parental beliefs and attitudes around ADHD and medication, which is associated with increased medication adherence for children with ADHD. Symptoms associated with ADHD are important risk markers for future life challenges (Caye et al., 2016); thus, medication adherence can contribute to long-term educational, psychosocial, and mental health well-being and maximize outcomes (Charach & Fernandez, 2013). This research is also important for those who make policies regulating healthcare and agencies who influence those policies. Some of these agencies include: the American Academy of Pediatrics, which influences healthcare policy; the NCQA, which awards recognition to PCMH; the Joint Commission, which provides PCMH accreditation; and Centers for Medicaid and Medicare Services, which intends to offer PCMH designation to assist in payment reimbursement. These policy-making organizations could make it a recommendation that all children diagnosed with ADHD attain access and receive treatment in a PCMH. A

policy change of this magnitude could significantly reduce the financial burden associated the increased academic and healthcare services required by this population.

This study has positive social change implications as it provides valuable outcomes data on PCMHs, which may support the hypothesis that parental beliefs/attitudes about their child's ADHD medication can be positively influenced by PCMHs. This data is also important as a measure of PCMH effectiveness in improving outcomes and whether they are meeting the goals as mandated in the Affordable Care Act.

Summary and Transition

Chapter 1 provided an overview of ADHD, medication adherence in children with ADHD, the influence of parental attitudes on medication adherence, and the role of PCMHs and their impact on health outcomes for children with chronic conditions. I also discussed the research questions, hypotheses, methodology, assumptions and limitations. Chapter 2 provides a detailed literature review on these topics as well as the theoretical framework that was utilized in this study.

Chapter 2: Literature Review

Introduction

This chapter presents a review of relevant scholarly literature around PCMHs, medication adherence, ADHD, parental beliefs/attitudes related to ADHD medication, and TPB. The problem that is explored is the high rate of medication nonadherence in children with ADHD and the impact of PCMHs on parental beliefs about ADHD medication and ADHD medication adherence. ADHD has many consequences, which include clinically significant academic and social impairment (Bussing et al., 2012; Express Scripts, 2014; Visser et al., 2014), an increased occurrence of grade retention and failure to graduate (Robb et al., 2011), risky sexual behaviors (Flory, Molina, Pelham, Gnagy, & Smith, 2006), substance use disorder (Wilens et al., 2011), poor quality of life (Danckaerts et al., 2010), peer rejection (Murray-Close et al., 2010), parenthood at an early age (Barkley et al., 2006; Reimer et al. , 2010), and increased rates of incarceration.

Nonadherence to medication has been shown to contribute to healthcare utilization, (Cutler &Everett, 2010; Hamilton, Lerner, Presson & Klitzner, 2013; McGrady & Hommel, 2013; Toomey et al., 2011), particularly for children with ADHD. Unintended injuries due to risky behavior and mental health service utilization are key consequences that directly impact healthcare utilization. Care provided in a PCMH has been associated with a reduction in healthcare utilization and improved outcomes (Toomey et al., 2011). Therefore, the purpose of this study was to determine if PCMHs have an impact on parental beliefs related to ADHD medication and ADHD medication adherence.

Literature Search Strategy

The literature review search strategy included a digital search of peer-reviewed literature through the Thoreau Multi-Database Search, Google Scholar, PsychINFO, PsychARTICLES, and EBSCOhost. The literature search was focused on the last five years (2011–2016); however, a complete and exhaustive review was conducted, which also included the seminal literature. The primary search terms included: *attention-deficit hyperactivity disorder (ADHD), mental health, medication adherence, behavioral health, medication compliance, medication persistence, patient-centered medical homes, medical homes, the theory of planned behavior, medication adherence theories, parental beliefs and medication, parental attitudes toward medication, parental beliefs or attitudes about medication, attitudes about ADHD, beliefs about ADHD, intention to adhere, parents and intention to adhere to medication, role of genetics in ADHD, genetic influences in ADHD, cognitive behavior therapy, behavior therapy, behavior therapy effectiveness, psychostimulants,* and *ADHD medication.* Term combinations included *ADHD and medication adherence, ADHD and genetics, ADHD and patient-centered medical hones, ADHD and the theory of planned behavior, medication adherence and the theory of planned behavior, ADHD and beliefs about medication, ADHD and medication, patient-centered medical homes and medication adherence,* and *patient-centered medical homes and parental attitudes.* I highlighted the definition of patient-centered medical homes, the recent research and findings pertaining to PCMHs and medication and ADHD, the factors that impact medication adherence and the relationship to clinical outcomes, the influence of parental beliefs on intention to adhere to medication, ADHD research and

the use of the theory of planned behavior as the theoretical framework, and the literature regarding the use of self-report in research.

Theoretical Framework

A variety of theoretical models have been utilized to understand reasons for medication nonadherence, including the illness career model (Parsons, 1951), the trans-theoretical model of change (Prochaska & DiClemente, 1984), the health belief model (Hochbaum et al., 1952), the social exchange theory (Emerson, 1976), UTB (Jaccard, et al., 2002), and TPB (Ajzen, 1991). The TPB was utilized as the framework for this study. However, I have included a brief summary of the preceding theories to elucidate the various approaches utilized in the literature to understand medication-taking behavior.

The Illness Career Model

The illness career model asserts people apply a social process to help-seeking behavior, which can be impacted by the patient's geography or social living environment (Biddle et al., 2007). Patients will consult with those outside of the medical community, including family, friends, and others in their social network to assist with their medical-related decision-making. The advice obtained from the social circle may go against medical advice and be perceived as irrational by medical practitioners (Charach, Volpe, Boydell, & Gearing, 2008). Moses (2011) suggested psychiatric treatment acceptability is influenced by peer socialization. Those youth who have peers in their circle who also receive psychiatric treatment tend to be more accepting of their own psychiatric treatment. Therefore, this framework has been utilized to understand how parents influence children's adherence to medication (Potter, 2013). This framework does fall in

line with the theoretical approach of this study, which asserts that beliefs and attitudes of those in a person's sphere of influence impact medication adherence, and would also be an appropriate theory for this study. However, this research placed additional emphasis on the role of parental beliefs and their influence on medication adherence.

The Trans-Theoretical Model of Change

The trans-theoretical model of change focuses on a person's readiness to change and contends behavior change occurs in the following stages: (a) pre-contemplation, where the person is not interested in making any behavioral changes in the near future; (b) contemplation, where the person considers making behavioral changes within the upcoming six months, but the change has not been initiated; and (c) preparation, where the person has implemented steps toward making the change within the next 30 days, an indicator that change is eminent (Prochaska & DiClemente, 1984); (d) action, where the person has successfully made and maintained the behavior change for under 6 months; and (e) maintenance, where the behavior change has been implemented for more than 6 months (Prochaska & DiClemente, 1984). People may often vacillate among the stages and not progress straight through from precontemplation to maintenance (Prochaska & DiClemente, 1984). Thus, regression can occur throughout the change process. Medication adherence would not be considered sustained until the person reached the maintenance stage of this model.

As reported in Watkins (2015), Charach et al. (2008) indicated medication adherence happens between the stages of action and maintenance and suggested while trying alternative treatments, some family members may need time to accept the

psychiatric diagnosis. This theory was not a fit for this research because it does not account for the influence of the beliefs and attitudes of parents on behavior change or the general impact of other factors that influence a person's decision to take action.

The Health Belief Model

The health belief model, which is considered one of the most frequently used theories related to health behavior (Orji, Vassileva, & Mandryk, 2012), has been utilized to explain behavior related to illness and prevention. The focus of the model is related to motivation and a person's perceptions, modifying behavior, and the likelihood that they will take action (Hochbaum et al., 1952). The five factors of the health belief model that impact a person's motivation and action-taking behavior are: (a) perceived susceptibility, a persons' perception of the odds of developing a condition that negatively impacts their health; (b) perceived severity, a persons' belief as to the life effect the condition will have; (c) perceived benefit of taking action, a person's belief that the condition is serious enough to warrant action, and the type of action taken is influenced by effectiveness of the available options; (d) barriers to taking action, in which persons may believe that they should take action but factors such as cost and inconvenience can adversely impact the follow-through with the action; and (e) cues to action, including internal and external triggers that prompt a person to action, which most likely occurs in the absence or elimination of barriers (Hochbaum et al., 1952). This model also places emphasis on a persons' beliefs; however, it does not address how others' beliefs and attitudes impact behavior.

Social Exchange Theory

Social exchange theory holds that people make decisions based on their ability to exchange and maximize resources and rewards and minimize costs (Hamrin et al., 2010). In other words, individuals assess the advances they can achieve through a reciprocal relationship. It is assumed that the individual or group is rational and is able to make rational decisions when contemplating the resource exchange. Hamrin et al., **(**2010**)** assert this theory can be applicable to families as they examine the potential benefits and alternatives to pharmacological treatment for their child who has a behavioral health diagnosis. This theory also supports the premise that previous parental experience with mental illness and favorable use of psychotropic medication is correlated with parents' willingness to entertain psychotropic medication for their child (Hamrin et al., 2010). This theory of parental attitudes toward medication and mental health diagnosis could be applicable to this research, but this research will not evaluate the reciprocal relationship as a variable for adherence.

Unified Theory of Behavior

UTB is a commonly used theory in the literature regarding the influences of behavior (Jaccard, et al., 2002). The UTB focuses on two dimensions. The first involves a person's behavior, which is influenced by the person's knowledge and skills for behavioral performance, environmental restrictions, intention or decision to perform behavior, importance of behavior, and habit and spontaneous processes (Guilamo-Ramos, Jaccard, Dittus, Gonzalez, & Bouris, 2008; Olin et al., 2010). The second dimension involves those components that impact a person's intention, emotions, social norms, self-

concept, expectancies, affect, and self-efficacy (Guilamo-Ramos et al., 2008; Olin et al., 2010). Based on this theory, it is believed that even if a person's intentions can be influenced to participate in a specific behavior, behavioral action may not occur until the first set of factors (i.e. environmental barriers or constraints, knowledge) are addressed (Olin et al., 2010). This theory does address intention and attitudes as factors that influence behavior, and the impact of environmental barriers such as knowledge and parental attitudes. Thus, this theory could also be an option for this research**.**

Theory of Planned Behavior

TPB is an extension of the theory of reasoned action and was selected for this research (Fishbein & Ajzen, 1975). The theory asserts the intention of a person to perform a specific behavior is a reflection of the motivational influences on that behavior (Ajzen, 1991). According to Ajzen, the three components that influence behavior are: (a) attitude, (b) subjective norm, and (c) perceived behavioral control. Ajzen further posits that the stronger a person's intention to engage in a behavior, the higher the probability that the behavior will occur. Subjective norms are indicative of a person's beliefs related to how individuals in their social network perceive the behavior in question. A person's belief in their ability is referred to as their perceived behavioral control (Azjen, 1991). Therefore, the more positive a person's attitude and subjective norm, the greater the person's perceived control as well as the likelihood of the person's intention to perform the targeted behavior.

The TPB is a popular theory utilized to investigate medication adherence for diverse ethnicities including Latinos, Caucasians, and African Americans, with chronic

diseases and conditions including pain, cardiovascular disease, depression, and diabetes. Laba, Lehnbom, Brien, and Jan (2015) suggested intention plays an important role in medication adherence in chronic illnesses. Lewis, Askie, Randleman, and Shelton-Dunstan (2010) found friends and family influenced beliefs and the behavior, which were correlated with medication adherence in African American participants. Several researchers found medication adherence was strongly associated with attitudes, social support/ social circle, and family (Ahmed & Aslani, 2013; August & Billmek, 2015; Charach & Fernandez, 2013, Cutler & Everett, 2010; Hébert et al., 2013; Luga & McGuire, 2014; Vissman, Young, Wilkin, & Rhodes, 2013). Charach and Fernandez (2013) asserted parents' beliefs and attitudes related to ADHD treatment significantly impact medication initiation. However, some parents do not accept medication as an appropriate choice to treat their child's ADHD-related behaviors. Other parents evaluate the potential of social disapproval and possible adverse effects of ADHD medications as the reason for forgoing medication initiation (Bussing et al., 2012; Toomey et al., 2012).

Social acceptability/social norms are popular themes associated with medication adherence and are a construct of the TPB. Charach and Fernandez (2013), and Hébert et al. (2013) reported increased parental feelings and attitudes related to medication social acceptability coincide with their increased willingness to accept pharmacological options. Ludwig et al. (2011) compared individuals who live in disadvantaged and those who live in affluent neighborhoods. They found those who reside in low-income neighborhoods are more likely to experience poor social cohesion, which may perpetuate norms that reduce good health behaviors.

Pillow, Naylor, and Malone (2014) utilized the TPB to evaluate the beliefs about stimulant medication of college students with ADHD. The study focused on the general attitudes of current and past stimulant medication users and proposed that people acquire and alter their beliefs related to stimulants due to their connections with others. They further contend that familiarity with and the experience of those who take stimulant medication can influence medication adherence. Pillow et al. **(**2014) further reported the constructs of the TPB (attitudes, perceived control, social norms) may possess clinical and predictive value due to the significant differences found in the general attitudes related to stimulant use, the perception of control, and the opinions of others around the use of stimulants.

Bai et al. (2015) utilized the constructs of the TPB in the design of psychoeducational programs for parents of children with ADHD. Parents were divided into a control group or an intervention group where their ADHD knowledge, TPB components, and children's ADHD symptoms were assessed. Bai et al. found that interventions, which used the TPB model effectively, improved adherence behavior and ADHD symptoms. Their research revealed that inaccurate disease state and treatment associated knowledge, poor emotional support, and feelings of isolation were the primary barriers to medication initiation and persistency among newly medicated patients.

Strecher, De Vellis, Becker, and Rosenstock (1986) reported self-efficacy is correlated with a person's beliefs around their capabilities to execute specific behaviors in certain situations. Thus, one's self-efficacy can vary greatly depending on the situation or task. Time on task and the amount of effort expended is also affected by self-

efficacy (Strecher et al., 1986). This may have an impact on ADHD medication adherence and persistence as inappropriate effort in understanding the need for ADHD medication and treatment may lead to poor adherence with the prescribed medication regimen. Based on the presented research and the utilization of the TPB in multiple health behavior studies, this theory was chosen as the best fit for this study and will provide context to the two research questions around parental beliefs and attitudes, and the influence of these beliefs on parent's adherence to medication. The TPB also serves as the basis to analyze the survey results, and represents the motivational influences that impact the parent's intention to follow the prescribed medication-taking regimen by a healthcare practitioner. Data related to this contention was collected via the BMQ–Specific and MMAS–8 surveys, which may support or challenge this theory. The results of this study may demonstrate that PCMHs positively impact parental beliefs/attitudes related to ADHD medication and improve parental adherence to ADHD medication for their children. This is important because it may support the belief that PCMHs improve treatment outcomes and thus advance the role of PCMHs as a viable option to improve medication adherence for this population. Increased medication adherence for children with ADHD could potentially decrease academic and social impairment, healthcare utilization, substance use, and risky behaviors; all of which are detrimental to children's long-term success.

Attention-Deficit Hyperactivity Disorder

The CDC reports approximately 10% of children in the United States have been diagnosed with ADHD (Centers for Disease Control and Prevention [CDC], 2013). New

data suggests the overall cost of ADHD, in both children and adults, is high as $266 billion dollars (Children and Adults with Attention Deficit/Hyperactivity Disorder, 2016) as ADHD can persist into adulthood. ADHD is a neurodevelopmental disorder that involves the inability to control impulsive behaviors and includes difficulty with paying attention (CDC, 2013). ADHD can lead to clinically significant academic and social impairment (Bussing, et al., 2012; Express Scripts, 2014; Visser et al., 2014), an increased occurrence of grade retention and failure to graduate (Robb et al., 2011), increased emergency room visits and unintended injuries (Merrill et al., 2009; Schwebel et al., 2011), increased risk of unsafe driving, suicidal behavior, eating disorders and parenthood at an early age (Barkley et al., 2006; Reimer et al., 2010). Medication may provide children and adolescents with ADHD with a significant opportunity to achieve long-term treatment success if they adhere to the treatment regimen (Chacko et al., 2010). Visser et al. (2015) found just over 74% of children with ADHD, between the ages of 4 and 17, had taken medication, however, ongoing adherence to medication treatment presents a challenge and contributes to the above detailed adverse impact of ADHD. As reported earlier, up to 87% of children are non-adherent to medication (Ahmed & Aslani, 2013).

Etiology/Genetics

There is a strong correlation between the involvement of multiple genes in the serotonin and dopamine pathways and ADHD, with approximately 76% of ADHD occurrences having a link to genetics (Farrone & Mick, 2010). Neurotransmitter dysregulation, particularly in serotonergic, dopaminergic, and noradrenergic gene

systems have been commonly hypothesized to be involved in ADHD (Banaschewski, Becker, Scherag, Franke, & Coghill, 2010). This hypothesis is supported by the effectiveness and significant therapeutic effects of stimulant medications, the role of dopamine in ADHD (Del Campo, Chamberlain, Sahakian, & Robbins, 2011) and serotonergic genes which have been implicated in impulsivity (Banaschewski et al., 2010). Other researchers have postulated that the exposure to maternal cigarette smoke while pregnant and the exposure to lead may create a genetic predisposition to ADHD (Braun, Kahn, Froehlick, Auinger, & Lanphear, 2006; Froehlich, Anixt et al., 2011). There is also some evidence that ADHD is the result of prefrontal-striatal circuitry dysfunction however, limited information is available to support this theory (Dickstein, Bannon, Castellanos, & Milham, 2006).

Researchers have additionally reported that there are age-related differences in the genetic and neurocognitive mechanism theory. Thissen et al. (2015) argue that age is a contributing factor to these variations, as gene expression can change during different developmental stages. Larsson, Lichtenstein, and Larsson (2006) reported ADHD-related hyperactivity and impulsivity decrease with age, and neurocognitive ability associated with genetic effects escalates with age (Polderman et al., 2007). Thissen et al. (2015) also found differences in a particular dopamine receptor allele and serotonin transporter between adults and adolescents lending further support to this theory. Wilcutt (2005) reported in the over 10,000 twin studies conducted to evaluate the etiology of ADHD, all studies found genetics were associated with the individual variations in ADHD

symptoms. Wilcutt further reported environmental influences accounted for the disparities in ADHD symptoms.

Diagnosis

Diagnosis and initial treatment for ADHD most frequently occurs when children are between the ages of seven and nine, or elementary school-aged, although the development of ADHD occurs before then (Charach et al., 2011). ADHD is defined as: a continued pattern of hyperactivity-impulsivity and/or inattention that impedes a person's ability to function or develop, with symptoms that present in at least two settings (e.g. school, home, with friends or family), and adversely impacts occupational, school, or social functioning. Multiple symptoms must be evident before the age of 12 (5th ed.; DSM-5; American Psychiatric Association, 2013). Additionally, parents and or teachers must provide information regarding the child's symptoms to substantiate an ADHD diagnosis (Feldman & Reiff, 2014). Charach et al. (2011) reported elementary school-aged children are twice as likely to be diagnosed with ADHD as adolescents, with boys representing the majority of incidences. Boys are also more likely to present with combined type (inattention and hyperactivity) versus inattention only symptoms (Feldman & Reiff, 2014). The severity of ADHD symptoms tend to decrease as children age, however, most children still experience symptoms as adolescents (Charach et al., 2011). Symptoms can also persist into adulthood and it has been reported that up to one third of all children diagnosed with ADHD also have symptoms in adulthood (Barbaresi et al., 2013). Many interventions have been utilized to address the symptoms of ADHD,

including psychopharmacology, behavioral interventions, and a combination of both. Unfortunately, researchers report the success of these interventions, even in combination; have been suboptimal (Murray et al., 2008). Of important note, the diagnosis of ADHD is often comorbid with other mental health diagnoses, particularly conduct disorder and oppositional defiant disorder, with occurrence rates as high as 50% (Nijmeijer, Minderaa, Buitelaar, Mulligan, Hartman, & Hoekstra, 2008). This high incidence of comorbidity can contribute to complexity and morbidity of ADHD.

Adverse Impact of ADHD

Academic achievement. Children with an ADHD diagnosis often experience academic difficulty and decreased academic achievement. Robb et al. (2011) reported there is a significant impact on the costs associated with special education services for children (kindergarten to 12th grade) with ADHD compared to those without. The average cost per year for a child with ADHD was $4,181 vs. $211 for a child without ADHD. Grade retention also occurred significantly more often with the ADHD group (M = .40) vs. the non-ADHD group (M = .08), with an average cost per year of $222 vs. $43 for the non-ADHD group. Lastly, Robb et al. reported children and adolescents diagnosed with ADHD had a significantly greater report of behavioral misconduct resulting in academic suspensions, discipline, or expulsion. The average cost for the ADHD group was $604 annually vs. $63 for the non-ADHD group. The aggregate cost of all three (special education, behavioral misconduct, and grade retention comes to a total of $5,007 annually, which does not include the regular annual costs associated with education, according to Chambers, Shkolnik and Perez (2003) of $7,793.

Masseti et al. (2008) evaluated 255 children (125 diagnosed using modified criteria for ADHD) over a period of eight years to assess academic performance. Impairment was measured based on parent and teacher report as well as several of instruments that evaluated achievement in various academic categories. The researchers found children who exhibited the inattentive subtype of ADHD experienced decreased academic performance. Bauermeister, Barkley, Bauermeister, Martínez, and McBurnett (2012) also supported the contention that inattention is associated with academic impairment. Lahey and Willcutt (2010) found children with ADHD exhibited poorer academic performance on standardized testing, and Power et al. (2012) found homework also to be a challenge for this population. Marshall, Evans, Eiraldi, Becker and Power (2014) reported homework challenges include low energy, slow task completion, mind wandering, and muted alertness and should be the target of interventions.

In a study of 178 children between the ages of 6 to 11, McConaughy et al. (2011) found as many as 55% of children with ADHD experienced a clinically significant deficit in Academic functioning, as demonstrated by lower scores on standardized and academic tests as well as teacher ratings of performance, when compared to children without ADHD. These scores included teacher ratings of child performance at grade level, child effort, and academic motivation and ability. The researchers suggested that interventions are needed to not only address the academic impairment experienced by these children, but also there is a need for interventions to address the primary symptoms of ADHD, of which includes the implementation and adherence to medication.

Social impairment. Social impairment is a common hallmark of ADHD. McConaughy et al. (2011) found up to 85% of children experienced clinically significant social behavior impairment, which included decreased participation in social organizations, sports, less friends, and more difficult relationships with family and peers. Nijmeijer et al. (2008) reported peer rejection could occur as a result of the disruptive and aggressive behaviors commonly exhibited by children with ADHD. And unfortunately, children who display these behaviors can be unaware of the adverse effect they have on others and therefore, are oblivious to their own unpopularity with peers. But not all children with ADHD demonstrate aggressive behaviors. Nijmeijer et al. (2008) reported some youth could become socially withdrawn, passive, shy, and display anxiety, which leads to poor relationship development with peers. Bagwell, Molina and Pelham (2001) found children with ADHD had fewer friends and were rejected more frequently compared to those children without ADHD. Murray-Close et al. (2010) reported peer rejection is very challenging to reverse and can impede children from acquiring important developmental skills necessary for the successful navigation of life. They further assert children might display an exaggerated self-concept that is off-putting to peers, leading to rejection. Hoza et al. (2010) asserted the rejection that is experienced as a result of this over-confidence could lead to aggression. Therefore, there appears to be a cycle of peer rejection and aggression, one contributing to the other, which ultimately impedes behavior change.

The trajectory of antisocial behavior in children with ADHD has been reported to take two different paths: the first which can begin during preschool age, and another that

commences in late childhood (Polier, Vloet, & Herpertz-Dahhmann, 2012). Moffitt, Caspi, Harrington, and Milne (2002) followed 1037 children from the age of three to 18, with a follow-up study of the cohort at age 26, and a second follow-up study by Odgers et al. (2007) of the same cohort at age 32. Odgers et al. reported those children who were diagnosed with ADHD early in childhood (pre-school aged), and who also exhibited persistent antisocial behaviors throughout childhood and into adulthood, were often involved in violent behaviors and had more health and financial issues. Even though this subset of the cohort represented only about 100 children (10%), they also accounted for roughly 70% of the time participants spent incarcerated. Klein et al. (2012) also reported youth with ADHD (36%) had a significantly greater incarceration rate as compared to those without ADHD (12%), which supports the adverse impact and deleterious effects of ADHD.

According to Burt, Obradovic, Long and Masten (2008), maladaptive behaviors in adulthood can be predicted by diminished social behavior in childhood. Mrug, Hoza, and Gerdes (2001) assert hyperactive children with ADHD typically benefit from a combination behavior management training and medication. Thus, treatment effectiveness may be decreased when medication is discontinued or children are nonadherent.

Substance use disorder and other risky behaviors. Researchers reported the likelihood of developing substance use disorder (SUD) is increased for those diagnosed with ADHD. Wilens et al. (2011) reported there is a considerable increase in risk for SUD in children diagnosed with ADHD, however, conduct disorder, which often co-

occurs with ADHD, alone has been shown to be a risk factor for SUD, including tobacco smoking, This is important is important as Brook, Brook, Zhang, and Koppel (2010) reported SUD in youth with ADHD may be mediated by conduct disorder.

ADHD in children has been implicated in the display of risky behaviors such as risky sexual activity and risky driving. Flory et al. (2006) found youth with ADHD initiated earlier sexual activity, had an increased numbers of sexual partners, had more casual sex, and a greater number of pregnancies. The researchers contend poor social functioning can steer youth toward affiliations with peer outcasts and outsiders who are more likely to participate in deviant behaviors. Family conflict, as a result of the negative behaviors demonstrated by some children with ADHD may also be a contributor.

Quality of life. Quality of life, which includes a person's perception of their psychological, physical, and social performance, can be improved by medication. Most studies that assessed quality of life and medication were those conducted with the non-stimulant medication Atomoxetine. In a systematic review of literature by Danckaerts et al. (2010), one study found medication resulting in a significant improvement in family engagement, behavioral health scores and psychosocial scores compared to placebo. Another study reported a significant increase in symptom ratings from teachers and parents after children took Atomoxetine. Two studies that utilized amphetamine salts were reviewed and both studies revealed statistically significant increases in quality of life scores at endpoint. These studies demonstrate that medication can positively impact

how children perceive their quality of life, which is a direct impact of mental, physical and social well-being.

Treatment

Medication. Medication is the most commonly used treatment for ADHD and can vary based on gender and geography. In 2012, the southern United States, specifically South Carolina, had the highest reported use of ADHD medication (5%), and for adolescent boys between the ages of 12 and 18, medication use was as over 14% (Express Scripts, 2014). These rates are 72% higher than those reported for the national average, and there is speculation that appropriate ADHD diagnosis, school-related testing that penalizes teachers for poor student performance, the lack of resources in the school system to address behavioral issues, and lower SES, are contributors to this inflated rate of medication utilization (Express Scripts, 2014). This data reflects geographic differences in medication use across the United States.

The two types of medications most frequently utilized are categorized as psychostimulants (e.g. amphetamine derivatives, methylphenidate) and norepinephrine reuptake inhibitors (Charach et al., 2011). While both have had some success in the treatment of ADHD symptoms, stimulants are the most frequently used medications and are first-line treatment for ADHD (Weyandt et al., 2014; Zuvekas & Vitiello, 2012). Evidence indicates non-stimulant medications are also safe and effective at relieving ADHD symptoms (Busche & Savill, 2014). They are particularly effective for those who fail to respond to stimulants and who also have comorbid substance use disorder (Weyandt et al.). These individuals have a higher abuse potential to stimulant

medications due to their affinity for the dopaminergic system, whereas non-stimulants target the norepinephrine neurotransmitter system (Weyandt et al., 2014). However, researchers have also reported patients who take non-stimulants are less adherent and have decreased medication persistence as compared to those who take stimulant medications (Christensen, Sasane, Hodgkins, Harley, & Tetali, 2010). This may be attributed to medication efficacy, which is one of the most commonly reported reasons for the discontinuance of ADHD medication.

Feldman and Reiff (2014) reported long-acting and sustained release stimulants have a greater preference over short-acting stimulant medications due to once a day morning dosing. This dosing schedule provides effective control of symptoms throughout the school day with limited side effects (Feldman & Reiff, 2014). The long-term use of stimulants and their cardiovascular safety profile trepidation among patients and practitioners. However, Cooper et al. (2011) found there is no increased frequency of unexpected death in children who utilized stimulants than what is found in the general population. Although these findings indicate there is no increased risk, in 2008 the American Heart Association recommended that practitioners conduct an electrocardiography prior to the initiation of treatment with stimulants (Feldman & Reiff, 2014).

Atomoxetine, a selective norepinephrine reuptake inhibitor, is the most well known non-stimulant medication (Polier et al., 2012). The investigators reported that although it may take a few weeks before the complete benefit of the drug is realized, the drug has been implicated with significant improvements in ADHD symptom severity.

Newcorn, Spencer, Biederman, Milton, and Michelson (2005) reported Atomoxetine has also been effective in mitigating aggression related to impulsivity in those with both ADHD and oppositional defiant disorder. Although some literature supports the effectiveness of Atomoxetine, stimulants are recommended as first line therapy, with short-acting stimulants demonstrating fewer side effects, which can lead to better adherence.

Behavior therapy/counseling. Behavior therapy has been utilized alone and in combination with medication to change behavior. Cognitive Behavior Therapy (CBT), which is used in both children and adults, has been recommended for children 5 and under, in combination with pharmacotherapy, and for children unable to tolerate psychostimulants (The American Academy of Pediatrics, 2011). Antshel, Farone, and Gordon (2014) reported that although there is some literature that indicates CBT is an effective treatment option for children and adolescents, CBT has demonstrated stronger efficacy in adolescents (Baer & Nietzel, 1991) and in adults (Safren et al., 2010) versus children, and suggested CBT efficacy may be moderated by cognitive development. While some children may have a singular diagnosis of ADHD, it often presents with co-occurring psychopathology, such as anxiety, mood disorders, and disruptive behavior (Kessler et al., 2006). Antshel et al. (2014) found adolescents with multiple mental health disorders (e.g. conduct disorder, and oppositional defiant disorder) received less benefit from CBT than those with ADHD alone or ADHD and anxiety or depression. The researchers further reported although adolescents with ADHD alone and ADHD and

anxiety or depression did realize some gains in functioning, they remained symptomatic and continued to experience some functional impairment.

Bussing et al. (2012) found negative attitudes were correlated with behavior therapy and counseling. Participants reported psychotherapy and counseling were generally ineffective, particularly when used alone. In addition to the cost associated with counseling, participants expressed concern around the stigma tied to the receipt of counseling and the possibility that public awareness of their counseling would have a devastating impact. Behavior therapy consistency for the family and across the continuum of care was reported as the greatest burden of this treatment option (Bussing et al., 2012). Parents can be trained on how to utilize interventions, such as positive and negative reinforcement, which can result in successful behavior modification and help their child to self-manage their behavior (American Academy of Pediatrics, AAP, 2011).

Another behavioral intervention that has been utilized is behavior classroom management, which is designed to increase classroom rules compliance and productivity, and minimize disruptive behavior (AAP, 2011). While behavior management is the first-line recommendation for younger children (ages 4-5), it may not be enough to sufficiently reduce problematic ADHD behavior, thus the addition of medication may be required, per AAP treatment guidelines (AAP, 2011). Although some children, parents, and teachers may find this treatment useful, it does not appear to be the most efficacious.

ADHD Treatment Guidelines

The American Academy of Pediatrics (2011) has provided guidelines for the treatment of ADHD and recommends the following:

1. Children between 4 and 5 years of age: In areas where behavioral treatments are available, they are recommended first-line. If the intervention does not provide a significant improvement and behavioral disturbances persist, methylphenidate may be prescribed, however the potential harm versus the benefits of starting medication at an early age should be weighed.
2. Children between 6 and 11 years of age: U. S. Food and Drug Administration approved ADHD medication and/or parent/teacher provided behavior therapy is recommended first line, with a preference for a combination of the two. The AAP reports there is strong evidence in support of the use of stimulants, and further recommends school involvement as part of the treatment regimen.
3. For children between 12 and 18 years of age: U. S. Food and Drug Administration approved ADHD medication is recommended with adolescent assent. Medication should be used preferably in combination with prescribed behavior therapy.

Medication Adherence

Medication adherence is defined as the degree to which a person's behavior matches the agreed recommendations from a health care practitioner, including following diet and lifestyle changes as well as taking medication (World Health Organization, 2003). Medication may provide children and adolescents with ADHD with a significant opportunity to achieve long-term treatment success if they adhere to the treatment regimen (Chacko et al., 2010). Reasons attributed to medication adherence (which is only around 50%) are patient-related (e.g. SES; Brown & Bussell, 2011), medication-

related (e.g., efficacy; Barner, Khoza, & Oladapo, 2011), and environment-related (e.g., parental beliefs; Ferrin & Taylor, 2011, Garbe et al., 2012; Zetterqvist et al., 2013). Dawood et al. (2010) contend that for children with chronic illness, the lack of parental understanding of their child's illness, reticence around therapy efficacy, and concern about adverse effects of medication, impact children's adherence. Thus**,** parents have the largest impact on their child's medication initiation and adherence (Bai, et al., 2015).

Medication interventions have demonstrated proven success in mitigating the ADHD symptoms of hyperactivity, inattention, and impulsivity, which contribute to social and academic impairment as well as risky behaviors. Specifically, medication has been shown to increase academic performance (Connor, 2005), improve mathematic scores (Molina et al., 2009), and enhance cognitive performance (Bedard, Jain, Johnson, & Tannack, 2007; Swanson, Baler, & Volkow, 2011). In a systematic review of literature by Shaw et al. (2012) to compare the long-term impact of ADHD treatment vs. non-treatment, several studies that looked at the long-term impact of no ADHD treatment over a period of nine years. Four studies indicated participants deteriorated significantly from baseline measures. For example, in one study, Powers, Marks, Miller, Newcorn, and Halperin (2008), investigators found children who had never or who had received minimal pharmacologic treatment for ADHD scored significantly worse on standardized academic achievement tests than those who had no ADHD diagnosis.

In another group of studies from the Shaw et al. (2012) literature review, driving, obesity, self-esteem, social function, academics, drugs, antisocial behavior, the use of services, and occupation were utilized as outcome endpoints for medication treatment for

ADHD. Medication treatment achieved the greatest benefit on driving, obesity, self-esteem, and social and academic function. However, improvements in obesity is may be attributed to the side effects of amphetamines, which is appetite suppression. Shaw et al. noted that although many studies reported an improvement in the outcome measures for those treated with medication, medication is unable to normalize or to eliminate completely the symptoms and adverse behaviors associated with ADHD. Therefore, when individuals who have received treatment for ADHD are compared to those without ADHD, those without ADHD still tend to perform better.

Attempts to increase medication adherence include enhancing parental knowledge and information regarding ADHD, educating parents on the safety of medication and the social acceptability of medication, behavior therapy, and psychoeducation (Bussing et al., 2012). However, Wang, Maursky-Horowitz, and Chronis-Tuscano (2015) reported parents own experience with ADHD could impact their child's treatment outcome. The researcher asserted this is due primarily to the manifestation of the parent's own ADHD symptoms, leading to poor and/or inconsistent monitoring and adherence to their child's pharmacologic treatment regimen, ultimately producing inadequate pharmacological response. Wang et al. reported that interventions designed to help parents attain better control of their own ADHD symptoms may create a trickle-down effect that leads to better medication adherence for their children. However, it is not clear as to the degree to which parental ADHD and the control of parental ADHD symptoms actually impact children's medication adherence.

Demonceau et al. (2013) conducted a systematic literature review and meta-analysis to assess interventions utilized to increase medication adherence. Eight types of interventions were evaluated including (a) treatment simplification (changing dose schedule and/or medication formulation, (b) cognitive-educational (education in group settings), (c) behavioral counseling, (d) social-psycho-affective (social support and relationships, (e) electronically monitored adherence feedback or EM-feedback (electronic feedback on patient dosing history), (f) technical reminder systems (i.e. mobile text messages), and (g) rewards. The researchers found patients who received EM-feedback had the greatest improvement (7.7%), and rewards were second. However, variations in study sample size, the repetition of the intervention, method for randomization, and the way adherence was operationally defined in studies may have impacted the study results (Demonceau et al. (2013).

Researchers revealed that while some interventions (psychoeducation and behavior therapy) may have some incremental impact on increased medication adherence in the short term (Dean et al., 2010; Hebert et al., 2013), an intervention that substantially increases medication adherence remains a challenge (Sitholey et al., 2011). Methods to reduce the economic loss, social impairment, and poor clinical outcomes related to poor ADHD medication adherence remains of significant importance to healthcare professionals and researchers (Bussing et al., 2012; Lehmann et al., 2014; Schwebel et al., 2011).

Patient–Related Factors

In this research, the patient is defined as the "parent-child dyad" because for children between the ages of 5 and 12, the parent(s) is the one generally responsible for medication administration (Chacko et al., 2010). As children age and become adolescents, they tend to be more vocal about their opinions related to ADHD medication and whether they will adhere and persist with their medication. The patient chiefly determines medication adherence, although many factors can influence whether the patient decides to initiate, adhere, and persist with treatment. Brown and Bussell (2011) argued the involvement of patients in their care is a key contributor to improved patient associated medication adherence.

Age. Age has been examined extensively as a factor that contributes to medication adherence. As children age, they become more vocal in their desire to be adherent to medication and parents wield less influence on their children's medication-taking behavior. In a qualitative study by Avisar and Lavie-Ajayi (2014), six of 14 participants completely discontinued medication after elementary school. Selective adherence was reported by three of the 14 participants, and only five participants reported that they persisted with their medication. However, they were also the younger participants in the sample. All of the participants reported they either completely stopped taking their medication or only took it intermittently by the time they reached high school. Of significance is that only one participant was advised by his parent to stop taking the medication due to a lack of improvement and the presence of side effects.

Although age has been cited as a factor that impacts medication adherence, some researchers dispute the role age plays in adherence. Hebert et al. (2013) contend medication adherence was not significantly impacted by a child's age. They found there were two factors that positively predicted adherence: 1) child's gender (male), and 2) the parent's perception of the psychosocial benefits of medication after three months. The researchers further reported parent's perceived psychosocial benefits of medication can be increased through their medication acceptability and through clinician-driven medication education, targeted toward the child, regarding the benefits of medication on psychosocial skills

Socioeconomic status. Patient SES status is a significant factor that can adversely impact medication adherence (Brown & Bussell, 2011). Low SES directly affects a patient's access to healthcare including transportation to appointments and the pharmacy, as well as their ability to pay for medication and services. Children who live in neighborhoods with limited access to a pediatrician and/or low-income areas may have worse health habits than those with higher SES (August & Billimek, 2015). Even if the child has health insurance, access to preferred medication that may have fewer side effects or be more efficacious could be a barrier to treatment adherence. Patients may also skip doses or not take the prescribed amount of medication due to the cost of medication costs. Billimek and August (2014) reported that medication cost is a core contributor to intentional nonadherence. When the researchers assessed the role of costs and beliefs about medication of Mexican Americans who had type 2 diabetes, they found participant beliefs was the greatest contributor to adherence. Billimek and August

reported participants beliefs were associated with neighborhood deprivation, but income or the type of insurance, and the opposite was true of medication cost, where cost was related to type of insurance and income.

Bussing et al. (2003) evaluated the influence of social networks and found there were significant differences in in network characteristics based on SES and ethnicity. Those networks which comprised White parents with higher SES were larger and included more healthcare practitioners. Even these results suggested White parents had greater access to healthcare professionals and increased opportunity to seek their advice. African American parents leaned more heavily on an informal network, consisting of family and friends and reported they had adequate social support.

Medication-Related Factors

The most commonly reported ADHD medication-related factors attributed to non-adherence are side effects and poor efficacy. Medication side effects include changes in mood, depression, irritability, suppression of appetite, and insomnia (Singh et al., 2010; Toomey et al., 2012). Toomey et al. (2012) surveyed parents of children with ADHD and found 21% of children no longer persisted with medication, and 42% of those discontinued within the first 30 days of medication initiation. An additional 33% discontinued between 4 and 6 months of initiation and 4% persisted for more than 6 months. The researchers reported 34% was attributed to poor medication efficacy and 62% of medication discontinuance was attributed to medication adverse effects. Additionally, up to 71% of children reported they experienced side effects.

Sitholey et al. (2011) assessed 24 newly diagnosed adolescents and children with ADHD from India to determine the factors related to medication adherence. The researchers found participant nonadherence exceeded 83% in the first month. Medication side effects were reported by 65% of participants, and poor medication efficacy was reported by 50% of participants. While the study results were congruent with other study reports on reasons for medication nonadherence, the small sample size impedes the generalization of the results.

Several researchers have also cited medication side effects and poor efficacy as the primary reason for medication nonadherence **(**Cutler & Everett 2010; Laba et al., 2015). However, in a qualitative study to assess young people's experiences of stimulant medication and ADHD, several youth reported their medication had a positive effect on their social behavior, increased their focus and concentration in the classroom, and improved their school work (Singh et al., 2010). While several participants reported they experienced school work improvement, the benefits of enhanced focus and concentration were not completely alleviated and participants still reported they experienced significant difficulty with school work. However, most of the youth expressed positive medication experiences and indicated they needed their medication. They further related improved social behaviors of the medication with improved peer relationships.

Environmental-Related Factors

Parental beliefs. Parental attitudes, beliefs, and perceptions are paramount to medication adherence (Ferrin et al., 2012). Toomey et al. (2012) examined why children discontinue their medication and asked parents to rate a series of questions related to

ADHD and medication. The researchers found medication discontinuation was correlated with positive parent agreement with the following statements: (a) "I prefer counseling over medicine to treat my child"; (b) "I feel that medicines to treat ADHD had bad side effects"; (c) "ADHD is best treated with counseling"; (d) "Sometimes [my child] doesn't need to use as much ADHD medicine as the doctor prescribed"; and (e) "I worry about the long-term effects of ADHD medicines" (p. 766). Therefore, parental perceptions and beliefs were correlated with parental behavior and medication adherence.

Hamrin et al. (2010) suggested that parent and child ambivalence toward medication is created through cultural messages that facilitate fear. Some messages, both cultural and not, influenced medication-taking behavior around disease and medication-related stigma. Hamrin et al. reported researchers found 45% of stigma was related to childhood mental health treatment that resulted in rejection in the school setting. In response to questions around mental health issues and the treatment of children with medication, participants reported (a) physicians prescribed too much medication; (b) long-term developmental side effects are caused by medication; and (c) medication postponed addressing the actual child's issues (Pescosolido, Perry, Martin, McLeod, & Jensen, 2007). This research supports the contention that attitudes and beliefs impact parental behavior related to medication.

Ferrin and Taylor (2011) contended illness management is directly impacted by the core beliefs of the patient, and suggested the treatment outcome for children and adolescents are most likely influenced by their attitudes. Johnston, Seipp, Hommersen, Hoza, and Fine (2008) reported parents who believed ADHD was attributed to

environmental or psychological influences versus biological causes had a greater propensity to encourage medication adherence for their children. They reported safety and efficacy of medication to moderate ADHD symptoms also greatly impacted parental medication adherence.

In a Danish study of 62,304 children, adolescents and adults up to 49 years of age to determine second prescription refills of ADHD medication, only 7,441 (12.6%) refilled their prescription a second time (Pottegård, Bjerregaard, Kortegaard, & Zoega, 2015). This number represents a decrease in second prescription refills over time. Similar results were found regardless of the gender, type of drug taken (methylphenidate immediate release, methylphenidate extended release, or atomoxetine), or age. However, adults discontinued medication over time at a greater rate than children and adolescents. Pottegård et al. suggested this may be attributed parental involvement in their child's medication taking, since parents are generally the decision-maker regarding medication persistence.

Raman et al. (2015) evaluated children aged 3 to 16, who were prescribed ADHD medication in the primary care setting in the United Kingdom between 1994 and 2006. The researchers looked at both the duration of the initial treatment course and the span of time between the courses of treatment. Initial treatment course duration lasted from the date the first medication was prescribed through the end of the last ADHD prescription medication treatment period. Treatment periods included a grace period of 30-days in for the main analysis and 60 and 90 grace periods for secondary analysis. Children who continued with their first course of treatment for more than six months were considered

persistent, and those who continued for less than 6 months were considered nonpersistent. The treatment gaps between treatment courses for those children who had multiple treatment courses were also determined. Raman et al. found just 35% of children were persistent with their medication at six months following their initial prescription, even with a 30-day grace period. And when given a 60-day grace period, only 57% of children were persistent. Long-acting methylphenidate was also associated with medication persistence at the six-month mark. The investigators supported Charach and Fernandez' (2013) assertion that elements not typically measured or collected in databases, such as attitudes around medication may be influenced by family and/or youth attitudes.

Nagae, Nakane, Honda, Ozawa, and Hanada (2015) assessed parental adherence and the factors that impact medication adherence in children who obtain outpatient medication. They evaluated 30 pairs of mothers and children who ranged in age between 7 and 17. The investigators found when mothers acknowledged their child's symptoms had improved following psychiatric visits and when mothers recognized symptom improvement was attributed to the effects of the medication, medication adherence was impacted. However, contrary to other research, no correlation was found between medication adherence and child age.

Parental Experience With ADHD

Parents who at some point were diagnosed with ADHD and prescribed medication for treatment are influenced by their experiences with treatment. Parents' experiences with psychotropic medication are correlated with their willingness to consider psychotropic medication for their child's mental illness (Hamrin et al., 2010).

For parents who have experienced a mood disorder and who have also had good and successful experiences with psychiatric medication associate their positive experience with the acceptability of the same type of treatment for their child (Chavira, Stein, Bailey, & Stein, 2003). In a study of 156 parents who had previous experiences with psychotropic medication, most attested to strong support for short and long-term treatment with medication (Post, Leverich, Fergus, Miller, & Luckenbaugh, 2002). Hamrin et al. (2010) asserts previous parental experience with psychotropic medication allows for the opportunity to more accurately establish expectations and to measure the cost and benefits of the medication for their children. However, some researchers contend for those parents where ADHD has persisted into adulthood, the familial history of ADHD is correlated with lower medication adherence, which may be due to their inadequate management and monitoring ability related to ADHD (Gau et al.,2008).

Medication Education/Psychoeducation

The benefits and accuracy of information related to medication is essential to psychotropic medication acceptance. Berger, Dor, Nevo and Goldzweig (2008) found most parents of children with ADHD had received negative information in regards to methylphenidate, which led to adverse attitudes about the medication. However, over 90% of parents and children reported the greatest influence related to their acceptance of methylphenidate was the medication education provided by the neurologist. These findings support the theory that affirmative parental beliefs associated with prescribed medication can create a significant impact on medication taking behavior and adherence. Berger et al found that medication education was advantageous during the medication

initiation phase. However, Johnston, Hommersen, and Seipp (2008) found it did not contribute to medication persistence. Corkum et al. (1999) also supported this assertion and reported adherence to stimulant medication over one year did not experience the same impact that parental ADHD knowledge had on medication initiation.

Bussing et al. (2012) conducted a longitudinal mixed methods study that included students, parents of elementary school students, and teachers. The investigators found teacher-reported behavior ratings for both students with and without ADHD, indicated that some general negative perceptions were correlated with ADHD education. Participants also reported while education is an important initial step, it must be combined with a plan and/or strategies to be effective. A strong and supportive social network that involves the family, school, and healthcare providers responsible for the child's care are important for the achievement of medication adherence success (Dawood et al., 2010).

Patient-Centered Medical Homes

Definition and Recognition of PCMHs

The concept of PCMHs originated through the Academy of Pediatrics in 1967 and was designed to help with the care of children with special health care needs (CSHCN; Sia et al., 2004). The term medical homes are also used interchangeably with PCMHs in the literature. It is estimated that children with special health care needs account for almost 20% of the pediatric population and encompass approximately 80% of pediatric health care spending (Hamilton et al., 2013). Following the adoption of the Patient Protection and Affordable Care Act in 2010, which included the requirement to establish

PCMHs, medical homes have been widely adopted across the United States (Fields, et al., 2010). The Patient-Centered Primary Care Collaborative (PCPCC 2013) defined PCMHsas a model of primary care or health delivery that takes on a team approach with a focus on care excellence. According to PCPCC, primary care or pediatric providers can be designated as a PCMH if they meet all five components of the following criteria:

1. Patient-Centered: Patients and families are provided with support to manage and to participate in their care as informed partners.
2. Comprehensive: The health care team is fully accountable for all of the patient's physical health and mental health needs.
3. Coordinated: Health care is coordinated throughout the health system to facilitate transition between specialty providers, hospitals, home health, and community and public health.
4. Accessible: Provides 24/7 access, via electronic or phone, offers decreased wait times and extended hours, and communication facilitated through health information technology.
5. Committed to quality and safety: Quality improvement is demonstrated through information technology innovation and tools that assist families with informed decision-making.

It is hypothesized that through these components that (a) patients will not postpone or avoid needed medical attention; (b) there is less medical and procedure duplication; (c) there is better chronic disease management which leads to improved outcomes; (d) there is a reduction in chronic disease severity; and e) there are cost

savings such as fewer emergency room visits and accurate medication utilization (Patient-Centered Primary Care Collaborative, 2013). These provisions may also impact the effectiveness of PCMHs through the enablement of patient engagement and increased disease state comprehension and treatment support.

The NCQA reports as many as 10% of primary care practices in the United States are recognized as a PCMH (NCQA, 2014). The NCQA is the first organization to offer a program to recognize PCMHs. However, The Joint Commission now offers a PCMH certification. With increased support, more organizations continue to seek PCMH status. This is evidenced by (a) the Department of Defense's intention to convert all of their primary care practices to NCQA recognized PCMHS (NCQA, 2014), (b) the Department of Health and Human Services plan to help practices become PCMHs, and (c) Medicare's plan to provide reimbursement to providers who deliver chronic care through non face-to-face means.

Benefits of Patient-Centered Medical Homes

Literature around PCMHs and CSHCN indicated medical homes are beneficial to the treatment and care of this population. Researchers found 58% of the parents experienced a significant health care burden while caring for their child with special health care needs, but only 53% of CSHCN acquired care in a medical home (DuPaul, Carson, & Fu, 2013). When patients did receive care in a medical home the receipt of patient-centered care, assistance coordinating care, and assistance with referrals had the greatest impact on the reduction of time burden for caring for CSHCN (Miller, Nugent, & Russell, 2013). Parents who had a medical home experienced between a 15-22%

reduction in the amount of time spent arranging or coordinating care, and a 16-19% reduction in the odds related to the burden of providing home care for the child. However, if even one of the five components of a medical home was absent, there was a reduction in the effectiveness of the home for families of CSHCN (Miller et al. 2013). This research may have a significant impact on parents seeking medical care for their child with ADHD and how their treatment can be more effectively managed.

Boudreau et al. (2014) reported coordinated care is a vital medical home component and found children who received coordinated care, in general, had fewer unmet specialty health care needs. Additionally, children who received coordinated care within a medical home, experienced a one third decrease in unmet specialty care needs (Boudreau, et al., 2014). These results demonstrate specialty care, which encompasses mental health diagnosis and treatment related to ADHD, may be more sufficiently addressed in a medical home and lead to increased medication adherence as well as fewer unmet needs of parents and children with ADHD.

In a study of over 5,000 children, Knapp et al. (2012) examined the factors related to having a medical home and the impact of the medical home on outcomes. Knapp et al. (2012) reported those children who are socioeconomically disadvantaged and/or are ethnically diverse are less likely to utilize a PCMH and are more apt to have unmet needs. The researchers reported this was largely due to the lack of insurance, caregiver strain, and paternal survey participants more likely to report they did not have a PCMH. Miller, Nugent, Gaboda, and Russell (2013) also supported these findings and reported children without a medical home are up to three times as likely to report an unmet need.

Hamilton, Lerner, Presson, and Klitzner, (2013) suggested PCMHs create positive experiences for socioeconomically disadvantaged parents of ethnically diverse children with complex healthcare needs. This is seen more specifically in the area of care coordination. The findings of Knapp et al and Miller et al. demonstrated that unfortunately, a significant number of children in this population are not receiving these important benefits.

Family-based care and medication decision-making are key benefits of the PCMH (PCPCC, 2012). This type of care may help families to provide significant influence over adolescent medication taking behaviors and increase their teenager's investment in the treatment regimen (Hogue, Bobek, Tau, & Levin, 2014; Stille et al., 2010). Hogue et al. asserted interventions that provide a focus on family, provide an avenue for parent and family behavior monitoring and ultimately influence medication decision-making. A core feature of PCMHs is a focus on patient support and involvement in their own care. Patients are encouraged to actively participate in the development of their care plans and acknowledgement of patient culture and attitudes are woven into the treatment regimen. This patient-centered component is in line with the literature that has demonstrated increased patient adherence rates are related to patient involvement and may be a critical PCMH component that contributes to patient adherence to medication.

The improvement of health outcomes is a central goal for PCMHs (Adamson, 2011). In a survey conducted by Raphael et al. (2015) of children enrolled in Texas Children's Health Plan, which is a managed care health plan serving low-income children, parents of children with chronic conditions reported fewer emergency

department visits and hospitalizations if they had a PCMH. PCMH communication and staff education were the crucial factors reported to be associated with this reduction in resource utilization. A reduction in ED visits and hospitalizations reduce overall healthcare costs and the burden of treating chronic diseases like ADHD. Nielsen, Buelt, Patel, and Nichols (2016) reported PCMHs provide (a) care plans that are personalized to the patient, provide medication review to help patients better understand and manage medication, (b) offer advice and coaching to assist patients with health goal attainment, and (c) help patients to connect with peers and those in the community with similar health experiences; who provide patient encouragement. These benefits may improve medication adherence for children with ADHD and reduce healthcare spending and resource utilization associated with adverse ADHD behaviors (Cutler & Everett, 2010; Hamilton et al., 2013; McGrady & Hommel, 2013; Toomey et al., 2011), as PCMHs have been shown to reduce utilization of healthcare services and are associated with improved health outcomes (Toomey et al. 2011).

Medical Home Attainment

Knapp et al. (2012) also found that White children are almost twice as likely to have a PCMH as ethnically diverse children, and children who had a physical or mental diagnosis in addition to ADHD, were up to 63% more likely not to have a medical home versus children with ADHD alone. Knapp et al. (2013) agreed with these findings and found for children with multiple behavioral health diagnoses, the likelihood of having a medical home was decreased. These finding suggest PCMH attainment is significantly impacted by SES, ethnicity, physical and mental comorbidities which are common for

children with ADHD. Richmond and Berry (2012) assert a person's perceptions and experiences regarding health care are significantly influenced by culture. Therefore, the introduction of these children to the benefits of PCMHs may decrease healthcare disparities and potentially reduce suboptimal healthcare experiences.

Adams, Newacheck, Park, Brindis, and Irwin (2013) reported that over the past 12 months, more than half of adolescents had a medical home. Children who resided in homes that were non-English speaking and lower income, who were uninsured, and who were minorities, were also less likely to have a medical home. Adams et al., suggested disparities in healthcare can be decreased for youth with lower SES and/or complex medical needs through the application of PCMH components, such as care coordination and family-centered care.

While the majority of research indicates medical homes do improve health outcomes and increase the level of coordinated care for patients, there continue to be some impediments to the full implementation of the PCMH model. Richmond and Berry (2012) reported ethnic/racial disparities related to transition services persist within medical homes, between White and Non-Hispanic Black children with special health care needs. In their research, transition services referred to the five components that define the medical home. The investigators reported roughly only 57% of CSHCN received all of the services that are available through the PCMH components. This percentage is critical, as more than 11 million, or over 15% if children in the U.S. have special health care needs (U. S. Department of Health and Human Services, 2013). This represents a disappointing percentage of CSHCN are achieving full PCMH benefit. These findings

indicate there is a lot of room to improve PCMH efficacy and compliance with program equality.

The Maternal and Child Health Bureau (USDHHS; MCHB, 2013) has identified the outcomes that are essential to evaluating CSHCN needs, which enable the measurement of the national progress of the PCMH components. As of 2013, only 43% of CSHCN met the standard for receipt of coordinated and comprehensive care in a medical home. The measures indicated almost all CSHCN had a personal doctor or nurse, 75% had a place they usually go when they are sick, 65% received family-centered care, and 23% encountered problems in the attainment of referrals (USDHHS; MCHB, 2013). These less than ideal results also demonstrate a significant opportunity for improvement in medical home operations and service delivery.

The greatest predictor of these reported disparities was the availability of adequate insurance and how services are reimbursed. Because many of the benefits and services delivered in a PCMH are not always reimbursed, such as (a) referral to specialists, (b) assistance with medication management, and (c) time spent to develop patient/provider relationship (Antonelli & Antonelli, 2004; Bodenheimer, 2006; McAllister, Sherrieb, & Cooley, 2009), providers offset the lost revenue by limiting the number of non-reimbursable PCMH services they provide to CSHCN (White, 2002). This current reimbursement structure continues to support a fragmented system of healthcare delivery. However, the Centers for Medicare and Medicaid will soon offer a PCMH definition and certification to allow for incentive payments, which should encourage PCMH compliance with service delivery standards (PCPCC, 2016). This

revision in Centers for Medicaid and Medicare Services policy should help to alleviate poor practitioner reimbursement as a barrier to the full implementation of PCMH services (PCPCC, 2016).

MCHB reported insurance benefits and provider access for CSHCN was frequently reported as a barrier to the receipt of PCMH components, as opposed to actual insurance coverage. MCHB also reported CSHCN have a greater potential to have insurance than the population of children in general, with as few as 3.6% of CSHCN reporting they did not have insurance (USDHHS, 2013), and just over 9% reporting that at some point within the last 12 months, they lacked insurance. Over 33% of participants reported their insurance was not always sufficient to meet their child's needs, due to insurance benefit design, out of pocket costs, or lack of provider access, which represents the larger issue for CSHCN and PCMH service attainment. Therefore, while 90% of CSHCN have uninterrupted health insurance, only 60% met all of the standards for this core outcome.

Patient-Centered Medical Homes Measurement

Rosenthal, Abrams, and Bitton (2012) reported that while PCMHs have been recognized as a promising answer to reduce the level of fragmented care that currently exists in the healthcare system, population inconsistencies and variable focus on PCMHs based on geography make it difficult to generalize quality measures. In an effort to address this issue, a core set of cost and utilization measures were developed in 2009 by the Patient-Centered Medical Home Evaluators' Collaborative. A recommended core measurement of pediatric quality for evaluation of PCMHs includes follow-up care for

children who have been prescribed ADHD medication. This measure is designed to quantify the effectiveness of behavioral health care and to evaluate the percentage of children who have been newly prescribed ADHD medication and have had at least three follow-up visits within 10 months (Rosenthal, Abrams, & Bitton, 2012). One of the three visits must have occurred within the 30 days of when the initial ADHD medication was dispensed (Rosenthal et al., 2012). Grabowski (2012) also supports the use of medication adherence as an effective performance measure of PCMHs, as medication adherence is a significant determinant of treatment outcomes (Dean et al., 2010).

Additional issues with the accurate measurement of PCMHs include the variation in the individual components of PCMHs and the way the components may work in combination to impact PCMH effectiveness (Alexander & Bae, 2012). It is important to keep in mind that research that finds PCMHs lack effectiveness in their ability to improve outcomes may have more to do with poor execution of PCMH components and less to do with the PCMH model itself (Alexander & Bae, 2012). For example, some PCMHs may spend more time developing the patient/provider relationship, which can have an effect on patient trust in the provider, and positively influence patient adherence. However, this research will not examine component execution, but it may be an area for future research.

PCMH success and improved health outcomes are already being realized in the state of Missouri. Care Management Technologies (2016) reported Missouri is the first to take advantage of the federal incentives earmarked for states to implement medical homes. Their data analytics tool, which is in line with the information technology core component for PCMH designation, has been an integral part in helping the state Medicaid

agency, MO HealthNet, to track claims data, manage individualized care goals, identify at-risk patients, implement targeted care management interventions, and monitor patient progress with those goals. During the first year of implementation, the state saved $31 million dollars, which were largely attributed to hospitalizations, unnecessary emergency room visits, and care for enrollees with chronic mental and physical health disorders. (Care Management Technologies, 2016). The tremendous success of the medical home program in Missouri demonstrates the significant impact program implementation can have not only on state finances, but also more importantly on patient health outcomes.

Summary and Conclusions

The review of the literature revealed ADHD is a chronic mental disorder that affects a significant number of children in the United States with treatment costs in the billions (Cutler & Everett, 2010). The exact reason for ADHD development is unclear, however, there is convincing evidence that genetics play a central role in ADHD etiology (Banaschewski et al., 2010). Non-adherence to ADHD medication is reported to be as high as 87% (Ahmed & Aslani, 2013), and researchers reported some of the greatest contributors to non-adherence include parental beliefs, medication side effects, medication efficacy (Toomey et al. 2012), patient age (Avisar & Lavie-Ajayi, 2014), and SES (Brown & Bussell, 2011). Uncontrolled symptoms of ADHD (inattention, hyperactivity, anxiety, and aggression) can lead to social and academic impairment, risky behavior, and diminished quality of life (Danckaerts et al., 2010; McConaughy et al., 2011; and Robb et al., 2011). McClain and Burks (2015) reported treatment received in a family-centered care setting may increase the medication-taking behavior of youth, and

suggested that the increased engagement in treatment could impact their opinions regarding the value of treatment and increase ADHD symptom management. Litzenburg (2014) also suggested that an increase in shared decision-making between medical personnel and caregivers could result in improved ADHD medication adherence. This literature supports the use of PCMHs, which utilize a shared approach and increase patient treatment engagement.

PCMHs have demonstrated that they not only positively impact treatment and health outcomes, but they also provide significant savings related to hospitalizations and the management of chronic mental and physical illnesses (Care Management Technologies, 2016). However, the lack of consistency in PCMH definition and PCMH component implementation/emphasis, create difficulties in the accurate measurement of PCMH effectiveness and differentiation between PCMH effectiveness and poor PCMH execution. The majority of researchers indicated that PCMHs do improve patient outcomes, particularly for CSHCN, although some PCMH components can have a greater impact on certain patient outcome measures, even though all components are important.

The purpose of this quantitative research was to examine the impact of PCMHs on parental beliefs (benefits vs. risks) about ADHD medication and ADHD medication adherence. This study will address the gap in research related to the efficacy of PCMHs and their influence on parental ADHD beliefs, as parental beliefs are a strong predictor of medication adherence (Ferrin & Taylor, 2011). The results of the study will determine the role of PCMH impact on parental beliefs/attitudes around ADHD medication and increase parental adherence to ADHD medication for their children. This would increase

what is known about PCMH's and their ability to improve treatment outcomes, and thus advance the role of PCMHs as a viable option to improve medication adherence for this population. Increased medication adherence for children with ADHD may decrease academic and social impairment, healthcare utilization, substance use, and risky behaviors; all of which are detrimental to children's long-term success. Chapter 3 will include the study design and rationale, methodology (including population, sampling, instrumentation, data analysis plan), and threats to validity.

Chapter 3: Research Method

Introduction

The purpose of this study was to determine if PCMHs have an impact on parental beliefs related to ADHD medication (benefits vs. risks) and on parental ADHD medication adherence. In this chapter I detail the research design, population, sample, instrumentation, data collection, and the plan for statistical analysis.

Research Design and Rationale

The nature of this study was quantitative and utilized a self-report survey distributed via Qualtrics to determine if PCHMs influenced parental beliefs and adherence to ADHD medication. There was one subject variable, PCMH, and two dependent variables, parental beliefs about ADHD medication (benefits vs. risks) and parental ADHD medication adherence. A multivariate analysis of covariance (MANCOVA) was used to analyze the data. Potential covariates including age, ethnicity, gender, education, SES, geography, and parent's own experience with ADHD medication were included in the demographic questionnaire. A quantitative survey was the most effective method to obtain this data because it allowed me to capture data from a large representative sample of parents who have children with ADHD and also allowed the participants to remain anonymous. This design choice also allowed me to statistically test differences between groups and advance what is known about the impact of PCMHs on parental beliefs and medication adherence.

Methodology

Population

The target population was parents with children between the ages of 5 and 12 who had been diagnosed with ADHD and who had been prescribed ADHD medication for at least three months.

Sampling

A nonprobability self-selected sample of convenience was recruited through Qualtrics and was drawn from parents who resided within the United States. The inclusion criteria for survey participation included:

1. Parents must have a child diagnosed with ADHD between the ages of 5 and 12.
2. The child must have been prescribed medication for at least three months.

All who met this inclusion criterion were eligible to participate in the study. This sampling strategy was chosen because of the large number of participants needed for the survey and the limited access to this population via other means. A power analysis using G*Power 3.1 was conducted (Faul, Erdfelder, Buchner, & Lang, 2009) with a suggested total sample size of 292.

Recruitment, Participation, and Data Collection

Following approval from the Walden Institutional Review Board (IRB), the survey was made available to potential respondents in the United States with set criteria through the Qualtrics website (https://www.qualtrics.com). All participants were required to review the consent form and indicate consent to participate by clicking the

Next button. Qualtrics is only a medium for data collection, and they do not keep or utilize information collected from surveys. Survey data was collected from 299 participants within 48 hours of the launch of the survey.

There were four parts to the survey. The first part of the survey gathered the following demographic information: age, ethnicity, gender, SES, education, geographic location, and parent's own experience with taking ADHD medication (Appendix A). Participants then proceeded to the first set of survey questions (see Table 1), which were taken from the 2007 NSCH (Centers for Disease Control and Prevention/National Center for Health Statistics, 2007). These questions were designed to determine whether or not a person had a PCMH, also referred to as PCMH status, and they have been used by other investigators to determine PCMH status (Boudreau et al., 2014; Knapp et al., 2013; Toomey et al., 2011). Participant responses determined the group in which the parents were placed: PCMH or non-PCMH. The next 10 questions came from the BMQ–Specific scale and assessed parental beliefs about ADHD medication (benefits vs. risks), followed by the 8-question MMAS–8, which assessed ADHD medication adherence (Morisky et al., 2008). Once participants answered all of the questions or if they felt they did not want to complete the survey, they could exit out of the survey by closing the page. Participants' data was anonymous and they were not contacted for any reason following survey completion.

Instrumentation

Each of the survey instrument authors had been contacted and permission to utilize them in this research was obtained. The National Survey of Children's Health is

in the public domain and therefore the PCMH status questions did not require permission for use; however, I contacted the U.S. Department of Health and Human Services to advise of this proposed research.

National Survey of Children's Health (2007)

The questions in Table 1 were used to determine PCMH status (subject variable): PCMH or non-PCMH. Survey data from the 2007 NSCH was used to determine whether the parent utilized a PCMH or a non-PCMH for their child's healthcare (Toomey et al., 2007). The NSCH is an accepted method for determining PCMH status and has been used in several peer-reviewed studies. To meet the criteria for having a PCMH, participants must answer one of the following to the 12 survey questions (see Table 2): Yes, Always, Usually, Not a problem, Very Satisfied.

Beliefs About Medicines Questionnaire

This study utilized the BMQ to assess core beliefs that influence parental adherence to ADHD medication (Horne et al., 1999). The questionnaire is divided into two sections: the BMQ–Specific and the BMQ–General. The BMQ–Specific evaluates beliefs related to prescribed medication for a specific disease or illness and is made up of two scales with a total of 10 questions.

Table 1

Questions to Determine PCMH Status From the 2007 NSCH

A personal doctor or nurse
1. Do you have one or more persons you think of as your child's personal doctor or nurse?
Family-centered care
1. During the past 12 months, how often did child's doctors and other health care providers spend enough time with (him/her)?
2. During the past 12 months, how often did child's doctors and other health care providers listen carefully to you?
3. When child is seen by doctors or other health care providers, how often are they sensitive to your family's values and customs?
4. In the past 12 months, how often did child's doctors or other health care providers help you feel like a partner in (his/her) care?
5. When you (or your child) needed an interpreter, how often were you able to get someone other than a family member to help you speak with (his/her) doctors or other health care providers?
Problem free referrals*
1. Was getting referrals a big problem, a small problem, or not a problem?
A usual source of care
1. Is there a place that your child USUALLY goes when (he/she) is sick or need advice about (his/her) health?
2. Is there a place that your child USUALLY goes when (he/she) need routine preventive care, such as a physical examination or well-child check-up?
Coordinated care
1. During the past 12 months, how often did you get as much help as you wanted with arranging or coordinating your child's care?
2. Overall, are you very satisfied, somewhat satisfied, somewhat dissatisfied, or very dissatisfied with the communication among child's doctors and other health care providers?
3. Overall, are you very satisfied, somewhat satisfied, somewhat dissatisfied, or very dissatisfied with communication among providers and school, special education program or vocational education program?

*When applicable

Table 2

PCMH Criteria

Component	Responses
Personal Provider	Yes
Comprehensive Care	
• Usual Source of care	Yes
• Getting a referral is not a problem	Not a Problem
Family-Centered Care	
• Spent enough time	Usually or Always
• Listened carefully	Usually or Always
• Was sensitive to family values and customs	Usually or Always
• Provided needed information	Usually or Always
• Partnered in care	Usually or Always
• Able to get someone other than family member to help interpret (if applicable)	Usually or Always
Care Coordination	
• Get help coordinating care	Usually or Always
• Satisfied with communication between providers	Very Satisfied
• Satisfied with communication between providers, school, and other programs	Very Satisfied

The first 5 questions are related to the necessity of ADHD medication to improve health (benefits), and the second 5 questions are related to the concerns about possible ADHD medication side effects (risks). The BMQ–Specific was used in this research.

The BMQ–General focuses on a person's general beliefs about prescribed medication for treatment. Because this study is interested in understanding specific parental beliefs about ADHD medication and the benefits and risks of taking it, only the BMQ–Specific was used in this research. Additionally, the General Harm scale did not reach statistical significance when correlations between the scale and medication adherence were evaluated. Horne et al. (1999) also recommended the General Harm scale be used with caution following results that indicated poor internal consistency in the asthma, cardiac, and general medical groups.

Participants responded to the BMQ–Specific survey questions via their agreement with each question, which can range from 1 = strongly disagree to 5 = strongly agree. Scores from both the necessity and concerns group of questions were summed, with scores for each scale having a possible range between 5 and 25. Higher positive difference scores indicate that the participants perceive the medication benefits are greater than their risks and vice versa for a negative score. This calculation of benefits versus risks is known as the Necessity-Concerns differential (Horne et al., 1999).

Reliability and Validity of the Beliefs About Medicines Questionnaire

The BMQ scale development included six different illness groups: (a) asthma (n = 78), (b) diabetes (n = 99), (c) renal dialysis (n = 47), (d) cardiac (n = 120), (e) psychiatric (n = 89), and (f) general medical (n = 91). A total of 34 statements that were

representative of frequently espoused beliefs about medication were taken from 16 studies and the investigator-initiated interviews of 34 chronically ill patients. Several researchers have utilized the BMQ as an effective method for measuring beliefs about medication. Conn et al. (2005) used the BMQ to assess beliefs about medication and medication adherence in children with asthma. Brown et al. (2005) also used the BMQ to evaluate beliefs about antidepressants. Horne et al. (1999) reported the BMQ is suitable to assess beliefs in all disease states and medication types.

The four measures that were utilized in the development of the BMQ were the Illness Perception Questionnaire (IPQ; Weinman, Petrie, Moss-Morris, & Horne, 1996), the Reported Adherence to Medication Scale (Horne et al. 1999), the Sensitive SOMA Scale (Horne, Faasse, Cooper, Diefenbach, Leventhal, Leventhal, & Petrie, 2013) and single measures assessing medication-related cognitions. Horne et al. (1999) reported the psychometric properties of the IPQ were assessed in seven chronically ill groups of patients, and found the discriminant and predictive reliability, test-retest reliability, and concurrent reliability were all within acceptable limits.

The Reported Adherence to Medication Scale was developed by Horne et al. (1999) for the BMQ study to assess medication adherence. It contained four questions: two scored on a likert scale and two as direct questions. Responses were summed for each question to provide a total medication adherence score, with better medication adherence indicated by higher scores. Scores ranged from 0.6 to 0.83 for Cronbach alpha coefficients on the main sample.

The Sensitive SOMA Scale assessed participant's personal sensitivity perceptions to the possible side effects of medicine. At the time of the BMQ development, this scale was still under development; however, internal reliability using Cronbach's alpha in both groups was reported to be acceptable (general medical = 0.80 and cardiac = 0.78). Single measures assessing medication-related cognitions were used to evaluate the psychometric properties of the BMQ.

Criterion validity for the BMQ–Specific-Necessity scale was determined via correlation with the IPQ scales: Timeline and Identity and correlation with medication-related cognition statements. BMQ–Specific-Necessity scores were positively correlated with the IPQ Timeline scores (Spearman $r = 0.49$, $p < 0.001$), which evaluated the likely length of the illness, and the IPQ Identity scores (Spearman $r = 0.24$, $p < 0.05$), which evaluated the perceived severity of symptoms. A negative relationship between the medication-related cognition statement, "I can cope without my medicines" (Spearman $r = -0.44$, $p < 0.001$; Horne et al., 1999, p. 18), which assessed medication related cognitions, and the BMQ-Specific-Necessity scale also supported the criterion validity of the instrument.

Criterion validity for the BMQ–Specific-Concerns scale was determined in several ways: (a) the positive correlation between BMQ–Specific-Concerns scale scores and the following medication-related cognition statements of the asthmatic group, "I cannot always trust my medicines" (Spearman $r = 0.33$, $p < 0.005$; Horne et al., 1999, p. 18) and "I would like to change my present treatment" (Spearman $r = 0.37$, $p < 0.001$; Horne et al., 1999, p. 18); (b) the negative correlation between the BMQ–Specific-

Concerns scale and the medication-related cognition statement, "I have been given enough information about my medicines" (Spearman $r = -0.45$, $p < 0.001$; Horne et al., 1999, p. 18) (), which indicated that the person would like more information about their medication; and (c) the positive relationship between the BMQ–Specific-Concerns scale and the general medical and cardiac groups scores on the Sensitive Soma Scale (Spearman $r = 0.5$, $p < 0.001$), which indicated a person's individual sensitivity to the side effects of the medicines.

The post-hoc Tukey's HSD tests compared the BMQ mean scores across the illness groups to determine if the scale could distinguish between patient illness groups. Discriminant validity of the Specific-Necessity scale was confirmed and indicated the diabetic group had significantly greater scores than all other groups ($M = 21.26$, $p < 0.01$), and the patients in the asthmatic group ($M = 19.67$, $p < 0.01$) attained significantly greater scores than the psychiatric group ($M = 17.72$, $p < 0.01$). Significantly greater Specific-Concerns were also seen in the asthma ($M = 15.76$, $p < 0.01$) and psychiatric (M = 15.60, $p < 0.01$) groups compared to the others.

Morisky Medication Adherence Scale–8

Lastly, the MMAS–8was used to assess the parent's adherence to ADHD medication, which is a validated instrument that has been reported to be reliable for any medication and/or disease state (Horne et al., 1999). Participants answered eight questions from the MMAS–8 regarding adherence to ADHD medication (dependent variable) for their children (Krousel-Wood, Islam, Webber, Morisky, & Munter, 2009; Morisky et al., 2008; Morisky, & DiMatteo, 2011).

Morisky Medication Adherence Scale–8 Reliability and Validity

Internal consistency, as measured by Cronbach's alpha, was 0.83, and was significantly correlated with the validated MMAS–4 ($r = 0.64$, $p < .05$). Morisky et al. (2008) reported predictive validity of the MMAS–8 was evaluated via correlations with patient control of their blood pressure, stress, social support, knowledge, and satisfaction with their visits to the clinic. Morisky et al. reported those with high scores of 8 were more apt to have controlled blood pressure versus those who had medium or low scores. Thus, a significant correlation between the MMAS–8 and blood pressure was found ($\chi^2 = 6.6$, $p < .05$). They also found that patient knowledge, stress level, coping, satisfaction, knowledge, and medication complexity were significant related to medication adherence. High medication adherence was significantly more likely to occur when patients expressed greater medical regimen knowledge, satisfaction with their medical care, experienced positive social support from family members, and had more robust coping behavior. It is important to note that validation of instruments that capture parent's reported medication adherence for his/her child is difficult, largely due to social desirability and parent concern for potential legal consequences.

Morisky Medication Adherence Scale–8 Scoring

Eight questions are included in the MMAS–8. Questions 1-7 are scored as yes or no. Question 8 uses a likert scale ranging from "Never" to "All of the time". A total score of 8 indicates high parental adherence to ADHD medication, a total score of 6 or 7, indicates medium adherence to ADHD medication, and a total score of 5 or less indicates low adherence to ADHD medication. The actual scores were used in this study.

Data Analysis Plan

This quantitative study evaluated the impact of PCMHs on parental beliefs about ADHD medication and their ADHD medication adherence. The data was analyzed using the SPSS 24.0 software package. MANCOVA was utilized to determine if there were differences in parental beliefs about ADHD medication (benefits vs. risks) and ADHD medication adherence (dependent variables) between the PCMH (subject variable) and non-PCMH groups. Data was reviewed for missing values and outliers. If outliers are detected, they were removed prior to running the MANCOVA. However, the survey was be set up to require each question to be answered in order to proceed to the next question. This reduced the potential of skipping any questions. Only completed surveys submitted through Qualtrics were included in the analysis. The following statistical assumptions were analyzed and reported for MANCOVA: Multivariate normality, linearity, homogeneity of variances. The type of test was an F test (One-way MANOVA) and a between groups subject variable. There was one subject variable, PCMHs, with two levels, yes or no. There were two dependent variables: 1) parent's beliefs about ADHD medications, and 2) adherence to ADHD medication. The results were interpreted using an effect size of .15, alpha of .05, and power set at .95.

Research Questions

RQ1: Is there a difference between parental beliefs about ADHD medications (benefits vs. risks), as measured by the BMQ - Specific scale between PCMH and non-PCMH groups?

$H_0$1: There is no significant difference in parental beliefs about ADHD medication (benefits vs. risks) between PCMH and non-PCMH groups.

H_a1: There is a significant difference in parental beliefs about ADHD medication (benefits vs. risks) between PCMH and non-PCMH groups.

RQ2: Is there a difference between parental adherence to ADHD medication, as measured by the MMAS–8 between PCMH and non-PCMH groups?

$H_0$2: There is no significant difference in parental adherence to ADHD medication between PCMH and non-PCMH groups.

H_a2: There is a significant difference in parental adherence to ADHD medication between PCMH and non-PCMH groups.

Threats to Validity

The survey was distributed through Qualtrics, and thus, there is no way to ensure equal participant representation (e.g. ethnicity, age) from across the country. There was also the possibility that the two groups (PCMH and non-PCMH) were not be equally represented, or have the same number of participants in each group. Both of these situations pose a threat to external validity, thus limiting generalization of the results.

Self-report also inherently has some weaknesses. Voils, Hoyle, Thorpe, Maciejewski, and Yancy (2011) posited instruments that utilize self-report could demonstrate inadequate reliability. They report these measures are typically 10-20% below the rates acquired through other methods. Memory recall and the tendency to overestimate adherence are disadvantages of self-report (Voils et al., 2011).

Social desirability response bias can also be an issue with self-report and instrument validity. Van de Mortel (2008) reported some researchers have utilized a social desirability scale to determine and/or to control for this bias in their research. The researchers reported that for those who did choose to use a scale, almost 50% of them reported social desirability did impact study responses. Therefore, these threats were considered in the data analysis process.

To minimize self-report bias, a statement was written at the beginning of the MMAS–8 and the BMQ–Specific that encourages participants to be as honest as possible and references that others have made similar statements. Therefore, participants may have been more likely to report a true answer. Equal participant representation cannot be controlled, as participants were a convenience sample distributed via Qualtrics, however the data was collected anonymously and therefore minimized self-report bias. Threats to construct validity were minimized through the use of validated instruments (BMQ–Specific and MMAS–8), which provided appropriate and consistent variable operationalization, question wording and strong instrument design. Statistical conclusion validity was minimized through the analysis and report of the following statistical assumptions for MANOVA: multivariate normality, linearity, and homogeneity of variances. High statistical power, which was set at .95 also reduced the likelihood of committing a type I or type II conclusion error.

Ethical Procedures

Following approval of the Walden Institutional Review Board, the survey was available through Qualtrics. All participants consented to participation via the electronic

consent form by ticking the "Next" box, and were advised that survey participation was completely voluntary and anonymous. Participants could withdraw from participation in the study at anytime without penalty. The electronic survey data was stored securely on a password protected an encrypted computer and kept for five years. No participant names or contact information was be collected, only a participant identifier for data management purposes. Only this researcher and statistician had access to survey data. Participants were only excluded for the following reasons: a) if the parent does not have a child within the specified age range, b) the participant's child has not been diagnosed with ADHD, or c) the participant's child has not been prescribed ADHD medication within the last 3 months. Incomplete surveys were not be included in data analysis, as all questions had to be answered in order for participants to reach the end of the survey.

Summary

Chapter 3 reviewed the research methods, including the utilization of a quantitative survey design and the use of Qualtrics to distribute the survey. The sampling strategy included 294 parents of children with ADHD between the ages of 5 and 12, who have been prescribed medication for at least three months. The survey included a questionnaire to determine PCMH status, the MMAS–8 questionnaire to assess parental ADHD medication adherence, and the BMQ-8 to assess parental ADHD medication beliefs. Completion of a participant consent form was required to participate in the study. The data analysis plan utilized a MANCOVA to compare the differences between the PCMH and non-PCMH groups. Chapter 4 details the data collection procedure, the

statistical procedures used to analyze the results and to answer the research questions and hypotheses.

Chapter 4: Results

The purpose of this study was to determine if PCMHs have an impact on parental beliefs about ADHD medication (benefits vs. risks) and parental ADHD medication adherence. Survey data were gathered from 294 parents of children diagnosed with ADHD. Demographic data and data from the BMQ–Specific, and the MMAS–8 were collected from parents of children with ADHD. PCMH questions from the 2007 NSCH were utilized to determine group assignment. In this chapter I review the data collection, analytic procedures, and statistical results. The following research questions and hypotheses were examined:

RQ1: Is there a difference in parental beliefs about ADHD medications (benefits vs. risks), as measured by the BMQ - Specific scale between PCMHs and non-PCMH groups?

$H_0$1: There is no significant difference in parental beliefs about ADHD medication (benefits vs. risks) between PCMH and non-PCMH groups.

H_a1: There is a significant difference in parental beliefs about ADHD medication (benefits vs. risks) between PCMH and non-PCMH groups.

RQ2: Is there a difference in parental adherence to ADHD medication, as measured by the MMAS−8, between PCMHs and non- PCMH groups?

$H_0$2: There is no significant difference in parental adherence to ADHD medication between PCMH and non-PCMH groups.

H_a2: There is a significant difference in parental adherence to ADHD medication between PCMH and non-PCMH groups.

Data Collection

The original survey host, SurveyMonkey, confirmed on August 4, 2016 that they would be able to recruit and distribute the survey to the targeted population for this research via their proprietary database to target participants. However, on April 24, 2017, the week prior to the survey launch, SurveyMonkey advised that they no longer had access to my targeted population and could not distribute my survey. Thus, the new survey vendor, Qualtrics, was selected and hosted the survey through an anonymous survey link on the Qualtrics website (https://www.qualtrics.com). Parents were invited to participate in the survey via Qualtrics on May 10, 2017. I received 299 responses by May 11, 2017, following participant consent. The approved Walden University IRB study number was 05-05-17-0475291.

Description of the Sample

Table 3 displays the frequency counts for the demographic variables in the study. Most of the parents were White (73.8%) and female (71.1%). Morgan, Staff, Hillemeier, Farkas, and Maczuga (2013) reported minority children between kindergarten and eighth grade were 69% less likely to have an ADHD diagnosis than White children. Walsh et al. (2013) and You, Nam, and Son (2015) also reported up to 88.8% of the time, mothers were responsible for giving medication at home. These studies support the demographic breakdown of this study, which is proportional for the population of interest. Incomes ranged from under $25,000 to over $100,000 with a median of $62,500. Most had attended some college (34.4%) or had earned a bachelor's degree or higher (41.2%). Eighty-seven parents had taken medication for ADHD themselves (29.6%). The sample

was nationally diverse with at least one survey from 43 different states. The most well represented states were California (11.9%), Florida (9.5%), New York (7.5%) and Texas (6.8%). The PCMH criteria met ranged from 1 – 12 (M = 8.26, SD = 2.89). Twenty-seven parents, which represented approximately 10% of the sample, met the PCMH criteria based on their responses to the 2007 NSCH.

Table 3

Demographic Frequency Counts

Variable	Category	*n*	%
Race			
	White or Caucasian	217	73.8
	Black or African American	36	12.2
	Native American or Alaska Native	6	2.0
	Asian	4	1.4
	Hispanic or Latin American	27	9.2
	Other race not described here	4	1.4
Gender			
	Male	85	28.9
	Female	209	71.1
Income			
	$0 - $25,000	49	16.7
	$25,001 - $50,000	97	33.0
	$50,001 - $75,000	71	24.1
	$75,001 - $100,000	45	15.3
	More than $100,000	32	10.9
Education			
	Did not complete high school	6	2.0
	GED or high school diploma	66	22.4
	Some college	101	34.4
	Bachelors degree or higher	121	41.2
Personally taken medication for ADHD			
	Yes	87	29.6
	No	207	70.4
State			
	California	35	11.9
	Florida	28	9.5
	New York	22	7.5
	Texas	20	6.8
	All others combined	189	64.3

Note. $N = 294$.

Based on the MMAS–8 guidelines (Morisky et al., 2008), most parents scored at a low level of adherence to ADHD medication (43.2%), 28.6% scored at a medium level of adherence, and 28.2% scored at a high level of adherence. Children were diagnosed with ADHD at a mean age of 6.27 years (*SD* = 1.91), and at the time of the survey had an average age of 9.04 years (*SD* = 2.04). They received their first ADHD prescription at an average age of 6.64 years (*SD* = 1.92; Table 4).

Table 4

Descriptive Statistics for Selected Child Demographics

Score	*M*	*SD*	Low	High
Age child diagnosed with ADHD	6.27	1.91	3.00	12.00
Age of child	9.04	2.04	5.00	12.00
Age of first ADHD prescription	6.64	1.92	3.00	12.00

Note. $N = 294$

Table 5 provides the psychometric characteristics for the summated scale scores from the PCMH, benefits, risks, differential, and adherence scales. The Cronbach alpha coefficients ranged from $\alpha = .79$ to $\alpha = .80$. This suggested that all scales had adequate levels of internal reliability (Cronbach, 1951).

Table 5

Psychometric Characteristics for Summated Scale Scores

Scale	*M*	*SD*	*Low*	*High*	*Cronbach's alpha*
Benefits	17.68	3.82	8.00	25.00	.80
Risks	16.84	4.06	7.00	25.00	.79
Differential[a]	0.84	4.94	-14.00	15.00	n/a
Adherence	5.86	2.15	0.50	8.00	.80

Note. $N = 294$. [a] Differential = Benefits scale – Risks Scale

Statistical Assumptions

Initially, 299 people completed the survey. Boxplots identified five univariate outliers in the benefits scale, and these were removed from the sample (Appendix D). No outliers were detected in the risks scale. Once the outliers were removed, the differential score was calculated. This left a final sample of 294, which exceeded the recommended sample of 292 participants. The following statistical assumptions were analyzed and reported for MANCOVA: multivariate normality, linearity, and homogeneity of variances. Skewness and kurtosis were also evaluated (Table 6), and the assumption of multivariate normality was met. The assumption of linearity was examined using scatterplots, and this assumption was met (Appendix E). For the MANCOVA model, Levene's test for homogeneity of variances found all scales to have equal variances across groups (benefits [$p = .861$], risks [$p = .301$], differential [$p = .031$], adherence [$p = .971$]), and thus, this assumption was also met.

Hypothesis Testing

A MANCOVA was conducted to determine if there were significant differences between PCMH and non-PCMH groups (independent variable) and parental beliefs about

ADHD medication (dependent variables: benefits, risks, differential) and adherence to ADHD medication (dependent variable). An adjustment was made for the following four covariates: parent's race, parent's gender, parent's income, and parent personally having taken ADHD medication (Table 6). Following the adjustment, the multivariate analysis of Pillai's trace = .032 was significant, F (3, 280) = 3.05, p = .029, partial η^2 = .032.

A step down analysis was completed and a significant difference was found between the PCMH and non-PCMH groups on the differential scale (F [1, 282] = 7.68, p = .006, η^2= .03) when controlling for parental race, gender, income, and personally having taken ADHD medication. The differential scale is a measure of parental beliefs about the benefits versus risks of ADHD medication. The mean differential score for the PCMH group was M = 3.59 and M = 0.56 for the non-PCMH. Both differential scores were positive, but it was significantly higher for the PCMH group. This indicated there was a significant difference between groups and demonstrated that PCMH parents scored higher in their beliefs that the benefits outweighed the risks of ADHD medication. Therefore, the null hypothesis for the first research question was rejected.

However, there was no statistically significant difference between the PCMH and non-PCMH groups for the risks scale (F [1, 282] = 2.74, p = .10, η^2 = .01) or the benefits scale (F [1, 282] = 3.55, p = .06, η^2 = .01) when controlling for the covariates. The adherence scale (F [1, 282] = 3.05, p = .08, η^2= .01) was not statistically significant and indicated there was no difference between groups in parental adherence to ADHD medication and the null hypothesis for the second research question was not rejected (Table 7).

Table 6

Covariates for MANCOVA

Covariate	Scale	*F*	*p*	η^2
Parent's Race	Risk	8.24	.004	.03
	Differential	5.67	.02	.02
Parent's Gender	Benefits	9.18	.003	.03
Income	Benefits	7.49	.007	.03
	Adherence	6.77	.01	.02
Parent Personally Taken ADHD Medication	Adherence	16.51	.001	.06

Table 7

Step-Down Analysis for Dependent Variables

Scale	Met PCMH Criteria	*n*	*M*	*SD*	*F*	*p*	η^2
Benefits scale					3.55		.01
	No	267	17.51	3.81			
	Yes	27	19.33	3.56			
Risk scale					2.74		.01
	No	267	16.96	4.00			
	Yes	27	15.74	4.65			
Differential scale					7.68	.006	.03
	No	267	0.56	4.80			
	Yes	27	3.59	5.48			
Adherence scale							
	No	267	5.79	2.13	3.05		.01
	Yes	27	6.53	2.28			

Summary

This study surveyed 294 parents of children diagnosed with ADHD to determine the impact of PCMHs on (a) parental beliefs about ADHD medication, and (b) parental adherence to ADHD medication. The results demonstrated that there was a significant difference between the PCMH and non-PCMH groups for the differential scale, which assessed parental beliefs about the benefits versus risks of ADHD medication when controlling for parent's race, gender, income, and personally having taken ADHD medication. The PCMH group scored higher in their beliefs that the benefits outweighed the risks for ADHD medication. However, no statistically significant results were found for the benefits or risks scales. No statistically significant results were found for the adherence scale when controlling for the covariates, which indicated there were no differences in parental adherence to ADHD medication between the groups. Additionally, parents in the PCMH group had higher incomes and more had personally taken ADHD mediation compared to the non-PCMH group. In the final chapter, I compare these findings to the literature draw conclusions and implications, and offer a series of recommendations.

Chapter 5: Discussion, Recommendations, and Conclusion

The purpose of this quantitative study was to determine if PCMH's have a significant impact on parental beliefs about ADHD medication and parental ADHD medication adherence. ADHD costs billions of dollars for the healthcare and educational systems and previous attempts to reduce these costs and increase ADHD medication adherence have not been successful. A MANCOVA was used to analyze the data, with one variable being PCMH (Yes, No) and two dependent variables, beliefs (benefits, risks, differential) and adherence. Parent's race, parent's gender, parent's income, and whether the parent had personally taken ADHD medication were the four covariates included in the MANCOVA.

The results demonstrated that the PCMH group scored higher in their beliefs that the benefits outweigh the risks of ADHD medication. However, there were no significant differences between the PCMH and non-PCMH groups on the individual beliefs scales (benefits/risks) and the adherence scale. It is important to note that even though the individual risk scale was not significant, the PCMH components are not designed to minimize the risks of medication. The PCMH components are designed to help parents better understand ADHD medication for their children, in spite of the associated medication risks.

Interpretation of the Findings

Parental Beliefs, Medication Adherence, and Patient-Centered Medical Home Use

This study did not support the literature that indicates positive parental beliefs are associated with increased medication adherence. Hébert et al. (2013) and Charach and

Fernandez (2013) found that positive parental beliefs about medication were associated with the acceptance of pharmacologic treatment options for their children. Ferrin and Taylor (2011) and Pillow et al. (2014) reported parental beliefs and attitudes around medication were correlated with parent's willingness to adhere to medication treatment for their children. In addition, Toomey et al. (2012) found that parents who believed that ADHD medication had bad side effects, who were concerned about the long-term effects of ADHD medication, and who preferred counseling over medication were more likely to discontinue medication use. Because PCMHs are designed to improve health outcomes (Adamson, 2011), increase family-based care, enhance medication decision-making (PCPCC, 2012), and reduce unmet needs through the coordination of care (Boudreau et al., 2014), it was hypothesized that this study would demonstrate higher parental adherence to ADHD medication in the PCMH group. However, no significant differences in adherence were found between the PCMH and non-PCMH groups even though the PCMH group had higher benefits versus risks belief scores on the differential scale. These higher belief scores may be attributed to specific PCMH attributes such as more time provided for medication education and medical provider relationship development. The results may also be due to the PCMH model in general which emphasizes the treatment of the patient as a whole, and takes into account culture, social determinants, and the coordination of both behavioral and physical health needs (De Vries et al., 2012). However, additional research is required to better determine how the PCMHs impact the parent's beliefs.

Strecher et al. (1986) reported that self-efficacy is associated with a person's beliefs in their ability to accomplish particular behaviors. This assertion may have played a role in why the higher belief scores in the PCMH group did not translate into significantly higher adherence scores in the PCMH group. Barriers not addressed in this study such as transportation (Brown & Bussell, 2011), medication costs (Billimek & August, 2014), and medication side effects (Singh et al., 2010; Toomey et al., 2012) have been reported to impact medication adherence and are associated with parental self-efficacy. Self-efficacy was not evaluated in this study and further research would be required to determine what barriers interfere with the conversion of positive parental beliefs about ADHD medication into increased ADHD medication adherence in the PCMH group.

Medication Adherence and Persistence

Some of the most noteworthy information gleaned from this data is the length of medication adherence, which was over two years. The average age that children received their first prescription in this research was 6.64 years old, and the average age of children at the time of the study was 9.04 years old. This is contradictory to the literature, which reports high ADHD medication discontinuation rates within the first 30 to 60 days of medication initiation. Toomey et al. (2012) reported 42% of children discontinued medication within 30 days and only 4% continued taking their medication after 6 months. Raman et al. (2015) reported only 35% of children persisted with medication, even with a 30-day grace period. Avisar and Lavie-Ajayi (2014) found out of a sample of 14, only five persisted with their medication, and in a study of over 60,000 children, adolescents,

and adults by Pottegård et al. (2015), fewer than 13% received a second medication refill. Thus, it is hypothesized that parent report of medication adherence and persistence may have been inflated as a result of response bias from the desire to provide a socially desirable answer. The relatively high education level of the sample could also explain the inflated adherence rates of both groups. Education level is associated with SES and has been linked to adherence rates (Noble et al., 2015). Although the percentage of parents with a Bachelor's degree or higher in the PCMH group (55.6%) was larger than that of the non-PCMH group (39.3%), these percentages represented the majority of parents in each group, and thus may explain the unusually high medication adherence rate in the study overall. A less educated sample may have yielded different results.

Previous Parental Experience with Attention-Deficit/Hyperactivity Disorder Medication

Hamrin et al. (2010) and Post et al. (2002) reported that parents who had personally taken ADHD medication are influenced by their experience with treatment, and this is associated with their acceptance of medication for their children. Hamrin et al. reported this acceptability of ADHD medication can be attributed to the parent's ability to set expectations for their children's medication use. In this study, parents in the PCMH group scored higher in their beliefs that the benefits outweighed the risks of ADHD medication, and 22.2% of them had also personally taken ADHD medication. However, 30.1% of parents in the non-PCMH group had personally taken ADHD medication, which does not support the literature that states parents' previous experience

with psychotropic medication may positively impact their beliefs about ADHD medication.

Income, Race, and Gender

SES and race are reported to be contributors to medication beliefs, adherence (August & Billimek, 2015; Brown & Bussell, 2011; Bussing et al., 2003), and PCMH attainment (Adams et al., 2013; Knapp et al., 2012; Knapp et al., 2013). Bussing et al. reported that White parents with higher SES had greater access to larger networks and healthcare providers from whom to seek advice. According to Brown and Bussell, those with low SES have decreased access to healthcare. Adams et al. (2013) reported children with lower income and who were minorities were less likely to have a PCMH. Knapp et al., (2012) found that White children were almost twice as likely to have a PCMH than ethnically diverse children. Parents in this study were mostly White in both the PCMH and non-PCMH groups, although 59.2% of the parents in the PCMH group had incomes ranging from $50,001 to over $100,000 and 50.7% of the parents had incomes ranging between $0 and $50,000. The fact that parents in the PCMH group were both White and had more reported incomes in the higher range is in line with the literature that indicates PCMH status is associated with SES and ethnicity.

In this study, race was a significant covariate for the differential and risks scales. The data showed that Whites had a higher differential scale score than non-Whites and non-Whites had a higher risk score. This demonstrated that there were racial differences related to parental beliefs about ADHD medication and showed non-White parents rated their beliefs about the risks of ADHD medication higher than. Morgan et

al. (2013) found that Whites were more likely to take ADHD medication than non-Whites and may account for why Whites in this study scored higher in their beliefs about the benefits of ADHD medication.

Income was a significant covariate for the benefits and adherence scales. Parents who reported their income to be between $75,001 and $100,000 had a higher benefits scale score, and parents who reported their income to be between $25,001 and $50,000 had a higher adherence scale score. This is counterintuitive because the literature suggests more positive beliefs related to the benefits of medication are correlated with greater adherence to medication. It is possible that there were other barriers to adherence for parents in the higher income group that were not examined in this study.

Gender was a significant covariate for the benefits scale. The benefits scale score was higher for male parents than for female parents, although male parents represented fewer than 29% of the total sample. This research did not examine gender-related differences in beliefs about ADHD medication, and it is not clear why male parents had higher benefits-related beliefs. However, further exploration of parental gender differences in beliefs about ADHD medication may be an opportunity for future research.

Theoretical Framework

The study results did not support the theoretical framework. The TPB asserts that a person's beliefs and attitudes impact their behavioral intention, and behavioral intention influences the targeted behavior. In this study, the targeted behavior was parental adherence to ADHD medication. Although a significant difference in parental beliefs about ADHD medication was found in the PCMH group, there was no significant

difference in parental adherence to ADHD medication between groups. Therefore, positive parental beliefs and attitudes about ADHD medication did not translate into the performance of the intended behavior, which was adherence to prescribed ADHD medication. This lack of support of the TPB may be the result of the barriers reported above such as poor self-efficacy, low SES, and medication side effects, although the exact reasons are not clear from this research. It is also possible that beliefs must meet a certain threshold before they are able to change a person's behavior, which is not a part of the TPB and would require further study.

The UTB (Jaccard, Dodge, & Dittus, 2002) may be an alternate theory to explain why the first hypothesis regarding parental beliefs about ADHD medication was supported and the second hypothesis regarding parental adherence was not. This theory has been applied to previous research related to medication nonadherence and posits that although a person's intentions are influenced to perform a particular behavior, other factors and barriers can impact the actual occurrence of that behavior. Further research would be required to determine parental reasons for nonadherence in this population.

Limitations

Medication Adherence Rates and Survey Methodology

A factor that may have played a role in the unusually high parental adherence to ADHD medication in the study is the use of a survey to determine patient adherence. As reported in the literature, surveys have inherent flaws, such as self-report bias and social desirability bias (Voils et al., 2011). In addition, adherence is a difficult behavior to accurately measure, as people often do not want to report they do not follow medical

advice. While there is no gold standard for measuring medication adherence, a more effective method is through the analysis of pharmacy claims data, which reports prescription refill rates. This method was utilized by Pottegård et al. (2015) who found that fewer than 13% of prescriptions were refilled a second time. The use of pharmacy claims data may have yielded lower parental adherence/persistence rates overall in this study and revealed differences between the two groups due to more accurate measurement. Future research should be done with pharmacy claims data to accurately measure medication adherence.

Patient-Centered Medical Home Group Assignment

For parents to be considered to have a PCMH, their responses to all 12 of PCMH-related survey questions had to match those on Table 3. If even one of the responses did not meet the criteria, the parent could not be included in the PCMH group. We know from the literature that PCMH component execution is inconsistent (Alexander & Bae, 2012; Richmond & Berry, 2012) and is dependent on factors such as insurance reimbursement for components like assistance with referrals and coordination with other service providers, and office staff to deliver the component services. Several researchers contend that as a result of poor provider reimbursement for several of the PCMH components; such as referral to a specialist, and assistance with medication management (Antonelli & Antonelli, 2004; Bodenheimer, 2006; Mcallister,et al., 2009), some providers limit the number of non-reimbursable services they provide (White, 2002) thus the true measurement of PCMH status is difficult when using the 2007 NSCH.

Miller et al. (2015) reported that having all five PCMH components present is critical to the effectiveness of PCMHs, and if just one of the five components is missing, there is a reduction in the effectiveness of the PCMH for children with special health care needs. Richmond and Berry (2012) asserted approximately only 57% of children with special health care needs received all of the services associated with the five components of PCMHs, which indicates a significant number of these children do not fully realize the PCMH benefit. The USDHHS; MCHB (2013) also reported only 43% of children with a PCMH achieved the full complement of services associated with coordinated and comprehensive care. The reasons attributed to these disparities in service delivery were largely attributed to insurance reimbursement for the PCMH components (USDHHS; MCHB, 2013) as well as poor execution of the components (Alexander & Bae, 2012).

In this study, approximately 68% of parents reported they received assistance with coordinating care, just over 61% reported their healthcare provider spent enough time with them, close to 57% indicated they were able to get a non-family member interpret for them, around 52% reported they were satisfied with communication between providers, and getting a referral was not a problem, and less than 47% of parents reported they were satisfied with communication between providers, school, and other programs. Thus, it may be more realistic to consider a change in some of the PCMH criteria response requirements to also accept "usually" along with "always" to better reflect the real-world experiences of patients with a PCMH when utilizing the survey for research group assignment. In the meantime, Medicaid and other healthcare insurers have moved closer to providing reimbursement for PCMH components (Arend, Tsang, Quinn, Levine

& Thomas, 2012), including the time spent to provide assistance with referrals and coordination with other providers, both of which demonstrated low frequency in participant reported PCMH criteria in this study.

Disparate Group Sizes

The small number of participants in the PCMH group (n = 27); approximately 9% of the total sample, may have had an impact on the study outcomes and impact external validity. The NCQA (2014) reported approximately 10% of primary care practices are PCMHs and close to 10% of parents surveyed in this study met the PCMH criteria to be included in the PCMH group. Statistical power may also be impacted by the small number of participants in the PCMH group and decrease the strength of the results.

Race and Gender

In this study, almost 74% of the parents were White and over 71% of them were female. This demographic make up can impact the ability to translate the results to the general population. However, research has shown that the majority of children who are diagnosed with ADHD between the ages of 5 and 12 are White (Morgan et al., 2013), and You et al. (2015) reported that most often mothers are responsible for dispensing medication at home. Non-White parents and males are underrepresented in this study and limits the generalizability of the results. It is important to conduct further research that includes a more diverse sample to better understand how PCMHs impact beliefs and adherence to ADHD medication in all races and genders.

Recommendations

The first recommendation is the need for a more accurate tool to measure PCMH status or to adjust the current PCMH criteria to include "usually" along with "always" as an acceptable response to some of the PCMH criteria (Table 3). This change may more accurately reflect shortcomings in current PCMH performance, such as staff shortages to assist with referrals or interpretation services for each patient visit. These shortages are not necessarily due to PCMH status but can be the result of limited insurance reimbursement of these services. Further research that relies on confirmed PCMH status, via accrediting bodies like NCQA and healthcare data, instead of participant responses to the 2007 NSCH PCMH criteria, may elicit different and/or more accurate participant group assignment and lead to a more accurate assessment of PCMHs. This method would provide two groups that are more accurately assigned, provide more accurate ADHD adherence data, and produce a much larger PCMH group to support more power and external validity.

Research should also evaluate which PCMH components have the greatest impact on medication adherence and ways to improve their consistency and execution, and could prove to bridge the gap between parental beliefs about the benefits of ADHD medication and enhanced targeted behavior execution (adherence). In this research, 9 of the 12 PCMH criteria questions had a frequency count of less than 75%, which indicated that parents did not report they received these services all of the time. It may be possible that an increased report of these services would contribute to a gain in parental adherence to ADHD medication and is an opportunity for future research.

Almost 30% of parents in this study reported they had personally taken ADHD medication. Although this research did not assess if a parent was currently taking medication for ADHD, Chronis-Tuscano, Wang, Woods, Strickland, and Stein (2017) reported ADHD symptom severity in the parent primarily involved in childcare could impact the treatment outcomes of the child. Therefore, it might be important to conduct this research with more fathers to assess if there are differences in their beliefs and adherence to ADHD medication.

Implications

This study has positive social change implications as it increases what is known about PCMHs and how they impact health outcomes. This research revealed that PCMHs impacted parental beliefs about ADHD medication and found that parents in the PCMH group scored higher in their beliefs that the benefits outweighed the risks of ADHD medication. This knowledge may be valuable to healthcare professionals as they attempt to positively change the health behavior of parents with children with ADHD. Practitioners can now concentrate on the identification and elimination of barriers that may interrupt the translation of positive beliefs and attitudes about ADHD medication into adherence to ADHD medication.

This research also exposed some of the shortcomings in the use of the 2007 NSCH PCMH criteria, which has been used in previous literature (Boudreau et al., 2014; Knapp et al., 2013; Toomey et al., 2011) to determine PCMH status. In research where the NSCH is utilized, consideration should be given to PCMH criteria changes that allow for fluctuations in PCMH component consistency, and/or execution, which currently may

not be a reflection of PCMH provider status. Lack of provider reimbursement for PCMH services was identified in the literature (PCPCC, 2016) as a reason for suboptimal PCMH component delivery. This study supports previous literature in the need for reimbursement of all PCMH services, which is required to realize the full health benefits of PCMHs (Miller et al., 2015), and may encourage the transformation of healthcare delivery as mandated by the Patient Protection and Affordable Care Act.

There are theoretical implications for this study, as this research increases what is known about the theory of planned behavior (Ajzen, 1991) and challenges how beliefs influence behavior. The theory asserts that a person's intention to perform a particular behavior is the result of the motivational influences on that behavior. It further contends the stronger one's intention to participate in a behavior, the greater the likelihood that the behavior will occur. Therefore, when a person has more positive beliefs, the greater his/her intention to perform the targeted behavior. This research demonstrated that parents in the PCMH group scored higher in their beliefs about ADHD medication but these higher beliefs did not lead to the intended behavior of ADHD medication adherence. Although significant differences were found in beliefs between groups, it is possible that there is a belief baseline that must be achieved before behavior is changed. The theory does not take into account the existence of barriers that may preclude the execution of the desired behavior, such as financial, access to care, and in particular for this study, medication side effects and efficacy; which are the two most common reasons for ADHD medication discontinuance (Toomey et al., 2012).

Changes to healthcare reimbursement via the Centers for Medicare and Medicaid and commercial insurers may not only open the door for more widespread delivery of these services, but it may also provide the opportunity for healthcare providers to offer more patient-centered and comprehensive care that can benefit the patient, the provider, and the payor. These benefits include decreased hospitalizations, increased academic performance, improved peer relationships, and better patient treatment adherence.

Opportunities also exist for further research to examine if PCMHs positively impact health beliefs in other disease states and patient populations based on the favorable results found in this study. As healthcare moves from a traditional fee for service structure to a value-based system of care, providers are required to measure and report patient outcomes to obtain reimbursement (Porter, Larsson, & Lee, 2016). Keeping patients healthy is tantamount to successful provider practices and learning how PCMHs can help achieve this is essential.

Conclusion

This research found that PCMHs positively influenced parental beliefs about ADHD medication, although it did not find that PCMHs significantly improved parental adherence to ADHD medication. Further research is needed to determine how PCMHs can have a positive impact on parental beliefs about ADHD medication and result in improved parental adherence to ADHD medication. According to the theory of planned behavior (Ajzen, 1991), changing health beliefs is the first step to changing health behavior. Although it may be important to understand to what degree beliefs must be

changed to result in behavior change, and/or how patient barriers to behavior change can be addressed to support positive behavior execution.

The Patient Protection and Affordable Care Act includes the transformation of practitioner practices into PCMHs and the identification of several PCMH components with suboptimal frequency provides a great opportunity for accrediting bodies and policy makers on which to focus their attention. This targeted approach may change how healthcare is delivered to this population and may assist PCMHs to improve health outcomes for children with ADHD.

Methods to increase ADHD medication adherence continue to elude practitioners. However, additional research that includes a more diverse sample, with certified PCMH practices, that also measure PCMH component execution, might demonstrate that PCMHs do increase ADHD medication adherence. Better adherence could decrease the detrimental factors associated with ADHD, such as poor academic achievement, poor quality of life, poor family and peer relationships, and increased emergency room visits.

References

Adams, S. H., Newacheck, P. W., Park, M. J., Brindis, C. D., & Irwin, C. E. (2013). Medical home for adolescents: Low attainment rates for those with mental health problems and other vulnerable groups. *Academic Pediatrics, 13*(2), 113-121. doi:10.1016/j.acap.2012.11.004

Adamson, M. (2011). The patient-centered medical home: An essential destination on the road to reform. *American Health & Drug Benefits, 4*(2), 122-124.

Adler, L. D., & Nierenberg, A. A. (2010). Review of medication adherence in children and adults with ADHD. *Postgraduate Medicine*, *122*(1), 184-191. doi:10.3810/pgm.2010.01.2112

Advokat, C. (2009). What exactly are the benefits of stimulants for ADHD? *Journal of Attention Disorders*, *12*(6), 495-498.

Ahmed, R., & Aslani, P. (2013). Attention-deficit/hyperactivity disorder: An update on medication adherence and persistence in children, adolescents and adults. *Pharmacoeconomic Outcomes Research, 13*(6), 791-815. doi:10.1586/14737167.2013.841544

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179-211. doi:10.1016/0749-5978(91)90020-t

Alexander, J. A., & Bae, D. (2012). Does the patient-centred medical home work? A critical synthesis of research on patient-centred medical homes and patient-related outcomes. *Health Services Management Research, 25*(2), 51-59. doi:10.1258/hsmr.2012.012001

American Academy of Pediatrics. (2011). ADHD: Clinical practice guideline for the diagnosis, evaluation, and treatment of attention-deficit/ hyperactivity disorder in children and adolescents. *Pediatrics, 128*(5), 1007-1022. doi:10.1542/peds.2011-2654

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: Author.

An, J. (2016). The impact of patient-centered medical homes on quality of care and medication adherence in patients with diabetes mellitus. *Journal of Managed Care & Specialty Pharmacy*, *22*(11), 1272-1284. doi:10.18553/jmcp.2016.22.11.1272

Antonelli, R. C., & Antonelli, D. M. (2004). Providing a medical home: The cost of care coordination services in a community-based, general pediatric practice. *Pediatrics, 113*(Supplement 4), 1522-1528.

Antshel, K. M., Faraone, S. V., & Gordon, M. (2014). Cognitive behavioral treatment in adolescent ADHD, *Journal of Attention Disorders, 18*(6), 483-495. doi:10.1177/1087054712443155

Arend, J., Tsang-Quinn, J., Levine, C., & Thomas, D. (2012). The Patient-Centered Medical Home: History, Components, and Review of the Evidence. *Mount Sinai Journal of Medicine: A Journal of Translational and Personalized Medicine, 79*(4), 433-450.

August, K. J., & Billimek, J. (2015). A theoretical model of how neighborhood factors contribute to medication nonadherence among disadvantaged chronically ill adults. *Journal of Health Psychology*, 1-11. doi:10.1177/1359105315589391

Avisar, A., & Lavie-Ajayi, M. (2014). The burden of treatment: Listening to stories of adolescents with ADHD about stimulant medication use. *Ethical Human Psychology and Psychiatry, 16*(1), 37-50. doi:10.1891/1559-4343.16.1.37

Baer, R. A., & Nietzel, M. T. (1991). Cognitive and behavioral treatment of impulsivity in children: A meta-analytic review of the outcome literature. *Journal of Clinical Child Psychology*, *20*(4). 400-412. doi:10.1207/s15374424jccp2004_9

Bai, G. N., Wang, Y. F., Yang, L., & Niu, W. Y. (2015). Effectiveness of a focused, brief psychoeducation program for parents of ADHD children: Improvement of medication adherence and symptoms. *Neuropsychiatric Disease and Treatment, 2015*(11), 2721-2735. doi:10.2147/NDT.S88625

Banaschewski, T., Becker, K., Scherag, S., Franke, B., & Coghill, D. (2010). Molecular genetics of attention-deficit/hyperactivity disorder: An overview. *European Child & Adolescent Psychiatry, 19*(3), 237-257. doi:10.1007/s00787-010-0090-z

Barbaresi, W. J., Colligan, R. C., Weaver, A. L., Voigt, R. G., Killian, J. M., & Katusic, S. K. (2013). Mortality, ADHD, and psychosocial adversity in adults with childhood ADHD: A prospective study. *Pediatrics, 131*(4), 637-644. doi:10.1542/peds.2012-2354

Barkley, R. A., Fischer, M., Smallish, L., & Fletcher, K. (2006). Young adult outcome of hyperactive children: Adaptive functioning in major life activities. *2006 Journal*

of the American Academy of Child & Adolescent Psychiatry, 45(2), 192-202.doi:10.1097/01.chi.0000189134.97436.e2

Barner, J. C., Khoza, S., & Oladapo, A. (2011). ADHD medication use, adherence, persistence and cost among Texas Medicaid children. *Current Medical Research and Opinion, 27*(sup2), 13-22. doi:10.1185/03007995.2011.603303

Bauermeister, J. J., Barkley, R. A., Bauermeister, J. A., Martínez, J. V., & McBurnett, K. (2012). Validity of the sluggish cognitive tempo, inattention, and hyperactivity symptom dimensions: Neuropsychological and psychosocial correlates. *Journal of Abnormal Child Psychology, 40,683 –697*. doi:10.1007/s10802-011-9602-7

Bedard, A. C., Jain, U., Johnson, S. H., & Tannock, R. (2007). Effects of methylphenidate on working memory components: Influence of measurement. *Journal of Child Psychology and Psychiatry*, *48*(9), 872-880. doi:10.1111/j.1469-7610.2007.01760.x

Berger, I., Dor, T., Nevo, Y., & Goldzweig, G. (2008). Attitudes toward attention-deficit hyperactivity disorder (ADHD) treatment: Parents' and children's perspectives. *Journal of Child Neurology, 23*(9), 1036-1042. doi:10.1177/0883073808317726

Biddle, L., Donovan, J., Sharp, D., & Gunnell, D. (2007). Explaining non-help-seeking amongst young adults with mental distress: A dynamic interpretive model of illness behaviour. *Sociology of Health & Illness, 29*(7), 983-1002. doi:10.1111/j.1467-9566.2007.01030.x

Billimek, J., & August, K. J. (2014). Costs and beliefs: Understanding individual-and neighborhood-level correlates of medication nonadherence among Mexican

Americans with type 2 diabetes. *Health Psychology, 33*(12), 1602. doi:10.1037/hea0000020

Bodenheimer, T. (2006). Primary care—will it survive? *New England Journal of Medicine*, *355*(9), 861-864.doi:10.1056/NEJMp068155

Boudreau, A. A., Goodman, E., Kurowski, D., Perrin, J. M., Cooley, W. C., & Kuhlthau, K. (2014). Care coordination and unmet specialty care among children with special health care needs. *Pediatrics, 133*, 1046-1053. doi:10.1542/peds.2013-2174

Braun, J. M., Kahn, R. S., Froehlich, T., Auinger, P., & Lanphear, B. P. (2006). Exposures to environmental toxicants and attention deficit hyperactivity disorder in US children. *Environmental Health Perspectives*, 1904-1909. doi:10.1289/ehp.9478

Brinkman, W. B., Sherman, S. N., Zmitrovich, A. R., Visscher, M. O., Crosby, L. E., Phelan, K. J., & Donovan, E. F. (2012). In their own words: adolescent views on ADHD and their evolving role managing medication. *Academic Pediatrics, 12*(1), 53-61. doi:10.1016/j.acap.2011.10.003

Brook, D. W., Brook, J. S., Zhang, C., & Koppel, J. (2010). Association between attention-deficit/hyperactivity disorder in adolescence and substance use disorders in adulthood. *Archives of Pediatrics & Adolescent Medicine*, *164*(10), 930-934. doi:10.1001/archpediatrics.2010.180

Brown, C., Battista, D. R., Bruehlman, R., Sereika, S. S., Thase, M. E., & Dunbar-Jacob, J. (2005). Beliefs about antidepressant medications in primary care patients:

Relationship to self-reported adherence. *Medical Care, 43*(12), 1203-1207. doi:10.1097/01.mlr.0000185733.30697.f6

Brown, M. T., & Bussell, J. K. (2011). Medication adherence: Who cares? *Mayo Clinic Proceedings, 86(*4), 304-314. doi:10.4065/mcp.2010.0575

Burt, K. B., Obradović, J., Long, J. D., & Masten, A. S. (2008). The interplay of social competence and psychopathology over 20 years: Testing transactional and cascade models. *Child Development*, *79*(2), 359-374. doi:10.1111/j.1467-8624.2007.01130.x

Bushe, C. J., & Savill, N. C. (2014). Systematic review of atomoxetine data in childhood and adolescent attention-deficit hyperactivity disorder 2009–2011: Focus on clinical efficacy and safety. *Journal of Psychopharmacology, 28*(3), 204 – 211. doi:10.1177/0269881113478475

Bussing, R., Koro-Ljungberg, M., Noguchi, K., Mason, D., Mayerson, G., & Garvan, C. W. (2012). Willingness to use ADHD treatments: A mixed methods study of perceptions by adolescents, parents, health professionals and teachers. *Social Science & Medicine, 74*(1), 92-100. doi:10.1016/j.socscimed.2011.10.009

Bussing, R., Zima, B. T., Gary, F. A., Mason, D. M., Leon, C. E., Sinha, K., & Garvan, C. W. (2003). Social networks, caregiver strain, and utilization of mental health services among elementary school students at high risk for ADHD. *Journal of the American Academy of Child & Adolescent Psychiatry, 42*(7), 842-850. doi:10.1097/01.CHI.0000046876.27264.BF

Care Management Technologies (2016). *Determining the return-on investment for consumer care management in health homes* [White paper]. Retrieved from http://www.openminds.com

Caye, A., Swanson, J., Thapar, A., Sibley, M., Arseneault, L., Hechtman, L., . . . Rohde, L. A. (2016). Life span studies of ADHD—conceptual challenges and predictors of persistence and outcome. *Current Psychiatry Reports*, *18*(111), 1-11. doi:10.10007/s11920-016-0750-x

Centers for Disease Control and Prevention. (2013, March 27). *CDC - medication adherence- cdc's primary care and public health initiative*. Retrieved from http://www.cdc.gov/primarycare/materials/medication/docs/medication-adherence-01ccd.pdf

Centers for Disease Control and Prevention. (2013, November 13). *Attention-deficit / hyperactivity disorder (ADHD*). Retrieved from www.CDC.gov

Centers for Disease Control and Prevention. (2016, April 16). *National Center for Health Statistics, Attention Deficit Hyperactivity Disorder*. Retrieved August 6, 1016 from http://www.cdc.gov/nchs/fastats/adhd.htm

Centers for Disease Control and Prevention/National Center for Health Statistics. (2007). *National Survey of Children's Health*. Hyattsville: Centers for Disease Control and Prevention.

Chacko, A., H Newcorn, J., Feirsen, N., & Z Uderman, J. (2010). Improving medication adherence in chronic pediatric health conditions: A focus on ADHD in youth.

Current Pharmaceutical Design, 16(22), 2416-2423. doi:10.2174/138161210791959908

Chambers, J.G., J. Shkolnik, and M. Perez. (2003). *Total Expenditures For Students With Disabilities, 1999-2000: Spending Variation By Disability*. SEEP: Special Education Expenditure Project by Center for Special Education Finance.

Charach, A., Dashti, B., Carson, P., Booker, L., Lim, C. G., Lillie, E., . . . Schachar, R. (2011*). Attention deficit hyperactivity disorder: Effectiveness of treatment in at-risk preschoolers; long-term effectiveness in all ages; and variability in prevalence, diagnosis, and treatment* (Report No. 12-EHCoo3-EF). Rockville, MD: Agency for Healthcare Research and Quality.

Charach, A., & Fernandez, R. (2013). Enhancing ADHD medication adherence: Challenges and opportunities. *Current Psychiatry Reports, 15*(7), 1-8. doi:10.1007/s11920-013-0371-6

Charach, A., Volpe, T., Boydell, K. M., & Gearing, R. E. (2008). A theoretical approach to medication adherence for children and youth with psychiatric disorders. *Harvard Review of Psychiatry, 16*(2), 126-135. doi:10.1080/10673220802069715

Chavira, D., Stein, M., Bailey, K., & Stein, M. (2003). Parental opinions regarding treatment for social anxiety disorder in youth. *Journal of Developmental and Behavioral, 24*(5), 315–322. doi:10.1097/00004703-200310000-00002

Children and Adults with Attention Deficit/Hyperactivity Disorder (2016). *Cost of ADHD*. Retrieved May 20, 2016, from http://www.chadd.org/Understanding-ADHD/About-ADHD/Data-and-Statistics/Cost-of-ADHD.aspx

Christensen, L., Sasané, R., Hodgkins, P., Harley, C., & Tetali, S. (2010). Pharmacological treatment patterns among patients with attention-deficit/hyperactivity disorder: Retrospective claims-based analysis of a managed care population. *Current Medical Research and Opinion, 26*(4), 977-989. doi:10.1185/03007991003673617

Chronis-Tuscano, A., Wang, C. H., Woods, K. E., Strickland, J., & Stein. (2017). *Journal of Abnormal Psychology*, *45*, 501-517. doi:10.1007/s10802-016-0238-5

Conn, K. M., Halterman, J. S., Fisher, S. G., Yoos, H. L., Chin, N. P., & Szilagyi, P. G. (2005). Parental beliefs about medications and medication adherence among urban children with asthma. *Ambulatory Pediatrics, 5*(5), 306-310. doi:10.1367/A05-004R1.1

Conner, D. (2005). Stimulants. In R Barkley. (Ed.), *Attention-deficit hyperactivity disorder: A handbook for diagnosis and treatment* (3rd ed.; pp. 608–647). New York, NY: The Guilford Press.

Cooper, W. O., Habel, L. A., Sox, C. M., Chan, K. A., Arbogast, P. G., Cheetham, T. C., . . . Fireman, B. H. (2011). ADHD drugs and serious cardiovascular events in children and young adults. *New England Journal of Medicine, 365*(20), 1896-1904. doi:10.1056/NEJMoa1110212

Corkum, P., Bessey, M., McGonnell, M., & Dorbeck, A. (2015). Barriers to evidence-based treatment for children with attention-deficit/hyperactivity disorder. *ADHD Attention Deficit and Hyperactivity Disorders*, *7*(1), 49-74. doi:10.1007/s12402-014-0152-z

Corkum, P., Rimer, P., & Schachar, R. (1999). Parental knowledge of attention-deficit hyperactivity disorder and opinions of treatment options: Impact on enrolment and adherence to a 12-month treatment trial. *Canadian Journal of Psychiatry, 44*(10), 1043-1048.

Croghan, T. W., & Brown, J. D. (2010). *Integrating mental health treatment into the patient centered medical home*. Rockville, MD: Agency for Healthcare Research and Quality.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 16, 297-334.*

Cutler, D. M., & Everett, W. (2010). Thinking outside the pillbox—Medication adherence as a priority for health care reform. *New England Journal of Medicine, 362*(17), 1553-1555. doi:10.1056/NEJMp1002305

Danckaerts, M., Sonuga-Barke, E. J., Banaschewski, T., Buitelaar, J., Döpfner, M., Hollis, C., . . . Taylor, E. (2010). The quality of life of children with attention deficit/hyperactivity disorder: A systematic review. *European Child & Adolescent Psychiatry*, *19*(2), 83-105. doi:10.1007/s00787-009-0046-3

Dawood, O. T., Izham, M., Ibrahim, M., & Palaian, S. (2010). Medication compliance among children. *World Journal of Pediatrics, 6*(3), 200-202. doi:10.1007/s12519-010-0218-8

Dean, A. J., Walters, J., & Hall, A. (2010). A systematic review of interventions to enhance medication adherence in children and adolescents with chronic illness. *Archives of Disease in Childhood, 95*(9), 717-723. doi:10.1136/adc.2009.175125

del Campo, N., Chamberlain, S. R., Sahakian, B. J., & Robbins, T. W. (2011). The roles of dopamine and noradrenaline in the pathophysiology and treatment of attention-deficit/hyperactivity disorder. *Biological Psychiatry, 69*(12), e145-e157. doi:10.1016/j.biopsych.2011.02.036

Demonceau, J., Ruppar, T., Kristanto, P., Hughes, D. A., Fargher, E., Kardas, P., . . . Vrijens, B. (2013). Identification and assessment of adherence-enhancing interventions in studies assessing medication adherence through electronically compiled drug dosing histories: A systematic literature review and meta-analysis. *Drugs, 73*(6), 545-562. doi:10.1007/s40265-013-0041-3

DeVries, A., Chia-Hsuan, W., Sridhar, G., Hummel, J., Breidbart, S., Barron, J. (2012) Impact of medical homes on quality healthcare utilization and costs. *The American Journal of Managed Care. 18*(9), 534-544. Retrieved from http://www.ajmc.com/publications/issue/2012/2012-9-vol18-n9/Impact-of-Medical-Homes-on-Quality-Healthcare-Utilization-and-Costs#sthash.vuXFYJRA.dpuf

Dickstein, S. G., Bannon, K., Xavier Castellanos, F., & Milham, M. P. (2006). The neural correlates of attention deficit hyperactivity disorder: An ALE meta-analysis. *Journal of Child Psychology and Psychiatry, 47*(10), 1051-1062.doi:10.1111/j.1469-7610.2006.01671.x

Domino, M. E., Wells, R., & Morrissey, J. P. (2015). Serving persons with severe mental illness in primary care–based medical homes. *Psychiatric Services*, *66*(5), 477-483.

Doshi, J. A., Hodgkins, P., Kahle, J., Sikirica, V., Cangelosi, M. J., Setyawan, J., . . . Neumann, P. J. (2012). Economic impact of childhood and adult attention-deficit/hyperactivity disorder in the United States. Journal of the American *Academy of Child & Adolescent Psychiatry, 51*(10), 990-1002. doi:10.1016/j.jaac.2012.07.008

DuPaul, G., Carson, K. M., & Fu, Q. (2013). Medical home care for children with special needs: Access to services and family burden. *Children's Health Care, 42*(1), 27-44. doi:10.1080/02739615.2013.753813

Emerson, R. M. (1976). Social exchange theory. *Annual Review of Sociology, 2*, 335-362. doi:10.1146/annurev.so.02.080176.002003

Express Scripts. (2014). *Turning attention to ADHD*. Retrieved from http://lab.express-scripts.com/lab/insights/industry-updates/report-turning-attention-to-adhd

Faraone, S. V., & Mick, E. (2010). Molecular genetics of attention deficit hyperactivity disorder. *Psychiatric Clinics of North America, 33*(1), 159-180. doi:10.1016/j.psc.2009.12.004

Faul, F., Erdfelder, E., Buchner, A., & Lang, A. G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analysis. *Behavior Research Methods, 41*, 1149-116. doi:10.3758/BRM.41.4.1149

Feldman, H. M, & Reiff, M. I. (2014). Attention Deficit-Hyperactivity Disorder in children and adolescents. *New England Journal of Medicine, 370*(9), 838-846. doi:10.1056/NEJMcp1307215

Ferrin, M., Ruiz-Veguilla, M., Blanc-Betes, M., El Abd, S., Lax-Pericall, T., Sinclair, M., & Taylor, E. (2012). Evaluation of attitudes towards treatment in adolescents with attention deficit hyperactivity disorder (ADHD). *European Child & Adolescent Psychiatry, 21*(7), 387-401. doi:10.1007/s00787-012-0277-6

Ferrin, M., & Taylor, E. (2011). Child and caregiver issues in the treatment of attention deficit-hyperactivity disorder: Education, adherence and treatment choice. *Future Neurology, 6*(3), 399-413. doi:10.2217/fnl.11.5

Fields, D., Leshen, E., & Patel, K. (2010). Analysis & commentary driving quality gains and cost savings through adoption of medical homes. *Health Affairs, 29*(5), 819-826. doi:10.1377/hlthaff.2010.0009

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behavior: An introduction to theory and research*. Reading, MA: Addison-Wesley

Flory, K., Molina, B. S., Pelham, Jr, W. E., Gnagy, E., & Smith, B. (2006). Childhood ADHD predicts risky sexual behavior in young adulthood. *Journal of Clinical Child and Adolescent Psychology*, *35*(4), 571-577. doi:10.1207/s15374424jccp3504_8

Froehlich, T. E., Anixt, J. S., Loe, I. M., Chirdkiatgumchai, V., Kuan, L., & Gilman, R. C. (2011). Update on environmental risk factors for attention-deficit/hyperactivity disorder. *Current Psychiatry Reports, 13*(5), 333-344. doi:10.1007/s11920-011-0221-3

Garbe, E., Mikolajczyk, R. T., Banaschewski, T., Petermann, U., Petermann, F., Kraut, A. A., & Langner, I. (2012). Drug treatment patterns of attention-

deficit/hyperactivity disorder in children and adolescents in Germany: Results from a large population-based cohort study. *Journal of Child and Adolescent Psychopharmacology, 22*(6), 452-458. doi:10.1089/cap.2012.0022

Gau, S. S. F., Chen, S. J., Chou, W. J., Cheng, H., Tang, C. S., Chang, H. L., ... & Chou, M. C. (2008). National survey of adherence, efficacy, and side effects of methylphenidate in children with attention-deficit/hyperactivity disorder in Taiwan. *Journal of Clinical Psychiatry, 69*(1), 1-478. doi:10.4088/JCP.v69n0118

Grabowski, D. C., Lakdawalla, D. N., Goldman, D. P., Eber, M., Liu, L. Z., Abdelgwad, T., Kuznik, A., . . . Philipson, T. (2012). The large social value resulting from us of statins warrants steps to improve adherence and broaden treatment, *Health Affairs, 31*(10), 2276 – 2283. doi:10.1377/hlthaff.2011.1120

Guilamo-Ramos, V., Jaccard, J., Dittus, P., Gonzalez, B., & Bouris, A. (2008). A conceptual framework for the analysis of risk and problem behaviors: The case of adolescent sexual behavior. *Social Work Research, 32*(1), 29-45. doi:10.1093/swr/32.1.29

Hamilton, L. J., Lerner, C. F., Presson, A. P., & Klitzner, T. S. (2013). Effects of a medical home program for children with special health care needs on parental perceptions of care in an ethnically diverse patient population. *Maternal and Child Health Journal, 17*(3), 463-469. doi:10.1007/s10995-012-1018-7

Hamrin, V., McCarthy, E. M., & Tyson, V. (2010). Pediatric psychotropic medication initiation and adherence: A literature review based on social exchange theory.

Journal of Child and Adolescent Psychiatric Nursing, 23(3), 151-172. doi:10.1111/j.1744-6171.2010.00237.x

Hébert, J., Polotskaia, A., Joober, R., Grizenko, N. (2013). Adherence to psychostimulant medication in children with attention-deficit/hyperactivity disorder: The role of attitudes. *Journal of the Canadian Academy of Child & Adolescent Psychiatry, 22*(4), 317-323.

Hochbaum, G., Rosenstock, I., & Kegels, S. (1952). *Health belief model*. United States Public Health Service.

Hogue, A., Bobek, M., Tau, G. Z., & Levin, F. R. (2014). Clinical strategies for integrating medication interventions into behavioral treatment for adolescent ADHD: The medication integration protocol. *Child & family behavior therapy, 36*(4), 280-304. doi:10.1080/07317107.2014.967631

Homer, C. J., Klatka, K., Romm, D., Kuhlthau, K., Bloom, S., Newacheck, P., . . . Perrin, J. M. (2008). A review of the evidence for the medical home for children with special health care needs. *Pediatrics, 122*(4), e922-e937. doi:10.1542/peds.2007-3762

Horne, R. (2000). Assessing perceptions of medication: psychological perspectives. Handbook of drug research methodology, 299-319. Newcastle upon Tyne: United Kingdom: Drug Utilisation Research Group..

Horne, R., Faasse, K., Cooper, V., Diefenbach, M. A., Leventhal, H., Leventhal, E., & Petrie, K. J. (2013). The perceived sensitivity to medicines (PSM) scale: An

evaluation of validity and reliability. *British Journal of Health Psychology. 18*(1), 18-30. Doi:10.1111/j.2044-8287.2012.02071.x

Horne, R., Weinman, J., & Hankins, M. (1999). The beliefs about medicines questionnaire: The development and evaluation of a new method for assessing the cognitive representation of medication. *Psychology and Health, 14*(1), 1-24. doi:10.1080/08870449908407311

Hoza, B., Murray-Close, D., Arnold, L. E., Hinshaw, S. P., & Hechtman, L. (2010). Time-dependent changes in positively biased self-perceptions of children with attention-deficit/hyperactivity disorder: A developmental psychopathology perspective. *Development and Psychopathology*, *22*(02), 375-390. doi:10.1017/S095457941000012X

Jaccard, J., Dodge, T., & Dittus, P. (2002). Parent-adolescent communication about sex and birth control: A conceptual framework. *New Directions for Child and Adolescent Development, 2002*(97), 9-42. doi:10.1002/cd.48

Johnston, C., Hommersen, P., & Seipp, C. (2008). Acceptability of behavioral and pharmacological treatments for attention-deficit/hyperactivity disorder: Relations to child and parent characteristics. *Behavior Therapy, 39*(1), 22-32. doi:10.1016/j.beth.2007.04.002

Johnston, C., Seipp, C., Hommersen, P., Hoza, B., & Fine, S. (2005). Treatment choices and experiences in attention deficit and hyperactivity disorder: Relations to parents' beliefs and attributions. *Child: Care, Health and Development, 31*(6), 669-677. doi:10.1111/j.1365-2214.2005.00555.x

Kessler, R. C., Adler, L., Barkley, R., Biederman, J., Conners, C. K., Demler, O., ... & Spencer, T. (2006). The prevalence and correlates of adult ADHD in the United States: Results from the national comorbidity survey replication. *American Journal of Psychiatry, 163*(4), 716-723. doi:10.1176/ajp.2006.163.4.716

Klassen, A. F., Miller, A., & Fine, S. (2004). Health-related quality of life in children and adolescents who have a diagnosis of attention-deficit/hyperactivity disorder. *Pediatrics*, *114*(5), e541-e547. doi:10.1542/peds.2004-0844

Klein, R. G., Mannuzza, S., Olazagasti, M. A. R., Roizen, E., Hutchison, J. A., Lashua, E. C., & Castellanos, F. X. (2012). Clinical and functional outcome of childhood attention-deficit/hyperactivity disorder 33 years later. *Archives of General Psychiatry*, *69*(12), 1295-1303. doi:10.1001/archgenpsychiatry.2012.271

Knapp, C. A., Hinojosa, M., Baron-Lee, J., Fernandez-Baca, D., Hinojosa, R., & Thompson, L. (2012). Factors associated with a medical home among children with attention-deficit hyperactivity disorder. *Maternal and Child Health Journal, 16*(9), 1771-1778. doi:10.10007/s10995-011-0922-

Knapp, C., Woodworth, L., Fernandez-Baca, D., Baron-Lee, J., Thompson, L., & Hinojosa, M. (2013). Factors associated with a patient-centered medical home among children with behavioral health conditions. *Maternal and Child Health Journal*, *17*(9), 1658-1664. doi:10.1007/s10995-012-1179-4

Krousel-Wood, M., Islam, T., Webber, L., Re, R., Morisky, D., & Muntner, P. (2009). New medication adherence scale versus pharmacy fill rates in seniors with hypertension. *American Journal of Managed Care, 15*(1), 59-66.

Laba, T. L., Lehnbom, E., Brien, J. A., & Jan, S. (2015). Understanding if, how and why non-adherent decisions are made in an Australian community sample: A key to sustaining medication adherence in chronic disease? *Research in Social and Administrative Pharmacy, 11*(2), 154-162. doi:10.1016/j.sapharm.2014.06.006

Lahey, B. B., & Willcutt, E. G. (2010). Predictive validity of a continuous alternative to nominal subtypes of attention-deficit/hyperactivity disorder for DSM-V.*Journal of Clinical Child and Adolescent Psychology*, 39(6), 761–775. doi:10.1080/15374416.2010.517173.

Larsson, H., Lichtenstein, P., & Larsson, J. O. (2006). Genetic contributions to the development of ADHD subtypes from childhood to adolescence. *Journal of the American Academy of Child & Adolescent Psychiatry, 45*(8), 973-981. doi:10.1097/01.chi.0000222787.57100.d8

Lehmann, A., Aslani, P., Ahmed, R., Celio, J., Gauchet, A., Bedouch, P., . . . Schneider, M. P. (2014). Assessing medication adherence: Options to consider. *International Journal of Clinical Pharmacy*, *36*(1), 55-69. doi:10.1007/s11096-013-9865-x

Lewis, L. M., Askie, P., Randleman, S., & Shelton-Dunstan, B. (2010). Medication adherence beliefs of community-dwelling hypertensive African Americans. *Journal of Cardiovascular Nursing, 25*(3), 199-206. doi:10.1097/JCN.0b013e3181c7ccde

Litzenburg, C. C. (2014). Adhering to medication for attention-deficit disorder in children. (Doctoral dissertation). Retrieved from

https://kuscholarworks.ku.edu/bitstream/handle/1808/18663/Litzenburg_ku_0099D_13796_DATA_1.pdf?sequence=1

Ludwig, J., Sanbonmatsu, L., Gennetian, L., Adam, E., Duncan, G. J., Katz, L. F., . . . McDade, T. W. (2011). Neighborhoods, obesity, and diabetes—a randomized social experiment. *New England Journal of Medicine, 365*(16), 1509-1519. doi:10.1056/NEJMsa1103216

Luga, A. O., & McGuire, M. J. (2014). Adherence and health care costs. *Risk Management and Healthcare Policy*, *7*, 35-44. doi:10.2147/rmhp.s19801

Malaysia, P. (2010, August 15). Medication compliance among children. [Editorial]. *World Journal of Pediatrics, 6*(3), 200 – 202.

Marshall, S. A., Evans, S. W., Eiraldi, R. B., Becker, S. P., & Power, T. J. (2014). Social and academic impairment in youth with ADHD, predominately inattentive type and sluggish cognitive tempo. *Journal of Abnormal Child Psychology*, *42*(1), 77-90. doi:10.1007/s10802-013-9758-4

Massetti, G. M., Lahey, B. B., Pelham, W. E., Loney, J., Ehrhardt, A., Lee, S. S., & Kipp, H. (2008). Academic achievement over 8 years among children who met modified criteria for attention-deficit/hyperactivity disorder at 4–6 years of age. *Journal of Abnormal Child Psychology*, *36*(3), 399-410. doi:10.1007/s10802-007-9186-4

McAllister, J. W., Sherrieb, K., & Cooley, W. C. (2009). Improvement in the family-centered medical home enhances outcomes for children and youth with special healthcare needs. *Journal of Ambulatory Care Management, 32*(3), 188-196.

McClain, E. K., & Burks, E. J. (2015). Managing attention-deficit/hyperactivity disorder in children and adolescents. *Primary Care: Clinics in Office Practice*, *42*(1), 99-112. doi:10.1016/j.pop.2014.09.014

McConaughy, S. H., Volpe, R. J., Antshel, K. M., Gordon, M., & Eiraldi, R. B. (2011). Academic and social impairments of elementary school children with attention deficit hyperactivity disorder. *School Psychology Review*, *40*(2), 200.

McGrady, M. E., & Hommel, K. A. (2013). Medication adherence and health care utilization in pediatric chronic illness: A systematic review. *Pediatrics, 132*(4), 730-740. doi:10.1542/peds.2013-1451

Merrill, R., Lyon, J., Baker, R., & Gren, L. (2009). Attention deficit hyperactivity disorder and increased risk of injury. *Advances in medical sciences, 54*(1), 20. doi:10.2478/v10039-009-0022-7

Miller, J. E., Nugent, C. N., Gaboda, D., & Russell, L. B. (2013). Reasons for unmet need for child and family health services among children with special health care needs with and without medical homes. *Plos ONE, 8*(12), 1-10. doi:10.1371/journal.pone.0082570

Moffitt, T. E., Caspi, A., Harrington, H., & Milne, B. J. (2002). Males on the life-course-persistent and adolescence-limited antisocial pathways: Follow-up at age 26 years. *Development and Psychopathology*, *14*(01), 179-207. Retrieved from www.researchgate.net

Molina, B. S., Hinshaw, S. P., Swanson, J. M., Arnold, L. E., Vitiello, B., Jensen, P. S., ... & Elliott, G. R. (2009). The MTA at 8 years: Prospective follow-up of children

treated for combined-type ADHD in a multisite study. *Journal of the American Academy of Child & Adolescent Psychiatry*, *48*(5), 484-500. doi:10.1097/CHI.0b013e31819c23d0

Morgan, P. L., Staff, J., Hillemeier, M. M., Farkas, G., & Maczuga, S. (2013). Racial and ethnic disparities in ADHD diagnosis from kindergarten to eighth grade. *Pediatrics*, *132*(1), 85–93. doi.org/10.1542/peds.2012-2390

Morisky, D. E., Ang, A., Krousel-Wood, M. and Ward, H. J. (2008), Predictive validity of a medication adherence measure in an outpatient setting. *The Journal of Clinical Hypertension, 10*, 348–354. doi:10.1111/j.1751-7176.2008.07572.x

Morisky, D. E., & DiMatteo, M. R. (2011). Improving the measurement of self-reported medication nonadherence: response to authors. *Journal of Clinical Epidemiology, 64*(3), 255. doi:10.1016/j.jclinepi.2010.09.002

Moses, T. (2011). Adolescents' commitment to continuing psychotropic medication: A preliminary investigation of considerations, contradictions, and correlates. *Child Psychiatry & Human Development, 42*(1), 93-117. doi:10.1007/s10578-010-0209-y

Mrug, S., Hoza, B., & Gerdes, A. C. (2001). Children with attention

defecit/hyperactivity disorder: Peer relationships and peer oriented interventions. *New Directions for Child and Adolescent Development*, *2001*(91), 51-78.

Murray-Close, D., Hoza, B., Hinshaw, S. P., Arnold, L. E., Swanson, J., Jensen, P. S., . . . Wells, K. (2010). Developmental processes in peer problems of children with

attention-deficit/hyperactivity disorder in the multimodal treatment study of children with ADHD: Developmental cascades and vicious cycles. *Development and Psychopathology*, *22*(04), 785-802.

Murray, D. W., Arnold, L. E., Swanson, J., Wells, K., Burns, K., Jensen, P., . . . Strauss, T. (2008). A clinical review of outcomes of the multimodal treatment study of children with attention-deficit/hyperactivity disorder (MTA). *Current Psychiatry Reports, 10*(5), 424-431. doi:10.1007/s11920-008-0068-4

Nagae, M., Nakane, H., Honda, S., Ozawa, H., & Hanada, H. (2015). Factors Affecting Medication Adherence in Children Receiving Outpatient Pharmacotherapy and Parental Adherence. *Journal Of Child & Adolescent Psychiatric Nursing, 28*(2), 109-117. doi:10.1111/jcap.12113

National Committee for Quality Assurance. (2014, February). Retrieved from http://www.ncqa.org

Newcorn, J. H., Spencer, T. J., Biederman, J., Milton, D. R., & Michelson, D. (2005). Atomoxetine treatment in children and adolescents with attention-deficit/hyperactivity disorder and comorbid oppositional defiant disorder. *Journal of the American Academy of Child & Adolescent Psychiatry*, *44*(3), 240-248.

Nielsen, M., Buelt, L., Patel, K., & Nichols, L. M. (2016). The patient-centered medical home's impact on cost and quality: Annual review of evidence 2014 – 2015. Washington, DC: The Patient-Centered Primary Care Collaborative. Retrieved from www.pcpcc.org

Nijmeijer, J. S., Minderaa, R. B., Buitelaar, J. K., Mulligan, A., Hartman, C. A., & Hoekstra, P. J. (2008). Attention-deficit/hyperactivity disorder and social dysfunctioning. *Clinical Psychology Review*, *28*(4), 692-708. doi:10.1016/j.cpr.2007.10.003

Noble, K. G., Houston, S. M., Brito, N. H., Bartsch, H., Kan, E., Kuperman, J. M., . . . Sowel, E. R.. (2015). Family income, parental education and brain structure in children and adolescents. *Nature Neuroscience*, *18*(5), 773–778. doi:10.1038/nn.3983

Odgers, C. L., Caspi, A., Broadbent, J. M., Dickson, N., Hancox, R. J., Harrington, H., . . . Moffitt, T. E. (2007). Prediction of differential adult health burden by conduct problem subtypes in males. *Archives of General Psychiatry*, *64*(4), 476-484. Retrieved from jamanetwork.com

Olin, S. S., Hoagwood, K. E., Rodriguez, J., Ramos, B., Burton, G., Penn, M., . . . Jensen, P. S. (2010). The application of behavior change theory to family-based services: Improving parent empowerment in children's mental health. *Journal of Child and Family Studies, 19*(4), 462-470. doi:10.1007/s10826-009-9317-3

Orji, R., Vassileva, J., & Mandryk, R. (2012). Towards an effective health interventions design: An extension of the health belief model. *Online Journal of Public Health Informatics, 4*(3). doi:10.5210/ojphi.v4i3.4321

Pai, A. L., & McGrady, M. (2014). Systematic review and meta-analysis of psychological interventions to promote treatment adherence in children, adolescents, and young

adults with chronic illness. *Journal of pediatric psychology, 39*(8), 918-931. doi:10.1093/jpepsy/jsu038

Parsons, T. (1951*). The social system*. Glencoe, IL: Free Press

Patient-Centered Primary Care Collaborative. (2012). *The patient-centered medical home: Integrating comprehensive medication management to optimize patient outcomes.* Washington, DC: American College of Clinical Pharmacy.

Patient-Centered Primary Care Collaborative. (2015). Defining the medical home. Retrieved from https://www.pcpcc.org/about/medical-home.

Patient-Centered Primary Care Collaborative (2016). The patient-centered medical home's impact on cost and quality: Annual review of evidence 2014-2015. Retrieved from https://www.pcpcc.org/resource/patient-centered-medical-homes-impact-cost-and-quality-2014-2015.

Patient Protection and Affordable Care Act, 42 U.S.C. § 18001 et seq. (2010).

Pescosolido, B. A., Perry, B. L., Martin, J. K., McLeod, J. D., & Jensen, P. S. (2007). Stigmatizing attitudes and beliefs about treatment and psychiatric medications for children with mental illness. *Psychiatric Services, 58*(5), 613-618. doi:10.1176/ps.2007.58.5.613

Phillips, L.,A., Leventhal, H., & Leventhal, E. A. (2013). Assessing theoretical predictors of long-term medication adherence: Patients' treatment-related beliefs, experiential feedback and habit development. *Psychology & Health, 28*(10), 1135-1151. doi:10.1080/08870446.2013.793798

Pillow, D. R., Naylor, L. J., & Malone, G. P. (2014). Beliefs regarding stimulant medication effects among college students with a history of past or current usage. *Journal of Attention Disorders, 18*(3), 247-257. doi:10.1177/1087054712459755

Polderman, T. J., Posthuma, D., De Sonneville, L. M., Stins, J. F., Verhulst, F. C., & Boomsma, D. I. (2007). Genetic analyses of the stability of executive functioning during childhood. *Biological Psychology, 76*(1), 11-20.doi:10.1016/j.biopsycho.2007.05.002

Polier, G. G., Vloet, T. D., & Herpertz-Dahlmann, B. (2012). ADHD and delinquency–a developmental perspective. *Behavioral Sciences & the Law, 30*(2), 121-139. doi:10.1002/bsl.2005

Porter, M. E., Larsson, S., & Lee, T. H. (2016). Standardizing patient outcomes measurement. *New England Journal of Medicine, 374*(6), 504-506. Retrieved from https://search-proquest-com.ezp.waldenulibrary.org/docview/1764749027?accountid=14872

Post, R., Leverich, G., Fergus, E., Miller, R., & Luckenbaugh, D. (2002). Parental attitudes towards early intervention in children at high risk for affective disorders. *Journal of Affective Disorders, 70*(2), 117–124. doi:10.1016/S0165-0327(01)00299-3

Pottegård, A., Bjerregaard, B. K., Kortegaard, L. S., & Zoëga, H. (2015). Early discontinuation of attention-deficit/hyperactivity disorder drug treatment: A Danish nationwide drug utilization study. *Basic & Clinical Pharmacology & Toxicology, 116*(4), 349-353. doi:10.1111/bcpt.12325

Potter, D. (2013). The social process behind inequalities in children's mental health: Incorporating an illness career framework. *Sociology Compass, 7*(9), 775-785. doi:10.1111/soc4.12061

Power, T. J., Mautone,J. A., Soffer, S. L., Clarke, A. T., Marshall, S. A., Sharman, J., . . . Jawad, A. F. (2012). A family-school intervention forchildren with ADHD: Results of a randomized clinical trial. *Journal of Consulting and Clinical Psychology, 80*(4), 611–613. doi:10.1037/a0028188.

Powers, R. L., Marks, D. J., Miller, C. J., Newcorn, J. H., & Halperin, J. M. (2008). Stimulant treatment in children with attention-deficit/hyperactivity disorder moderates adolescent academic outcome. *Journal of Child and Adolescent Psychopharmacology*, *18*(5), 449-459. doi:10.1089/cap.2008.021

Prasad, V., Brogan, E., Mulvaney, C., Grainge, M., Stanton, W., & Sayal, K. (2013). How effective are drug treatments for children with ADHD at improving on-task behaviour and academic achievement in the school classroom? A systematic review and meta-analysis. *European Child & Adolescent Psychiatry*, *22*(4), 203-216. doi:10.1007/s00787-012-0346-x

Prochaska, J. & DiClemente, C. (1984). *The transtheoretical approach: Crossing traditional boundaries of therapy.* Homewood, Ill: Dow Jones-Irwin.

Raman, S. R., Marshall, S. W., Gaynes, B. N., Haynes, K., Naftel, A. J., & Stürmer, T. (2015). An observational study of pharmacological treatment in primary care of children with ADHD in the United Kingdom. *Psychiatric Services, 66*(6), 617-624. doi:10.1176/appi.ps.201300148

Ramírez, M., Ford, M. E., Stewart, A. L., & Teresi, J. A., (2005). Measurement issues in health disparities research. *Health Services Research, 40*(5p2), 1640-1657. doi:10.1111/j.1475-6773.2005.00450.x

Raphael, J. L., Dietrich, C. L., Whitmire, D., Mahoney, D. H., Mueller, B. U., & Giardino, A. P. (2009). Healthcare utilization and expenditures for low income children with sickle cell disease. *Pediatric Blood & Cancer, 52*(2), 263-267. doi:10.1002/pbc.21781

Raphael, J. L., Rattler, T. L., Kowalkowski, M. A., Brousseau, D. C., Mueller, B. U., & Giordano, T. P. (2015). Association of care in a medical home and health care utilization among children with sickle cell disease. *Journal of the National Medical Association*, *107*(1), 42-49. doi:10.1016/S0027-9684(15)30008-0

Reimer, B., Mehler, B., D'Ambrosio, L. A., & Fried, R. (2010). The impact of distractions on young adult drivers with attention deficit hyperactivity disorder (ADHD). *Accident Analysis & Prevention, 42*(3), 842-851. doi:10.1016/j.aap.2009.06.021

Richmond, N. E., Tran, T., & Berry, S. (2012). Can the medical home eliminate racial and ethnic disparities for transition services among youth with special health care needs? *Maternal and Child Health Journal*, *16*(4), 824-833. doi:10.1007/s10995-011-0785-x

Robb, J. A., Sibley, M. H., Pelham, W. E., Foster, E., Molina. B. S. G., Gnagy, E. M., & Kuriyan, A. B. (2011). The estimated annual cost of ADHD to the US education system. *School Mental Health, 3*, 169-177. doi.org/10.1007/s12310-011-9057-6

Rosenthal, M. B., Abrams, M. K., & Bitton, A. The Patient-Centered Medical Home Evaluators' Collaborative. (2012). Recommended core measures for evaluating the patient-centered medical home: Cost, utilization, and clinical quality. The Commonwealth Fund. Rosenstock, I. M. (2000). Health Belief Model. In A. E. Kazdin (Ed.) , *Encyclopedia of psychology, Vol. 4* (pp. 78-80). American Psychological Association. doi:10.1037/10519-035.

Safren, S. A., Sprich, S., Mimiaga, M. J., Surman, C., Knouse, L., Groves, M., & Otto, M. W. (2010). Cognitive behavioral therapy vs relaxation with educational support for medication-treated adults with ADHD and persistent symptoms: A randomized controlled trial. *JAMA, 304*(8), 875-880. doi:10.1001/jama.2010.1192

Sajatovic, M., Velligan, D. I., Weiden, P. J., Valenstein, M. A., & Ogedegbe, G. K. (2010). Measurement of psychiatric treatment adherence. *Journal of Psychosomatic Research, 69*, 591-599. doi:10.1016/j.jpsychores.2009.05.007. doi:10.1016/j.jpsychores.2009.05.007

Schwebel, D. C., Roth, D. L., Elliott, M. N., Visser, S. N., Toomey, S. L., Shipp, E. M., . . . Schuster, M. A. (2011). Association of externalizing behavior disorder symptoms and injury among fifth graders. *Academic Pediatrics, 11*(5), 427-431. doi:10.1016/j.acap.2011.03.003

Shaw, M., Hodgkins, P., Caci, H., Young, S., Kahle, J., Woods, A. G., & Arnold, L. E. (2012). A systematic review and analysis of long-term outcomes in attention deficit hyperactivity disorder: Effects of treatment and non-treatment. *BMC Medicine*, *10*(99), 1-15. doi:10.1186/1741-7015-10-99

Sia, C., Tonniges, T. F., Osterhus, E., & Taba, S. (2004). History of the medical home concept. *Pediatrics, 113*(Supplement 4), 1473-1478.

Singh, I., Kendall, T., Taylor, C., Mears, A., Hollis, C., Batty, M., & Keenan, S. (2010). Young people's experience of ADHD and stimulant medication: A qualitative study for the NICE guideline. *Child and Adolescent Mental Health, 15*(4), 186-192. doi:10.1111/j.1475-3588.2010.00565.x

Sitholey, P., Agarwal, V., & Chamoli, S. (2011). A preliminary study of factors affecting adherence to medication in clinic children with attention-deficit/hyperactivity disorder. *Indian Journal of Psychiatry, 53*(1), 41. doi:10.4103/0019-5545.75561

Strecher, V. J., DeVellis, B. M., Becker, M. H., & Rosenstock, I. M. (1986). The role of self-efficacy in achieving health behavior change. *Health Education & Behavior, 13*(1), 73-92. doi:10.1177/109019818601300108

Strickland, B. B., Jones, J. R., Ghandour, R. M., Kogan, M. D., & Newacheck, P. W. (2011). The medical home: Health care access and impact for children and youth in the United States. *Pediatrics*, 604-611. doi:10.1542/peds.2009-3555

Stille, C., Turchi, R. M., Antonelli, R., Cabana, M. D., Cheng, T. L., Laraque, D., & Perrin, J. (2010). The family-centered medical home: Specific considerations for child health research and policy. *Academic Pediatrics, 10*(4), 1-7. doi:10.1016/j.acap.2010.05.002

Swanson, J., Baler, R. D., & Volkow, N. D. (2011). Understanding the effects of stimulant medications on cognition in individuals with attention-deficit

hyperactivity disorder: A decade of progress. *Neuropsychopharmacology*, *36*(1), 207-226. doi:10.1038/npp.2010.160

Thissen, A. J., Bralten, J., Rommelse, N. N., Arias□Vasquez, A., Greven, C. U., Heslenfeld, D., ... & Franke, B. (2015). The role of age in association analyses of ADHD and related neurocognitive functioning: A proof of concept for dopaminergic and serotonergic genes. *American Journal of Medical Genetics Part B: Neuropsychiatric Genetics, 168*(6), 471-479. doi:10.1002/ajmg.b.32290

Toomey, S. L., Chan, E., Ratner, J. A., & Schuster, M. A. (2011). The patient-centered medical home, practice patterns, and functional outcomes for children with attention deficit/hyperactivity disorder. *Academic Pediatrics, 11*(6), 500-507. doi:10.1016/j.acap.2011.08.010

Toomey, S. L., Homer, C. J., & Finkelstein, J. A. (2010). Comparing medical homes for children with ADHD and asthma. *Academic Pediatrics*, *10*(1), 56-63. doi:10.1016/j.acap.2009.11.001

Toomey, S. L., Sox, C. M., Rusinak, D., & Finkelstein, J. A. (2012). Why do children with ADHD discontinue their medication? *Clinical Pediatrics, 51*(8), 763-769. doi:10.1177/0009922812446744

U.S. Department of Health and Human Services, Health Resources and Services Administration, Maternal and Child Health Bureau. *The National Survey of Children with Special Health Care Needs Chartbook 2009–2010*. Rockville, Maryland: U.S. Department of Health and Human Services, 2013. Retrieved from http://mchb.hrsa.gov/cshcn0910/core/co.html

Van de Mortel, T. F. (2008). Faking it: Social desirability response bias in self-report research. *Australian Journal of Advanced Nursing, 25*(4), 40.

Visser, S. N., Bitsko, R. H., Danielson, M. L., Ghandour, R. M., Blumberg, S. J., Schieve, L. A., . . . Cuffe, S. P. (2015). Treatment of attention deficit/hyperactivity disorder among children with special health care needs. *Journal of Pediatrics*, *166*(6), 1423-1430. doi:10/1016/j.jpeds.2015.02.018

Visser, S. N., Danielson, M. L., Bitsko, R. H., Holbrook, J. R., Kogan, M. D., Ghandour, R. M., . . . Blumber, S. J. (2014). Trends in the parent-report of health care provider diagnosed and medicated ADHD: United States, 2003 – 2011. *Journal of the American Academy of Child and Adolescent Psychiatry, 53*(1), 34-46. doi:10.1016/j.jaac.2013.09.001

Vissman, A. T., Young, A. M., Wilkin, A. M., & Rhodes, S. D. (2013). Correlates of HAART adherence among immigrant Latinos in the Southeastern United States. *AIDS Care, 25*(3), 356-363. doi:10.1080/09540121.2012.701722

Voils, C. I., Hoyle, R. H., Thorpe, C. T., Maciejewski, M. L., & Yancy, W. S. (2011). Improving the measurement of self-reported medication nonadherence. *Journal of Clinical Epidemiology, 64,* 250-254. doi:10.1016/j.jclinepi.2010.07.01

Walsh, K. E., Robin, D. W., Weingart, S. N. Houlahan, K. E. Degar, B., Billet, A., . . . Mazor, K. M. (2013). Medication errors in the home: A multisite study of children with cancer. *Pediatrics, 131*(5), e1405 – e1414. doi:10.152/peds.2012-2434

Wang, C. H., Mazursky-Horowitz, H., & Chronis-Tuscano, A. (2015). Is parental ADHD related to child ADHD treatment response? *The ADHD Report, 23*(3), 1-5. doi:10.1521/adhd.2015.23.3.1

Watkins, S. L. (2015). Impact of patient-centered medical homes on medication adherence of ethnically diverse children with attention-deficit hyperactivity disorder. Unpublished manuscript, Walden University

Weinman, J., Petrie, K. J., Moss-Morris, R., & Horne, R. (1996). The illness perception questionnaire: A new method for assessing the cognitive representation of illness. *Psychology and Health, 11*(3), 431-445. doi:10.1080/08870449608400270

Weyandt, L. L., Oster, D. R., Marraccini, M. E., Gudmundsdottir, B. G., Munro, B. A., Zavras, B. M., & Kuhar, B. (2014). Pharmacological interventions for adolescents and adults with ADHD: Stimulant and nonstimulant medications and misuse of prescription stimulants. *Psychology Research and Behavior Management, 7*, 223. doi:10.2147/PRBM.S47013

White, P. H. (2002). Access to health care: Health insurance considerations for young adults with special health care needs/disabilities, *Pediatrics, 110*(6), 1328-1335.

Wilens, T. E., Martelon, M., Joshi, G., Bateman, C., Fried, R., Petty, C., & Biederman, J. (2011). Does ADHD predict substance-use disorders? A 10-year follow-up study of young adults with ADHD. *Journal of the American Academy of Child & Adolescent Psychiatry*, *50*(6), 543-553. doi:10.1016/j.jaac.2011.01.021

Willcutt, E. (2005). The etiology of ADHD: Behavioral and molecular genetic approaches. *Cognitive and affective neuroscience of psychopathology*. Oxford, United Kingdom: Oxford University Press.

World Health Organization. (2003). *Adherence to long term therapies: Evidence for action*. Geneva, Switzerland: Author.

You, M. A, Nam, S. M, & Son, Y. J. (2015). Parental experiences of medication administration to children at home and understanding of adverse drug events. *Journal of Nursing Research, 23*(3), 189 – 196. doi:10.1097/jnr.00000000000000.80

Zetterqvist, J., Asherson, P., Halldner, L., Långström, N., & Larsson, H. (2013). Stimulant and non-stimulant attention deficit/hyperactivity disorder drug use: Total population study of trends and discontinuation patterns 2006–2009. *Acta Psychiatrica Scandinavica, 128*(1), 70-77. doi:10.1111/acps.12004

Zuvekas, S. H., & Vitiello, B. (2012). Stimulant medication use among U. S. children: A twelve-year perspective. *American Journal of Psychiatry, 169*, 160-166. doi:10.1176/appi.ajp.2011.11030387

Appendix A: Demographic Questionnaire

1. Which category below includes your age?

    a. 18 -29 years old
    b. 30 – 39 years old
    c. 40 – 49 years old
    d. 50 – 59 years old
    e. 60 years old or older

2. Which best describes your race?

    a. White or Caucasian
    b. Black or African American
    c. Native American or Alaska Native
    d. Asian
    e. Hispanic or Latin American
    f. Other race not described here

3. Which best describes your gender?

    a. Male
    b. Female

4. Which best describes your income?

    a. $0 - $25,000
    b. 25,001 - $50,000
    c. $50,001 – 75,000
    d. $75,001 - $100,000
    e. More than $100,000

5. Which best describes your education?

    a. Did not complete high school
    b. GED or high school diploma
    c. Some college
    d. Bachelors degree or higher

6. Have you personally ever taken medication for ADHD?

    a. Yes
    b. No

7. Please indicate the state that you live in

- Alabama
- Alaska
- Arizona
- Arkansas
- California
- Colorado
- Connecticut
- Delaware
- District of Columbia
- Florida
- Georgia
- Hawaii
- Idaho
- Illinois
- Indiana
- Iowa
- Kansas
- Kentucky
- Louisiana
- Maine
- Maryland
- Massachusetts
- Michigan
- Minnesota
- Mississippi
- Missouri
- Montana
- Nebraska
- Nevada
- New Hampshire
- New Jersey
- New Mexico
- New York
- North Carolina
- North Dakota
- Ohio
- Oklahoma
- Oregon

- Pennsylvania
- Rhode Island
- South Carolina
- South Dakota
- Tennessee
- Texas
- Utah
- Vermont
- Virginia
- Washington
- West Virginia
- Wisconsin
- Wyoming

Appendix B: Permission to Use to MMAS - 8

Morisky License Contract and Copyright Agreement

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9) All licensees must submit to me all manuscripts that are being considered for publication to make certain that all copyright requirements are included in all manuscripts submitted for publication. This is to protect the licensee as I have encountered many violations of international copyright laws from clients as well as individuals who use my intellectual property without authorization. Review of a manuscript does not infer that the developer/owner must be an author on the manuscript, as this is the decision of the author.

Please print, sign, and scan (PDF) and email *this entire document to* dmorisky@ucla.edu

Please sign and return this contractual agreement in a PDF format, to Professor Morisky and he will provide you (upon receipt of the payment invoice) with pages listing the Morisky items, scoring and re-coding criteria and signature authorizing full use of this copyrighted scale. I agree to use only the English version of the Morisky unless I purchase a validated translation of the MORISKY through Professor Morisky. I understand that it is a violation of international copyright laws to either use your own translation and call it the "MORISKY" or use an existing MORISKY scale that has been translated and used for another study. The validated translation is non-transferrable and is linked to a specific license agreement and cannot be reproduced, copied, distributed, placed on the internet, published, or used by another

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individual. If the licensee violates any copyright laws contained in this licensing agreement they will be solely responsible for a $5000.00 penalty and any associated legal costs.

Name and Contact Information of Licensee: Sydney L. Watkins, PhD Candidate, Health Psychology Walden University, 404.323.1616

Title of Study: Patient-Centered Medical Homes and Attention-Deficit Hyperactivity Disorder Medication Beliefs and Adherence

Total Number of Administrations: Total administrations is 292; the instrument is used only one time for each patient

Starting and Ending date of data collection for your study: The plan is to administer the survey sometime between October and December 2016, and complete by September 1, 2017, pending IRB approval

Signature of developer/owner of the MMAS-8: Signed by Donald E. Morisky
Donald E. Morisky, ScD, Developer/Owner of the MMAS-8

Date Signed: 8/17/16

Signature of Licensee: 

Date Signed:

LICENSURE AGREEMENT

The following shall constitute a contract for use of the © MORISKY MEDICATION ADHERENCE SCALE (MORISKY) made on August 17, 2016, between Sydney L. Watkins, Licensee and Donald E. Morisky, ScD. ScM, MSPH, herein referred to developer/owner of the MMAS- 8.

SECTION 1. USE OF THE MORISKY MEDICATION ADHERENCE SCALE

Client hereby uses the Morisky Medication Adherence Scale on the terms set forth in this contract.

SECTION 2. FEES AND TERMS OF USAGE

Morisky License Contract and Copyright Agreement

In consideration of the owner's intellectual property, client agrees to pay owner a fee of $292 (The study has 292 participants, the instrument is used only once for each patient). The license fee is in effect for a one-year period for data collection. You must inform me if you exceed this number of administrations during your contract period and make another invoice payment.

SECTION 3. DUTIES OF OWNER

Owner shall provide the client with a listing of the © **8-item Morisky English scale along with a description of how each item is to be coded and summed to give a total score, ranging from 0 to 8. Psychometric properties of the scale (reliability and validity) will also be provided upon request. This form (Appendix II) will be provided to the Licensee upon payment of the invoice.**

SECTION 4. DUTIES OF THE CLIENT

Client agrees not to publish, distribute, copy or divulge the contents of the © Morisky Scale or its coding methodology to any individual. Transfer of this intellectual property is prohibited under copyright law.

SECTION 5. TERMS and TERMINATION

The license contract is in effect for a one-year for data collection or the duration of the study, whichever is shorter. The license contract is locked into a one-year period and may be renewed without additional cost for an additional year provided the Licensee submits a status report of the number of administrations that year and cumulative number of administrations to Dr. Morisky prior to expiration of current contract. This contract shall automatically terminate without further notice at the end of the term of usage as specified in SECTION 2.

This contract shall automatically terminate without further notice at the end of the term of usage as specified above. If the Licensee terminates the contract the owner will be entitled to the full amount of the contract terms.

SECTION 6. PAYMENT OF FEES

Licensee shall pay owner the amount of fees calculated based on the terms stated under SECTION 2 at the time of contract signature. Payment shall be made out to: Dr. Donald E. Morisky, 2020 Glencoe Ave., CA 90291-4007. Payment must be made at

least 45 days after to the signing of this contract. A 10% late payment will be assessed on all late payments. Written notification must be sent to the Owner prior to the payment deadline date if Licensee needs additional time processing the invoice, otherwise a late fee will be assessed.

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all) will take place in Los Angeles.

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.

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8) Required citations and footnote that must be placed on the first table or figure in all manuscripts submitted for publication and in the Acknowledgement Section of the manuscript appear in Appendix 1. The scoring and re-coding trade secrets, along with the listing of the MMAS-8 items, psychometric properties and categorical scoring frequencies are in Appendix 2 upon payment of the invoice.

9) I am now requiring licensees to submit to me all manuscripts that are being considered for publication to make certain that all copyright requirements are included in all manuscripts submitted for publication. This is to protect the licensee as I have encountered many violations of international copyright laws from clients as well as individuals who use my intellectual property without authorization. Review of a manuscript does not infer that the developer/owner must be an author on the manuscript, as this is the decision of the author.

Please print, sign, and scan (PDF) and email *this entire document to* *dmorisky@ucla.edu*

8/17/16

Appendix C: Permission to Use BMQ

Dear Sydney

Thank for your interest in the Beliefs about Medicines Questionnaire (BMQ) in your research. We ask all potential users to sign up to our standard conditions for use of the questionnaires.

These conditions are found on the attached CONDTIONS form. They are not designed to restrict your research with the questionnaire or your rights to publish your findings. Rather, they are designed to:

- Preserve the integrity of the questionnaire

- Promote uniformity of analysis and presentation (to facilitate comparison of findings across studies)

- Ensure that you are using a valid and up-to date version of any disease specific BMQ

If you agree to these conditions then please arrange for the Principal Investigator on your study to sign the form and return it by email. Permission to use the questionnaire is automatic on receipt on the signed form.

Please let me know if you require further information.

Best wishes

Penny

Penny Weller

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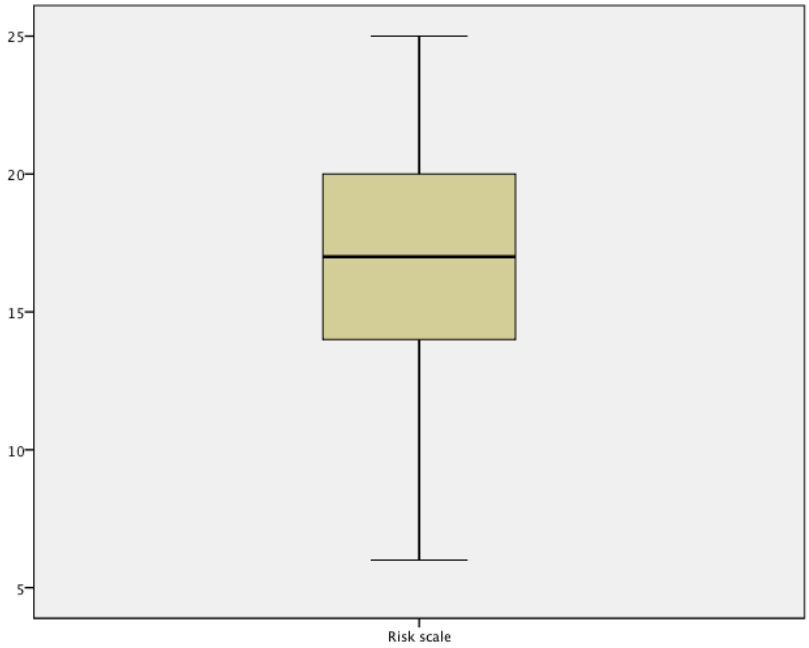
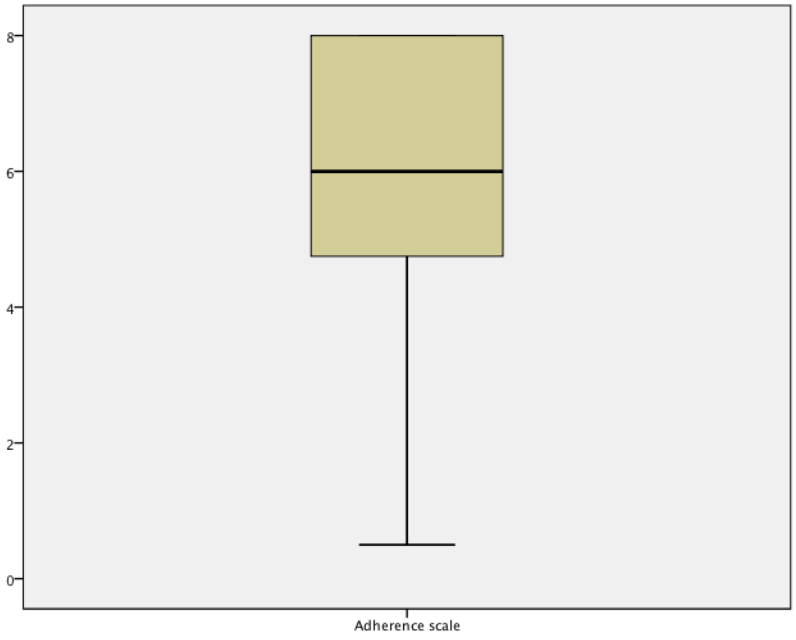
Appendix D: Box Plots

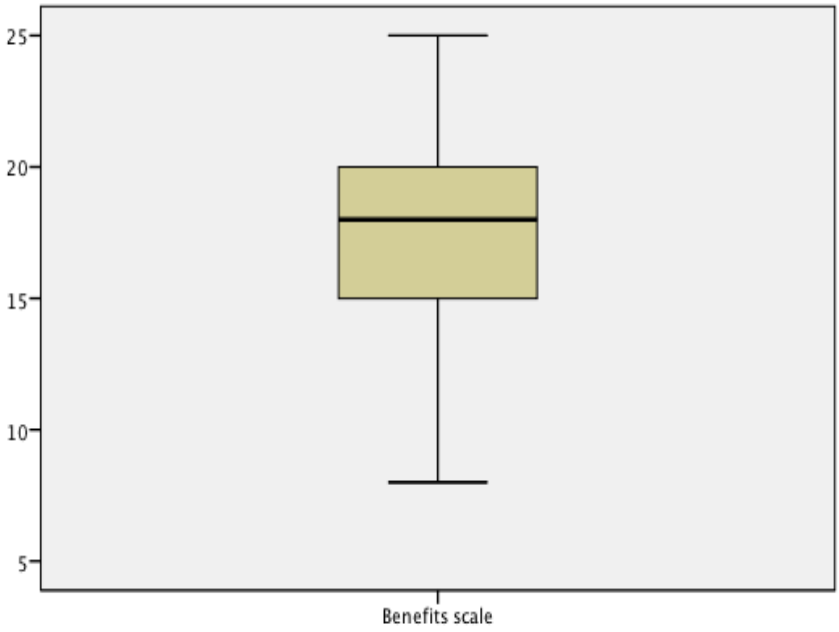
Risk Scale



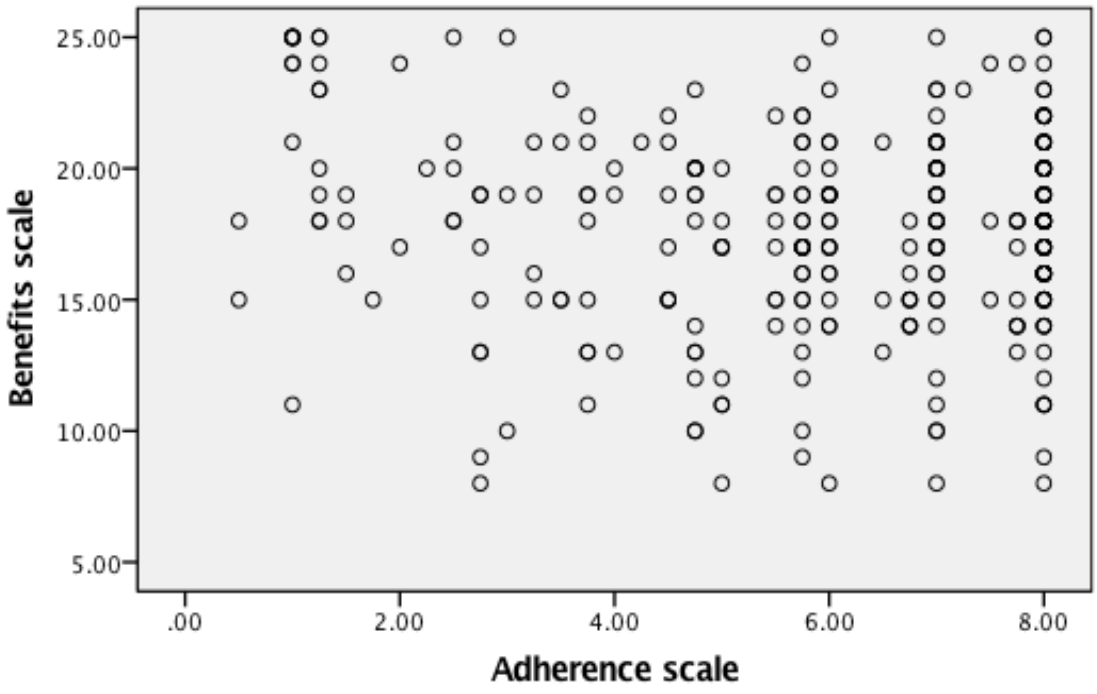
Adherence Scale

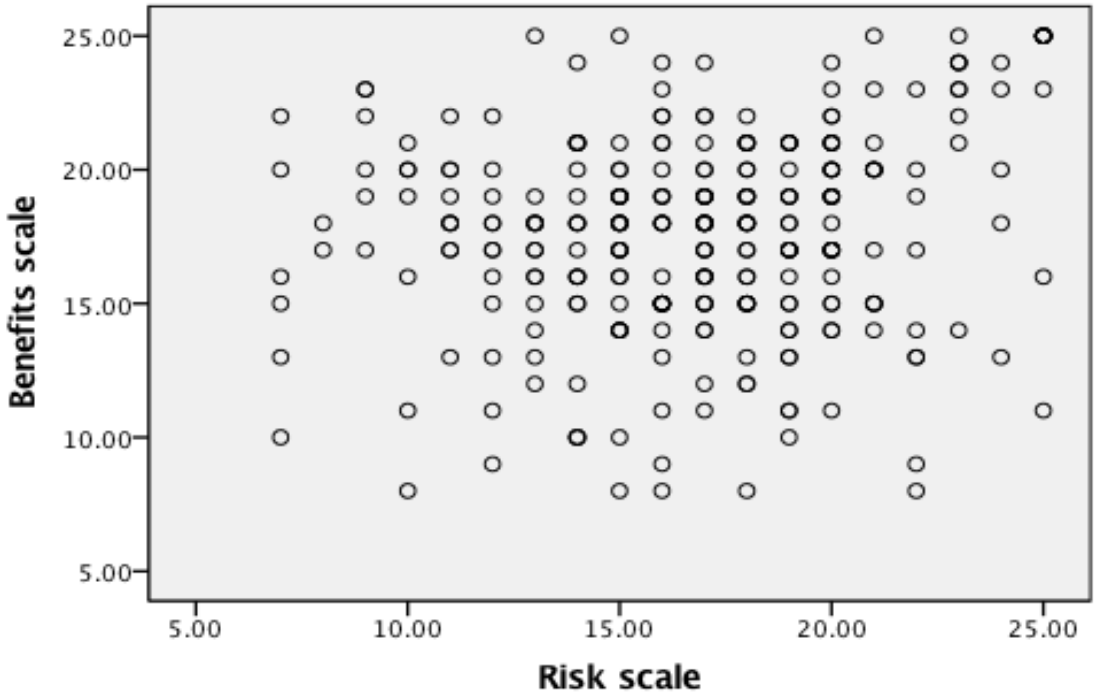


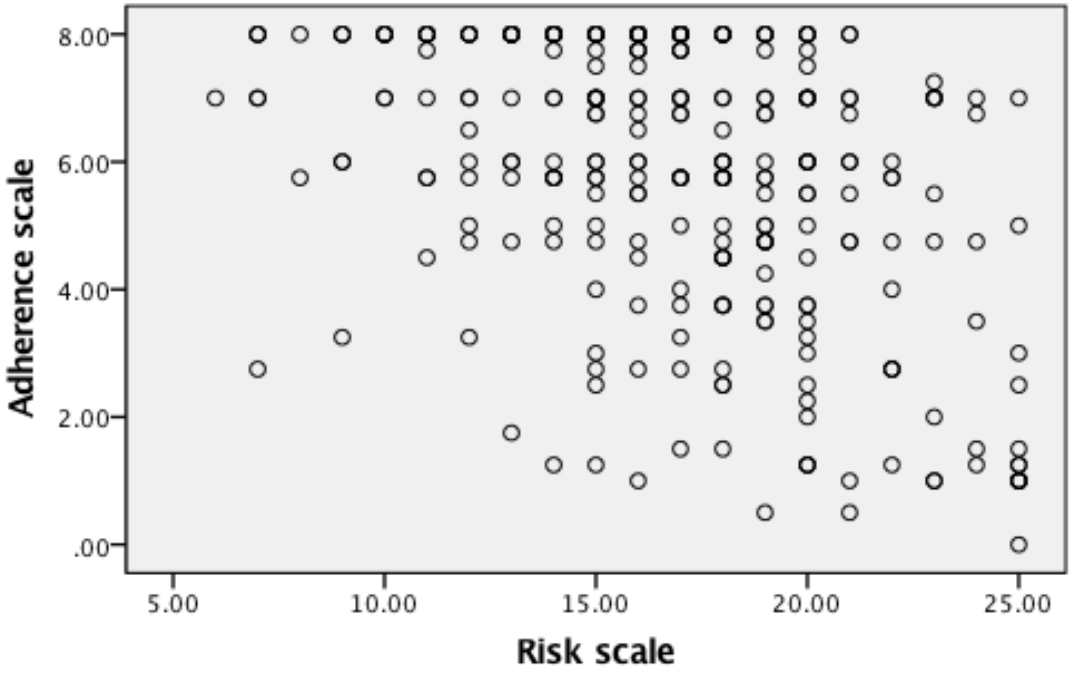
Benefits Scale



Appendix E: Scatterplots






Adherence scale
8.00
6.00
4.00
2.00
.00
5.00
10.00
15.00
20.00
25.00
Risk scale