PEDIATRICIAN ADHERENCE WITH THE AAP ADHD GUIDELINES: UNDERSTANDING THE CONTRIBUTIONS OF INDIVIDUAL AND PRACTICE-LEVEL CHARACTERISTICS

by

SARAH E. DEW-REEVES

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Approved:

Professor Leonard Bickman

Professor Craig Anne Heflinger

Professor Lynn S. Walker

Professor Steven D. Hollon

To my husband Kevin, for his day-to-day love, support,

encouragement, and his belief in my ability to do great things.

To my mother, who has taught me perseverance and independence through

her actions, and who has always been the loudest member of my cheering section.

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CHAPTER I

INTRODUCTION

The present study examined physician adherence to clinical practice guidelines (CPG's). CPG's are a synthesis of the research literature. Successful implementation of CPG's may increase the quality of services delivered. Because youth often present in primary care settings with emotional and behavioral problems, CPG's can help physicians make appropriate decisions about the diagnosis and treatment of mental health problems. Building on prior research, the present study examined the relative contributions of individual and practice-level knowledge and attitudes on pediatrician adherence with the American Academy of Pediatrics guidelines for the evaluation, diagnosis and treatment of children with Attention Deficit Hyperactivity Disorder.

Clinical Practice Guidelines

The Institute of Medicine (IOM) has noted that it takes an average of 17 years to incorporate knowledge from randomized controlled trials into practice, and that, even when evidence is applied in practice, it is not in a systematic way (Institute of Medicine, 2001). The IOM notes that, with respect to treatment of mental health and substance use conditions, there is frequently a discrepancy between empirically supported care and the care being delivered (Institute of Medicine, 2006). Practical aides, such as clinical practice guidelines (CPG's) can assist in the dissemination of scientific evidence to the professional community and general public. Clinical practice guidelines (CPG's) are "systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical

circumstances" (Field & Lohr, 1990, p. 38). They represent the synthesis of research findings and are designed to support physician utilization of evidence-based practices. Successful utilization of CPG's can help decrease unnecessary, inappropriate variability of services delivered (Deutsch, Denton & Borenstein, 1998). The IOM asserted that CPG's can help ensure that scientific evidence is timely, useful and accessible, and results in effective health care (Institute of Medicine, 2001).

CPG's are available for both physical and mental health practice, although the predominance of CPG's are for physical health. They are developed and/or endorsed by national organizations (e.g., Agency for Healthcare Research and Quality; American Academy of Pediatrics), state mental health agencies (e.g., Tennessee Department of Mental Health and Developmental Disabilities), state Medicare plans, and insurance providers (e.g., Blue Cross Blue Shield). CPG's can be discriminated from practice parameters (PP's), which are not necessarily derived from a systematic review of the empirical literature (Szatmari & March, 2007). PP's, such as those developed by the American Academy of Child and Adolescent Psychiatry, represent generally accepted practices, rather than standards of care.

Adherence with Clinical Practice Guidelines

Because of their potential for improving services, and the substantial time, energy and money spent developing CPG's, successful implementation of CPG's is a major issue. Implementation involves actions that translate guidelines into practice, influence physician behavior, and encourage physicians to align their practice with guidelines (Cheater & Closs, 1997). Implementation is typically assessed through the rates of adherence with CPG's. Adherence is primarily evaluated by physician self-report; in rare instances, an independent chart

review is conducted. Adherence rates reported in studies are generally not compared to an acceptability standard, making interpretation unclear. While some investigators report rates of adherence in practice as usual, protocols are often utilized to facilitate implementation and the resulting adherence rates are reported (e.g., Leslie, Weckerly, Plemmons, Ladsverk & Eastman, 2004; Olson, Rosenbaum, Dosa & Roizen, 2005).

Research suggests that successful implementation of CPG's may contribute to increased quality of medical care and patient outcomes (Brindis & Sennett, 2003). For example, by using a two-stage declining effects model (which is similar to growth modeling in hierarchical linear modeling), Dennehy et al. (2005) found that increased adherence with the Texas Medication Algorithm treatment recommendations was associated with larger decreases in overall psychiatric symptoms and depressive symptoms over time in patients with Bipolar Disorder. This should not be surprising, given that CPG's are based on the most current empirical support suggesting best practices.

Despite the potential benefits of adherence, research suggests that CPG's may be infrequently applied in practice (Grol & Buchan, 2006). Accordingly, there appears to be a great deal of variability in guideline adherence, depending on the CPG's under investigation, whether all guidelines of interest or only a subset of guidelines are the focus, the medical specialty targeted, and the sample utilized. Many studies describing current adherence with CPG's find adherence with some or many of the guidelines (e.g., Broder et al., 2005; Gentile et al., 2004). However, few if any physicians in these studies reported adherence with all guidelines. In their self-report study, Cheng and colleagues (Cheng, Miller, Ottolini, Brasseux & Rosenquist, 1996) found that 22% of physicians reported full adherence with the 1994 American Academy of Pediatrics guidelines for tuberculosis testing. Cabana and Flores (2002) cited that, among

pediatricians in the United States, only 35% report fully using CPG's and (except asthma CPG's) no CPG's are used by more than 27% of pediatricians. Bauer (2002) reviewed studies assessing adherence with CPG's for a variety of mental health and substance conditions published from 1992 to 2000, and found that only 27% reported adequate adherence. Although poor adherence is often cited as a problem in this literature, few meta-analyses describing adherence rates across CPG's could be identified, making it difficult to get an overall sense of physician adherence across CPG's.

Models of Adherence with Clinical Practice Guidelines

The aforementioned research focuses on adherence as an outcome, without considering the process that leads to it. Historically, the active dissemination model was used to explain how new medical knowledge affects physician behavior (Pathman, Konrad, Freed, Freeman & Koch, 1996). This model asserts that information disseminated by respectable sources reliably leads to change in physician behavior. Research does not support this overly simplistic model and suggests the need for a more complex decision-making model (Pathman et al., 1996; Richens, Rycroft-Malone & Morrell, 2004; Solberg et al., 2000).

Several such models exist, which attempt to describe the internal process leading to adherence. Pathman et al. (1996) asserted a phase model in which physicians must: first become aware of guidelines, then intellectually agree with the guidelines, then decide to adopt the guidelines by following them in practice, and finally adhere to guidelines by successfully utilizing them when appropriate. This model follows in the tradition of the transtheoretical model of change, which suggests that individuals make change intentionally as a result of proceeding through the stages of change (Prochaska and DiClemente, 1983). Although Pathman and

colleagues found some support for their model, physician behavior did not always follow the phases sequentially. This is illustrated by their finding that 11% of physicians followed guidelines despite not agreeing with them. The assertion that physician adherence behaviors must follow a stepwise path seems too restrictive and does not adequately capture the complex decision making process that leads to physician behavior.

Cabana et al. (1999) offer an alternative model of adherence. They conducted a review of studies examining barriers to adherence and found that identified barriers related to knowledge, attitudes and external characteristics. “Cognitive” barriers included lack of awareness or familiarity with the CPG’s. “Affective” barriers included a lack of: agreement with CPG’s, motivation, self-efficacy, or outcome expectancy. “Behavioral” barriers included characteristics of the patients, guidelines, and environment. Cabana and colleagues found that knowledge and attitude barriers were cited twice as often as external barriers to adherence. This model asserts knowledge, attitudes and external characteristics as potential mechanisms of action leading to adherence or non-adherence. This model also suggests a sequence leading to behavior change, with CPG’s first affecting knowledge, then attitudes before affecting behavior, although proceeding through this sequence is not a necessary precursor to behavior change. Like social cognitive theory (e.g., Bandura, 1977), this model emphasizes the impact of outcome expectancy, self-efficacy, and the environment on behavior change. Cabana et al. reported on the frequency with which barriers were reported by physicians, but did not relate these frequencies to adherence rates. Cabana, Rushton and Rush (2002) applied this model to adherence to the CPG’s for depression and cited multiple physician knowledge, attitude and external barriers to following guidelines. However, they focused on reviewing these barriers, rather than empirically testing their model.

Support for Relationship between Physician and Practice Characteristics and Adherence

Studies exploring adherence with CPG's in specific areas of medicine may supplement the model proposed by Cabana et al. (1999). The majority of studies focus on adherence with physical health rather than mental health guidelines. Familiarity with and knowledge of CPG's has repeatedly been linked to increased adherence. Cheng and colleagues (Cheng, Miller, Ottolini, Brasseux & Rosenquist, 1996) found that, when entered into a logistic regression, awareness of AAP tuberculosis testing guidelines was most predictive of adopting those guidelines. With respect to adherence with pharmacotherapy guidelines for hypertension, physicians with knowledge of best practices were more likely to select the correct treatment option in a vignette (Nelson, Reid, Krum & McNeil, 2003).

However, the relationship between familiarity and adherence varies, based on the CPG's investigated. For example, in Ward et al.'s study (2002) targeting adherence with the Agency for Health Care Policy and Research smoking cessation guidelines, the majority of physicians reported practices consistent with adherence despite the fact that 44% of physicians reported little or no familiarity with the guidelines. Given that the sample was drawn from Veterans Health Administration facilities, where smoking cessation is frequently a goal of treatment, physicians likely already had the requisite knowledge about smoking cessation, making the guidelines less salient. This suggests that familiarity with guidelines may not be critical to adherence when guidelines are intuitive or represent behaviors physicians are already doing.

Related to research on familiarity and adherence are studies examining academic detailing and other education-based interventions. Academic detailing involves having a credible expert deliver key information about evidence based practice to an individual or group of providers, typically in their own office. Because these interventions aim to change physician

behavior by targeting knowledge, they are relevant to the current discussion. Results of these studies are mixed. Some research suggests that academic detailing is an effective way of improving CPG implementation (e.g., Avorn & Soumerai, 1983; Davis & Taylor-Vaisey, 1997; May, Rowett, Gilbert, McNeece & Hurley, 1999). Lu and colleagues (Lu, Ross-Degnan, Soumerai, & Pearson, 2008) reviewed studies on improving medication management and found that disseminating educational materials was not a sufficient strategy, but one-on-one academic detailing was. Some studies suggest mixed findings (e.g., Chaillet et al, 2006), while others indicate it is not an effective implementation intervention (e.g., Simon, 2002; Witt, Knudsen, Ditlevsen & Hollnagel, 2004). Taken together, this research indicates that although knowledge is linked to physician adherence behavior, the process of changing physician behavior is complex.

Physician attitudes have also been tied to adherence; here, "attitudes" include thoughts, beliefs and perceptions about: the disease or problem, its assessment and treatment; external barriers (e.g., time constraints on practice); specific CPG's; CPG's in general; and patient receptiveness toward physician recommendations. Examples of studies focusing on each of these relationships are shown in Table 1. In these studies, more negative attitudes were consistently associated with poorer adherence.

Table 1. *Studies Linking Physician Attitudes to Adherence.*

Type of Attitude	**Study**
Perceived external barriers	Gentile et al., 2004
Negative attitudes toward CPG's	Foley, Vasey, Alexander & Markson, 2003 Ubel, Jepson & Asch, 2003
Lack of agreement with CPG	Cabana et al., 2000
General attitudes/beliefs about guidelines	Flores, Lee, Bauchner & Kastner, 2000
Beliefs about patient receptiveness to recommendations	Gentile et al., 2004 Vaughn et al., 2002

Physician demographic variables have also been linked to adherence. Gender has been associated with adherence, with female physicians demonstrating increased adherence (e.g., Broder et al., 2005; Ely et al., 1998; Gentile et al., 2004). In addition, physician specialization has been repeatedly linked with adherence. This is especially evident in the pediatric literature, in which pediatricians are consistently more adherent with pediatric CPG's than family physicians (e.g., Cheng et al., 1996; Pathman et al., 1996).

Although individual characteristics such as knowledge and attitudes are tied to adherence, they are not necessarily sufficient preconditions for adherence (Cabana et al., 1999). The context which physicians practice in can also influence their adherence to CPG's. Contextual variables include organizational characteristics, such as supportive leadership, having strategic plan for implementation, and capability and culture for continuous quality improvement (Solberg et al., 2000). Although such organizational characteristics are asserted to influence physician practices and adherence behaviors, empirical research linking these characteristics to individual physician adherence is lacking.

Because individual-level knowledge and attitudes impact adherence, it follows that the overall knowledge and attitudes of physicians within a practice may influence adherence of physicians in that practice. Such practice-level internal characteristics represent additional contextual variables that may relate to adherence. Surprisingly, no studies were identified which explored these relationships, which suggests a gap in the research literature.

Finally, in terms of other factors that may impact physician adherence, there is a limited amount of research on the relationship between patient characteristics and physicians' diagnosis and treatment practices. There are mixed findings regarding the relationship between patient demographics (e.g., age, gender, and ethnicity) and physician adherence. For example, Dennehy

et al (2005) did not find a significant relationship between patient demographics and physician adherence with the Texas Medication Algorithm.

Attention Deficit Hyperactivity Disorder

Attention Deficit Hyperactivity Disorder (ADHD) is the most commonly diagnosed behavioral disorder of childhood. Prevalence rates of ADHD in school-age children range from 2% to 18% in community samples (Rowland, Lesesne & Abramowitz, 2002). Visser and Lesesne (2005) found that 7.8% of parents of school-aged children were reported that their children had ADHD. Individuals with ADHD experience marked difficulties with attention, impulsiveness, and/or hyperactivity. While some youth with ADHD may experience a combination of these symptoms (Combined Type), others may experience a predominance of attention difficulties (Inattentive Type) or difficulties with impulsivity and hyperactivity (Hyperactive-Impulsive Type). Other youth may experience symptoms of inattention or hyperactivity/impulsivity, but do not meet full criteria for one of the three aforementioned ADHD Diagnoses (ADHD Not Otherwise Specified, or ADHD NOS) (American Psychiatric Association, 2000). Clinically, ADHD NOS is frequently used as a preliminary ADHD diagnosis while additional information is being gathered. Currently, assessment of ADHD involves the use of parent, teacher and/or youth interviews, responses to rating scales, and behavioral observations. ADHD is most often treated using medication (primarily stimulants in youth), behavior therapy or a combination thereof.

Although recent research suggests that the diagnosis of ADHD is likely to be initially suggested by teachers (Sax & Kautz, 2003), youth with ADHD are evaluated and treated in a variety of settings. While school psychologists, counselors, clinical psychologists and psychiatrists may all be involved in caring for youth with ADHD, most children with ADHD are

treated by neurologists and primary care physicians (Zarin, Suarez, Pincus, Kupersanin & Zito, 1998). Given that ADHD is typically diagnosed in children and young adolescents (between 6 and 12 years old), pediatricians are particularly important in evaluating and treating ADHD in primary care.

American Academy of Pediatrics Clinical Practice Guidelines for ADHD

Because primary care physicians—particularly pediatricians—are integral in the assessment and treatment of youth with ADHD, it is critical that they are aware of best practices. However, many physicians do not receive specialized training in managing emotional and behavioral disorders (EBD's). This may lead to considerable variability in the evaluation and treatment of EBD's, such as ADHD. To combat this and provide physicians with evidence-based recommendations, the American Academy of Pediatrics (AAP) developed CPG's for the evaluation and treatment of youth with ADHD.

The AAP developed these guidelines through collaboration among individuals from various primary care and subspecialty groups. Chosen individuals formed a subcommittee, which met over a 3-year period to review the medical, psychological and educational literature and determine the practices for which the best empirical support exists. Relevant empirical studies were obtained, reviewed, and summarized, which led to the development of draft practice guidelines. These drafts were subjected to internal and external review, and subsequent revisions. The results of this process were two clinical practice guidelines: the evaluation and diagnosis guideline (American Academy of Pediatrics, 2000) and the treatment guideline (American Academy of Pediatrics, 2001). Strength of evidence for each recommendation is included with the guidelines. Evidence for the evaluation and diagnosis recommendations is rated as good,

while evidence for the treatment recommendations ranges from weak to good. Despite the variable strength of empirical support for recommendations, all recommendations in both CPG's were strongly recommended.

Descriptive studies suggest that physicians practicing as usual (i.e., without the aid of an implementation intervention) vary in terms of their adherence to the AAP ADHD guidelines. Rushton, Fant and Clark (2004) found that self-reported overall adherence with evaluation and treatment guidelines ranged from 39% among family physicians to 78% among pediatricians. They found that 14% of family physicians and 35% of pediatricians self-reported using all evaluation guidelines. Chan, Hopkins, Perrin, Herrerias and Homer (2005) found that only 8% of their sample reported evaluation practices consistent with four of the six AAP guidelines. Self-reported adherence to specific evaluation guidelines reportedly varies between 40 and 96% depending on the guideline and sample (Daly, Rasmussen, Agerter & Cha, 2006; Rushton et al., 2004). Using chart audits, Epstein and colleagues (2008) found that adherence to specific evaluation guidelines ranged from 38% to 55%, while adherence to specific treatment guidelines ranged from 9% to 52%. Rushton et al. found that adherence to specific treatment guidelines ranged from 52 to 81% depending on the guideline. All aforementioned studies except the study conducted by Epstein and colleagues used physician self-report to determine adherence rates, rather than independent chart review.

Results of empirical studies investigating adherence to the AAP ADHD guidelines suggest that increased familiarity with the guidelines has been linked to better adherence (Lanham, 2006). Although physicians in several studies reported perceived barriers to using the AAP ADHD guidelines, the relationship between barriers and adherence was not explored. Likewise, basic practice-level characteristics (e.g., type of practice) were reported but not

empirically examined. No studies exploring the connection between youth or physician descriptive characteristics and adherence with the AAP ADHD guidelines were identified. Despite the lack of research exploring what may affect AAP ADHD guideline adherence, many investigators utilized interventions to increase adherence rates.

The Present Study

Reviewing the literature reveals several weaknesses of research on physician adherence to CPG's. First, while some basic research has been conducted that describes adherence rates in treatment as usual, there is inconclusive knowledge about overall adherence rates, variables associated with adherence, and impact of adherence on patient outcomes. In addition, while some models of physician behavior change have been asserted, they have not generally been linked to empirical studies. Pursuing more foundational research on physician adherence and the factors that may affect adherence is a logical next step for research in this area, to ensure that interventions, when developed, will be appropriate and more likely to be effective.

Because CPG's may have the greatest impact when they address practices outside of physicians' existing knowledge and training, examining adherence to CPG's addressing emotional and behavioral disorders could prove beneficial. Because ADHD is frequently assessed and treated in primary care, understanding adherence to the AAP ADHD guidelines can provide insight into these important physician mental health care practices. However, few studies in this area explore the factors associated with adherence without the aid of an implementation intervention. Basic research investigating physicians' practice as usual with regard to the AAP ADHD guidelines could serve as a foundation, to determine if such interventions are necessary and, if so, what to target with interventions.

Studies focusing on physician adherence largely do not hypothesize about the pathway leading to physicians' adherence behaviors. Rather, they assert that physicians frequently do not provide evidence-based care in part because of barriers or because they do not have a systematic way of implementing guidelines, and target these variables with interventions. Cabana et al. (1999) provide one model of how physician knowledge and attitudes interact with external characteristics to determine physician adherence, but this model has not been empirically tested. In addition, although differences in adherence based on physician descriptive characteristics (e.g., female physicians being more adherent, as previously described) have been found in multiple studies, these findings have not been examined in great detail to help understand why they exist.

The methods utilized in studies of physician adherence are also lacking. Familiarity with CPG's is often equated with knowledge about CPG's. However, familiarity may capture something different, since knowledge can be objectively measured whereas familiarity (as assessed here) is a subjective measure. In addition, most studies use physician self-report to determine their adherence with CPG's. Chart reviews are rarely used, despite the fact that they provide more objective descriptions of physician behavior (e.g., Montaño & Phillips, 1995). Finally, analysis methods for investigating physician adherence are generally simplistic and unable to answer more complex questions addressing relationships between adherence and characteristics at multiple levels (i.e. physician level, practice level).

Based on these weaknesses in the literature, the present study addressed the characteristics that affect pediatrician adherence to the AAP ADHD guidelines. Because empirical research suggests that both physician knowledge and attitudes are connected to physician adherence, these characteristics were be investigated. While the majority of studies

investigating the relationship between adherence and practice-level characteristics have focused on organizational qualities, the present study took an alternative approach, focusing instead on the practice-level knowledge and attitudes of physicians. In addition, the present study improved on the measurement and analysis of prior research by: assessing objective knowledge rather than subjective familiarity, utilizing chart review data to assess adherence, and using analyses that will adequately capture the multi-level nature of the data being used. Thus, understanding the relative contributions of individual and practice-level knowledge and attitudes on pediatricians' adherence to the AAP ADHD guidelines were pursued in the present investigation. The following research questions were addressed:

1. Based on prior significant findings as well as the conceptual model asserted by Cabana and colleagues (1999), the prediction of physician adherence by knowledge and attitudes will be examined. Thus, the first research question is: do greater knowledge and more positive attitudes predict increased physician adherence with AAP ADHD guidelines?
2. The present study will also examine the context within which pediatricians practice. Because of the empirical link between adherence and knowledge and attitudes at the individual level, knowledge and attitudes across the pediatricians within the individual's practice will also be examined. Thus, the second research question is: do greater practice-level knowledge and more positive practice-level attitudes predict increased adherence with AAP ADHD guidelines?
3. Because multilevel modeling will be used, it will be possible to simultaneously examine the predictive value of individual pediatrician and practice-level characteristics. Thus, the third research question to this is: what are the relative contributions of individual

physician and practice-level knowledge and attitudes on physician adherence with AAP ADHD guidelines?

4. Prior descriptive studies examining adherence with the AAP ADHD guidelines have found that adherence varies depending on which type of adherence (overall, evaluation or treatment) or what specific guideline is being examined. Thus, the current study will examine these three types of adherence in separate multilevel models to answer the question: do individual and practice-level knowledge and attitudes predict adherence differently based on the guidelines (i.e., overall guidelines versus evaluation guidelines versus treatment versus guidelines)?
5. Based on the literature examining adherence with guidelines, it is evident that gender may be related to adherence. The present study will examine the prediction of adherence by gender and age, answering the question: does the prediction of adherence vary based on physician descriptive characteristics? In particular, do female pediatricians have higher rates of adherence?
6. Although there is not strong research supporting the relationship between youth characteristics and adherence, youth characteristics such as specific ADHD diagnosis, youth age and gender provide an additional context for pediatricians' practice behavior and as such will be examined. Thus, the next research question being examined is: does the prediction of adherence by knowledge and attitudes vary based on youth descriptive and diagnostic characteristics?
7. Given that there are some issues related to timing—both in terms of the data being collected in two phases and in terms of the timing of the release of guidelines compared to data collection—it was important to look at the effect of timing on adherence. Thus,

the final research question being examined is: does the prediction of adherence vary based on wave of data collection?

CHAPTER II

METHOD

Purpose of Original Study

The present study is a secondary data analysis of an existing data set (Center for Evaluation and Program Improvement, 2007). The primary study was focused on first describing pediatricians' diagnosis and treatment of ADHD and their adherence with the AAP ADHD guidelines, and then examining the effects of a brief intervention on adherence behaviors. The intervention was developed in response to the National Advisory Mental Health Council's challenge to develop reasoned methodology to promote clinical guideline utilization (National Institute of Mental Health, 1998). The intervention was intended to educate and motivate physicians in order to increase compliance with the AAP ADHD guidelines (Center for Evaluation and Program Improvement, 2007). Ongoing approval from the Institutional Review Board was obtained for the original study.

Participants

Participants were 78 pediatricians and 749 of their patients with ADHD from 18 independent practices in the metropolitan Atlanta area. Participating pediatricians and their practices were part of a network of providers dedicated to improving the quality of office-based pediatric healthcare. The pediatrician sample was 59% male. The pediatriciansample was 90% Caucasian, 4% African American, 5% Asian and Pacific Islander, 5% Hispanic[1] and about 1%

[1] Because participants could indicate their race as well as their ethnicity (whether they were of Spanish/Hispanic origin), the total sample race and ethnicity adds up to greater than 100%.

other (self-identified). Average age of the pediatrician sample was 45.4 years (SD = 8.92). The average practice was 67% male, was 94% Caucasian and about 6% Asian, and was composed of pediatricians with an average age of 47.98 (SD = 8.23). There were an average of approximately 4 pediatricians in each practice (mean = 4.33).

Based on chart review, descriptive information was obtained about the sample of patients. Patients were 69% male with an average age of 12.6 years (SD = 2.71). Racial and ethnic information was not included in 50% of the charts, so were not available for analysis. With respect to ADHD diagnosis, 25.2% of the patients were diagnosed with ADHD Inattentive Type, 5.5% were diagnosed with ADHD Hyperactive-Impulsive Type, 17.8% were diagnosed with ADHD Combined Type, and 51.5% were diagnosed with either an unspecified ADHD diagnosis or with ADHD Not Otherwise Specified.

Procedures

To conduct the primary study, Vanderbilt University partnered with a large network of primary care pediatricians. The network was created to integrate clinical and financial practice through quality management, managed care contract participation, and linked electronic information systems. The project was endorsed by the directors of the network and advertised to all pediatricians within the network. Pediatricians were then mailed introductory information about the study and were asked to complete a background survey to help describe the population from which the sample was drawn. The introductory packet also contained the consent form and a more specific background survey, both of which were completed by pediatricians interested in participating in the study. A third background survey assessing practice characteristics was simultaneously sent to a Key Staff Person (KSP) in the pediatricians' office and was completed

if pediatricians chose to participate in the study. The pediatrician questionnaires used in the present study came from baseline data collection and were completed between June of 2001 and February of 2002.

Physician adherence with the AAP ADHD guidelines was assessed through independent chart reviews. KSP's at each participating practice reviewed charts to determine eligibility for study participation. For charts to be eligible, youth must have been diagnosed with ADHD between the ages of 6 and 18 years. Youth had to be diagnosed by a participating pediatrician or someone the pediatrician referred the youth to for diagnosis (e.g., psychiatrist, psychologist, neurologist). Charts for youth who had been diagnosed within 6 to 24 months were preferable, as were charts for youth who had been in treatment for 12 months or more. However, when a sufficient number of charts meeting these criteria were not identified, the length of treatment criteria was relaxed. Multiple charts were selected for each physician (mean number of charts per physician = 9.85). After KSP's selected eligible charts, each chart was redacted, and the anonymous charts were then sent to the research team for auditing.

Because of the goals of the primary study, the chart audit data used in the present study were collected in two waves- at baseline (pre-intervention) and post-intervention. Charts were collected on different patients at each wave. Three hundred and thirty-five baseline charts were collected from October of 2001 till September of 2002. The intervention phase of the study began in February of 2002 and ended in February of 2003. Four hundred and fourteen post-intervention charts were collected from June of 2005 to April of 2006. Analyses from the primary study indicated that there were no effects of the intervention; thus data will be used that were collected both pre- and post-intervention (additional discussion about ruling out wave effects is included in the analysis plan). An additional time-related issue is the release of the

AAP ADHD guidelines; diagnostic guidelines were published in May of 2000, while treatment guidelines were published in October of 2001.

Measures

I. Pediatrician Background Questionnaire (for copies of relevant questionnaires included in the Pediatrician Background Questionnaire, see Appendix A)

Background and Demographics. Participating pediatricians were asked to provide basic demographic information (e.g., age, gender, racial/ethnic background). In addition, they reported on background characteristics relevant to their training as a physician and their current practice.

Knowledge. Pediatricians completed a 66-item Knowledge Questionnaire (Center for Evaluation and Program Improvement, 2000) assessing their knowledge of the best practices when evaluating and treating ADHD. Items were designed to capture the recommendations made in the AAP ADHD guidelines. Specific items addressed issues such as screening for comorbid conditions, DSM-IV criteria for ADHD, behavior therapy and medication management for ADHD. The majority of items are rated true or false, with two items scored rated on a 4-point scale. Higher scores indicate more knowledge about the content of the AAP ADHD guidelines.

Attitudes. Pediatricians' perceived barriers to better ADHD care were assessed using an eighteen-item Perceived Barriers Questionnaire (Center for Evaluation and Program Improvement, 2000). Pediatricians reported on various internal (e.g., insufficient knowledge and skills) and external (e.g., not enough time) barriers to better ADHD assessment and treatment. Pediatrician responses were made on a 5-point scale (0-4 scale), with higher scores indicating a higher level of perceived barriers. Internal consistency of the Perceived Barriers Questionnaire was .83 in the present sample. Part-whole correlations indicated that six items had low

correlations with the measure and thus were eliminated. Coefficient alpha was recalculated for the revised twelve item Perceived Barriers Questionnaire (PBQ-R) and was .85, which indicates good reliability. Physician responses to the revised twelve item measure were subjected to exploratory factor analysis with promax rotation to allow correlations between factors. Results suggested that the items were best captured by a one-factor structure, which accounted for 39% of the variance. In addition, Kaiser's mean sampling adequacy (MSA) was investigated to assess whether the items fit a common factor model; overall MSA of .79 suggests that the items measure a common factor.

The fourteen-item Physician Belief Scale (PBS; McLennan, Jansen-McWilliams, Comer, Gardner & Kelleher, 1999) was used to assess pediatricians' beliefs about psychosocial aspects of their work with patients. Items address pediatricians' thoughts about providing psychosocial care to their patients, as well as what physicians perceived their patients' and caregivers' thoughts were about receiving psychosocial care from their pediatrician. Pediatricians rated responses on a 5-point scale (1-5 scale); higher scores indicate more negative attitudes toward providing psychosocial care. McLennan et al. found coefficient alphas between .75 and .81, suggesting adequate internal consistency. The PBS was modified slightly for the present study, with the order of items slightly changing and one additional item being added. Internal consistency for the revised PBS (PBS-R) in the current sample was .88, which indicates good reliability. The part-whole correlations indicated moderate to large correlations among items. Physician responses were subjected to exploratory factor analysis with promax rotation. Results suggested that the items were best captured by a one-factor structure, which accounted for 41% of the variance. Overall MSA was .85, which suggests that the items measure a common factor. The PBS-R is mildly correlated with the PBQ-R in the present sample ($r = .26$, $p < .05$).

II. Pediatrician Chart Audit (for copies of the Summary Chart Audit Form, see Appendix B)

Adherence. Anonymous charts were audited to determine pediatricians' adherence to each recommendation of the AAP ADHD guidelines. Several challenges of using chart data were evident and were taken into account when determining adherence. First, it would be virtually impossible for an independent reviewer to determine whether or not some specific AAP ADHD recommendations were being followed. For example, Recommendation 6 of the AAP ADHD Evaluation guidelines specifies that other diagnostic tests should not be routinely used to diagnosis ADHD (e.g., laboratory tests). However, because reviewers did not have complete knowledge of each case, they could not establish whether or not laboratory tests requested were requested solely for ruling out ADHD (i.e., perhaps the child needed the laboratory tests for another reason). Challenges such as this led to the exclusion of three evaluation recommendations and two treatment recommendations (see Appendix B for list of recommendations and rationale for exclusion, when applicable).

Each remaining recommendation was utilized as criteria for the chart audit (Center for Evaluation and Program Improvement, 2000; see Appendix B for a copy of the Summary Chart Audit rating system). Recommendations were operationalized into concrete actions and categorized into components. Raters were then trained to the criteria, and underwent periodic retests to minimize drift. Charts were then assessed for completeness of necessary information. For example, Recommendation 2 of the AAP ADHD Evaluation guideline specifies that all DSM-IV criteria be used in diagnosing ADHD. To evaluate adherence to that recommendation, physicians' attention to symptoms, functional impairment, age of onset, and use of rating scales were all necessary for pediatricians to be rated as adherent to that recommendation. Pediatricians were thus rated on each component within a recommendation. Each chart was independently

reviewed by two trained auditors. Auditors then met to come to a consensus on the ratings; the consensus data comprises the chart audit data used in the present study. Final ratings were then summed and adherence scores were calculated for each chart. Higher positive scores indicate more adherence to the AAP guidelines. Separate adherence scores were calculated for overall adherence (with all AAP ADHD guidelines), and the evaluation and treatment guidelines.

Youth Background and Demographics. From each chart, youth age and gender were collected. In addition, the youth's specific ADHD diagnosis (Hyperactive-Impulsive Type, Inattentive Type, Combined Type, Not Otherwise Specified) was included.

Data Analysis

Prior to conducting the primary analyses of the study, a power analysis was calculated to ensure adequate ability to detect significant effects (see Appendix C). Following this, descriptive analyses of study variables at each level of data were conducted. Overall physician adherence as well as adherence with the evaluation and treatment guidelines was examined, to determine which statistical procedure should be used to for modeling. Responses to the knowledge and attitudes measures were also examined. Results of these basic descriptive analyses are presented before results of the primary analyses.

Because the data for the present sample are nested—charts within pediatricians within practices—multilevel modeling (MLM) was used to test the main research questions. The present data can be best described by the classic Singer (1998) school effects model, in which the data are at multiple levels within an organizational hierarchy, and one wishes to examine a dependent variable at a particular level as a function of predictors at various levels. The random effects within the multilevel model describe the variability in the dependent variable between

(i.e., specified random effects) and within (i.e., residual) each specified level. The fixed effects represent the predictor variables at each level; that is, fixed effects describe the relationship between the independent variables and dependent variable. Thus, MLM makes it possible to control for the variance accounted for by each nesting level and examine adherence as a function of individual and practice level knowledge and attitudes.

The SAS PROC MIXED procedure was used for multilevel modeling. A series of models were fitted to determine which model accounted for the most variance and was most parsimonious (Singer & Willett, 2003). Chart audit data represent level 1, individual pediatricians represent level 2, and practice level data represent level 3. Chart level adherence was used as the dependent variable, to capture the variation in adherence across charts. Separate models were specified for overall adherence, adherence to evaluation guidelines, and adherence to treatment guidelines. To account for the effect of pediatrician and practice level clustering on adherence, Levels 2 and 3 were specified as random effects. Knowledge and attitudes were predictor variables specified as level 2 and 3 fixed effects. Level 1, 2 and 3 descriptive characteristics[2] (youth and physician gender and age), as well as specific youth ADHD diagnosis (Hyperactive-Impulsive Type, Inattentive Type, Combined Type, and NOS/Unspecified) were included as additional fixed effects to determine whether the prediction of adherence varies based on different levels of these characteristics.

Based on Singer's analysis suggestions (1998) and later recommendations from Singer and Willett (2003), the unconditional means model was the initial model tested. It includes level 2 and 3 random effects, but no predictors; only the intercept predicts adherence in this model. The unconditional means model is the baseline against which substantive models can be compared. The random effects (covariance parameter estimates) were examined to determine whether

[2] Pediatrician and youth race and ethnicity were not included in the modeling due to missing data.

variance components statistically differ from 0. This establishes how much variance in adherence is accounted for by the systematic variation (i.e., clustering) between pediatricians and between practices. If random effects were significant, they remained in subsequent models to control for this clustering.

Next, separate models specifying only level 1, 2 or level 3 predictors were tested. The relationship between specified random effects and the outcome were examined. The relationship between each fixed effect and the outcome was examined to test for main effects. Examining these relationships helped establish how much variation is explained by the addition of each fixed effect and how much continued to be explained by the specified random effects. A multilevel model including all significant predictors and significant random effects at each level was then specified. Relative goodness of fit of each model was established. Because the data were collected in two waves, time represents a threat to validity of the current study. To follow-up on this, an additional model for each adherence variable was tested for significance, which included wave as a fixed effect. The best fitting, most parsimonious model was retained for each adherence variable.

CHAPTER IV

RESULTS

Descriptive Statistics

Pediatrician Knowledge and Attitudes. Physicians varied in their knowledge of best practices for evaluation and treatment of ADHD (see Table 2), with the average score on the Knowledge Questionnaire being 83%. By sorting the data by practice, the knowledge of pediatricians within practices was examined. Results indicate that while the average physician and practice level scores on the Knowledge Questionnaire were the same, there was greater variation in individual pediatricians' knowledge of best practices.

Results suggest that individual pediatricians vary widely in their perception of barriers to their providing better ADHD care (see Table 2). While the mean score on the PBQ-R was 1.4, indicating that the average amount of barriers endorsed is about 35%, some pediatricians perceive very few barriers to their providing better care while others perceive many barriers. As seen in Table 2, the average practice endorsed slightly fewer perceived barriers to providing better ADHD care, with practices being slightly less variable in perceived barriers than individual pediatricians.

Physicians had generally positive attitudes toward providing psychosocial care, as evident in responses on the PBS-R. The mean score on the PBS-R was 2.17, indicating that physicians endorsed an average of 29% of the possible negative attitudes toward providing psychosocial care. As evident in Table 2, some physicians had very positive attitudes toward providing psychosocial care while others had somewhat negative attitudes. The average practice

endorsed slightly more negative attitudes than the average physician, with the range of practice scores on the PBS-R being slightly smaller and more negative.

Table 2. *Knowledge and Attitudes Scores at Pediatrician and Practice Levels.*

Measure	Scale	N	Mean/Percent[3]	SD	Min	Max
Pediatrician Level (Level 2)						
Knowledge Questionnaire	0-66	75	54.83 (83%)	4.86	42 (63%)	64 (97%)
Attitude Measures						
Perceived Barriers Questionnaire- Revised	0-4	78	1.40 (35%)	0.57	0.25 (6%)	2.55 (63%)
Physician Belief Scale-Revised	1-5	75	2.17 (29%)	0.54	1.13 (3%)	3.31 (58%)
Practice Level (Level 3)						
Knowledge Questionnaire	0-66	16	54.81 (83%)	4.59	48 (72%)	62 (94%)
Attitude Measures						
Perceived Barriers Questionnaire- Revised*	0-4	18	1.27 (32%)	0.54	0.33 (8%)	2.42 (61%)
Physician Belief Scale-Revised*	1-5	16	2.19 (30%)	0.53	1.33 (8%)	3.31 (58%)

Adherence with AAP ADHD Guidelines. Adherence with the AAP ADHD guidelines varied based on the type of guideline (see Table 3). Across all 749 charts, the average adherence with all guidelines (i.e., overall adherence) was 58%. There was a wide range of overall adherence, with some charts having very poor adherence and some having near perfect adherence. The average adherence with evaluation guidelines across charts was much higher (85%), with the majority of charts having high to near perfect in adherence. With respect to treatment guidelines, the average adherence was quite low (37%), with most charts having low to

[3] For Knowledge Questionnaire, higher percentage indicates more knowledge. For PBQ-R, higher percentage indicates higher perception of barriers. For PBS-R, higher percentage indicates more negative attitudes.

moderate adherence. Graphs illustrating the distribution of each adherence score are presented in Appendix D.

Table 3. *Adherence with AAP ADHD Guidelines at Chart Level.*

Adherence	N	Mean/ Percent	SD	Min	Max
Overall Adherence	749	0.58 (58%)	0.12	0.14	0.96
Adherence with Evaluation Guidelines	749	0.85 (85%)	0.22	0.00	1.00
Adherence with Treatment Guidelines	749	0.37 (37%)	0.13	0.00	0.75

Multilevel Models

Overall Adherence. The unconditional means model was fit first (Table 4). This model revealed significant variation between pediatricians and between practices[4], which indicates the need to include both random effects in subsequent models. The intraclass correlation coefficient was .11, indicating that a moderate amount of variance in adherence was due to clustering (Hox, 2002). The Pearson correlation assessing the relationship between the predicted and observed adherence was .41 ($p < .001$), which suggests a moderate relationship.

By following the previously described stepwise process, a parsimonious substantive model, including significant random and fixed effects at all levels, was derived (Table 5). Wave of data collection was not a significant predictor of adherence, and was thus not included in the final model. When simultaneously entered with fixed effects, there continued to be significant variation in overall adherence between pediatricians. Results indicate a main effect for youth

[4] Because adherence is assessed on a 0-1 scale, all estimates are given out to 3 decimal places.

age, such that the older the patients were, the less adherent physicians were with the overall guidelines (see Figure 1). In addition, there was a main effect of youth diagnosis on overall adherence (see Figure 2). Pediatricians were significantly more adherent with the overall guidelines for youth diagnosed with ADHD Inattentive Type or ADHD Combined Type as compared to youth diagnosed with ADHD NOS/Unspecified Type. The Pearson correlation between the observed and predicted adherence for the multilevel model was .50 ($p < .001$), indicating a moderate to strong relationship, and an improvement over the unconditional means model.

Table 4. *Unconditional Means Models Predicting Overall, Evaluation and Treatment Adherence.*

	Overall Adherence			Evaluation Adherence			Treatment Adherence		
Random Effects	Estimate	SE	z	Estimate	SE	z	Estimate	SE	z
Pediatrician	.001	.001	1.73*	.004	.002	1.72*	.000	.000	NS
Practice	.001	.000	1.95*	.004	.002	2.72**	.000	.000	NS
Residual	.012	.001	18.35***	.041	.002	18.33***	.018	.001	19.21***
Fixed Effects	Estimate	SE	t	Estimate	SE	t	Estimate	SE	t
Intercept	.571	.009	64.26***	.835	.019	44.38***	.373	.006	64.71***

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 5. *Final Multilevel Models Predicting Overall, Evaluation and Treatment Adherence.*

	Overall Adherence			Evaluation Adherence			Treatment Adherence		
Random Effects	Estimate	SE	z	Estimate	SE	z	Estimate	SE	z
Pediatrician	.002	.001	2.97*	.006	.002	3.63***	-----	-----	NS
Residual	.012	.001	15.42***	.039	.002	18.28***	.018	.001	16.60***
Fixed Effects	Estimate	SE	t	Estimate	SE	t	Estimate	SE	t
Intercept	.611	.024	25.35***	.799	.014	57.76***	.500	.035	14.43***
Practice Level Perceived Barriers	-----	-----	-----	-----	-----	-----	-.048	.015	-3.18*
Youth Age	-.004	.002	-2.42*	-----	-----	-----	-.005	.002	-2.40*
Youth Diagnosis									
Combined Type	.052	.013	3.90**	.123	.021	5.77***	-----	-----	NS
Inattentive Type	.037	.012	3.17*	.103	.019	5.58***	-----	-----	NS
Hyperactive-Impulsive Type	.042	.022	NS	.043	.033	NS	-----	-----	NS

* $p < .05$, ** $p < .01$, *** $p < .001$

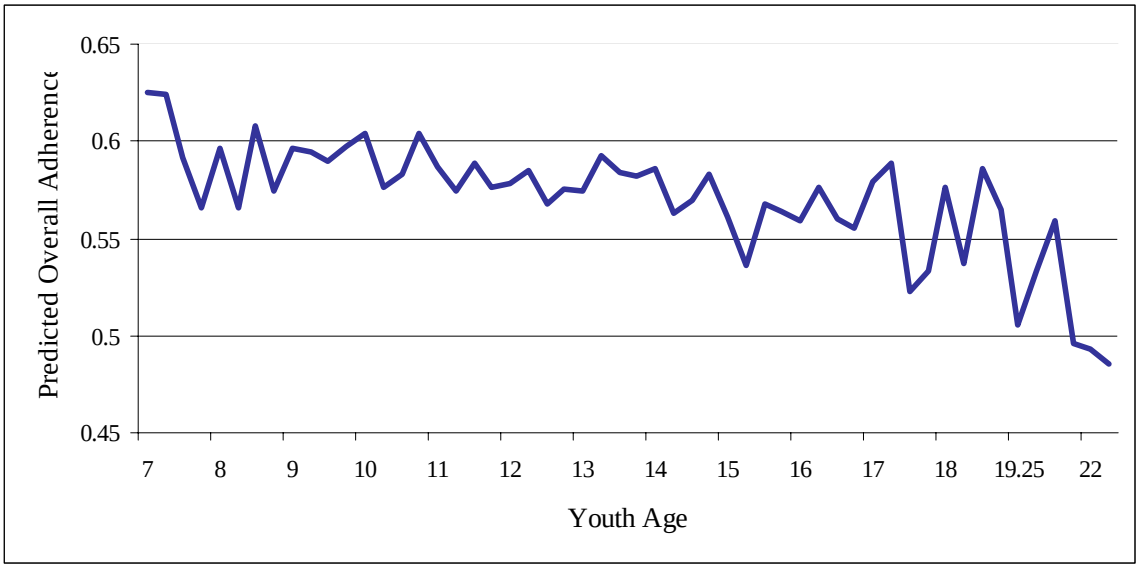

Figure 1. *Main effect of youth age on overall adherence.*

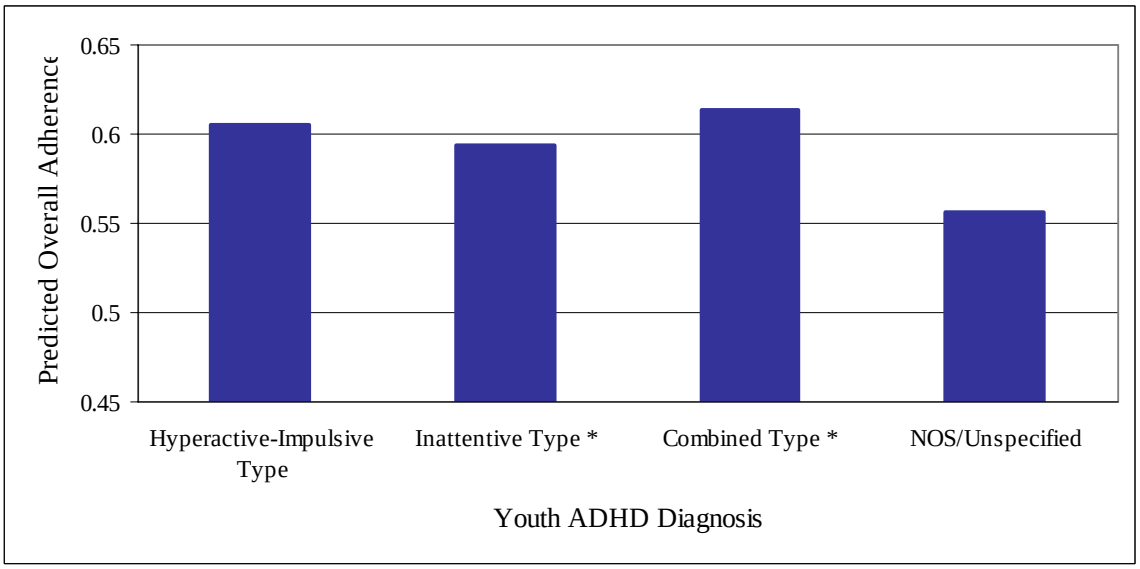

Figure 2. *Main effect of youth ADHD diagnosis on overall adherence.*

Evaluation Adherence. The unconditional means model revealed that pediatricians and practices varied systematically in adherence with the AAP evaluation guidelines (Table 4), thus both random effects were included in subsequent models. The intraclass correlation coefficient

was .17, indicating that a large amount of the variance in adherence was due to clustering. The Pearson correlation between predicted and observed evaluation adherence was .48 ($p < .001$), suggesting a moderate relationship.

Results of the multilevel model are presented in Table 5. Wave of data collection was not a significant predictor and was thus not included in the final analysis. When simultaneously entered with fixed effects, there continued to be significant variance in evaluation adherence between pediatricians. Results indicate a main effect of youth diagnosis on treatment adherence (see Figure 3). As was the case for overall adherence, compared to youth with ADHD NOS/Unspecified Type, if youth were diagnosed with ADHD Inattentive Type or ADHD Combined Type, their pediatricians were significantly more adherent with the overall guidelines. The Pearson correlation between the observed and predicted adherence for the multilevel model was .51 ($p < .001$), indicating a strong relationship, and an improvement over the unconditional means model.

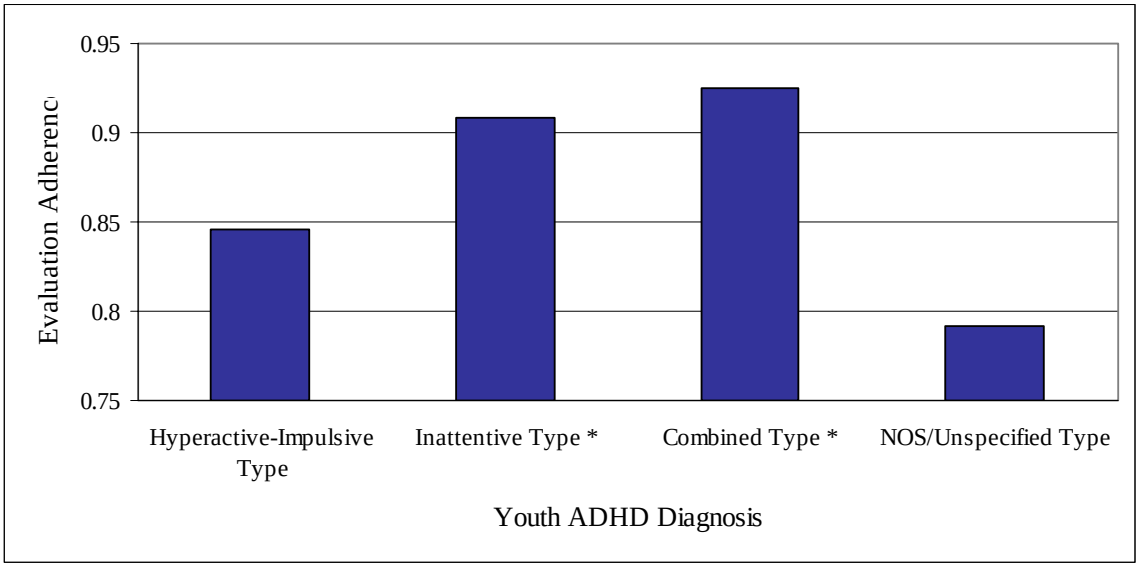

Figure 3. *Main effect of youth ADHD diagnosis on evaluation adherence.*

Treatment Adherence. The unconditional means model did not reveal significant variation between pediatricians or practices, thus random effects were not included in subsequent analyses and the intraclass correlation was not calculated. The Pearson correlation between predicted and observed treatment adherence was .15 ($p < .001$), which suggests a relatively weak relationship.

Results of the multilevel model are presented in Table 4. Results indicate a main effect for youth age, such that the older patients were, the less adherent physicians were with the overall guidelines (see Figure 4). In addition, there was a main effect of practice level perceived barriers (see Figure 5). Practices with higher levels of perceived barriers to providing better ADHD care had poorer treatment compliance than practices where fewer perceived barriers were endorsed. The Pearson correlation between predicted and observed treatment adherence was .16 ($p < .001$), which suggests a small relationship and slight improvement over the unconditional means model.

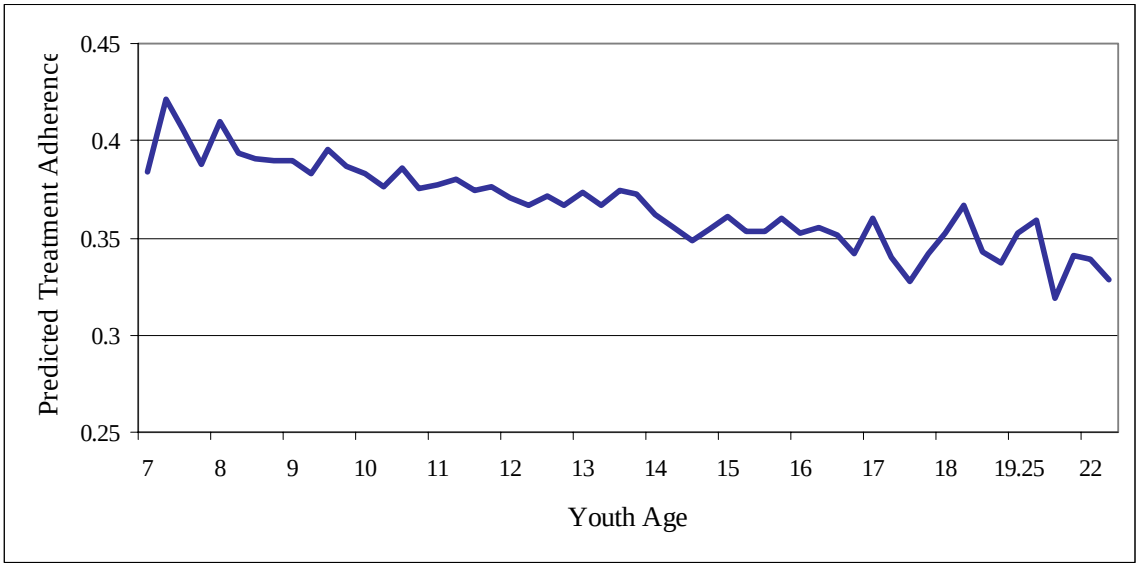

Figure 4. *Main effect of youth age on treatment adherence.*

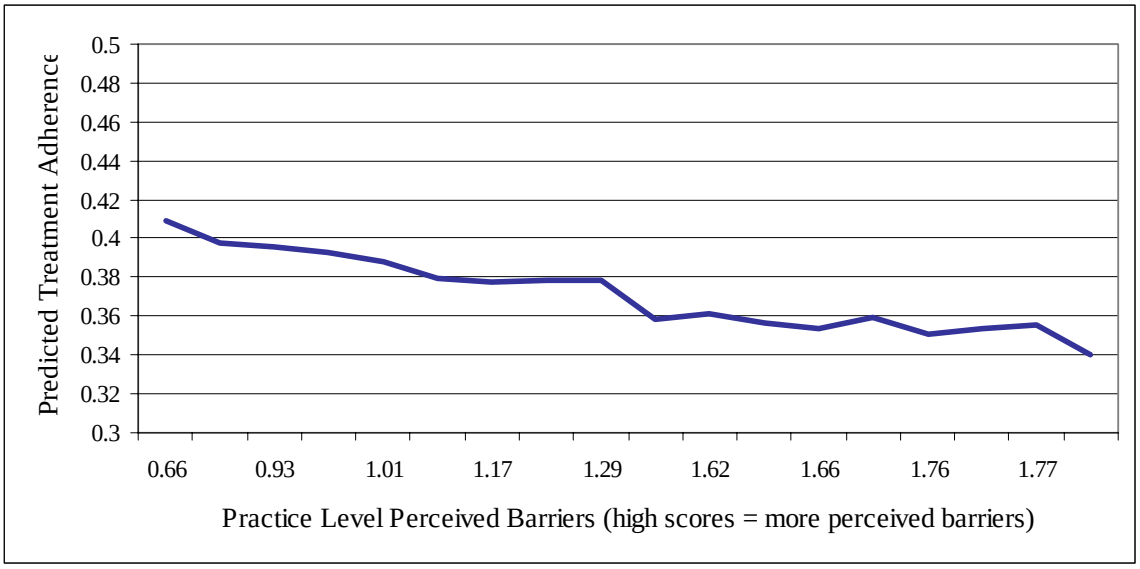

Figure 5. *Main effect of practice level perceived barriers on treatment adherence.*

Chapter V

DISCUSSION

The present study examined the impact of pediatrician and practice knowledge and attitudes on adherence with the AAP ADHD guidelines using multilevel modeling. Attitudes toward providing psychosocial care and perceived barriers to providing better ADHD care were examined. Pediatrician and youth characteristics as well as wave of data collection were also examined as possible predictors of adherence. Overall adherence, adherence with evaluation guidelines, and adherence with treatment guidelines were examined in separate models.

Results indicate that pediatricians in the present sample varied widely in their adherence with the AAP ADHD guidelines. No charts indicated 100% adherence across all guidelines. Overall adherence among the present sample (14% to 96%) had a wider range than the rates self-reported by physicians in Rushton, Fant and Clark's study (39% to 78%; 2004). Adherence with evaluation guidelines in the present study was generally higher than rates self-reported in prior studies (Rushton, Fanton & Clark, 2004; Chan Hopkins, Perrin, Herrerias & Homer, 2005). No prior studies identified examined adherence across treatment guidelines, so the findings from the present study provides rates against which future studies may be compared. Compared with the rates of adherence with specific guidelines Epstein and colleagues (2008) found with chart reviews, the present study had more variable adherence rates with both evaluation and treatment guidelines.

There are several possible explanations for the differences between the present findings and the results of prior studies. These differences could represent sample to sample differences in

adherence. This divergence may represent the difference between objective and subjective reports of adherence, as self-reports may be less accurate. In addition, the present study did not utilize all guidelines, given that some could not easily be translated into an objective measure, so differences could indicate the difference in guidelines targeted.

Results of the present study indicate that on average, pediatricians were fairly knowledgeable about the AAP ADHD guidelines; however there continued to be some variability, with some pediatricians attaining near perfect scores on the Knowledge Questionnaire while others appear to be lacking key knowledge about evidence-based evaluation and treatment of ADHD. The majority of KQ's were completed prior to the release of the treatment guidelines. Thus, the present findings regarding knowledge may in part indicate a lack of availability of knowledge about best practices.

The present study found that neither pediatrician nor practice-level knowledge were significant predictors of any of the three types of adherence. This finding contrasts with the results of prior research on the AAP ADHD guidelines (Lanham, 2006), which suggests that increased familiarity was associated with better adherence. However, research examining the relationship between knowledge or familiarity and adherence with other CPG's is mixed, with some studies suggesting that familiarity or knowledge is associated with better adherence and other studies suggesting that familiarity with CPG's is not critical for adherence.

There are multiple possible explanations for the non-significance of knowledge as a predictor of adherence in the present study. First, the pediatricians in the current sample scored fairly high on the Knowledge Questionnaire, suggesting that they already knew the information covered in the guidelines. Another potential explanation is that perhaps the pediatricians in the present sample perceived that they "knew better" than the guidelines. That is, because they are

likely familiar with youth with ADHD and with evaluating and treating these youth, their actual practice may be based on their clinical experiences rather than on the best practice guidelines. Related to this, years of experience as a pediatrician may lead to variation in practice despite knowledge of best practices. Corresponding to the possible impact of experience, pediatricians may perceive themselves to have competence based on their experience, which may or may not be an accurate perception. Such perceptions could affect their openness to trying new or different practice behaviors, such as those outlined in the AAP ADHD guidelines. Thus, perhaps familiarity and experience—both with youth with ADHD and in terms of years of experience—and/or pediatricians' perception of their competence impacts the relationship between knowledge and adherence.

The present study also found that, with the exception of practice-level perceived barriers predicting adherence with treatment guidelines, pediatrician and practice attitudes were generally not significant predictors of adherence. This study is the first study identified that empirically examined the relationship between attitudes and adherence with the AAP ADHD guidelines. Research examining other CPG's has generally shown that more negative attitudes are associated with poorer adherence with guidelines.

Attitudes in the present study may have generally not predicted adherence for a variety of reasons. First, there may have been decreased variability in attitudes among the pediatricians sampled, as they had generally positive attitudes toward psychosocial care. It is likely the case that multiple other variables interact with attitudes to predict adherence. For example, while pediatricians or practices may have negative attitudes toward providing psychosocial care, their motivation and commitment may lead them to provide quality care despite these attitudes. Thus, perhaps additional pediatrician characteristics must be examined to fully understand the present

finding. Similarly, it could be that youth or family characteristics also play a key role in determining whether pediatrician attitudes predict adherence. For example, pediatricians may have positive attitudes toward providing psychosocial care and may be working with a patient with a complex presentation or whose family is unwilling or unable to follow-through with appointments or treatment recommendations, which could impact their adherence with evaluation and treatment guidelines.

Related to measurement, the attitudes measures utilized in the present study may have contributed to the non-significant findings. Although both the PBQ-R and PBS-R had adequate psychometrics and conformed to single factor structures, both assess a variety of attitudes. This contrasts with the majority of prior research examining the relationship between attitudes and adherence, which typically assessed only one type of attitudes. Thus, perhaps by assessing various types of attitudes within a given measure, the relationship between relevant attitudes and adherence was weakened.

Although no pediatrician level attitudes predicted adherence in the present study, higher practice-level perceived barriers were associated with poorer adherence with treatment guidelines. Examining the items endorsed by practices revealed that the most frequently cited barriers are external barriers, related to insufficient time, competing demands, having inadequate support and tools, and billing concerns. Internal barriers, such low motivation or knowledge, were less frequently cited by practices. This finding is consistent with the current findings that knowledge and attitudes are generally high in this sample. This suggests that the external barriers practices perceive may interfere with their adherence.

It is possible that those practices with higher perceived barriers have a different culture or different approach to providing psychosocial treatment. Treating youth with ADHD can be an

involved process that requires multiple follow-ups, collateral contacts and modifying treatment over time. This work can be time consuming and may not yield high reimbursements. In addition, some physicians may be less inclined to work with this population, given the behavioral problems that often coincide with ADHD.

While practices may screen and evaluate youth for ADHD, they may elect to refer these patients elsewhere for treatment based on perceived external barriers such as time, reimbursement, and availability of consulting mental health professions or internal barriers such as discomfort of office staff in dealing with patients with ADHD, lack of interest, or confusion about behavioral scales or treatment tools. Because of this, when patients with ADHD are treated by pediatricians in such practices, the pediatricians may be less able to provide care that is consistent with the AAP ADHD guidelines. Alternatively, it is possible that the perception of barriers is accurate; this would suggest that some practices have more barriers to providing better care and that these barriers impede the quality of treatment provided.

Adherence rates in the present study varied depending on the type of guideline, as did the prediction of adherence using multilevel modeling. With respect to the prediction of adherence, each final model was a unique combination of random and fixed effects. This makes sense, as evaluation and treatment and overall management of youth with ADHD each require a different set of skills. Descriptively, adherence was generally higher for evaluation guidelines than treatment guidelines.

These findings may be explained by the observation that the treatment guidelines are more complex and require more efforts than the evaluation guidelines. Although the evaluation guidelines indicate the need for collateral contacts, the use of assessment measures, and screening for comorbid conditions, which take additional time, the behavior needed to follow

these recommendations are fairly consistent across youth. This contrasts with the treatment guidelines, which may require different actions and follow-up depending on a variety of factors including characteristics of the youth, the youth's response to treatment, and the family's openness to and ability to try different treatments. In addition, pediatricians may be more experienced diagnosing ADHD than treating ADHD, since many pediatricians may do initial evaluations then subsequently refer youth to psychiatrists for psychopharmacology follow-up.

Although pediatrician demographic characteristics were not significant predictors of adherence within the present study, youth descriptive characteristics were. In particular, youth age and ADHD diagnosis were both significant predictors of overall adherence, while youth ADHD diagnosis predicted adherence with evaluation guidelines, and youth age predicted adherence with treatment. With respect to youth age, physicians were less adherent overall and with treatment guidelines for older youth. Given that onset of ADHD symptoms is in early childhood, pediatricians are likely more familiar and experienced in evaluating and treating younger children with ADHD. In addition, the presentation of ADHD can vary across time, causing differences in the most prominent symptoms. Accordingly, pediatricians may be more comfortable with management strategies for younger children. Additional concerns may impact pediatrician behavior and lead to them deviating from the AAP ADHD guidelines. For example, because adolescents have more involvement in their own treatment, they may be less tolerant of multiple medication trials or of side effects, which may impact pediatrician adherence. In addition, pediatricians may not prescribe the recommended first-line medications, due to developmental changes or concerns about possible medication abuse among adolescents.

The present findings regarding youth diagnosis significantly predicting pediatrician overall and evaluation adherence make sense in the context of pediatricians' typical practice.

Diagnosis likely feels more straightforward for youth with ADHD Hyperactive-Impulsive Type than for youth with Inattentive or Combined Types. This is because children presenting with Hyperactive-Impulsive Type often have symptoms that are more easily observable. Because of this, pediatricians may be more likely to deviate from the AAP guidelines by taking short-cuts or skipping steps, because the child "appears" to have ADHD. Similarly, the overall process of managing a youth with ADHD may seem more straight-forward for youth with Hyperactive-Impulsive Type, leading pediatricians to utilize their typical practice and not rely on the AAP ADHD guidelines. For youth with Inattentive or Combined Types, pediatricians may be more likely to want or feel like they need additional support and information obtained by following the guidelines, as these youth have a more complex presentation.

There was no effect of wave of data collection on prediction of adherence, suggesting that time did not impact pediatricians and practices. This is notable, given that wave two charts were collected several years after the release of the AAP ADHD guidelines, and pediatricians would have potentially had ample opportunity to learn about and incorporate the guidelines into their practice. In addition, the lack of wave effect is important given that charts were collected following (or for early pre-intervention charts concurrent with) the dissemination of the AAP ADHD guidelines.

The current study was the first to use multilevel modeling to examine the relationship between pediatrician and practice level predictors and pediatrician adherence with the AAP ADHD guidelines. This analysis method ensured that systematic variation between pediatricians and practices was accounted for, while allowing for inspection of the effects of predictor variables at multiple levels. Results suggest that there is significant variation between pediatricians. In addition, this study was the first to examine a combination of youth, pediatrician

and practice level predictor variables to attempt to explain pediatrician adherence with these guidelines. Practice level and youth characteristics in conjunction with pediatrician clustering predicted adherence. However, counter to expectations, in the present study, knowledge and attitudes did not generally contribute to the prediction of adherence, with the exception of practice level perceived barriers predicting treatment adherence.

One limitation in the present study is related to measurement. Although utilizing chart audit data provided a more objective measure of adherence, not all guidelines could be included, which could have impacted the present results. More importantly, although the chart audit captures the actions pediatricians are taking that are consistent with the guidelines, it does not account for the actions pediatricians take that are inconsistent with the guidelines. Thus, it is be possible that pediatricians in the present sample are engaging in clinical practices that are not recommended. To this effect, several studies examining the AAP ADHD guidelines found that physicians frequently used response to a trial of stimulant medication to assist in evaluating patients for ADHD (Daly, Rasmussen, Agerter & Cha, 2006; Lanham, 2006). In addition, multiple studies have found that physicians routinely use other laboratory tests in evaluating youth for ADHD, counter to the AAP ADHD guidelines (Chan, Hopkins, Perrin, Herrerias & Homer, 2005; Rushton, Fant & Clark, 2002).

An additional measurement related concern is that although there was variation in attitudes scores, pediatricians in the present study had generally positive attitudes. By somewhat restricting the variability in attitudes, the predictive power of attitudes may have been constricted. It will be important to examine the attitudes of physicians in further studies, to determine whether their attitudes are as positive or if it is tied either to the current sample or measures utilized.

Another limitation is related to the sample of physicians used. All studies identified examining the AAP ADHD guidelines target physicians in a given community, and the present study continues this trend. In addition, pediatricians at independent practices made up the current sample. These pediatricians may have different knowledge, attitudes, and practice behaviors from pediatricians in hospitals and academic settings. Finally, pediatricians are generally better at following CPG's than family physicians, which has been documented in the general literature on CPG's (e.g., Cheng et al., 1996; Pathman et al., 1996) as well as in the literature on the AAP ADHD guidelines (Rushton, Fant & Clark, 2002).

Despite these limitations, the present study extends the literature on adherence guidelines in general and on adherence with the AAP ADHD guidelines in particular. Findings suggest that the sample had generally high knowledge and positive attitudes, and knowledge and attitudes were generally not significant predictors of adherence. The primary study's knowledge-based intervention for adherence showed a non-significant effect. In addition, the dissemination of the guidelines alone by publishing them did not appear to change pediatrician behavior, given that pediatricians in the sample continued to demonstrate variable adherence well after the release of the guidelines. Taken together, these findings suggest that pursuing additional research on knowledge and attitudes may not be a helpful avenue. However, further research is needed to help establish what is driving physician adherence behaviors.

The significance of practice-level perceived barriers as predictors of treatment adherence suggests that they are an important area to explore in future research. Further assessing perception and experience of barriers, particularly external barriers, may be helpful in identifying practices in need of support or intervention. Interventions focused on overcoming external barriers may be more likely to have a significant impact than those targeting knowledge and

attitudes, however it may be difficult to intervene on external barriers, given that they largely represent systemic issues impacting health care treatment (e.g., time for office visits, reimbursement rates).

Because prediction models differed by type of adherence, different types of interventions may be helpful at improving overall management versus evaluation adherence versus treatment adherence. Targeting treatment adherence may be most beneficial, given that adherence with treatment guidelines was generally lower than adherence with evaluation guidelines in the current study as well as in prior research. Understanding which aspects of the treatment guidelines physicians are less adherent with would be helpful in guiding such interventions.

The present study suggests that pediatricians may be less likely to engage in best practices for youth who are older or who have ADHD Hyperactive-Impulsive Type. It will be important to do additional research to understand the meaning of lower adherence with these youth. It may be helpful to provide additional supports for pediatricians, to ensure that they are able to provide quality services across development and diagnoses. However, this will depend on whether deviations from the guidelines are found to indicate problematic practices.

Although significant prediction models were developed for each type of adherence in the present study, there remained a significant amount of variation in adherence that was not accounted for by study variables. This suggests the need for further multilevel research to fully understand what is contributing to pediatrician adherence. Including new predictors in these multilevel models, such as variables related to pediatrician experience or motivation and commitment to providing quality care, will help determine whether they moderate the relationship between knowledge or attitudes and adherence.

In conclusion, this study examined the relationship between pediatrician and practice level knowledge and attitudes and pediatrician adherence with the AAP ADHD guidelines. Although results did not support the relationship between knowledge and adherence, practice level perceived barriers to providing better ADHD care was predictive of adherence with treatment guidelines. In addition, youth age and diagnosis were significant predictors of adherence. This study highlights the importance of examining variables at each level of the data to help establish what contributes to pediatrician behavior.

Appendix A: Pediatrician Background Questionnaire

Pediatrician Knowledge of the AAP Guidelines

Knowledge Questionnaire

Pediatrician Attitudes

Perceived Barriers Questionnaire

Physician Belief Scale

Knowledge Questionnaire

The following questions ask about your knowledge of best practices when evaluating and treating ADHD.

1. How many subtypes of ADHD are there?

Circle only one

One 1
Two 2
Three 3
Four 4
Don't know 88

2. To be diagnosed with ADHD – hyperactive/impulsive subtype, how many positive symptoms must a child have?

Circle only one

At least 6 of 9 1
All 9 2
At least 6 of 18 3
At least 4 of 9 4
Don't know 88

3. True or false, pediatricians should screen children for the following conditions when evaluating children for ADHD?

	True	False	Don't know
a. Oppositional defiant disorder	1	0	88
b. Conduct disorder	1	0	88
c. Anxiety disorder	1	0	88
d. Depressive disorder	1	0	88
e. Learning disabilities	1	0	88
f. Language disabilities	1	0	88
g. Tic disorders	1	0	88
h. Pervasive developmental disorders	1	0	88
i. Psychotic disorders	1	0	88
j. Motor disabilities	1	0	88
k. High lead levels	1	0	88
l. Abnormal electrical brain activity	1	0	88
m. Hyperthyroidism	1	0	88
n. Bipolar disorder	1	0	88
o. Age-appropriate behaviors in active children	1	0	88

4. True or false …	**True**	**False**	**Don't know**
a. Pediatricians should obtain information directly from classroom teachers when evaluating a child for ADHD.	1	0	88
b. The DSM-IV outlines 20 symptoms that define ADHD.	1	0	88
c. Child must exhibit functional impairment in two or more settings to diagnose ADHD.	1	0	88
5. True or false, the treatment plan …	**True**	**False**	**Don't know**
a. should target improvement in core symptoms.	1	0	88
b. should target improvement in functioning.	1	0	88
c. needs to be monitored once the child is stabilized on medication	1	0	88
d. should be developed with the pediatrician, parents and patient working together.	1	0	88
e. should target child's social relationships.	1	0	88
f. should target academic performance.	1	0	88
g. should include educating parents about the chronic nature of ADHD.	1	0	88
6. True or false, the following behavior therapies are effective treatments for ADHD.	**True**	**False**	**Don't know**
a. positive reinforcement.	1	0	88
b. time out.	1	0	88
c. response cost.	1	0	88
d. token economy programs.	1	0	88
7. True or false, the following are appropriate targets for behavior management.	**True**	**False**	**Don't know**
a. completion of assignments.	1	0	88
b. increased on-task behavior.	1	0	88
c. diminishing disruptive behavior.	1	0	88
d. oppositional behavior.	1	0	88
e. conforming to home and school rules.	1	0	88
8. True or false, in long-term use stimulant medications …	**True**	**False**	**Don't know**
a. can be stopped when children enter puberty.	1	0	88
b. improve children's functioning.	1	0	88
c. can stunt growth.	1	0	88
d. have a permanent effect on the brain.	1	0	88
e. are frequently stopped because the patient develops tolerance.	1	0	88
9. True or false …	**True**	**False**	**Don't know**
a. Short and long-acting methylphenidate, short- and long-acting Dexedrin and mixed amphetamine salts can equally be recommended for treatment.	1	0	88

9. True or false …	**True**	**False**	**Don't know**
b. When treating with stimulants, serologic or hematological monitoring should be done.	1	0	88
c. Adverse effects of stimulants are usually mild, short lived and easily treated by adjusting dose or schedule of medication.	1	0	88
d. Permanent slowing of growth velocity is a side effect when children are treated with stimulant medications.	1	0	88
e. Pemoline should not be a first line treatment because of potential fatal hepatotoxicity.	1	0	88
f. Desipramine and Bupropion are supported for treating ADHD but only after two trials of stimulant medication have failed.	1	0	88
g. During medication titration weekly feedback from parents is recommended.	1	0	88
h. During medication titration weekly feedback from classroom teacher(s) is recommended.	1	0	88
i. The best dose for stimulant medication is achieved when symptoms are eliminated to a maximal degree with minimal side effects.	1	0	88
j. Children who are treated with stimulants usually have the best response to the first dose prescribed.	1	0	88
k. Behavioral therapy may be needed to manage core ADHD symptoms but is not helpful for co-occurring symptoms.	1	0	88
l. Monitoring long-term treatment requires direct input from teachers.	1	0	88
m. Since the response to medication is stable during school aged years there is no need to continually reassess the child.	1	0	88
n. An office visit every 12 months is adequate for monitoring after a child has stabilized.	1	0	88
10. True or false, during medication refills the pediatrician should document …	**True**	**False**	**Don't know**
a. child's adherence to regimen.	1	0	88
b. medication side effects.	1	0	88
c. improvement in targeted behaviors.	1	0	88
d. improvement in core ADHD behaviors.	1	0	88
e. improvement in behavior in general.	1	0	88
f. child's academic performance.	1	0	88
g. child's functioning in home.	1	0	88
h. child's interpersonal relationships.	1	0	88
i. changes in child's appetite.	1	0	88
j. child's weight.	1	0	88
k. child's height.	1	0	88

Perceived Barriers Questionnaire

Over the past 12 months, how frequently did the following issues prevent you from providing better care to children who were being assessed or treated for ADHD?	**Never**	**Rarely**	**Some-times**	**Usually**	**Always**
a. Not enough time during the office visit to address ADHD	0	1	2	3	4
b. Other medical/behavioral conditions take precedence over ADHD	0	1	2	3	4
c. A lack of sound scientific evidence to support clinical decisions	0	1	2	3	4
d. Low reimbursement rates	0	1	2	3	4
e. Confusion on how to bill for assessing and/or treating ADHD	0	1	2	3	4
f. Few qualified mental health providers available for consultations	0	1	2	3	4
g. My office staff is uncomfortable dealing with ADHD	0	1	2	3	4
h. Lack of personal/professional interest in ADHD	0	1	2	3	4
i. Insufficient personal/professional knowledge and skills about ADHD	0	1	2	3	4
j. Confusion about how to use behavioral rating scales	0	1	2	3	4
k. Lack of practical tools to assess ADHD	0	1	2	3	4
l. Lack of practical tools to treat ADHD	0	1	2	3	4

Physician Belief Scale

The following questions ask about your feelings when addressing children's behavioral health issues in general.

How much do you agree or disagree with the following statements about providing psychosocial care to your patients?	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
a. My patients and/or their parents/caregivers do not want me to investigate psychosocial problems.	1	2	3	4	5
b. I cannot help patients with problems I have not experienced myself.	1	2	3	4	5
c. If I address psychosocial issues, patients will reject these issues and never return.	1	2	3	4	5
d. Exploring psychosocial issues with the patient often causes me pain.	1	2	3	4	5
e. Evaluating and treating psychosocial problems will cause me to be more overburdened than I already am.	1	2	3	4	5
f. I feel guilty probing the psychosocial concerns of my patients.	1	2	3	4	5
g. The psychosocial problems we all experience do not significantly influence the onset or course of disease.	1	2	3	4	5
h. One reason I do not consider information about psychosocial problems is the limited time I have available.	1	2	3	4	5
i. Patients will become more dependent on me if I raise psychological concerns.	1	2	3	4	5
j. There are so many issues to be investigated when seeing a patient that I do not always consider psychosocial factors.	1	2	3	4	5
k. Investigating issues of psychosocial problems decreases my efficiency.	1	2	3	4	5
l. I cannot help a patient with a psychosocial problem that I have not resolved myself.	1	2	3	4	5
m. I focus on organic disease because I cannot treat psychosocial problems.	1	2	3	4	5
n. I find great satisfaction in treating psychosocial problems in patients in my practice.	1	2	3	4	5
o. I believe most psychosocial interventions are not effective.	1	2	3	4	5

Appendix B: Pediatrician Chart Audit

Summary Chart Audit Form

AAP ADHD Recommendations Included in Chart Audit and Rationale

Date of Audit: **SUMMARY CHART AUDIT** **Auditor's ID #:**

1. How many pages were copied from the chart?

2. What is the date of ADHD diagnosis or start of ADHD medication?

____/____/____ Month / Day / Year (Unknown=88)

A. FAC Dx Start date: ____/____/_____ or N/A
B. Date Copied: ___/___/____; Mos Dx-Copy __

3. Pediatrician's Diagnosis:

ADHD Unspecified Subtype **……..**…1
314.01 ADHD, Hyperactive/Impulsive……..2
314.00 ADHD, Inattentive……..3
314.01 ADHD, Combined…….....4
314.9 ADHD Not Otherwise Specified…..…6
Other: _____.....5

4. What is the child's birth date?

___/___/___ Month / Day / Year (Unknown=88)
A. Age at Dx:

5. What is the child's gender?

Female.....0
Male.....1
Unknown – not able to tell from chart…….88

6. From reviewing the medical record, what is the child's ethnicity/race?

Circle all that apply

African American/Black.....1
Caucasian/ White.....2
American Indian and Alaska Native.....3
Asian.....4
Native Hawaiian or Other Pacific Islander.....5
Other (*Specify*) _____.....6
Unknown- unable to tell from chart.....8

7. From reviewing the medical record, is the child of Spanish or Hispanic origin?

Yes.....….1
No.....….0
Unknown – unable to tell from chart….8

8. After you have reviewed the medical record, please rate the overall legibility of the materials in the chart.

Circle only one

Poor (can read < 25%).....0
Challenging (can read 26% to 50%).....1
Fair (can read 51% to 75%).....2
Excellent (can read 76% or more).....3
Variable.....4

9. <u>Evaluation/Diagnosis phase:</u> Base assessment process on the need to document DSM-IV criteria.

A. Did the pediatrician document presence/absence of <u>all</u> 18 behavioral symptoms outlined in DSM-IV through interview, behavior rating scale or psycho-educational report?					**YES**	**NO**	**UK**
B. Did MD meet DSM-IV guidelines regarding symptoms?					**YES**	**NO**	**UK**
1) Makes careless mistakes	**Yes**	**No**	**SU**	**NM**			
2) Difficulty sustaining attention	**Yes**	**No**	**SU**	**NM**			
3) Seems not to listen	**Yes**	**No**	**SU**	**NM**			
4) Fails to finish tasks	**Yes**	**No**	**SU**	**NM**			
5) Difficulty organizing	**Yes**	**No**	**SU**	**NM**			
6) Avoids tasks requiring sustained attention	**Yes**	**No**	**SU**	**NM**			
7) Loses things	**Yes**	**No**	**SU**	**NM**			
8) Easily distracted	**Yes**	**No**	**SU**	**NM**			
9) Forgetful	**Yes**	**No**	**SU**	**NM**			
10) Fidgety	**Yes**	**No**	**SU**	**NM**			
11) Unable to stay seated	**Yes**	**No**	**SU**	**NM**			
12) Moves excessively (restless)	**Yes**	**No**	**SU**	**NM**			
13) Can not play quietly	**Yes**	**No**	**SU**	**NM**			
14) "On the go"	**Yes**	**No**	**SU**	**NM**			
15) Talks excessively	**Yes**	**No**	**SU**	**NM**			
16) Blurts out answers	**Yes**	**No**	**SU**	**NM**			
17) Difficulty awaiting turn	**Yes**	**No**	**SU**	**NM**			
18) Interrupts/intrudes upon others	**Yes**	**No**	**SU**	**NM**			
C. Scales used, but not included_____							
D. Functional impairment in at least two settings	**TP**				**YES**	**NO**	
Impaired functioning in <u>home</u> setting?	**Yes**	**No**	**NM**		*Need 2 of 3* }		
Impaired functioning in <u>school</u> setting?	**Yes**	**No**	**NM**				
Impaired functioning in <u>other</u> setting?	**Yes**	**No**	**NM**				
Impaired functioning in MD office or during psych evaluation?	**Yes**	**No**	**NM**				
Impaired functioning in unspecified setting?	**Yes**	**No**					
E. Were impairing behavioral symptoms present before the age of 7 years?	**TP**	**YES**	**NO**		**N/M**		
F. Were impairing behavioral symptoms present for at least 6 months before diagnosis/treatment?	**TP YES**	**NO**			**N/M**		

10. Evaluation/Diagnosis phase: Pediatricians should obtain information about the DSM-IV criteria directly from multiple informants, including but not limited to parent/care giver and classroom teacher.

A. Any information relevant to DSM-IV criteria collected directly from family?		**YES**	**NO**	**UK***	
1) Does medical record contain written communication (letter, email, note, behavior rating scale, forms, behavior report card, etc.) from parent/caregiver/family?	**Yes**	**a) o**	**b) K**	**OR**	
2) Does medical record contain verbal communication with parent/caregiver/family (phone call, attending meeting)?	**Yes**	**c) o**	**d)**	*OR*	
3) Other (*Describe)*_____	**Yes**	**e) o**	**f) K**	**g)**	
B. Any information relevant to DSM-IV criteria collected from classroom teacher?	**N/A**	**YES**	**NO**	**UK***	
1) Does medical record contain written communication (letter, email, note, behavior rating scale, forms, behavior report card, etc.) from teacher?	**Yes**	**h) o**	**N/A**	**U K**	*OR*
2) Does medical record contain verbal communication with teacher (phone call, attending meeting)?	**Yes**	**i) o**	**N/A**		*OR*
3) Does medical record contain copy of grades or sample of school work?	**Yes**	**j) o**	**N/A**	**U K**	*OR*
4) Other (*Describe)* _____	**Yes**	**k) o**	**N/A**	**U K**	OR
C. Pediatrician considers information from other professionals (e.g., school counselor, nurse) and/or psycho-educational testing when evaluating children for ADHD.		**YES**		**NO**	
1) Medical record contains unstructured written communication from professional other than classroom teacher (psychologist, counselor, nurse, etc.)	**Yes**	**l)**	**No**	**OR**	
2) Medical record contains structured written communication (report, scales, form, etc.) from professional other than classroom teacher?	**Yes**	**m)**	**No**	**OR**	
3) Medical record contains documentation about verbal communication (phone call, attending meeting) with professional other than classroom teacher?	**Yes**	**n)**	**No**	**OR**	
4) Other (*Describe*) _____	**Yes**	**o)**	**No**		
D. Any information relevant to DSM-IV criteria collected from someone not included in 10A-C?	**YES**		**NO**		
Describe_____					

11. <u>Evaluation/Diagnosis phase:</u> Pediatricians should screen children for common co-morbid conditions and potential alternative diagnoses

A. Documentation indicates pediatrician screened for <u>any alternative explanations for the ADHD symptoms</u> (Pervasive developmental disorder, hearing or vision problems, psychotic disorder, motor disabilities, family violence, age-appropriate behaviors in active children)	**Yes**	**No**	**UK***
B. Documentation indicates pediatricians may screen for co-morbid conditions (ODD, CD, Anxiety, Depressive disorder, Learning disabilities, Language disabilities, Tics)with <u>behavioral rating scales</u> or <u>structured/semi-structured interviews that focus on DSM-IV criteria</u> for the co-morbid conditions.	**Yes**		**NO**
1) Medical record contains behavior-rating scale(s) that screens for behaviors associated with co-morbid conditions.	**Yes**	**No**	**O**
2) Medical record contains documentation about co-morbid conditions	**Yes**	**No**	**O**
3) Medical record contains report(s) from other professional (psychologist, counselor, behavioral developmental pediatrician, or psychiatrist) that indicates co-morbid conditions have been screened for.	**Yes**	**No**	**O**
4) Medical record indicates the school has evaluated for co-morbid conditions	**Yes**	**No**	
C. Pediatricians should consider referring child to mental health clinician if child exhibits co-morbid conditions and/or differential diagnosis is a complex process			
1) Child referred to mental health specialist	**Yes**	**No**	

12. <u>Treatment phase:</u> The clinician should recommend stimulant medication and/or behavior therapy, as appropriate, to improve target outcomes in children with ADHD (if more than 3 ADHD meds, use an Additional Medication Form).

A. Does documentation indicate physician/staff prescribed/ provided behavior therapy?		**Yes**	**No**		
B. Does documentation indicate child taking stimulant medication? *(if no, skip to #13)*		**Yes**	**No**		
Medication 1: _____ Start date:_____ Stop date: _____PRN? _____	*Is there Med 1?*	**Yes**	**No**		
C1) Documentation indicates <u>side effects</u> were <u>screened for</u>		**Yes**	**No**	**NA**	
C2) Documentation indicates <u>side effects</u> were <u>present</u>		**Yes**	**No**	**NA**	<2 wks & cut off?
C3) Documentation indicates <u>functioning/ADHD behaviors</u> were <u>screened</u>		**Yes**	**No**	**NA**	
C4) Documentation indicates <u>improvement</u> in <u>functioning/ ADHD behaviors</u>	**Mixed**	**Yes**	**No**	**NA**	
C5) Documentation indicates <u>dosage/frequency</u> was changed while on this drug		**Yes**	**No**	**NA**	
Medication 2: _____ Start date:_____ Stop date: _____PRN? _____	*Is there Med 2?*	**YES**	**NO**		
D1) Documentation indicates <u>side effects</u> were <u>screened for</u>		**Yes**	**No**	**NA**	
D2) Documentation indicates <u>side effects</u> were <u>present</u>		**Yes**	**No**	**NA**	<2 wks & cut off?
D3) Documentation indicates <u>functioning/ADHD behaviors</u> were <u>screened</u>		**Yes**	**No**	**NA**	
D4) Documentation indicates <u>improvement</u> in <u>functioning/ADHD behaviors</u>	**Mixed**	**Yes**	**No**	**NA**	
D5) Documentation indicates <u>dosage/frequency</u> was changed while on this drug		**Yes**	**No**	**NA**	
Medication 3: _____ Start date:_____ Stop date: _____PRN? _____	*Is there Med 3?*	**YES**	**NO**		
E1) Documentation indicates <u>side effects</u> were <u>screened for</u>		**Yes**	**No**	**NA**	
E2) Documentation indicates <u>side effects</u> were <u>present</u>		**Yes**	**No**	**NA**	<2 wks & cut off?
E3) Documentation indicates <u>functioning/ADHD behaviors</u> were <u>screened</u>		**Yes**	**No**	**NA**	
E4) Documentation indicates <u>improvement</u> in <u>functioning/ADHD behaviors</u>	**Mixed**	**Yes**	**No**	**NA**	
E5) Documentation indicates <u>dosage/frequency</u> was changed while on this drug		**Yes**	**No**	**NA**	

13. <u>Treatment phase:</u> Primary care clinicians should establish a management program that recognizes ADHD as a chronic condition.

Provide care consistent with the principles of any chronic condition				**YES**	**NO**
1) Documentation indicates MD/staff assessed family's knowledge of ADHD on a date after diagnosis and/or beginning of treatment.	**Yes**	**No**	*AND*	}	
2) Documentation indicates MD/staff counseled any family member about their response to child's condition.	**Yes**	**No**	*AND*		
3) Documentation indicates MD/staff educated child about ADHD on a date after diagnosis and/or start of treatment (e.g., stimulants, therapy).	**Yes**	**No**	*AND*		
4) Documentation indicates MD/family set specific treatment goals.	**Yes**	**No**	*AND*		
5) Documentation indicates MD/staff provided families with information on how to contact support groups/families with children.	**Yes**	**No**			

Providing the family with information on the etiology of ADHD, treatment, long-term outcomes, and effects on daily life and family activities.				**YES**	**NO**
1) Documentation indicates any family member (e.g. parents, siblings, child) educated about the causes of ADHD on a date after the diagnosis of ADHD and/or start of stimulant medication?	**Yes**	**No**	*OR*	}	
2) Documentation indicates any family member educated about treatments (stimulant medication, therapy, classroom modifications, etc.) for ADHD.	**Yes**	**No**	*OR*		
3) Documentation indicates any family member educated about the effects of ADHD on child's daily life activities (can incl. info related to school).	**Yes**	**No**	*OR*		
4) Documentation indicates any family member educated about the effects of child's ADHD behaviors on family activities.	**Yes**	**No**			

14. <u>Treatment phase:</u> The clinician should periodically provide a systematic follow-up for the child with ADHD. Monitoring should be directed to target outcomes and adverse effects by obtaining specific information from parents, teachers, and the child.

A.	**Monitoring efforts are documented**				**YES**	**NO**
1)	Documentation shows monitoring of at least one behavior targeted for treatment.	**Yes**	**No**	**N/A**		
2)	Documentation contains information about child's school functioning	**Yes**	**No**	*AND*		
3)	Documentation indicates child's functioning and/or presence/absence of 18 ADHD behavioral symptoms were evaluated at least once after diagnosis.	**Yes**	**No**	*AND*	}	
4)	Documentation outlines medication name, dosage, and frequency of administration.	**Yes**	**No**	**NA**		
5)	Documentation indicates side effects were evaluated at least once after stimulants started.	**Yes**	**No**	**NA**		
B.	**Monitoring should include a system for communication among parent, child and clinician with periodic direct contact with teacher or other school personnel before follow-up visit.**				**YES**	**NO**
1)	Documentation indicates communication (e.g., letters, scales, in office visit, phone calls) w/ parents at least once since ADHD diagnosis and/or start of treatment.	**Yes**	**No**	*AND*		
2)	Documentation contains communication with child at least once since ADHD diagnosis and/or start of treatment.	**Yes**	**No**	*AND*		
3)	Documentation contains communication with classroom teacher at least once since diagnosis and/or start of treatment.	**Yes**	**No**	*OR*	}	
4)	Documentation contains communication with other school personnel besides classroom teacher at least once since diagnosis and/or start of treatment.	**Yes**	**No**			
C.	**Monitoring plan should consider normal developmental changes in behavior over time, educational expectations, and dynamic nature of child's school and home environments**				**YES**	**NO**
1)	Documentation indicates MD/staff knew child's grade level after ADHD diagnosis and/or start of treatment	**Yes**	**No**	*OR*		
2)	Documentation indicates MD/staff asked about changes in child's school or home environment at least once after ADHD diagnosis and/or start of stimulant medication.	**Yes**	**No**		}	

14. **<u>Treatment phase:</u> The clinician should periodically provide a systematic follow-up for the child with ADHD. Monitoring should be directed to target outcomes and adverse effects by obtaining specific information from parents, teachers, and the child.**

D.	**Once child is stable an office visit every 3 to 6 months allows for assessment of learning and behavior.**			**NA**	**YES**	**NO**
1)	Documentation indicates MD/staff evaluated <u>weight AND height</u> and/or <u>growth velocity</u> at least every 6 months since start of medication treatment for ADHD.	**Yes**	**No**	**NA**	*AND*	
2)	Documentation indicates MD/staff evaluated functioning in school at least every 6 months since ADHD diagnosis and/or start of treatment	**Yes**	**No**	**NA**	*AND*	
3)	Documentation indicates MD/staff evaluated interpersonal relationships at least every 6 months since ADHD diagnosed and/or start of treatment	**Yes**	**No**	**NA**	*AND*	
4)	Documentation indicates MD/staff obtained updates from school personnel at least every 6 months since ADHD diagnosis and/or start of treatment.	**Yes**	**No**	**NA**		

AAP ADHD Guidelines and PPP

	AAP Assessment and Diagnosis Recommendation	Included in Chart Audit?	Rationale
1	In a child 6 to 12 years old who presents with inattention, hyperactivity, impulsivity, academic underachievement, or behavior problems, primary care clinicians should initiate an evaluation for ADHD.	NO	Not suitable for current sample
2	The diagnosis of ADHD requires that a child meet DSM-IV criteria.	YES	
3	The assessment of ADHD requires evidence directly obtained from parents or caregivers regarding the core symptoms of ADHD in various settings, the age of onset, duration of symptoms, and degree of functional impairment.	YES	
3a	Use of these (parent-report ADHD-specific) scales is a clinical option when evaluating a child for ADHD.	YES	
3b	Use of (parent-report) broad-band scales is not recommended in the diagnosis of ADHD, although they maybe useful for other purposes.	NO	Cannot determine helpfulness or relevance of broad-band scales Many broad-band scales may incorporate ADHD symptoms
4	The assessment of ADHD requires evidence directly obtained from the classroom teacher (or other school professional) regarding the core symptoms of ADHD, the duration of symptoms, the degree of functional impairment, and the coexisting conditions. A physician should review any reports from a school-based multidisciplinary evaluation where they exist, which will include assessments from the teacher or other school-based professional.	YES	
4a	Use of these (teacher-report ADHD-specific) scales is a clinical option when diagnosing a child for ADHD.	YES	
4b	Use of teacher global questionnaires and rating scales is not recommended for the diagnosis of ADHD, although they maybe useful for other purposes.		
5	Evaluation of the child with ADHD should include assessment for coexisting conditions.	YES	
6	Other diagnostic tests are not routinely indicated to establish the diagnosis of ADHD.	NO	Cannot determine whether diagnostic tests were unnecessary- do not understand the whole context of the case

AAP ADHD Guidelines

	AAP Treatment Recommendation	Included in Chart Audit?	Explanation
1	Primary care clinicians should establish a management program that recognizes ADHD as a chronic condition.	YES	
2	The treating clinician, parents, and the child, in collaboration with school personnel, should specify appropriate target outcomes to guide management.	YES	
3	The clinician should recommend stimulant medication and/or behavior therapy, as appropriate, to improve target outcomes in children with ADHD.	NO	Cannot determine appropriateness of treatment plan or treatment Can evaluate whether pediatricians are using specific components as recommended (e.g., when stimulants are used, establishing whether they titrate)
3a	For children on stimulants, if one stimulant does not work at the highest feasible dose, the clinician should recommend another.	YES	
4	When selected management for a child with ADHD has not met target outcomes, clinicians should evaluate original diagnosis, use all appropriate treatments, adherence to the treatment plan, and presence of coexisting conditions.	NO	Difficult to determine when child is not meeting outcomes and the re-evaluation process
5	The clinician should periodically provide a systematic follow-up for the child with ADHD. Monitoring should be directed to target outcomes and adverse effects by obtaining specific information from parents, teachers, and the child.	YES	

Appendix C: Power Analysis

Description of Power Analysis

Figure 1: Power analysis for the present study

Power Analysis

Because the data are nested and multilevel modeling (MLM) was used to analyze the data, a Cohen-based power analysis would likely yield an inaccurate estimate of the power. Thus, the Optimal Design software for longitudinal and multilevel data was used to obtain a power estimate (Spybrook, Raudenbush, Liu & Congdon, 2006). Since the data are from an existing data set on which preliminary analyses were conducted, intraclass correlations (ICC's) for the physician (ICC = .07) and practice (ICC = .14) were available (Lambert, 2006). Using the ICC's, the cluster size (number of charts per physician = 10), the number of clusters per site (number of physicians per site = 4) and the number of sites (number of practices = 22), the power was calculated. Cohen's recommended power of .80 was used, to attempt to balance Type I and Type II errors (Cohen, 1992).

As shown in Figure 1, the minimum detectable effect at .80 power is about 0.44. Following Raudenbush's practice (personal communication, March 27, 2006), an additional power calculation was conducted, estimating additional covariate that explains 60% of variation within the outcome. Based on this analysis, the minimum detectable effect at .80 power is about 0.37. These power calculations represent best and worst case scenarios and suggest that the present study has adequate power to detect a small-to-medium sized effect. Given this, the main analyses were conducted.

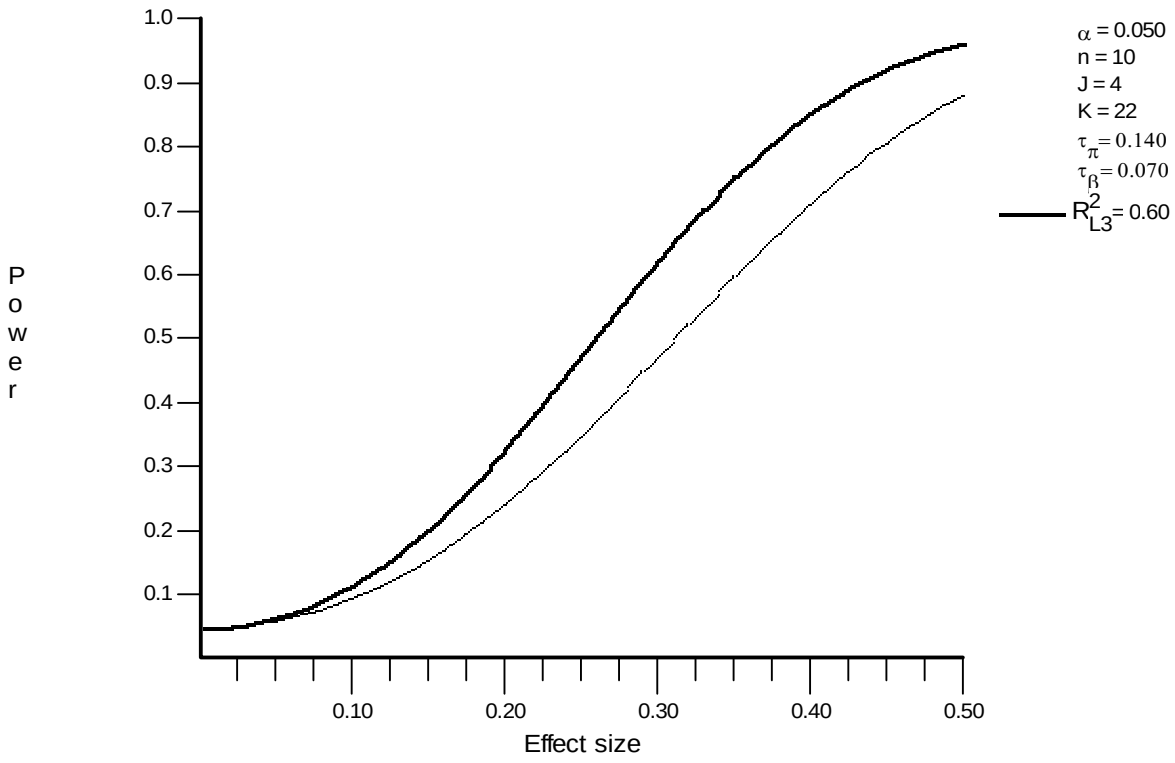

Figure 1. *Power analysis for the present study.*

Appendix D: Distribution of Adherence Scores

Figure 2: Overall adherence with AAP ADHD guidelines across charts

Figure 3: Adherence with AAP ADHD evaluation guidelines across charts

Figure 4: Adherence with AAP ADHD treatment guidelines across charts

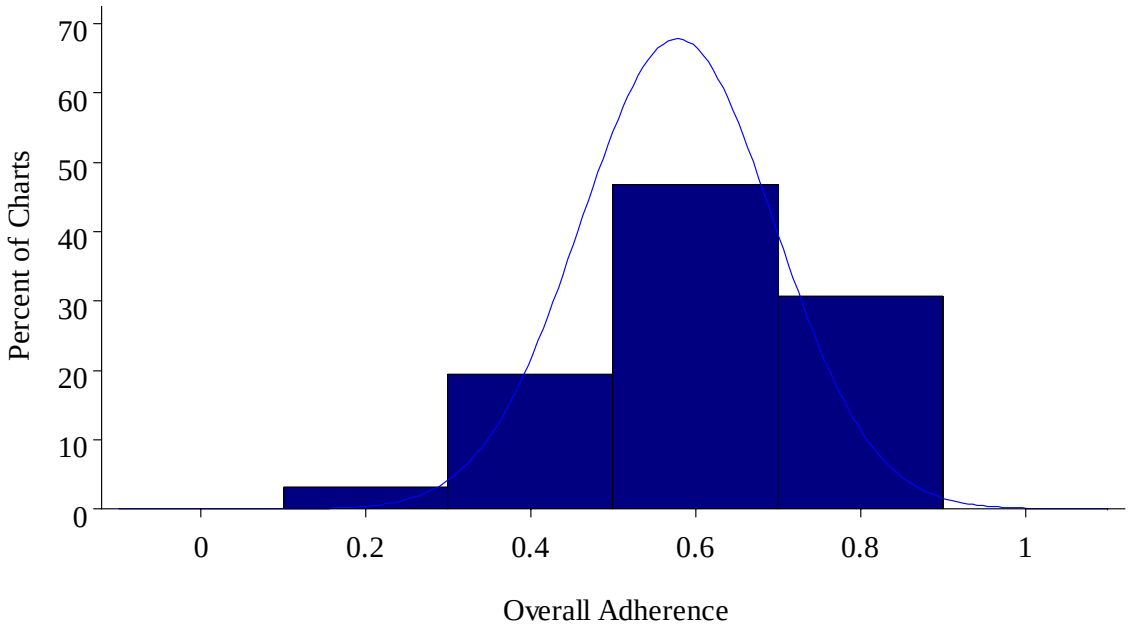

Figure 2: *Overall adherence with AAP ADHD guidelines across charts*

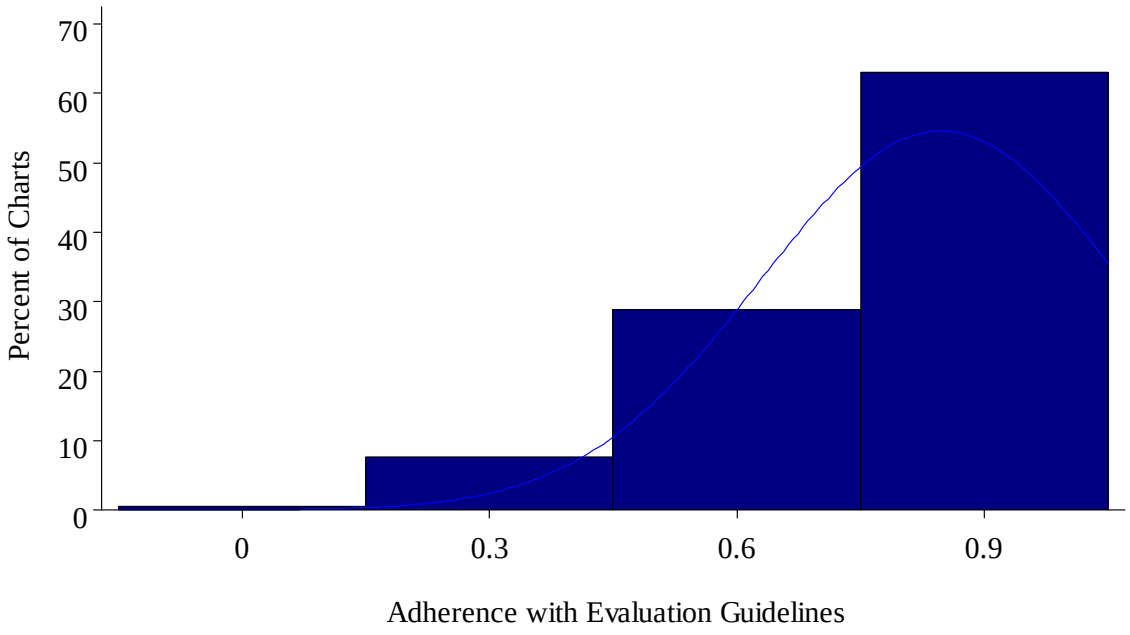

Figure 3: *Adherence with AAP ADHD evaluation guidelines across charts*

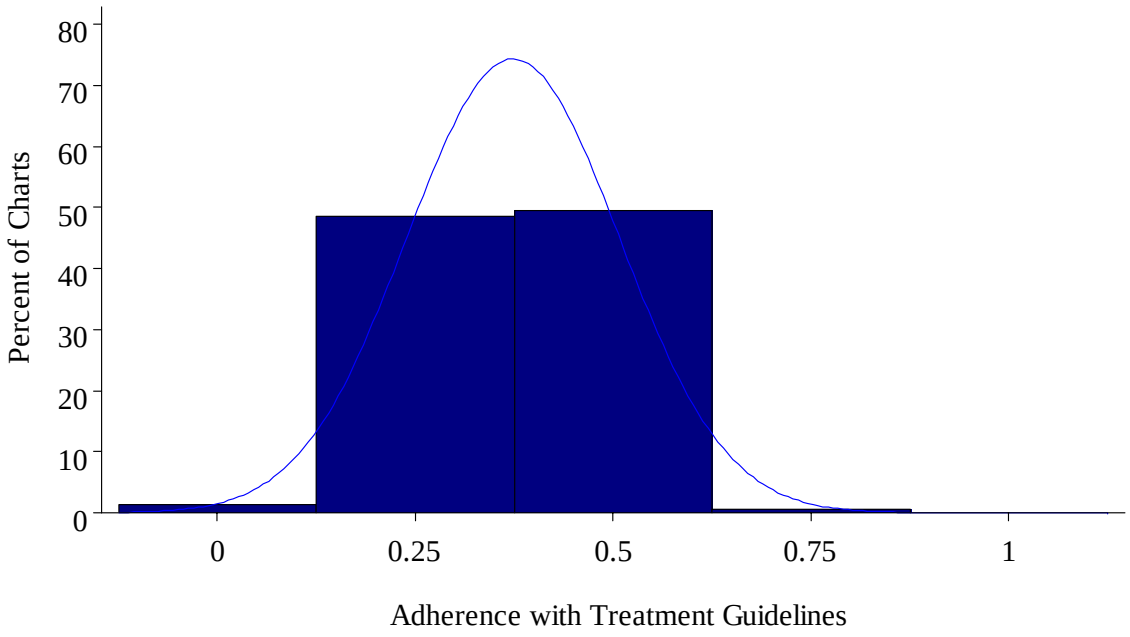

Figure 4: *Adherence with AAP ADHD treatment guidelines across charts*

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