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Adult Attention Deficit Hyperactivity Disorder: The Benefits and Risks of Pharmacologic Treatment

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ADULT ATTENTION DEFICIT HYPERACTIVITY DISORDER:

THE BENEFITS AND RISKS OF PHARMACOLOGIC TREATMENT

by

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This independent project, submitted by Heather Shimek in partial fulfillment of the requirements for the Degree of Master of Science from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done and is hereby approved.

Chairperson

This independent project meets the standards for appearance, conforms to the style and format requirements of the Graduate School of the University of North Dakota, and is hereby approved.

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ABSTRACT

This project examines adult attention deficit hyperactive disorder (ADHD) and the risks of not receiving pharmacological management for the condition. The prevalence of adult ADHD is 4.4%, with the majority of cases being untreated. ADHD can be a very debilitating condition. Research has indicated that the long-term effects and risk factors of untreated adult ADHD includes a higher risk for accidents, either vehicular or nonvehicular, substance abuse, and disruptions in personal and professional life. Research also indicates that the majority of individuals with ADHD in childhood, as much as 70-80 percent, continue to experience symptoms into adulthood. Further, fewer than 10 percent of adults with ADHD are compliant with their pharmacologic treatment. Pharmacologic options for ADHD has been limited in the past, but a growing list of medications are now available that are longer acting and with fewer side effects. It is hoped that with an increasing cadre of pharmaceutical options, many more individuals with ADHD will choose to receive treatment. This project will provide important information to make more individuals aware of the potential effect ADHD has on the lives and safety of adults. The presentation will be given to attendees of the University of North Dakota Graduate School Scholarly Forum. This audience is appropriate as graduate students and faculty have frequent contact with adults diagnosed with ADHD. Additionally, this forum was chosen as these individuals have the potential to identify adults with ADHD and refer them for treatment.

CHAPTER I

Introduction

Attention Deficit Hyperactivity Disorder (ADHD) consists of three components for children (hyperactivity, inattention, and implusivity) and two components for adults (inattention and impulsivity), all of which are associated with limitations in daily function. This would include things such as being unorganized, losing items needed for tasks, being consistently late, and difficulty sustaining attention. Though these limitations may be present in an adult without ADHD, they are not present to the degree that they are in an adult with ADHD.

The exact cause of ADHD is still being researched, but indications are that ADHD results from a neurochemical imbalance in the brain and is hereditary. There is also some emerging research being done regarding a possible gene contributing to the development of ADHD (Searight & Burke, 2008).

ADHD expression in adults differs from that noted with children. The core expression of ADHD in children is hyperactivity. While some individuals may assume that the loss of this childhood expression is indicative of symptom resolution, there is reason to believe otherwise. Individuals get the diagnosis of ADHD by meeting criteria on a behavioral assessment form, both from evaluation of a physician as well as by self report.

Adults with ADHD that are not medicated are at significant risk. Adult drivers with ADHD have more motor vehicle accidents where they are at fault and have more severe accidents with more dollar damage and worse injuries than the general public (Barkley, 2004; Barkley, Guevremont, Anastopoulos, DuPaul, & Shelton, 1993). They are also more at risk for road rage, a phenomenon characterized by impulsivity and inattention (Barkley, Murphy, & Kwasnik, 1996; Richards, Deffenbacher, Rosen, Barkley, & Rodricks, 2006).

In this chapter, the statement of the problem, the project purpose, and the project's significance are discussed. The theoretical framework of the independent study is Roy's Adaptation Model. This theory is used to describe the individual with ADHD, coping mechanisms, as well as autonomy of the individual. ADHD, treatment, and limitations of ADHD are defined.

Statement of the Problem

ADHD expression in the adult population is different than in the children or adolescent population. In elementary and high school the symptoms of ADHD cause many difficulties such as inattention to material presented in class, poor grades, conduct disorders as a result of the hyperactivity, etc. College-aged individuals with ADHD may also experience difficulties with inattention in class and poor grades, but usually do not manifest as much hyperactivity. Out of the confinements of the classroom situation found in elementary school, high school, and college, many adults find a relief of symptoms that had been brought out in the classroom. These adults may assume that the

relief of symptoms is indicative of resolution of their ADHD. Though adult ADHD symptoms are not as apparent and are different than childhood symptoms, they may be just as devastating.

Adult ADHD can be a very debilitating condition. Research has been done in the past few years on some of the long-term effects and risk factors of ADHD. Research has indicated that individuals with ADHD have lower risk in many areas, including accidents, either vehicular or non-vehicular, and substance use disorders when being properly treated. Medication options for ADHD has been limited in the past, but a growing list of medications are now available that are longer acting and with fewer side effects. Thus, many more individuals with ADHD may now choose to receive treatment that had not before.

Purpose of the Project

This project provided important information to make more individuals aware of the potential effect ADHD has on the lives and safety of adults. A comprehensive literature review was conducted, and a presentation was given to attendees of the Graduate School Scholarly Forum, University of North Dakota. This audience was appropriate as graduate students and faculty have frequent contact with adults who may suffer from ADHD. Additionally, this forum was chosen as these individuals have the potential to identify adults with ADHD symptoms and refer them for evaluation and treatment.

Another purpose of this project was to provide information about current treatment modalities. Intermediate and long acting stimulants are now available that maintain a steady state of concentration in the body and do not have the violent ups and

downs that the original stimulant medication had. There are also nonstimulant medication alternatives to treatment. Though short acting stimulants are still available, they are no longer the only alternative for pharmaceutical treatment.

Conceptual/Theoretical Framework

The theoretical framework used for this study was Sister Callista Roy's Adaptation Model (Tomey & Alligood, 2006). This theory consists of inputs, throughputs, and effectors. Inputs are the stimuli from the environment that affect the individual. These stimuli can be focal (the stimulus that is immediately presenting to the individual), contextual (all other stimuli present), and residual (which would include attitudes about the specific disorder). Throughputs are the control mechanism that the individual uses to adapt to the system. Effectors are the physiologic function, self-concept, or role function in adaptation (Tomey & Alligood).

According to this Roy's theory, there are two types of coping mechanisms that must act together in order for individual to adapt. The first is the regulator. This consists of input, internal processes, and output. The input, or stimuli from the internal or external environment, affects the neural and chemical release from the individual. The internal processes refer to the processing of the input by the individual. The output is the response of the body (Tomey& Alligood, 2006).

The second coping mechanism is the cognator. The cognator controls the processing of stimuli, application of past learning, judgment, innate responses, and emotion. These regulator and cognator coping mechanisms work together to produce the behavior that is elicited (Tomey & Alligood, 2006).

There are four concepts to Roy's theory (Tomey & Alligood, 2006). The first concept is the person. The person has an active part in the role of their care. They interact with their changing environment and adapt to stressors using their coping mechanisms. The second concept is environment. The environment is all of the surrounding conditions that influence development and behavior of the individual. The third concept is health. According to Roy, health is a goal of the individual's behavior and is a process of becoming an integrated, or whole, individual. The fourth and last concept is nursing. Nursing is required when an individual uses up energy on coping that is needed for basic survival (Tomey & Alligood).

In the case of an individual with ADHD, there are a lot of inputs that can be overwhelming. Input includes the individual's adaptation level, or the amount of stimuli that the individual can tolerate without impairment (Tomey & Alligood, 2006). For the adult with ADHD, the adaptation level is generally less than an adult without ADHD (Searight & Burke, 2008). Throughput would include medication, therapy, or other interventions the individual employs to control the inputs (Tomey & Alligood). The effectors would include how the individual functions with the disorder as well as their interpretation of their ability to adapt (Tomey, & Alligood).

In an individual with ADHD, the neural and chemical release is altered when responding to inputs. This altered chemical release will limit the ability of the adult with ADHD to respond appropriately to inputs. This will also interfere with the regulator and cognator (coping mechanisms). The individual will internalize inputs in order to apply

past learning, judgment, innate responses, and emotion. The impulsive characteristics of adults with ADHD have the potential to significantly limit the application of these coping mechanisms.

According to Roy, the individual with ADHD has an active part in the role of their care. This includes learning to use coping mechanisms to adapt to their inputs. For the individual with ADHD, environment is all of the conditions and situations in their everyday life including the classroom, social settings, family life, and daily life situations. With the coping mechanisms that the individual with ADHD employ, the individual is able to gain health over impairment. Also, medications can bring the chemical levels of the adult with ADHD to a state of health. For an individual with ADHD, as energy expenditure goes toward focusing and processing all of the stimuli they are presented with, this leaves them feeling exhausted and mentally drained. Over the course of years with this condition the individual is left with significant impairment if their coping methods are not successful. The nurse in this situation is instrumental in promoting adaptive responses and coping methods with these individuals, including pharmaceutical interventions.

Definitions

Definitions for this project include:

Attention deficit hyperactivity disorder (ADHD) which is a common disorder that is characterized by inattention, hyperactivity, restlessness, distractibility, and impulsiveness that is not appropriate for the age of the individual.

ADHD Treatment is defined as providing a means to reverse a condition and with ADHD can involve pharmacotherapy alone or in combination with behavior modification. For this project, treatment is achieved by means of pharmacotherapy alone.

Significance of the Project

Research now indicates that the majority of individuals with ADHD in childhood, as much as 70-80 percent, continue to experience symptoms into adulthood (Staller & Faraone, 2006; Weyandt & DuPaul, 2006). The prevalence of adult ADHD is 4.4% of the general population, with the majority of cases being untreated (Kessler et al., 2006). Unfortunately, fewer than 10 percent of the individuals with ADHD reportedly comply with and persist with treatment (Barkley, Fischer, Smallish, & Fletcher, 2003; Weiss, Gadow, & Wasdell, 2006).

Adult ADHD is associated with lower levels of education and employment status (Faraone & Biederman, 2005; Harpin, 2005). Married adults with ADHD reported lower overall marital adjustment and family dysfunction as well as perceived the health of their marriage and family was more negative than their spouses (Eakin et al., 2004). Untreated ADHD in adolescents was a significant risk factor for substance use, while treatment was associated with an 85 percent reduction in the use of addictive chemicals (Biederman, Wilens, Mick, Spencer, & Faraone, 1999).

Adults with ADHD are more likely to have driven an automobile before they were licensed drivers, less likely to display sound driving habits, more likely to have had their license suspended or revoked, more likely to have received repeated traffic citations

(mostly for speeding), and nearly four times more likely to have had an accident in which they are found to be at fault (Barkley, 2004; Barkley et al., 1993; Fischer, Barkley, Smallish, & Fletcher, 2006). Not only do more vehicle accidents occur, but also more severe accidents, with more dollar damage and bodily injury (Barkley, 2004; Barkley et al., 1993). Further, the risk of ADHD and driving are that individuals with ADHD may be more prone to frustration, anger, hostility, and aggression, which may put them at risk for road rage while driving (Barkley et al., 1996; Richards et al., 2006). Additionally, adults with ADHD have been reported as having a greater probability of having at least one accident claim in their lifetime as compared with adults without ADHD (38% versus 18%), as well as increased cost of healthcare because of the increased number of accidents (Swensen et al., 2004).

Assumptions/Limitations

An assumption of this project was that individuals with access to adults with ADHD at the Graduate Forum read the poster presentation and asked questions about the content. Another assumption of this project is that the adult with ADHD may have not been diagnosed with ADHD, and may not identify the symptoms in themselves. Some of the adults attending the Forum were considered "Baby Boomers" who were born between 1946 and 1964. This generation may not have been identified in elementary school, a time with the most obvious impairment, as having ADHD. At that time not much was known about ADHD so that it could be identified. The classroom setting was also very different from today, and there may not have been the same settings that would bring out ADHD behavior. The final assumption is that the individual wants to attempt a trial of medication after receiving information from poster presentation.

Summary

ADHD expression in the adult population is different than in children and adolescents in that adults do not manifest as much hyperactivity. This change in presentation may lead the adult with ADHD to erroneously assume that they are no longer affected by ADHD. Research has indicated that individuals with ADHD have lower risk in many areas, including accidents and substance use disorders when treated. This project provided important information to individuals attending the Graduate School Scholarly Forum at the University of North Dakota so that these individuals could help to identify adults with ADHD symptoms and refer for treatment, as well as provide this information to adults already diagnosed.

The theoretical framework chosen for this project was Sister Callista Roy's Adaptation Model, and was used as it provides an excellent explanation for the adapting to stressors in the individual with ADHD. The definition of ADHD and treatment were discussed as it pertains to the adult with ADHD. The significance of this project is that as many as 70-80 percent of individuals with ADHD as a child will continue to experience symptoms into adulthood. Fewer than 10 percent of individuals diagnosed with ADHD comply with treatment. Nontreatment can have serious consequences to the adult with ADHD in lower levels of education and employment, substance use, increase number of vehicular accidents, and increased risk of displaying road rage. Assumptions were that individuals at the Graduate Forum read the poster and inquired about the information presented, that adults with ADHD recognize their symptoms as conducive with ADHD, and that adult with ADHD want to trial medication.

CHAPTER II

Introduction

In the review of literature, the incidence of ADHD in children, college-aged individuals, and adults are discussed. Impairments in everyday functioning of adults resulting from ADHD are also addressed. Three phenomena are examined; ADHD treatment and substance use disorders, driving impairments in individuals with ADHD that are not medicated, and social effects of adulthood ADHD. Past and present medications used to treat ADHD are also discussed.

Review and Critique of Related Studies

ADHD occurs in 3-5 percent of the US population of children, with similar occurrences in other countries (Woodard, 2006). ADHD is a common, chronic condition usually arising in childhood and persisting, with varying degrees of expression, into adulthood (Weiss, et al., 2006). It is associated with significant functional impairment and is considered highly treatable (Weiss). Though fewer than 10 percent of the children and adults with ADHD comply with and persist with treatment, 74-97 percent of school-aged children with ADHD respond positively to stimulant medication, according to a longitudinal quantitative study by Barkley et al., (2003). In this study, 147 clinic referred children with ADHD were followed 13 years into adulthood for substance use and duration of stimulant treatment.

Prior to the 1970s, ADHD was thought to be a condition of childhood and outgrown with the onset of puberty (Weyandt & DuPaul, 2006). Research now indicates that the majority of individuals with ADHD in childhood continue to experience symptoms into adulthood, as much as 70-80 percent. The expression of the symptoms change over time from primarily hyperactivity, to inattention and impulsivity (Staller & Faraone, 2006; Weyandt & DuPaul). The prevalence of adult ADHD remains consistent with childhood prevalence, at 4.4%, with the majority of cases being untreated (Kessler et al., 2006). Weyandt and DuPaul found that two to four percent of college-aged students had ADHD, again similar to the childhood prevalence.

College students with ADHD symptoms typically present with academic and psychological difficulties; they have lower grade point averages than students without ADHD and they have more anxiety and depression (Heiligenstein, Guenther, Levy, Savino, & Fulwiler, 1999; Weyandt & DuPaul, 2006). College-aged students are also less likely to attend and graduate from college than students without ADHD (Murphy, Barkley, & Bush, 2002). The underlying factors are not well understood but may be related to study skill deficits, deficits in executive functioning, impaired organization, or other cognitive deficits (Weyandt & DuPaul). Study skills deficits results in the inability to study because the individual lacks the knowledge pertaining to how to study and does not know how to implement study skills. Deficits in executive functioning include poor planning and difficulty in abstract thinking. Impaired organization presents with the individual unable to organize daily life and results in missed appointments, lost items needed (such as keys or papers), and the inability to hold employment where being organized is a requirement. It is speculated that high levels of internal restlessness and

intrusive thoughts contribute to the outcomes of college students with ADHD (Weyandt & DuPaul). Internal restlessness is described as not being able to concentrate on the event occurring at the present time due to racing thoughts. Intrusive thoughts are thoughts that interrupt the current thought process and are unrelated to the task at hand. Psychological distress, including anxiety and depression, and aggression have also been found to be greater in college students with ADHD (Weyandt & DuPaul).

Adults with ADHD may have symptoms that persist and cause disruptions to their professional and personal life and may result in lower levels of education and employment status (Faraone & Biederman, 2005; Harpin, 2005). Married adults with ADHD reported lower overall marital adjustment and family dysfunction than their spouses did (Eakin et al., 2004). According to Wozniak (2003), adults with ADHD that are not medicated frequently experience frequent job changes or losses, marital difficulties, multiple marriages, or problems with the law. With increasing age, the symptoms of hyperactivity and impulsivity usually decline at a higher rate than the symptom of inattention (Bekker et al., 2005).

In a quantitative study by Paulson, Buermeyer, & Nelson-Gray (2005), poor outcomes of individuals with ADHD were thought to be related to deficit in social functioning and the consequence of social rejection. Videotapes segments were watched by participants without ADHD that contained displays of ADHD, depression, and social anxiety. The displays of ADHD elicited the same level of rejection from the viewer as the displays of depression. This rejection may be attributed to a stigma that may be present toward ADHD.

One of the concerns with treatment of ADHD is whether or not treatment leads to later substance abuse. A reason for this concern is that stimulants such as methylphenidate may be chemically similar to cocaine, causing the concern for potential abuse and addiction, particularly if it were to be inhaled or injected intravenously similar to cocaine use (Greenhill & Osmon, 1999). Research has shown that cocaine and methylphenidate posses different pharmokinetic properties, as methylphenidate enters and clears the brain more slowly than does cocaine (which accounts for cocaine's more addictive properties) (Volkow, Ding, & Fowler, 1995). The second reason for concern is the potential for stimulant use to lead toward increased sensitization to stimulant use later (Lambert & Hartsough, 1998). Research has indicated that substance abuse as a result of treatment is not a problem since sensitization occurs as a result of alternating between high interparental doses and drug-free periods. Stimulant treatment is not administered in this manner; instead stimulants are taken orally, in low doses, on a daily basis, and for a long period of time (Greenhill & Osmon). Barkley et al., (2003), conducted a study using a random sample of individuals with a diagnosis of ADHD, and found that stimulant treatment in childhood or during high school was not associated with a risk of adolescent or adult substance abuse, the frequency of such use in adulthood, or the likelihood of having a substance use problem. Also, there was no evidence of an increased risk with duration of treatment (Barkley et al.). In fact, the greatest indicator of substance abuse was with individuals with conduct disorder (Barkley et al.).

According to Pomerleau et al., (2003), more adult cigarette smokers had ADHD than did not have ADHD. They found that individuals with ADHD were more likely to

experience nicotine withdrawal symptoms of irritability and difficulty concentrating when quitting than individuals without ADHD (Pomerleau et al.).

ADHD is also associated with an increase in substance use. In a quantitative study in which the Structured Clinical Interview for DSM-III-R was administered to both subjects with ADHD and controls without ADHD, the authors found that ADHD predicted an increased risk for subsequent drug abuse or dependence in individuals with alcohol use disorders (Biederman et al., 1998). The results of a meta-analytic study determined that treatment of childhood ADHD is associated with a decreased risk for later substance abuse (Wilens, Faraone, Biederman, & Gunawardene, 2003). In a study by Biederman et al., the authors used data from a longitudinal family genetic study of ADHD of white, non-Hispanic males, and found that untreated ADHD in adolescents was a significant risk factor for substance use, while treatment was associated with an 85 percent reduction in the use of addictive chemicals.

Significant risk is assumed if the non-medicated adult with ADHD operates a motor vehicle. Quantitative longitudinal studies have shown that individuals with ADHD are more likely to have driven an automobile before they were licensed drivers, less likely to practice safe driving habits, more likely to have had their license suspended or revoked, more likely to have received repeated traffic citations (mostly for speeding), and nearly four times more likely to have had an accident in which they are found to be at fault (Barkley, 2004; Barkley et al., 1993; Fischer et at., 2006). Not only do more vehicle accidents occur to adults with ADHD, but also more severe accidents, with more dollar damage and bodily injury (Barkley, 2004; Barkley et al., 1993). Other research differentiated individuals with ADHD that were receiving medication from those that

were not. In a cross-over design study using a convenience sample of seven subjects with ADHD and six male subjects without, results indicated that individuals with ADHD who were not medicated and operating a motor vehicle were at an increased risk of a motor vehicle accident (Cox, Merkel, Kovatchev, & Seward, 2000). Compared with control subjects, individuals with ADHD reported having more accidents and more citations (Cox et al.). Ritalin (a stimulant medication used to treat ADHD) administration reportedly improved the driving performance of the individuals with ADHD to that of the control group (Cox et al.). Though the sample was small and the drivers in the study were not experienced drivers, there was some speculation that Ritalin had the potential to have a positive effect on driving performance. Ritalin has limitations in that it has a very short half life. Thus, treatment with this medication would leave drivers undertreated during a known time of increased accident rates (5:00-6:00, or rush hour) or during one of the times of the highest motor vehicle fatalities (1:00-3:00 am), depending on when the scheduled medication was taken (Cox et al.). Fortunately, newer medications are now available with longer half lives that could prove useful in these situations.

A literature review on ADHD and unintentional driving injury, and pharmaceutical intervention was performed by Jerome, Habinski, and Segal, 2006. They found that current data supports administration of stimulant medication to improve the driving performance of individuals with ADHD. In an earlier study by Jerome and Segal, 2001, spouses of individuals with ADHD were found to rate their partners as significantly less impulsive and generally safer after receiving treatment with stimulant medication. It is important to note that research suggests that ADHD does not interfere with driving knowledge so much as with actual performance, according to a quantitative

study done using a convenience sample of 25 young adults with ADHD referred from a university medical center and 23 young adults recruited from the local community. (Barkley et al., 1996). Further risks of ADHD and driving are that individuals with ADHD may be more prone to frustration, anger, hostility, and aggression which may put them at risk for road rage while driving (Barkley et al.; Richards et al., 2006).

Another area of risk with individuals that have ADHD is incidence of non-motor vehicle related accidents. Swensen et al., 2004, found that ADHD is a significant predictor of having an accident claim. Patients with ADHD had a greater probability of having at least one accident claim than controls for children (28% versus 18%) adolescents (32% versus 23%), and adults (38% versus 18%).

History of ADHD Pharmacologic Treatment

Medication options for ADHD in the past were very limited, and consisted of only a short acting stimulant. This short acting stimulant was methylphenidate, brand name Ritalin, and was the treatment option as of 1937 (Liu, Muniz, Minami, & Silva, 2005). Stimulants act on the central nervous system as dopamine agonists, and stimulate the release of and prevent the reuptake of dopamine, serotonin, and norepinephrine within the presynaptic nerve endings (Wynne, Woo, & Olyaei, 2002). This allows these neurotransmitters to provide a more significant effect on the cerebral cortex, brain stem, and reticular activating system (Wynne et al.). Stimulation of these areas in the central nervous system produces effects on thinking, feeling, and response to emotional stimuli (Wynne et al.). This medication was associated with dramatic fluctuations in mood and affect on onset and on wearing off.

Current ADHD Pharmacologic Treatment

Today, short acting stimulants are still available, but they are not as frequently prescribed due to their rapid onset and wearing off. The stimulant methylphenidate is still available, and has been formulated to intermediate and long acting formulas.

Another stimulant now available for the treatment of ADHD is a combination of dextroamphetamine and amphetamine salts. The brand-name of this combination is Adderall, and is a longer acting alternative to methylphenidate (Wynne et al., 2002). Dextroamphetamine alone is also available generically, or in the brand-name Dexedrine.

Nonstimulant medications are also now available for treatment. These include atomoxetine, brand-name Strattera, and the antidepressant bupropion, brand-name Wellbutrin (Epocrates Inc., 2007). Nonstimulant medications do not have abuse potential since they do not contain any stimulants and are easier to obtain a prescription for since they are not controlled substances (Epocrates Inc.).

Short acting stimulants

There are four types of short acting stimulants available for the treatment of ADHD. Methylphenidate was the first stimulant available for use, brand name Ritalin and Methylin. The duration of action of this form of methylphenidate is 3-5 hours, which means that multiple dosing is necessary in order to be of benefit throughout the entire day (Liu et al., 2005). This is a significant disadvantage in using these medications. Methylin is available as chewable grape-flavored tablets (Methylin, 2008).

The second type of short acting stimulant is dextroamphetamine, which has an off-label use of ADHD treatment. The brand name for dextroamphetamine is Dexedrine. This medication was released for the treatment of narcolepsy (Epocrates Inc., 2007).

Dexedrine is available as a spansule, which delivers a set amount of medication immediately, and then the remaining amount is delivered slowly over a prolonged period, or scored tablets (Dexadrine, 2008).

The third short acting stimulant is a combination of dextroamphetamine and amphetamine salts, and has a slightly longer duration of action than methylphenidate. Adderall is the brand name for this stimulant, and has a duration of action of 4-6 hours (Epocrates Inc., 2007).

The last stimulant with a short duration of action is dexmethylphenidate, or brand name Focalin. Its duration is similar to methylphenidate, at 3-5 hours. Capsule may be opened and sprinkled on applesauce for ease of administration as long as it is not chewed (Epocrates Inc., 2007).

Intermediate acting stimulants

Methylphenidate has been formulated to be an intermediate acting stimulant, and has a duration of action of 4-8 hours. The brand name of intermediate acting methylphenidate-based stimulants include Methylin ER and Ritalin SR. This medication can also be opened and sprinkled on applesauce to make is easier to administer (Epocrates Inc., 2007).

Long acting stimulants

Long acting stimulants have the property of tapered onset and long duration of action, which allows for one daily dosing. The tapered wearing off does not produce the dramatic fluctuations in mood that the short acting ones did (Liu et al., 2005). Long acting methylphenidate, which is generic for Concerta, Metadate CD, Metadate ER, and Ritalin LA, has a duration of action of 8-12 hours (Epocrates Inc., 2007).

The methylphenidate transdermal patch, Daytrana, has a duration of action that is dependent on how long the patch is worn, though generally the duration is 9 hours. The patch is placed on the hip below the waistline every morning and is typically worn until around 4pm. Since the medication is delivered through the skin, modification in diet should not be necessary. This medication remains active in the body for 3-5 hours after removing the patch, and has a very gradual taper when wearing off (Epocrates Inc., 2007).

Adderall XR is an extended release combination of dextroamphetamine and amphetamine salts, and has a half-life ranging from 9-14 hours. It is available as generic as well as brand name (Epocrates Inc., 2007). Capsule cannot be opened or medication will be released too quickly (Epocrates Inc.).

Focalin XR is dexmethylphenidate is another long acting stimulant medication, with a duration of action of 8-12 hours. This medication is different than most extended release medications. Though it cannot be crushed or chewed, the capsules can be slit open and contents sprinkled on applesauce immediately before administration (Epocrates Inc., 2007). This can allow for some of the medication to be disposed of if the current dose is too much.

Lisdexamfetamine-based stimulants are another treatment for ADHD, and are available only as longer acting stimulants. Vyvanse is the brand name of lisdexamfetamine-based stimulants and has a half life of 12 hours (Epocrates Inc., 2007).

Non-stimulant based medication for ADHD

There are now also medications used to treat the symptoms of ADHD that are not stimulant based. Strattera, generic name atomoxetine, is a medication indicated solely for

treatment of ADHD. The exact mechanism of action is unknown, but selectively inhibits the reuptake of norepinephrine (Epocrates Inc., 2007). Strattera provides a full day's relief from ADHD symptoms, and does not cause insomnia as stimulants can. Because it is not a stimulant, it is not a controlled substance and has no risk of abuse (Epocrates Inc.).

Another non-stimulant treatment for ADHD is buproprion, or brand name Wellbutrin. Buproprion is an antidepressant and is used in smoking cessation. It has been used off-label to reduce ADHD symptoms. The added benefit of buproprion is that in addition to treating the symptoms of ADHD it can also help with the comorbidity of depression (Epocrates Inc., 2007).

Summary

The review of literature summarized past studies done pertaining to the long term effects of ADHD in the adult population. Driving and social impairment was discussed, as well as risk for substance use when receiving stimulant treatment for ADHD. Past research studies were summarized. Accident incidence with individuals with ADHD was addressed. ADHD, which is a condition usually associated with children, is a condition with long-lasting impairments in adults. There is a significant number of adults with ADHD that do not take medication. Since the behavior typically seen in children with ADHD has resolved, adults notice less obvious symptoms and may assume that their impairment is minimal, which is actually contrary to studies performed. This error in assumption puts them, as well as others in the community, at risk in the worst case scenario, and at best still causes significant impairment in their own lives.

Information was also presented on past and current medication available for treatment of adult ADHD. These medications include the short acting and long acting stimulants, as well as nonstimulant medication. The short acting stimulant methylphenidate was the first medication available for the treatment of ADHD and is associated with violent mood swings on onset and when wearing off. Long acting stimulants do not produce such dramatic fluctuations in mood and have a much smoother onset and wearing off. Nonstimulant medications have the benefit of no abuse potential and are not controlled substances.

CHAPTER III

Introduction

Understanding adult ADHD and the implications that inappropriate or under treatment of the condition has on the health and wellness of individuals is important. In this chapter, the target audience the plan, evaluation, expected results and implications for nursing are discussed.

Target Audience

The target audiences for the information about adult ADHD were scholarly populations consisting of practicing nurses, graduate students, and university professors. In September 2007, a poster presentation was provided for the Sigma Theta Tau International Research Conference held at the University of North Dakota, Grand Forks, North Dakota. A review of literature, statement of problem, purpose of project, theoretical framework, and plan were presented, with presentation of information prompting several questions that were discussed on an informal basis with the author.

The second presentation, and the focus of the project, was a poster presentation to the Graduate School Scholarly Forum held at the University of North Dakota. This Forum consisted of scholarly attendees who where other graduate students and faculty. An updated poster presentation was provided, with addition of information that focused on medication used to treat adult ADHD. This audience was chosen over the previously selected nurses on the Obstetrics, Pediatrics, and Neonatal Intensive Care Units in the

local hospital because of the larger number of people expected at the Graduate Forum. They were also chosen as they are in the position to have contact with adults that may or may not be diagnosed with ADHD. With this information, this population has the ability to recognize symptoms congruent with ADHD and refer these adults for treatment. The attendees of the Scholarly Forum were highly educated individuals that challenged the information presented and prompted important discussion and questions. Another target population for this project was adults with ADHD, either previously diagnosed or not, that attended either presentation. Adults with a diagnosis of ADHD that were not medicated were provided information on appropriate treatment. Adults with ADHD who were not previously diagnosed would recognize symptoms presented and identify themselves as affected by ADHD. These adults also were presented with information on treatment.

Poster Development

A poster was developed and used to present the information obtained from the project. Information regarding the statement of the problem, purpose, and significance were included on the poster as this information is necessary to understand the impact that ADHD has on the lives of the adults that have the condition. Information from the literature review was provided to give past and current background of research performed. The nursing theory used to explain adult ADHD is very important when examining this condition, as it provides an excellent framework for describing the conditions and effects of ADHD. The expected implications for nursing and medications

were included as implications serve to explain how the project was used to further nursing, and information regarding medications is vital to present as treatment is discussed.

Evaluation

Advisor reviewed poster for content and layout. Poster was created with a reading level of college-prepared individuals. This was done as the audience was attendees of a Graduate Forum and expected level of preparation was a college degree. The pictures were chosen to provide a visual impact of the devastating effects untreated adult ADHD can have on the individual, as well as to embrace pharmacologic treatment.

Summary

The target audience was attendees at the Graduate Forum. This consisted of college-educated individuals that had access to adults with ADHD as well as adults with ADHD. A poster was used to present the information gathered in the project. Information used in the poster included the problem, purpose, and significance of the project, as well as the nursing theory used, nursing implications, and medications. Graphics used on the poster were intended to capture the attendee's attention and display the impact ADHD can have.

CHAPTER IV

Introduction

This independent study examined adult ADHD and the impact it has on individuals' lives. In this chapter, the outcome of the project was discussed. Sister Callista Roy's nursing theory of adaptation was applied to the project. The implications for nursing are discussed including practice, education, research, and policy.

Attendees of the two presentations took the information received and to share it with adults that they know that have ADHD, so that they are informed of the potential risks of non-treatment, as well as new medication treatments that are available, so that an educated decision can be made. Attendees also shared this information with their colleagues, and information can be dissipated, so that more people can be aware of the risks and can advocate for adequate treatment.

In the case of an individual with ADHD, there are a lot of inputs that can be overwhelming. The use of medications, or throughput, the adult with ADHD is better able to cope with the inputs. Medication alters the neural and chemical release when responding to inputs, and will return the neurochemicals to a more normal level. Finally, the use of medication will also help the individual to implement coping mechanisms in order to better manage their symptoms by being able to apply past learning, judgment, innate responses, and emotion.

According to Roy, the individual with ADHD has an active part in the role of their care. By presenting this information to not only adults with ADHD, but also to individuals that can disseminate the information to adults with ADHD, the individual has an active role in their healthcare. In this way, the individual is able to gain health over impairment.

Discussion at both the Research Conference and the Scholarly Forum provided much discussion. Questions were answered by both Graduate Forum attendees as well as adults with ADHD. Attendees at both presentations received the information from my project and have a better understanding of the additional risks that unmedicated adults with ADHD have, as well as potential treatment modalities available.

Implications for Nursing: Practice, Education, Research, and Policy

Practice

An implication of this project for nursing practice is to provide information to attendees of the Graduate Forum so that referral can be made for adults with ADHD for pharmacologic treatment. The attendees of this forum have access to adults with ADHD and can help to identify those without a diagnosis and provide a referral for those not medicated. By referring these adults for treatment, the nursing practice will be implemented and positively impact the individual.

Education

This project served to educate the attendees of the Graduate Forum about the risks of not treating adult ADHD pharmaceutically as well as pharmaceutical treatment

options. The attendees will take the information presented and educate others, including adults with ADHD. Advanced practice registered nurses can not only educate their patients, but also use the information received as a catalyst to research the topic more thoroughly. Future presentations can be given with this information as the basis.

Research

As the information presented in this project is disseminated to the population of adults with ADHD that are not medicated, treatment may be chosen. With more adults being treated for their ADHD, there is a potential for more prospective studies to be performed to determine the extent of improvement. For example, adults that are not treated can be compared to adults that receive stimulant or nonstimulant treatment. Incidence of accidents (vehicular and nonvehicular), substance use, job satisfaction, and road rage can all be examined. It can be determined what effect pharmacologic treatment has on these factors.

Policy

With the information gathered for this project, in addition to any research that results, policy may be created to assist adults in receiving treatment or for referral for treatment. It is important that policy be in place to assist adults with ADHD get proper treatment of this condition. With proper treatment, risk reduction can occur.

Summary

The outcome of the project was that attendees of the presentations received information about potential risks of non-treatment as well as benefits of treatment. These atendees had access to adults with ADHD and were provided with information to share, so that an informed decision can be made. According to Sister Callista Roy, with the use

of medications, or throughput, the adult with ADHD is better able to cope with inputs. Medication alters the neural and chemical release when responding to inputs, and returns the neurochemicals to a more normal level. The use of medication also helps the individual to implement coping mechanisms. The adult with ADHD has an active role in their healthcare, and by providing them with the information from this project, they are able to participate fully.

An implication of this project for nursing practice is to provide information to attendees of the Graduate Forum so that referral can be made for adults with ADHD for pharmacologic treatment. This project served to educate the attendees of the Graduate Forum. With more adults being treated for their ADHD, there is a potential for more research opportunities to be created in following years to determine the extent of improvement. With the information gathered for this project, in addition to any research that results, policy may be created to assist adults in receiving treatment or for referral for treatment.

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