Development of a body weight assessment algorithm for adolescents

Katherine Serneels
Medical College of Ohio

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FINAL APPROVAL OF SCHOLARLY PROJECT
Master of Science in Nursing

Development of a Body Weight Assessment Algorithm for Adolescents

Submitted by

Katherine Serneels

In partial fulfillment of the requirements for the degree of
Master of Science in Nursing

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Development of a Body Weight Assessment Algorithm for Adolescents

Katherine Serneels

Medical College of Ohio

2005
DEDICATION

I dedicate this scholarly project to my future husband Jonathon Barricklow who has supported me throughout this decision to continue my education. He has been patient throughout the process and has been there emotionally, financially, and has given me many late-night, stress-relieving foot massages. I am grateful to have met you and can’t wait to begin our new life together.
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Introduction

The prevalence of obesity in children and adolescents is increasing rapidly worldwide and is viewed as a significant health problem (Jerum, 2001). The number of overweight adolescents has tripled since 1980 (Montague, 2003). Approximately 20-30% of children and adolescents in the United States are obese (Jerum, 2001). This is of significance to health care professionals because research has shown that overweight and obese adolescents are at an increased risk for developing co-morbid physical illnesses such as hypertension, dyslipidemia, impaired glucose tolerance, and sleep apnea (Ball & McCargar, 2003).

Several longitudinal studies have shown that obesity and risk factors for cardiovascular diseases and type 2 diabetes can develop early in life, which lead to significantly increased morbidity and mortality in adults (Ball & McCargar, 2003). Obesity becomes more detrimental to health if it originates in childhood and adolescent obesity is associated with premature death (Thomas, Baker, & Davies, 2003).

This rise in obesity has an adverse effect on health care costs. In 1995, approximately $51.6 billion dollars were spent on direct medical costs associated with diseases attributable to obesity (Montague, 2003). Today, in the United States, health-care costs associated with childhood/adolescent obesity have been estimated to total $92.6 billion or 9.1% of national health-care spending (Longjohn, 2004). The costs for health care will continue to rise as many obese adolescents become obese adults (Jerum, 2001).
There are many factors leading to this rising epidemic, including parental influences, genetic predisposition, and lifestyle factors. One lifestyle factor that can influence the development of overweight and obesity in adolescents is dietary habits (Drohan, 2001). Dietary habits are developed as a result of the food environment that parents provide, which help shape a child’s food preferences and subsequent selection patterns (Drohan, 2001). Adolescents’ food patterns differ from younger children in that they rely more on snacks and fast foods for their energy sources (Thomas, Baker, & Davies, 2003). Meal patterns, such as skipping breakfast and increased intake of high fat and refined sugar in purchased foods, also play role in the development of overweight and obesity in adolescents (Nicklas, Morales, Linares, Yang, Baranowski, Moor, & Berenson, 2004).

It has been proposed that there is a developmental trend 10 – 15 years before the outcomes of obesity are identified or detrimental to health (Thomas, Baker, & Davies, 2003). This theory provides support for aggressive intervention in obese adolescents to decrease the potential for extreme health problems in adulthood. In 1985, Griffith and colleagues hypothesized that successful treatment of overweight and obese young people, ages 11 – 19 years of age would lead to a 30 – 45 % reduction in adult obesity (Griffith, Rivers, & Hoinville, 1985). Since 1980, the number of overweight adolescents has tripled (Montague, 2003), which intensifies the urgency for an effective intervention to prevent obesity and treat overweight youth. While there are many lifestyle factors that need to be considered when designing an effective intervention to implement when working with adolescents, dietary habits are perhaps one of the most important lifestyle factors that need to be addressed. Even though there are many nutritional programs
available for the treatment of overweight adolescents, they are time-consuming and expensive. An effective algorithm for health care professionals to use in the limited amount of time allotted for intervention has not been developed. Therefore, there is a need for an effective algorithm to be developed in order to combat this growing epidemic.

Statement of Problem

The rising incidence of overweight and obesity in adolescents, and the knowledge gap of interventions, have led to an increase in morbidity, mortality, and health care costs (Jain, Sherman, Chamberlin, Carter, Powers, & Whitaker, 2001). Some studies have shown that lifestyle factors have a major impact on the development of overweight and obesity (Poston & Foreyt, 1999). An effective step-by-step algorithm for working with the lifestyle issues of overweight adolescents and their parents, in effort to assess the client and improve their lifestyle habits, has not been developed.

Statement of Purpose

The purpose of this study is to develop an assessment algorithm to guide advanced practice nurses (APNs) in working with overweight and obese adolescents and their parents/guardians.

Research Question

The research question for this study is “What assessment and dietary intervention components, based upon current research, are necessary components of an interventional algorithm for overweight adolescents?”
Theoretical Framework

Orem’s Self Care Deficit Theory of Nursing (SCDTN) is one of the most widely used theories in nursing. Orem’s self-care deficit theory includes the major constructs of self-care agency (and dependent care agency), self-care (and dependent care), therapeutic self-care demand, self-care deficit, and nursing agency (Orem, 2001). Orem believes that individuals care for themselves in order to maintain life, health, and well-being. When an individual is unable to meet these needs (self-care requisites), self-care deficits occur and this implicates a need for nursing assistance (Orem, 2001).

The nurse is responsible for assisting persons to acknowledge their therapeutic self-care demands, to recognize self-care deficits, and to act on their own behalf to regulate the development of their self-care (Fawcett, 2003). The self care deficits of imbalance between physical activity and rest, normalcy and foods and fluids are at issue with overweight adolescents.

Significance to Nursing

The number of patients who are overweight and obese that are seen in primary health care practices continues to increase (Barlow, Dietz, Klish, & Trowbridge, 2002). There is a lack of established and effective interventions that can be implemented with these patients in the short time that they are seen by the health care professional, including nurse practitioners.

Orem defines a goal of nursing as helping a person become sound in health and move toward responsible self-care (Fawcett, 2003). Orem also states that nursing is responsible for helping dependent care agents to become “competent in providing and managing the patient’s care using appropriate nursing supervision and consultation”
(Fawcett, 2003, 281). The nurse must be available to help both the self-care agent (overweight or obese adolescent) and the dependent-care agent (parent/guardian) increase their knowledge and ability to meet the therapeutic self-care demands of the patient (Orem, 1995).

**Summary**

The rising incidence of overweight and obesity in adolescents is of concern for health care professionals. There is no protocol for these professionals to use when assessing the lifestyle and dietary habits of these adolescents and their family. This project will review the research available on this topic and develop an algorithm that will address these habits. Primary care practitioners, including nurse practitioners, will apply Orem’s theory to help increase the knowledge of both parents and adolescents through education of proper dietary habits. This increase in knowledge may better enable the dependent-care agency (parents/guardian) to meet the therapeutic self-care demands of their overweight or obese adolescent.
CHAPTER II
LITERATURE REVIEW

In this chapter a review of the existing literature regarding overweight adolescents will be done in an effort to identify factors that should be considered during assessment and interventions. The data taken from the literature will then be used to compose an algorithm that Advanced Practice Nurses can use to conduct an initial assessment of overweight adolescents and their lifestyle.

Nursing Theoretical Framework

Nursing theories are often used to provide insights about nursing practice by guiding practice and research. Orem’s Self Care Deficit Theory of Nursing (SCDTN) is the nursing theory that is used to guide this research. Central to this theory is that people maintain life, health and well-being through deliberate, learned self-care actions. Nursing is essential as a helping profession when persons are no longer able to meet their self-care demands (Orem, 2001).

The major concepts of Orem’s SCDTN central to this research include self-care agency, self-care, self-care requisites, self-care deficit, and nursing system. Adolescents are at a developmental state where they are able to make decisions that affect their health and well-being. Therefore this research focuses on the theoretical concepts that are central to self-care.

Developmental state is a basic conditioning factor, which are internal and external factors that affect an individual’s ability to engage in self-care (Orem, 2001). According to Erikson, adolescence is a developmental stage that occurs between 12 – 20 years of age. Developmental tasks include overcoming the transition from childhood to adulthood.
and developing a sense of identity and overcoming the psychosocial crisis that occurs, identity versus role confusion (Erikson, 1963). The developmental stage of the adolescent presents a challenge to the advanced nurse practitioner.

Self-care is the practice of activities that maturing or mature persons initiate and perform on their own behalf in the interest of maintaining life, healthful functioning, continuing personal development and well-being (Orem, 2001, p. 521). It is a deliberate, result-seeking activity; for example, exercising to maintain or lose weight. Self-care agency is the complex acquired ability of mature and maturing persons to know and meet their continuing requirements for deliberate, purposive action to regulate their own human functioning and development (Orem, 2001, p. 522). Therefore, it is the ability of the adolescent to actually engage in self-care activities.

Self-care requisites are formulated insights about actions to be performed by individuals that are known to be necessary in the regulation of individual’s human functioning and development (Orem, 2001, p. 224, 225). Therefore, they are the required actions that an adolescent has to take to maintain healthful functioning and development. This research assumes that the adolescent is not meeting their self-care requisites and therefore have a self-care deficit (SCD), which is being overweight.

A self-care deficit is an indicator that persons need help to meet their self-care requirements (Orem, 2001, p. 53). When a person’s ability for self-care, self-care agency (SCA), is not meeting the actions a person should take (the therapeutic self-care demand (TSCD)) to maintain their health and well-being, it equals a self-care deficit (SCA<TSCD = SCD). In this research, the adolescent’s self-care deficit is not being able to maintain a healthy weight.
Nursing system is a series and sequences of deliberate, practical actions of nurses performed at times in coordination with actions of the patients to know and meet components of their patient’s therapeutic self-care demands and to protect and regulate the exercise or development of patient self-care agency (Orem, 2001, p. 519). So, nursing systems involve nurses assisting individuals with self-care activities that they are unable to perform for themselves and eventually guiding the patient towards performing their own self-care. According to Orem’s SCDTN, there are three types of nursing systems: supportive-educative, partly compensatory, and wholly compensatory. This research focuses upon a supportive-educative nursing system in that the nurse will assist the adolescent that is able or can learn to perform their therapeutic self-care, yet require assistance in decision-making, behavior control, and acquiring knowledge or skills that relate to achieving a healthy weight.

The nursing process is comprised of assessment, diagnosis, planning, intervention, and evaluation. The two components of the nursing process that this research focuses on are nursing assessment and nursing intervention. Nursing assessment focuses on the assessment of the self-care requisites; this includes universal requisites (air, food, and water), developmental requisites, and health deviation. Nursing assessment also includes calculation of the total self-care demands confronting the patient and assessing the patient’s self-care abilities to meet those demands (Orem, 2001). Nursing intervention involves the production and management of the designated nursing system and methods of helping. It comprises the provision of direct nursing care (Orem, 2001). This project involves developing an algorithm for advanced nurse practitioners to use in their practice to assist them with nursing assessment and nursing intervention.
Implications for Research

The prevalence of obesity has increased steadily over the past few decades and is still increasing today (National Institutes of Health, 2003). There is no one identifiable cause for the rising incidence of obesity. Obesity is a chronic disease that arises from multiple influences including genetic, cultural, socioeconomic, behavioral, physiologic, metabolic, and molecular (Montague 2003). It is a worldwide epidemic that is receiving growing attention because of its detrimental impact on health, effect on increasing
healthcare expenditures, and its increasing prevalence (Racette, Deusinger, & Deusinger, 2003).

Included in this population, in which obesity rates are rising, are adolescents. According to a report published by the National Institutes of Health (NIH), the proportion of youth ages 6 to 18 in the United States who are overweight has increased steadily from 6 percent during 1976-1980, to 11% between 1988-1994, and continued to rise to 15% during 1999-2000 (NIH, 2003). Youths who are overweight have a high risk of becoming overweight or obese adults. Therefore, effective interventions for nurse practitioners to initiate with their young overweight and obese patients need to be developed to fight this rising epidemic.

This review will evaluate literature that exists on this topic in efforts to identify implications for practice. It will begin by discussing current guidelines for assessment and several factors that contribute to childhood and adolescence obesity, including behavioral, home and socioeconomic, and psychological factors. It will then explore dietary factors related to the rising incidence of overweight and obesity in adolescence, and lastly discuss implications for intervention.

Current Guidelines for Assessment

According to the Center for Disease Control (CDC) guidelines, it is preferred to refer to adolescents as “at risk for overweight” or “overweight” due to the potential negative connotations associated with the term “obesity” (CDC, 2004). All obese persons are overweight, but not all overweight persons are obese. To determine if the adolescent is either at risk for overweight or overweight, one must first calculate the adolescent’s Body Mass Index (BMI). BMI is a value that is determined by dividing
body weight in kilogram by the square of height in meters (kg/m²) (Racette et al., 2003). This value is then charted on a CDC growth charts for ages 2 – 20 years old. At risk for overweight is defined as a BMI-for-age between the 85th and the 95th percentiles and overweight is defined as a BMI-for-age at or above the 95th percentile on the growth charts (CDC, 2004).

Assessing measures of weight relative to stature in adolescence needs to be approached with caution because these measures are influenced by pubertal status (CDC, 2004). Puberty changes result in obvious differences of the genitalia and secondary sex characteristics; however there are differences between individuals of the same age because some develop early as compared to others who develop later in their teenage years (CDC, 2004). During puberty, there is not as much of a spurt in weight gain as there is in stature (CDC, 2004). Also, the body tissue compositions that make up the change in weight during puberty differ between males and females. Females accelerate their accumulation of fat and lean tissue during their peak height velocity, which increases weight right before menarche and between the age of 12 and 13, girls at the 5th percentile gain less than 8 lbs while those at the 95th percentile gain more than 13 lbs (CDC, 2004). However, boys accumulate fat during their growth spurt, but not as much as girls and between the age of 13 and 14, boys at the 5th percentile gain less than 8 lbs while those at the 95th percentile gain more than 17 lbs (CDC, 2004).
In 1994, Himes and Dietz published recommendations for an overweight screening procedure:

This algorithm is a beginning to a complete algorithm to guide advanced practice nurses when assessing the overweight adolescent.

Other assessment recommendations from the CDC include investigating the medical history for underlying syndrome or secondary complications, family history for familial risks, dietary assessment to evaluate eating practices including quantity, quality, and timing of food intake, physical activity assessment to assess daily activity and
sedentary levels, and physical examination to provide information about the degree of overweight (CDC, 2004).

Behavioral Factors

One aim of research has been to establish associations between behavioral characteristics and the occurrence of obesity. One theory is that the hostility exhibited by adolescents correlates with the development of metabolic syndrome, which is defined as the co-existence of obesity, hyperinsulinemia, dyslipidemia, and hypertension (Räikkönen, Matthews, & Salomon, 2003). It was found that two risk factors in particular, obesity and insulin resistance, were largely responsible for the positive correlation they discovered between hostility and metabolic syndrome (Räikkönen et. al., 2003). However, in this study, other lifestyle factors that may contribute to obesity were not controlled.

Another study examined weight-control behavior exhibited by children and their level of obesity (Wu, Yu, Wei, & Yin, 2003). Weight-control behavior was defined as actions taken in order to lose weight or maintain an ideal body weight (Wu et. al., 2003). Important findings were that children who are obese are more likely to consume soft drinks, watch more television, and not exercise regularly or enough (Wu et. al., 2003). This study also concluded that family is an important factor affecting health behavior of children.

The connection between television watching and the development of obesity in children and adolescents is a widely discussed behavioral factor and has been established as a causal relationship (Dietz & Gortmaker, 1985). It was observed that as the number of hours spent watching television increases, so did the prevalence of obesity (Dietz &
Increased television watching correlates with increased between-meal snacking, increased consumption of foods advertised on television, and decreased physical activity (Dietz & Gortmaker, 1985). One study found that children are exposed to a food advertisement every seven minutes, the majority of which promote the consumption of foods high in fat, energy and sugar (Story, 2003). All of these factors contribute to the increased caloric intake and decreased caloric expenditure that result in obesity. Severely obese children and adolescents may not be aware that excessive consumption and specific food preferences result in excessive caloric intake (Wu et al., 2003).

Another study introduced a contingent TV (children had to pedal a cycle to activate a TV) to obese children, which resulted in a significant increase in exercise, decrease in TV viewing time, and a reduced percentage of body fat (Faith, Berman, Heo, Pietrobelli, Gallagher, Epstein, Eiden, & Allison, 2001). This is a possible example of how behavioral intervention might modify physical activity and TV watching in obese children. However, a follow-up was not done and further research should investigate whether behavioral interventions result in long-term lifestyle changes. Overall, health professionals should consider the importance of behavioral evaluation in their young patients and possibly include behavioral intervention to reduce hostility, increase physical activity, and decrease television-viewing time as a way to reduce the risk of developing childhood and adolescent obesity.

Home and Socioeconomic Factors

Characteristics of the home environment and socioeconomic status have been thought to play a role in the development of overweight and obese adolescents. A study found that
children raised in environments that have a high level of cognitive stimulation have the lowest rates of overweight and obesity, independent of socioeconomic status, race, maternal marital status, or maternal BMI (Strauss & Knight, 1999). Racial disparities also exist in overweight adolescents. Strauss and Knight (1999) observed more than an 86% increased incidence of obesity in black children when compared with white children (Strauss & Knight, 1999). Based on the National Health and Nutrition Survey NHANES III (1988-1994), Mexican American boys had a tendency to be more overweight than non-Hispanic black or white boys and Non-Hispanic black girls had a higher prevalence of overweight compared to non-Hispanic white and Mexican American girls (Trojano & Flegal, 1998).

Strauss (1999) also looked at different levels of socioeconomic status and found a significant inverse relationship between the development of obesity and family income level. Maternal obesity and single mother status were also significant risk factors for the development of childhood obesity (Strauss & Knight, 1999). Another study also found that obesity was more common in women with less education and their preschool children were more likely to be overweight (Baughcum, Chamberlin, Deeks, Powers, & Whitaker, 2000). Among Mexican American and non-Hispanic black adolescents, family income is not a reliable predictor of overweight and obesity (Trojano & Flegal, 1998). However, non-Hispanic white adolescents from lower income families demonstrate a higher prevalence of overweight than those from higher income families (Trojano & Flegal, 1998).

Parental perception about weight related issues could influence children’s weight. In one study (Baughcum, 2000), most mothers considered themselves overweight
whether they were overweight or normal weight; however, they did not perceive their overweight children as being overweight. Another study showed that, when examining parental beliefs and attitudes, it was found that parents who exhibit more concern and supervision towards their children’s weight-control behaviors positively influence their children’s weight-control and health behaviors (Wu et. al., 2003). Although health professionals may not change any of these factors and attitudes, identifying people who exhibit them can help to focus intervention and educational efforts.

Psychological Factors

Research has also been conducted about psychological issues such as self-esteem, depression, eating disorders, and family dynamics in overweight and obese children. Some of the most widespread consequences of obesity are psychological (Dietz & Gortmaker, 1985). Obese children experience psychological pressure that stems from the desire to lose weight and may become frustrated with weight-control efforts that fail. Obese adolescent girls have been described as passive, withdrawn, and isolated (Dietz & Gortmaker, 1985). Interventions that aim to establish self-confidence and increase self-esteem may result in these children developing more realistic expectations and have greater success monitoring their weight effectively (Wu et. al., 2003). It has also been reported that lack of family emotional support will positively influence obesity. One study found no association between family and emotional support and the development of childhood obesity (Strauss & Knight, 1999). Many people also eat in response to negative emotions, such as boredom, anger, and sadness (Montague, 2003). An effective intervention should encourage activities that prevent and discourage eating at these times.
**Dietary Factors**

Diets that are associated with overweight and obesity in childhood not only increase the risk of developing chronic diseases, such as cardiovascular disease and type 2 diabetes, but they are associated with high energy and fat intakes and low calcium and iron intakes (Healthy People 2010). Increased snacking has been suggested as one of the major contributors to the rise of adolescent overweight and obesity and the decrease in the nutritional quality of their diets (Sullivan, Legowski, Jacobsen, Snyder Heelan, Johnson, & Donnelly, 2002). It has also been shown that adolescents rely on fast food as an energy source (Thomas, Baker, & Davies, 2003). Increased snacking and fast food consumption leads to an increase in total energy, fat, and saturated fat in the diet.

Another important factor influencing the food intake in adolescent is their meal pattern. Very little research has been conducted regarding meal patterns in adolescents and their weight. One meal pattern that needs to be considered is skipping breakfast. Research has shown that skipping breakfast contributes to poorer diets in children than those who eat breakfast (Nicklas et. al., 2004). Another study found that skipping breakfast was a risk factor for overweight and obesity in adolescents (Neutzling, Taddei, & Gigante, 2003). This study also found an inverse relationship between meal frequency and adolescent’s body weight, which may imply that eating more frequent meals may be protective against obesity (Neutzling, Taddei, & Gigante, 2003). Research with adults has shown that individuals consuming two or less meals a day were reported to weight more than those consuming five or more meals a day (Nicklas et. al., 2004).

Overconsumption of food is prevalent in Western society (Thomas, Baker, & Davies, 2003). Portion sizes in restaurants, fast-food establishments, and at home have
been steadily increasing over the past few decades (Young & Nestle, 2003). This increase in portion sizes has “coincided with an increase in the incidence of obesity” and therefore increased portion sizes may be another major contributor to the increased prevalence of childhood overweight and obesity (Rolls, Roe, Meengs, & Wall, 2004). Adolescents also consume large amounts of beverages that are high in sugar, such as soft drinks, juice, and sports drinks, which contribute to increased caloric intake (Rampersaud, Bailey, & Kauwell, 2003).

**Implications for Intervention**

Intervention in overweight and obese children and adolescents may help to prevent adult obesity, control additional weight gain, and reduce their current excess weight (Barlow, Trowbridge, Klish, & Dietz, 2002). According to current recommendation from the Center for Disease Control, weight maintenance is recommended for children age 7 years older who are at risk for overweight with no identified complications (CDC, 2004). However, weight loss is recommended for overweight and at risk for overweight children that are 7 years or older with complications (CDC, 2004). An appropriate goal is a BMI-for-age below the 85th percentile (CDC, 2004). An effective intervention for obese children and adolescents should contain educational, behavioral, motivational, and exercise components as well as the active involvement of at least one parent (Jerum & Melnyk, 2001). Family lifestyle and food habits greatly influences an adolescent’s food preferences, the parents are responsible for food variety and availability in the home, and parents encouraging their children to eat promotes fat gain (Neutzling, Taddei, & Gigante, 2003).
Population-based education, such as school interventions may be successful at preventing or improving obesity (Jerum & Melnyk, 2001). For example, a school-based educational intervention that consisted of four sessions resulted in a significantly reduced trend towards choosing high fat foods and increased duration of physical activity (Frenn, Malin, & Bansal, 2003). However, another study showed that an educational/instruction only approach may not be sufficient. An educational intervention may be more effective if children and families are provided with problem-solving exercises associated with weight control (Drohan, 2001).

A primary goal of behavior modification should be to develop an awareness of positive and negative lifestyle habits that affect diet and activity and enhance the positive behaviors that support healthy eating and activity (Drohan, 2001). For example, when children make healthy food choices, they should be praised for their decision (Jerum & Melnyk, 2001). However, food should not be used to reinforce, promote, or bribe good behavior (Dietz, 2001). Parents should also receive guidance about motivating physical activity in their adolescents and limiting the amount of TV viewing and other sedentary activities (Jerum & Melnyk, 2001).

Self-monitoring may support positive behavior change in dietary and exercise habits in adolescents. However, even though self-monitoring seems to be a widely used technique in weight-loss interventions, the research is limited regarding the relationship between self-monitoring frequency and weight-loss outcomes (Saelens & McGrath, 2003). In 1986, it was found that the parent’s report of the frequency of children’s food self-monitoring was related to short-term weight loss (Flanery & Kirschenbaum, 1986). Saelens and McGrath (2003) found that self-monitoring is an important aspect of
successful weight control for overweight adolescents (Saelens & McGrath, 2003). They found that adolescents who wrote down at least five food items eaten on each day had positive changes in their body mass index (BMI) immediately and three months after a self-monitoring intervention. They also found that more frequent recording and summing calories during treatment were significantly related to positive changes in caloric consumption. Self-monitoring takes a lot of time and they found that adolescents who predicted they would have a high rate of self-monitoring were the ones in the study who recorded most frequently (Saelens & McGrath, 2003). This indicates that self-monitoring may be a useful tool to use when working with adolescents, but only if the adolescent is committed to the time-consuming practice.

The health care provider should work with the adolescent to educate them about nutrition guidelines. A suggestion is to teach the adolescent what a calorie, how it relates to weight loss, and how to read food labels. Education concerning reducing portion sizes should also be implemented. A concept that is commonly not grasped is that increased portion sizes means increased calories (Nestle, 2003). It may be important to emphasize the concept that an overall decrease of daily caloric intake is necessary to successfully lose weight and maintain a healthy weight.

A popular diet that has gained much attention is the low-carbohydrate, high-protein diet. It is possible that the adolescent will ask about this dietary approach. Increased consumption of energy in this country has lead to an increased consumption of dietary carbohydrates in the form of bread, pasta, and simple sugars found in soft drinks, fruit juices, and sport drinks (Daniels, 2003). A 12-week trial that compared the effects of a low-carbohydrate diet with those of a low-fat diet on weight loss and serum lipids in
overweight adolescents found that the low-carbohydrate diet was effective for short-term weight loss and did not harm the lipid profile (Sondike, Capperman, & Jacobson, 2003). However, the long-term effects regarding safety and effectiveness of such a diet has not been evaluated and does not promote the necessary lifestyle modification necessary to maintain a healthy weight. It has also been reported that the weight loss in a low-carbohydrate diet is predominantly fluid loss rather than fat loss (Daniels, 2003). This study failed to include measures of body composition. Another theory is that low-carbohydrate diets are successful because it leads to a restriction of a variety of food choices (Daniels, 2003). Much research still needs to be performed before this method of weight loss can be deemed effective and safe. However, a reduction of calories from simple-sugar and refined-grain carbohydrates should be emphasized (Daniels, 2003).

It has recently been promoted in the media that a sufficient intake of low-fat, calcium-rich foods will help an individual to lose weight. But because this research is a new concept, studies have not been performed with adolescents. However, one study found that over a two year period, young women that followed a low-energy diet that included a consumption of at least 780 mg calcium resulted in no increase of body fat or weight loss compared to women that gained body fat, who maintained a low energy diet and consumed less than 780 mg of calcium per day (Lin, Lyle, McCabe, McCabe, Weaver, & Teegarden, 2000). Similar results were also seen in a group of obese adults in which consumption of a 500 kcal/day deficit diet with calcium supplements (800 mg of calcium/day) resulted in greater weight and fat loss than the group that only consumed the calorie deficit diet (Zemel, Thompson, Milstead, Moris, & Campbell, 2004). However, the greatest weight and fat loss was seen in the group that consumed the calorie
deficit diet and calcium in the form of dairy products, which supplied 1200 to 1300mg of dietary calcium (Zemel, Thompson, Milstead, Moris, & Campbell, 2004). A review of five calcium supplementation studies involving a total of 780 women that had a habitual calcium intake of 700 mg/day showed that calcium intake was negatively associated with body weight; in young women for every 100 mg increase in calcium intake there was a 0.82kg per year decrease in body weight (Davies, Heaney, Recker, Lappe, Barger-Lux, Rafferty, & Hinders, 2000). It is also important to emphasize calcium-rich foods, especially in female adolescents, because weight loss has been associated with a slower progression of bone development then in a normal-weight population of adolescent females (Rourke, Brehm, Cassell, & Sethuraman, 2003).

Changes in the adolescent’s meal patterns may also have a positive influence on their dietary intake and therefore should be part of a behavioral intervention (Nicklas et al., 2004). Health care professional need to emphasize eating a healthy breakfast, making sensible, healthy choices for lunch at school or when eating away from home, and eating smaller, more frequent meals instead of snacking between meals. Replacing high sugar beverages with more healthful choices, such as milk, water, or 100% fruit juice, should also be emphasized (Jerum & Melnyk, 2001).

It is also important for the health care provider to monitor abdominal fat, in the form of waist or abdominal circumference, as a means for assessment of the efficacy of weight loss (Montague, 2003). The presence of increased abdominal fat seems to be an independent risk predictor of morbidity associated with obesity, such as cardiovascular disease and diabetes mellitus, even when the BMI is not markedly increased (Montague, 2003).
Incorporation of physical activity into daily routines is an important strategy to facilitate energy expenditure in adolescents. Encouraging the adolescent to walk to school or local neighborhood places, using stairs instead of elevators, or playing with friends instead of talking on the phone are ways to increase physical activity. Also, joining an organized sporting team will help the adolescent to become more active (Barlow & Dietz, 2004).

The psychosocial state must be considered when working with the adolescent. The discrimination that many adolescents experience from their peers as a result of being overweight or obese may lead to social isolation, which can affect their psychological development (Wabitsch 2000). A study conducted with adolescent girls found that girls who tried to restrain the food they consumed displayed high levels of feelings of worthlessness, body dissatisfaction, fear of weight gain, and they were heavier and more physically developed than girls who did not restrain what they ate (Killen, Taylor, Hayward, Wilson, Haydel, & Hammer, 1994). Neutzling and colleagues (2003) found that adolescents in their study who were on a diet for weight-loss purposes was the risk factor that presented the highest association with overweight and obesity (Neutzling, Taddei, & Gigante, 2003).

A study that surveyed healthcare providers, including pediatric nurse practitioners, found that most professionals did not initiate treatment in adolescents who did not have health conditions or indicate they wanted to control their weight (Jonides, Buschbacher, & Barlow, 2002). Therefore, not only are methods needed to increase motivation in overweight adolescents, but health professionals should also be motivated to promote weight control efforts in their clients regardless of whether they have current
health conditions (Jonides et. al., 2002). It was also suggested that pediatric practitioners do not need more information on what to advise their overweight patients, but would benefit from guidance on how to advise them (Barlow et. al., 2002). The use of pharmacological and surgical treatment is beginning to emerge as treatment options in overweight and obese children and adolescents (Kimm & Obarzanek, 2002). Before these become standard methods of treatment, effective dietary interventions for weight reduction need to be developed and tested (Kimm & Obarzanek, 2002).

Summary

Improvement of care for overweight and obese children must develop from an understanding of current research and practice. It is known that obesity is a result of a multitude of dietary and lifestyle factors and effective interventions are needed. However, effective interventions that can be utilized by most health practitioners it is unknown along with a lack of knowledge on how to effectively combat the increasing epidemic in the child and adolescent population. Medical researchers have conducted the majority of the research that exists regarding childhood obesity. Nursing research has just begun to focus on this issue in the past few years. Therefore, there is limited nursing literature regarding childhood obesity. This project aims to contribute to the growing body of nursing literature by developing a dietary intervention in the form of an algorithm that can be used by health practitioners with a wide variety of overweight and obese adolescents.
CHAPTER III
METHOD

The purpose of this study is to develop an assessment protocol and dietary intervention algorithm to guide nurse practitioners professionals in working with overweight and obese adolescents and their parents/guardians. This chapter aims to describe the methods in which this study will be carried out. It will describe the design and subjects of the study, the materials that will be used, and how the data collection will take place.

Design

This study is a descriptive, systematic review of the existing literature regarding dietary interventions with overweight and obese, high school aged adolescents. An algorithm will then be developed utilizing the criteria identified in the literature review. The purpose of this algorithm will be to assist advanced practice nurses to assess and guide dietary interventions with overweight adolescents. It will give step-by-step directions on how to proceed with assessment of an overweight adolescent. Once the data collected from existing research becomes saturated with information, the algorithm will be drafted. It will then be submitted to four experts experienced with the issues of adolescent overweight to be reviewed and critiqued for content validity. A methodological disadvantage to this design is the limited review of the existing research that has been performed.

Subjects

This is not an interventional study and therefore, subjects will not be included. The algorithm is being developed for use by APNs with overweight 14 – 18 year old adolescents.
Materials

Data will be collected from peer-reviewed articles that are found in the research databases of PubMed and CINAHL. The information will be summarized and an algorithm will be developed with the intention of further testing this algorithm in another research study, in which health professionals will test the effectiveness of the algorithm with overweight or obese adolescents in their practice. For the purpose of this study, the algorithm will be submitted to a panel of experts to elicit feedback of the practicality and effectiveness of the proposed assessments and interventions in the algorithm.

The experts that will be in the interdisciplinary review panel will include a Registered Dietitian, a Pediatric Endocrinologist, an Exercise Physiologist, and a Pediatric Nurse Practitioner. Inclusion criteria for these experts are that they must be currently practicing, have had at least one year experience working with overweight high school aged adolescents, and have had experience in treating or counseling overweight adolescents to assist them in losing weight.

Content validity of this algorithm will be established based upon the review and feedback of the expert panel. The members will be contacted by phone to see if they are willing to participate in this study. If they agree, the suggested algorithm (see Appendix I) will be emailed to the experts with instructions for evaluation. They will then review the algorithm and submit critiques, and their suggestions will be taken into consideration when finalizing the protocol. Reliability and validity regarding the efficacy of this algorithm will be established in future intervention that tests the effectiveness of the
algorithm in helping overweight and obese adolescents develop healthier dietary habits and reduce their weight.

Data Collection

Sample

The study will collect literature on dietary interventions performed with high school aged male and female adolescents ages 14-18. However, recent research performed with adults will also be considered due to the constrictions on research with adolescents.

Protection of Human Rights

This current study will not require a review by an Institutional Review Board.

Data Collection

Research that has been published regarding weight-loss interventions, specifically dietary interventions, will be reviewed. The suggestions for intervention from these studies will be collected and summarized into an algorithm. A copy of the proposed algorithm will then be submitted to an expert panel and their remarks and critiques will be reviewed and incorporated into the algorithm.

Controls for Threats to Internal and External Validity

The review of literature that focuses on different aspects of intervention with overweight and obese adolescents combined with submitting the algorithm to an interdisciplinary expert panel that works with overweight adolescents will help to ensure the validity of the protocol.
Assumptions

One assumption involved with this method of data collection is that the articles reviewed will provide a representative summary of the research conducted with overweight and obese adolescents. Another assumption is that the expert panelists will provide all the critique needed to revise the algorithm before testing occurs.

Limitations

Limitations of the data collection include that it focuses mainly on dietary interventions that have been conducted only with high school aged adolescents. Another limitation is that the experts will not fully represent the wide range of interdisciplinary practices that interact with overweight and obese adolescents. Last, a limitation may be that an inferential statistics analysis was not conducted.

Data Analysis

Inferential statistical analyses will not be conducted in this study. Data will only be analyzed for content validity and suggestions by the expert panel will be considered. Statistical validation will occur in a subsequent study that tests the effectiveness of the algorithm. Although not a part of this project, testing of the algorithm will include a pilot study after suggestions are received from the expert panel.

Summary

The first part of this research involves a descriptive, systematic review of the existing literature in which research regarding dietary interventions to assist overweight, high school aged adolescents lose weight will be reviewed. The recommendations for intervention depending on the outcome of these studies will be summarized into an algorithm, which will consist of an intervention instrument. An expert panel will then
review the algorithm and their recommendations for revision will be taken into
consideration. In the future, the efficacy of this algorithm can be tested during a follow-up study that performs an intervention.
CHAPTER IV
RESULTS

Included in this chapter are the recommendations regarding the assessment algorithm, which were received in two sets of information from the expert panel. The comments from the Pediatric Nurse Practitioner were sent via email while the comments from the Pediatric Endocrinologist, Registered Dietitian, and Exercise Physiologist (Pediatric Endocrinology Team) were grouped together on one sheet of paper and faxed. These comments, discussed below, can also be viewed in Table 1.

Theoretical Suggestions

The theoretical basis of this project is Orem’s Self Care Deficit Theory of Nursing. This comes into play at the bottom of the assessment algorithm after the health care provider conducts the in-depth medical assessment. The provider ultimately would decide if a self-care deficit exists, which would indicate a need for intervention.

It was suggested that Orem’s theoretical framework be expanded upon or not used in the algorithm itself. Some specific suggestions included assessing Self Care Requisites in the beginning assessment and listing some nursing diagnoses in the portion of the algorithm that deals with assessing risk factors (example include: alteration in growth and development, alteration in nutrition more than body requirements, body image disturbance, etc.).

Practical Suggestions

In the beginning screening portion of the algorithm, suggestions were made regarding the division of percentile categories. It was suggested that the “less than or equal to 85th percentile” category be changed to “75th – 85th percentile” and that the child should be checked again in three months instead of the suggested re-screening next year.
It was also suggested to add a fourth category of “50\textsuperscript{th} – 75\textsuperscript{th} percentile” and that these adolescents should be rechecked in 6 – 8 months.

The entire expert panel agreed upon one practicality of the assessment algorithm. It was felt that adolescents who fell above the 95\textsuperscript{th} percentile and did not have one of the first risk factors positive needed some sort of therapeutic action instead of the suggested note in chart with no therapeutic action and having the adolescent return next year. The suggested course of action was anticipatory guidance, such as discussion and nutritional handouts.

Another comment regarding practicality of the algorithm was directed towards the final decision if there was a need for intervention. Part of the expert panel felt that there would definitely be something that needed to be intervened upon, even if a self-care deficit did not exist.

Editorial Suggestions

Two editorial comments were made regarding the language in the assessment algorithm. One panel member suggested that the word “medical” be left out of the box that instructs the provider to conduct a further, in-depth medical assessment. The other panel members suggested that in the behavioral factors assessment box, “etc.” be changed to “frequency”.
<table>
<thead>
<tr>
<th>Item</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructions</td>
<td>#1  -No comments received.</td>
</tr>
<tr>
<td></td>
<td>#2  -The group asked how in detail did the comments need to be.</td>
</tr>
<tr>
<td>Theory</td>
<td>#1  -Expand the use of the theoretical framework or not use it the algorithm;</td>
</tr>
<tr>
<td></td>
<td>-Use Orem in the beginning of the assessment also;</td>
</tr>
<tr>
<td></td>
<td>-List nursing diagnoses in the portion of the algorithm that deals with positive risk factors.</td>
</tr>
<tr>
<td>Practicality</td>
<td>#2  -No comments were made regarding theory</td>
</tr>
<tr>
<td></td>
<td>#1  -Teens should be given some anticipatory guidance if their BMI falls &gt;95th %ile and have no positive risk factors. Some form of education should be mentioned.</td>
</tr>
<tr>
<td></td>
<td>#2  -The box containing the &lt;85th %ile should be changed to 75th – 85th %ile and these adolescents should be rechecked in 3 months.</td>
</tr>
<tr>
<td></td>
<td>-Another box should be added that indicates a 50th – 75th %ile and these adolescents should be rechecked in 6-8 months.</td>
</tr>
<tr>
<td></td>
<td>-There should be some sort of intervention if the adolescent is in the 85th %ile or above but does not have a positive risk factor.</td>
</tr>
<tr>
<td></td>
<td>-At the end of the algorithm, you will definitely find something that need to be intervened with, so therefore you do not need the box that states “there is no need for intervention”.</td>
</tr>
<tr>
<td>Editorial</td>
<td>#1  -In the middle of the page, under “Conduct a further, in-depth medical assessment,” leave out the word “medical”.</td>
</tr>
<tr>
<td></td>
<td>#2  -No comments were made.</td>
</tr>
</tbody>
</table>

#1 – Represents comments received from the Pediatric Nurse Practitioner
#2 – Represents comments that were received from the Pediatric Endocrinology Team, which consisted of a Pediatric Endocrinologist, Registered Dietitian, and Exercise Physiologist.
CHAPTER V
DISCUSSION

This chapter discusses the findings of the extensive literature review and the applicability of the comments made by the expert committee to the assessment protocol that was devised as a result of the literature review. The chapter will also explore the strengths and limitations of the study, the implications for nursing research and practice, and summarize the findings.

Findings

The Body Weight Assessment Algorithm for Adolescents was composed after a thorough review of literature was conducted regarding research that was conducted with high-school aged, overweight adolescents. The first portion of the algorithm was modeled after a previous algorithm published in 1994 by Himes and Dietz that detailed an overweight screening procedure for use with adolescents (Himes & Dietz, 1994).

The expert committee felt that this portion of the algorithm should be revised to more restrictive when categorizing the adolescent into a BMI percentile and the resulting action to take with the adolescent. They also felt that some attempt at an intervention should be made once an adolescent had reached the 85th percentile or above, even if one of the first group of risk factors was negative.

The resulting change in these recommendations included an additional percentile be added to the algorithm, a shorter period in which the adolescent would be re-screened if needed, and education to be offered to any adolescent who is at the 85th percentile or above.

The second portion of the algorithm was largely based upon the intervention studies that were discussed in the literature review. If an adolescent is found to be at the
85th percentile or above for BMI and has a positive risk factor listed in the first group of the algorithm, it is suggested that a further, in-depth assessment should be conducted.

The first category to be investigated is Home & Socioeconomic Factors. Research has shown that the following factors may have a positive correlation to an adolescent’s weight: Parents’ or guardians’ weight status, parents’ or guardians’ eating/cooking habits, family’s eating patterns, income level of family, and cultural/ethnic factors (Strauss & Knight, 1999; Baughcum, Chamberlin, Deeks, Powers, & Whitaker, 2000; Trojano & Flegal, 1998; Wu et. al., 2003).

The second category includes a more in-depth physical examination of the overweight adolescent. Suggested physiological and biochemical tests to be performed include an EKG, a urine test for ketone bodies, blood draw for a lipid profile and complete blood count (CBC), serum glucose and insulin levels, triceps skinfold, body fat percentage, and a thyroid screen.

The third category involves a more in-depth examination into dietary factors that may play a role in the adolescent being overweight. Researchers has suggested that the following factors may influence the adolescent’s weight status: snacking habits, types of drinks consumed, meal frequency, breakfast consumption, fast food consumption (type and frequency), and portion sizes of food consumed (Sullivan et al., 2002; Thomas, Baker, & Davies, 2003; Nicklas et. al., 2004; Young & Nestle, 2003; Rolls et. al., 2004; Rampersaud, Bailey, & Kauwell, 2003).

The fourth category of the algorithm takes into consideration psychological factors that might have a positive correlation with an adolescent’s weight. Researchers have implicated the following psychological factors: emotions and eating patterns, self-
esteem of the adolescent, the adolescent’s system of social support, and the presence of depression or social isolation (Dietz & Gortmaker, 1985; Wu et. al., 2003; Strauss & Knight, 1999; Montague, 2003).

The fifth category included on the in-depth assessment portion of the algorithm is behavioral factors. Many researchers have suggested that the following behavioral factors may positively correlate with the weight of the adolescent: presence of anti-social or hostile behaviors, time spent daily performing sedentary activities and the adolescent’s exercise patterns (type, duration, and frequency) (Räikkönen et. al., 2003; Wu et. al., 2003; Dietz & Gortmaker, 1985; Story, 2003).

The expert committee reviewed the algorithm and no suggestions were made regarding this portion of the algorithm. Therefore, it is assumed they thought investigating these factors would adequately constitute an in-depth assessment with an overweight adolescent.

Nursing Theory

This project used Orem’s Self-Care Deficit Theory of Nursing (SCDTN) as a guide in which to conduct this research. Orem’s theory was incorporated into the algorithm at the end, when the assessment asks whether a self-care deficit exists for the adolescent. If it is found that there is a self-care deficit, then there is a need for intervention with the adolescent. However, if there is no self-care deficit, there is no reason why an intervention would need to take place.

It is safe to assume that if a health care provider has reached this portion of the assessment, there will be a need for intervention. However, there is always the possibility that the healthcare provider would not find a problem when assessing the proposed
factors. This may be due to the fact that there are factors that would contribute to overweight in adolescents that has not been discussed in the literature and therefore were not included in this algorithm. Or it is possible that the factor was just not included in the algorithm.

In this case, it would be up to the health care provider to decide what is needed. Based upon Orem’s SCDTN, this algorithm suggests that there is no need for intervention. The expert committee stated that there will definitely be a need for intervention, regardless of whether one of these factors exhibited a self-care deficit. Therefore, the algorithm was modified in that the healthcare provider would be directed towards an earlier box that suggested a need for one-on-one counseling and education about lifestyle habits.

The expert committee also felt that Orem’s theory should be either incorporated more into the language of the algorithm or left out of the algorithm altogether. (Orem, 2001). Since Orem’s theory is an essential component to this project, the algorithm was changed to include more of the theory in the framework. At the point in which the algorithm instructs the provider to conduct a more in-depth assessment, it also states that the provider will be assessing the adolescent’s self-care deficits. Also, at the end of each of the categories for further assessment, potential nursing diagnoses are listed specific to those factors.

Strengths and Limitations

One of the strengths of this project was the extensive review of the literature and collecting information until it became saturated. While there are probably many factors that were not taken into consideration when devising the algorithm, the main factors
emphasized in today’s research were included. Another strength of this study is the review conducted by the expert committee. This provided feedback regarding the practicality of the algorithm for use; therefore the algorithm should be ready to be used in an intervention.

A limitation to this study is that it required subjective responses from the committee members. Some of the response and evaluation were not very in-depth and recommendations for change were not clear. Also, only four health professionals located in the Toledo, Ohio area were able to give feedback regarding the algorithm. This may limit its practicality to other areas in the United States. A final limitation is the literature review was conducted until the data became saturated with information; however it was not possible to review all the literature available. Therefore key factors may not have been included in this algorithm.

Implications for Further Nursing Research and Practice

Further nursing research needs to address the practicality and use of the algorithm in an actual healthcare setting. If an intervention was conducted with the algorithm, a more thorough analysis of the effectiveness of the assessment tool would be done. This analysis may lead to modifications of the algorithm, which would yield a more efficient tool for nursing practice.

This algorithm may also be used by nurses in the future in school and community settings. It also provides a general awareness of adolescent overweight and obesity and provides basis for social action for APNs. They can respond by writing grants to fund programs that can be developed to combat this rising epidemic.
Summary

In the past decades, the prevalence of overweight adolescents has risen dramatically (CDC, 2004). As a consequence, researchers and practitioners have begun focusing on prevention and intervention with adolescents to reduce these increasing rates. Research has investigated many factors in effort to find positive correlations and possible causes for this overweight epidemic. But the vast amount of information available had not been composed into a tool that advance practice nurses could use in their practice.

A weight assessment tool for adolescents did not exist prior to this project. Therefore, an extensive review of the literature was performed in this study and a weight assessment algorithm was invented based upon the findings of the review. The algorithm was then submitted to a panel of experts who provided feedback regarding the practicality of the tool. The suggestions were taken into consideration, modifications were made (Appendix 2), and the algorithm is now ready to be tested in an interventional setting.
Appendix 1: Body Weight Assessment Algorithm for Adolescents.

Calculate BMI

< 85th %ile   85th – 95th %ile   > 95th %ile

Has adolescent reached growth spurt?

Re-screen next year

Is at least one of the following factors positive?
- Family Hx of Overweight or Obesity
- Elevated BP
- Elevated total cholesterol
- Large change in BMI
- Concern about weight gain

Yes

No

- Note in chart
- No therapeutic action
- Return next year for screen

Does a Self-Care Deficit Exist?

Yes

No

Home & Socioeconomic Factors
- Parents or guardians’ weight status
- Parents’ or guardians’ eating/cooking habits
- Family eating patterns
- Income level of family
- Cultural/Ethnic Factors

Physical Examination
- EKG
- Urine test for ketones
- Blood draw for lipid profile & CBC
- Serum Glucose/insulin level
- Triceps skinfold
- Body fat percentage
- Thyroid screen

Dietary Factors
- Snacking habits
- Types of drinks consumed
- Meal frequency
- Breakfast consumption
- Fast food consumption – type and frequency
- Portion sizes of food consumed

Psychological Factors
- Emotion & eating pattern correlations
- Self-esteem of adolescent
- System of social support
- Presence of depression or social isolation

Behavioral Factors
- Presence of anti-social or hostile behaviors
- Time spent daily performing sedentary activities
- Adolescent’s exercise patterns (type, duration, etc.)

Conduct a further, in-depth medical assessment.

There is a Need For Intervention

There is No Need for Intervention

References


