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Bone Health Promotion for Youth: A Primary Care Intervention

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Bone Health Promotion for Youth: A Primary Care Intervention

Submitted in partial fulfillment of the requirements for the degree of Doctor of Nursing Practice
at Eastern Kentucky University

By
Kay G. Wilson
Lexington, KY
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Abstract

Obese youth have high rates of vitamin D and calcium deficiencies and are at risk for developing osteoporosis. Clinical guidelines are needed in primary pediatric care services to promote bone-healthy behaviors. The aim of this project was to: a) implement the infrastructure and processes for physiological monitoring, consistent parameter-based vitamin D & calcium supplementation, family education, and coaching, and b) evaluate the impact of bone promotion changes on patients and parents and the primary care delivery system. The project outcomes included modest gains in bone health awareness among staff, patients, and families. In addition, modifications to clinical pathways and related agency forms ensured that evidence-based guidelines were integrated into the Healthy Horizon Children's Center system.

Key words: youth, families, unhealthy eating and lifestyle behaviors, primary care, vitamin D blood serum levels, calcium blood serum levels, bone health promotion and osteoporosis.

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Kay G. Wilson

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Background and Significance of the Problem

Problem Identification

Youth are known to have issues of unhealthy eating patterns contributing to decreased levels of blood serum vitamin D levels and muscular aches and pains (Centers for Disease Control [CDC], 2012; Magee, Stubery, & Schmutte, 2008). Inadequate bone development can eventually lead to disabling osteoporosis (CDC, 2012; Magee et al., 2008; Martin et al., 2004). Promotion of bone health and prevention of osteoporosis are essential components in the primary health care of youth.

Context of the Problem

Obesity, recognized as one of the major causes of vitamin D deficiency, harbors excess body fat where the fat-soluble vitamin D is readily assimilated, trapped and stored (Harel, Flannagan, Forcier, & Harel, 2011). Vitamin D entrapped in the excess adipose tissue is rendered less metabolically bioavailable, leading to vitamin D deficiency in the obese child and adolescent (Censani et al., 2013; Lenders et al., 2009). Censani et al. (2013) reported that vitamin D serum levels are deficient in most youth, with the lowest Vitamin D levels reported in the morbidly obese child and adolescent. Harel et al.'s (2011) retrospective chart review of 68 obese male and female adolescents reported vitamin D deficiency in 91% of the obese males and 100% of the obese females.

The role of vitamin D is to promote calcium absorption from the small intestine through a synthesizing process (Holick et al., 2011). After the synthesizing process, the vitamin D and calcium are distributed into the skeletal bone tissue and sustained throughout the child and adolescent accelerated skeletal bone growth period (Censani et al., 2013; Chan, Kwong, Zang,

Wan, 2007). Decreased vitamin D levels with low calcium absorption are primarily the etiology of unhealthy demineralized osteoporotic bone leading to potentially negative health outcomes of impaired immune systems, increased risk of bone deformities, osteoporosis, pain and/or fractures (CDC, 2012; Censani et al., 2013; Chan et al., 2007; Holick et al., 2011; Magee et al., 2008; Martin et al., 2004; Rudolf et al., 2006).

Bone health promotion begins in utero where the typical pregnancy requires increased nutrients, minerals, hormones and vitamins. Shin, Shin, and Lee (2013) suggested that the fetus and the newborn rely on adequate maternal serum 25 (OH) D concentration levels for bone health promotion. Daily prenatal vitamins along with healthy lifestyles and healthy eating behaviors provide the viable fetus and pregnant female with the required recommended daily allowance (RDA) for the best overall health and bone health outcomes. Pregnancy requires greater amounts of calcium and vitamin D to protect maternal bones and to ensure the growing fetal skeleton has the required levels of vitamin D (600IU daily) for bone health promotion (Holick et al., 2011). The U.S. Endocrine Task Force reported that 600 IU daily may be insufficient for the vitamin D deficient pregnant woman, and recommended vitamin D supplementation of up to 1,500-2,000 IU/daily (as cited in Holick et al., 2011). Even breast milk has been shown to be vitamin D insufficient. The American Academy of Pediatrics' vitamin D Recommended Daily Intake (RDI) guidelines suggest that the totally breast fed infant be administered 400 IU/daily of vitamin D (1 drop) orally by the mother throughout breastfeeding and until the infant is weaned to vitamin D fortified milk (Holick et al., 2011; Holick, 2012a).

As the child matures towards pre-school age, bone health promotion strategies are achieved through the incorporation of: a) healthy eating behaviors; b) healthy lifestyles/exercise/sports; c) ingesting the minimal daily RDA of vitamin D (400 IU); d)

absorbing sunlight for 15-20 minutes during the peak UVB hours of 10am to 2 pm (while NOT wearing sunscreen); and e) eating a well-balanced diet that includes daily servings of calcium and vitamin D rich foods (Holick, 2010; Holick et al., 2011; Holick, 2012 b). With growth and maturation, the pre-adolescent and adolescent period of 9-16 years old demands increased calcium and vitamin D as lifetime bone accrument or the bone matrix formation “peaks” and the need for vitamin D increases to at least the RDA of 600 IU daily (Holick, 2011; Holick, 2012 a; Holick 2012 b). The 9-16 years olds’ growth spurt is brief compared to a person’s life expectancy years of almost 80 years, yet up to 80% of adult bone mass is accumulated during this time period and forms the lifelong permanent skeletal frame (Ford, Zhao, Tsai, & Li, 2011; Holick, 2010; Holick et al., 2011: Holick, 2012b). Papadopoulos (2007) reports the inadequate laying down of bone tissue during the child and adolescent rapid skeletal growth period is the main contributing factor to later-in-life development of osteoporotic or “cobweb” type bones.

The youths’ period of overall rapid growth realizes bone accrument that is about the same as the amount of bone lost throughout the lifespan. Peak bone mass of up to 80% the adult total is accumulated by late adolescence and failure to develop healthy eating patterns with the RDI of calcium and vitamin D is detrimental to bone development. Persistent low vitamin D levels in youth often leads to poor bone health, myopathies with proximal muscle weakness, diffuse muscle weakness and pain with gait impairments of a “waddling” type of walking, and osteoporosis (Casazza & Ciccazzo, 2006; Holick et al., 2012, p. 192).

Scope of the Problem

Censani et al. (2013) reported that the national adolescent obesity rate has more than tripled over the last thirty years and is viewed as one of the most serious public health risks (Censani, et al., 2013; National Collaborative on Childhood Obesity Research [NCCOR], n.d.).

CDC (2012) statistics estimated that 17% (12.7 million) of American children are obese. Childhood obesity is measured by a body mass index (BMI) at or above the 95th percentile of the sex-specific CDC BMI-for-age growth charts (CDC, 2012). The CDC (2012) reported that among children and adolescents there are significant racial and age disparities with higher prevalence rates in Hispanics (22.4%) and non-Hispanic black youth (20.2%) than non-Hispanic white youth (14.1%). The non-Hispanic Asian youth obesity prevalence was lower (8.6%) than non-Hispanic white, non-Hispanic black and Hispanic youth (CDC, 2012). U.S. children ages 2-5 years old had the lowest percentage of obesity (8.4%) as compared to children 6-11 years old (17.7%) and 12-19 years old (20.5%) (CDC, 2014).

In 2014, the Trust for American's Health and the Robert Wood Johnson Foundation reported in the State of Obesity project, that 31.6% of Kentucky's adults and 19.7% of Kentucky's youth (ages 10-17 years old) were classified as being obese, which placed them eighth highest in the national childhood and adolescent obesity rankings. Kentucky's youngest children (ages 2-4 years old) were classified in the nation's top ten states of the most obese, ranking 6th nationally with an obesity rate of 15.5 % (Kentucky Health News, 2014).

Childhood and adolescent obesity are a great economic burden on the health care system, costing an estimated \$14 billion annually in direct health expenses (NCCOR, n.d.). Medicaid-covered youth are nearly six times more likely to be treated for the diagnosis of obesity than private pay children (NCCOR, n.d.). Youth were also found to be absent from school more often than their average weight peers, contributing to decreased learning, parent/guardian missed work wages, and less monetary reimbursement for schools due to the absenteeism (NCCOR, n.d.).

Thorpe (2009) projected that if obesity rates continue to increase at their current pace in the U. S., then obesity related direct health care costs would exceed \$344 billion dollars by 2018.

Nationally, obesity costs will rise from \$361 per person to a projected \$1425 per person by 2018, an increase of \$1064 per person (Thorpe, 2009). However, if obesity rates simply remained stable, then by 2018 the U.S. could save an estimated \$820 per adult in health care costs, a savings of about \$200 billion dollars (Thorpe, 2009).

Kentucky is one of five states, along with Oklahoma, Ohio, Missouri, and Mississippi, with the highest obesity-attributable health care spending costs for adults (Thorpe, 2009). For Kentucky, these costs were \$433 per adult in 2008, \$750 per adult in 2013, and were projected to increase to \$1836 per adult by 2018 (Thorpe, 2009). This would be \$411 higher than the projected national per person cost (Thorpe, 2009).

Magee et al. (2008) posited that osteoporosis is a preventable metabolic bone disease that has become a global health crisis: Globally, data suggests one in three women and one in twelve men older than 50 years will suffer from osteoporosis in their lifetime (Lanham-New, 2007). The World Health Organization (WHO) projects persons affected by osteoporosis worldwide could rise to a staggering 6.26 million by the year 2050 (Lanham-New, 2007).

Consequences of the Problem

Osteoporosis is a preventable metabolic bone disease (Magee et al., 2008). Osteoporosis is often referred to as the “silent thief” capable of producing a “silent epidemic” of undiagnosed porous osteoporotic bone fractures (Chan et al., 2007). In 2014, the National Osteoporosis Foundation reported the estimated healthcare costs in United States for the treatment of osteoporotic related fractures and subsequent sequelae exceeded \$17 billion and were predicted to trend upward.

Recent reports suggest vitamin D deficiency is considered at pandemic levels worldwide (Holick, 2010), and “In the U. S. alone, it has been estimated that at least 50 million teenagers,

and 70 percent of children (6-11 years old) were vitamin D deficient” (Holick, 2010, p.275). A 20 percent decline in serum vitamin D levels was reported between 1994 and 2004 in the U.S., with the major etiologies being obesity, unhealthy dietary intake, lack of physical activity, decreased milk consumption, and increased use of sun protection (Holick, 2010). Uncorrected vitamin D deficiency levels affects the absorption of calcium, which is widely recognized as the etiology to inadequate bone development, weakened immune system, joint and muscular pain, lack of physical activity, deformities and later in life osteoporotic bone architecture malformations (CDC, 2012; Chan et al., 2007; Magee et al., 2008; Martin et al., 2004; Rudolf et al., 2006). A strong predictor of bone health outcomes is the quality of the dietary intake measured by the dietary choices of the obese and overweight youth (Rafferty, Heaner, & Lappe, 2011).

Evidence-Based Intervention

The need for preventive health care counseling and education is paramount to promoting healthy lifestyles early in life to prevent adult onset health problems known to impact the entire health care system and economic environment (Schor, 2009). It is important, therefore, for youth and their parents to understand bone health. Making changes for a healthier lifestyle requires knowledge and support.

During childhood and youth, healthy weight, eating, and lifestyle patterns are imperative for prevention of disease, disability and premature death. One crucial aspect of this wellness and prevention concept is for youth to develop a strong knowledge base for making lifelong healthy eating and lifestyle choices (Magee et al., 2008; Martin et al., 2004; Rafferty et al., 2011). Many youth and their parents or guardians who have not been exposed to healthy eating and lifestyle interventions have developed obesity and obesity related health care problems such as vitamin D

deficiency. Educational interventions of healthy lifestyles and healthy eating with adequate daily intake of fortified calcium and vitamin D foods and drinks have demonstrated improvements in eating habits, overall well-being, decreased musculoskeletal pain, decreased fractures, and increased vitamin D levels (Weaver, Lindsay, & Gitelman, 2012). The significance of unhealthy eating behaviors and bone health promotion in youth is a dynamic, multidimensional challenge in the primary care setting.

Improving health care initiatives and health care outcomes of youth is considered the focus of specialty providers such as physicians and allied healthcare providers (primary care providers, pediatric nurse practitioners and nurses) (Barlow, 2007). Increased knowledge development through individualized educational programs and interventions directed by health professionals can influence youth and their parents to change towards healthier eating and lifestyle options (Casazza & Ciccazzo, 2006; Rydell et al., 2005).

Purpose of the Project

The purpose of the project was to implement evidence-based bone health promotion components in a primary care setting for youth. Changes to the structure and processes of a particular health care delivery system related to bone health was the focus of project. The objectives of the project were to: a) implement the infrastructure and processes for physiological monitoring, consistent parameter-based vitamin D and calcium supplementation, family education, and coaching, and b) evaluate the impact of bone promotion changes on patients and parents and the primary care delivery system. This project focused on providing family educational materials, specific prescriptive preventative guidelines for practitioners, and interactive support to assist with lifestyle changes.

Theoretical Framework

The theoretical basis for the project was King's (1971, 1981) Theory of Goal Attainment. The Theory of Goal Attainment described the context of nursing care and provided a structure for developing interventions within that context.

King's (1971, 1981) systems approach included the characteristics of the personal, interpersonal, and social systems through which the nurse interacts. King's (1981) overall philosophical assumption is that "...the focus of nursing is human beings interacting with their environment leading to a state of health for individuals, which is an ability to function in social roles" (p.143). King (1971, 1981) emphasized the importance of family as an interpersonal and social system.

Key dynamics addressed by the Theory of Goal Attainment (King, 1971, 1981) include communication, interaction, and the transactions involved in mutual goal setting and goal attainment for health outcomes between the nurse, the client and the family. These human processes are guided by the nursing process in King's theory to enhance understanding in the nurse-family relationship and assist in the planning of care.

In family health care, the nurse uses special knowledge and skills to communicate appropriate information, which is based on the best evidence from the literature. The nurse works with the family to help them identify clear goals, and facilitates their progress in attaining those goals (King, 1971, 1981).

The structure and concepts of the Theory of Goal Attainment (King, 1971, 1981) were used to design each phase of the proposed bone promotion intervention in the primary care setting. The project initiation entailed collaboration with the current health care providers (HCPs) to integrate evidence-based protocols into the agency practice. During the assessment

phase of the project, the project leader (nurse), the child, and the family established an open communication process of sharing perceptions, knowledge about self and roles, and identifying health issues. Goals related to eating behaviors, bone health promotion, osteoporosis knowledge, healthy lifestyles, and vitamin D and calcium intake were negotiated. Subsequent interactions between the project leader, child, and family focused on monitoring progress on established goals. Evidence-based strategies for coaching and motivating were applied to the process.

Review of Literature

The review of the literature described evidence to support the strategies selected for this project. Studies included in this review addressed: a) the prevalence of vitamin D deficiency among the targeted population; b) educational components needed for improving knowledge of bone health; c) methods for delivering knowledge content, including computer based strategies and family based interventions; and d) recommendations for pharmacological treatment of vitamin D and calcium deficiency.

Prevalence

Harel et al. (2011) conducted a retrospective chart review to explore the prevalence of vitamin D deficiency in obese patients seen in an adolescent clinic of an urban hospital in Rhode Island. A total of 68 obese patients (BMI >95%) were included in the study. The ethnic composition was Hispanic 45%, African American 40%, and Caucasian 15%. The average age was 17 years (range 11-27). Low vitamin D status was defined as serum 25-hydroxyvitamin-D <20 ng/ml.

Harel et al. (2011) reported that the prevalence of low vitamin D status was 100% in obese girls and 91% in obese boys. The mean (\pm SE) vitamin D level was lower for African Americans (18 ± 1 ng/mL) and Hispanics (17 ± 2 ng/mL) than for Caucasians (21 ± 3 ng/mL).

Turer, Lin and Flores (2012) examined the prevalence of vitamin D deficiency using data from the publicly available 2003-2006 National Health and Nutrition Examination Survey (NHANESs). This cross-sectional, stratified, multistage, probability sample survey was conducted by the National Center for Health Statistics. The NHANES study included 12,292 children between the ages of 6-18 years old. Body weight, height and serum vitamin D levels were directly measured. Weights were categorized by the recommended percentile of BMI for age and gender and defined as healthy weight $\geq 5^{\text{th}}$ to $< 85^{\text{th}}$; overweight = $\geq 85^{\text{th}}$ to $\leq 95^{\text{th}}$; obese = $\geq 95^{\text{th}}$ to $\leq 99^{\text{th}}$; severely obese = $> 99^{\text{th}}$. Vitamin D deficiency was defined by using the definition of a serum 25-hydroxyvitamin-D < 20 ng/ mL (< 50 nmol/L). The prevalence of vitamin D deficiency among healthy weight children was 21%, overweight 29%, obese 34%, and severely obese 49%. The disparity of vitamin D deficiency among racial/ethnic groups was significant, revealing frequencies of 90% for African-American children, 50% for Latino children and 27 % for white children.

Knowledge and Education

The descriptive survey design study by Martin et al. (2004) explored knowledge of osteoporosis among female adolescents. The investigators selected a Michigan public school setting with students from diverse ethnic and socioeconomic backgrounds. The convenience sample of 107 female adolescents (11-17 years old, M=14) were given the modified self-administered Healthy Bones Knowledge Questionnaire (HBKQ) (see Appendix A). The HBKQ consisted of 33 items focused on osteoporosis knowledge risk factors, dietary calcium, and exercise. All 107 participants completed the questionnaire at one time. Internal consistency was acceptable (K-R 20 =.69). The HBKQ was retested two weeks later to 50 randomly selected participants from the sample and found to be stable at a coefficient of .69.

The results reflected that the majority of participants were knowledgeable that being a woman (82.2%) and having decreased milk product consumption (80.4%) increased their risk of developing osteoporosis, while fewer participants knew sufficient exercise decreased the risk of osteoporosis (70.1%). Additional results indicated half blamed poor posture for developing osteoporosis (50%) while nearly half were unaware anorexia was an osteoporosis risk factor (46.7%).

Overall, the adolescent girls had general knowledge about osteoporosis. However specific understanding of risk factors, benefits of calcium-rich foods, dietary calcium requirements, and the type of exercise needed to reduce osteoporosis risk was limited. Martin et al. (2004) recommended that targeted bone health promotion and osteoporosis education activities need to be provided in different settings. The authors also emphasized that comprehensive bone health promotion must consider factors beyond knowledge that influence behavior change such as health beliefs, self-efficacy, social support, and modeling.

Brown and Schoenly (2004) conducted a two group randomized multi-site field study to examine the effects of an education program about osteoporosis prevention to male and female high school students (n=693). The Osteoporosis Prevention Teaching In Our Nation's Schools (OPTIONS) program was developed by the National Association of Orthopedic Nurses (NAON). This intervention provided bone promotion knowledge for the prevention of osteoporosis later in life. For the intervention group, pretest data was collected and a 20-minute education session was delivered in the initial meeting. Four weeks later the posttest data was collected from the intervention group. For the control group, pretest data was collection at an initial session. Four weeks later the posttest data was collected followed by a 20-minute session using the OPTIONS program. The program content was presented through power point slides and live narration from

volunteer members of the NAON. The pictorial slides provided knowledge about the importance of weight-bearing exercise, calcium's role in building healthy bones, sources of calcium rich foods, and reading food labels. For further educational enrichment, the NAON educators also provided samples of calcium rich foods and examples of food labels.

The Healthy Bones Knowledge Questionnaire (HBKQ) (see Appendix A [female] and Appendix B [male]) pre and posttest were utilized to measure knowledge of osteoporosis and associated risk factors (Brown & Schoenly, 2004). The girls' version of the knowledge instrument contained 33 multiple choice items. Previous test-retest reliability was reported to be .69. Internal consistency coefficients of KR-20 = .51 was found for the girls version at pretest and .65 at posttest; the KR-20's for the boys version were .61 and .74 respectively. No validity testing was reported. The authors reported that the HBKQ has been developed through testing with three groups of girls (ages 9-18) and in two mixed gender intervention studies one with young teenagers and the other with pre-teens.

The results reflected the OPTIONS group average knowledge difference score was 8.4 percentage points higher (95% confidence interval = 6.5 – 10.4) than that of the control group. Additional results indicated students from all types of schools responded equally to the interventions and in some of the data analysis, girls achieved more knowledge from the intervention than did boys. Overall, the OPTIONS intervention increased the knowledge base of teens about the importance of building bones during teen years in order to prevent osteoporosis, however, influencing behavioral change through gained knowledge continues to be a central focus of health educators. The authors also reported the development of an OPTIONS 2 from the initial OPTIONS that stressed the importance of engaging the teens in choices about bone

promoting foods and weight bearing exercises to increase the overall interaction between the teens and the intervention.

Magee et al. (2008) conducted a quasi-experimental study to examine whether an osteoporosis in-service educational program in a high school setting would improve knowledge and confidence about osteoporosis prevention, self-efficacy, and self-reported bone-health lifestyle behaviors in adolescent girls. Students from two high schools in an urban U.S. city participated in the study. One high school was randomly selected to be the intervention group; the other school was designated as the no-intervention control group. The intervention school group consisted of 53 female students, ranging in age from 14 to 18 years, who were present for all study-relevant sessions and completed both pre and posttests. The control group consisted of 31 female students of comparable age who completed pre and post-tests.

The in-service program was provided by the primary investigator (a doctoral prepared physical therapist). Three days after pre-test data was collected, a 50-minute class program was conducted. This included age appropriate National Osteoporosis Foundation videotapes about osteoporosis and osteoporosis prevention, followed by a group discussion and a calcium-rich snack. One week later, post-tests were completed. For the control group, no information was given at pre-test; post-test data was collected one week later. At the completion of the post-test, the same in-service program was provided to students in the control group school.

Four instruments were used in this study. The Osteoporosis Knowledge Test (OKT) developed by Kim, Horan, and Gendler (n.d.) for the adult population and is a multiple-choice test consisting of 24 items that measure knowledge of osteoporosis. The OKT has a calcium subscale and an exercise subscale. The Kuder-Richardson reliability coefficient (KR-20) was reported by the original developers to be 0.72 for the calcium subscale and 0.69 for the exercise

subscale. Magee, et al (2008) established test-retest reliability for the OKT calcium subscale to be $r = 0.91$ and for the exercise subscale $r = 0.98$ (significant at $p < 0.01$).

The Osteoporosis Self-efficacy Scale (OSES) was developed by Horan, Kim, and Gendler (1998) to measure confidence concerning calcium intake and exercise. This scale consists of 12 items using a visual analog line graph. The Cronbach's alpha was reported by the original developers to be 0.90. Magee et al. (2008) established test-retest reliability for the OSES calcium to be $r = 0.87$ and the OSES exercise $r = 0.93$ (significant at $p < 0.01$).

The Calcium Inventory was used to ask how much calcium girls ingest in an average day. This tool was developed by Martin in 2005, but was not published. No tests of reliability or validity were reported by the original developer. Magee et al. (2008) established test-retest reliability for the Calcium Inventory to be $r = 0.99$ (significant at $p < 0.01$).

The Previous Day Physical Activity Recall (PDPAR) was developed by Weston, Petosa, and Pate (1997) to measure recall and intensity of physical activities for after school hours. Test-retest reliability coefficient was reported by the original developers as $r = 0.98$ (significant at $p < 0.01$). Magee et al. (2008) established test-retest reliability for the PDPAR to be $r = 0.99$ (significant at $p < 0.01$).

The data analysis identified significant differences. The intervention group had a large number of African American students compared to the control group. The intervention group was significantly older ($M = 15.92$, $SD = 1.24$) than the control group ($M = 15.16$, $SD = 0.97$). The intervention group had a significantly higher grade level ($M = 10.40$, $SD = 1.24$) than the control group ($M = 9.52$, $SD = 0.81$). In spite of the age difference between the two groups, the Pearson correlation analyses between age and scores on OKT, OSES, and Calcium Inventory

were not significant. A negative correlation was found between age and PDPAR ($r = -0.23$) but the magnitude was considered low and not clinically meaningful.

In a 2 x 2 analysis of variance, the intervention group demonstrated a 65% increase in the total OKT score; a 78% increase in the OKT calcium subscale and a 63% increase in the OKT exercise subscale; a 15% increase on the OSES calcium subscale and a 14% increase on the OSES exercise subscale; a 34% increase on the Calcium Inventory; and a 18% increase on the PDPAR score. The control group did not significantly change on any of these variables except for the PDPAR score which were lower on post-test than on pre-test.

Adolescents in both groups scored poorly on the osteoporosis knowledge pre-test, confirming their limited knowledge of the disease. Post-test scores for the group receiving the educational in-service provided evidence of effectiveness for improving knowledge of osteoporosis and confidence for doing things necessary to promote bone health.

Jacobson and Melnyk (2012) performed a seven-week design intervention study in a pediatric primary care setting. Overweight/obese school age children and their parents were studied to test the feasibility, acceptability, and preliminary effects of the Healthy Choices Intervention (HCI) on mental health, healthy lifestyles, and increased knowledge about health. Even though the child was the focus of the intervention, the parents were active participants in the cognitive behavior skills-building workbook activities.

Seven instruments were used to examine participants' body mass percentiles, physical activity, nutrition knowledge, beliefs, choices and behaviors, anxiety, depression, self-concept and competence. Jacobson and Melnyk (2012) described pediatric obesity affecting mental health through low self-esteem from being victims of peer discrimination. The 2003 National Survey on Children's Health reported overweight white and Hispanic youth experience increased

anxiety with increased body mass indexes. Peer group pressure influences are heightened after 8 years of age when the child is known to be more sensitive and worried about what their peers think about them rather than their overall physical wellness.

Jacobson and Melnyk (2012) utilized quantitative and opened ended evaluations to determine that the Healthy Choices Intervention content and delivery method were highly acceptable and useful. After the children completed the HCI program, their knowledge scores, physical activity and healthy lifestyle scores increased. As the study suggests, in a pediatric primary care setting, continued cognitive behavioral skills-building interventions that focus on the problems of obese school age children and parents is a highly feasible and acceptable preventive health care strategy.

Sadler et al. (2013) incorporated materials and activities from the *Best Bones Forever* campaign to increase the dissemination of bone health information into existing nutrition and physical activity programs based in community coalition outreach. The study had two distinct parts. The first part involved three community coalitions (in Arizona, Nevada, and New York). The investigators conducted a qualitative review of the community coalition structure and processes for integrating the Best Bones Forever campaign strategies using agency records and staff interviews (three from each of the three sites, n=9). Content analysis of records and interviews revealed that the three community coalition sites successfully integrated creative messages and approaches into bone health promotion. Thirteen thousand attendees participated in 30 different community events and health fairs. The author reported 900 persons attended 22 community and professional presentations with up to 1.3 million persons exposed to bone health information through promotional activities held at sporting and school events and through social media.

The second part of the Sadler et al. (2013) study used a quasi-experimental design to evaluate the effectiveness of the BodyWorks program. BodyWorks was a multisession program aimed at making changes in eating and exercise behaviors. The program included opportunities to engage in bone strengthening physical activities. Girls aged 9-14 years and their parents were recruited from 5 metropolitan community organizations. The BodyWorks intervention group consisted of 159 participants (parents = 71; girls = 88). The control group consisted of 112 participants (parents = 54; girls = 58). The BodyWorks pre-posttest questionnaire included items related to bone health knowledge, attitudes, self-efficacy and behaviors, and was administered to all participants. The majority of the parents were women (31-50 years old) with participants who were white (60%), Hispanic (25%), African American (11%) and other (3%). Girls and parents in the BodyWorks intervention group significantly increased bone health knowledge ($P < .001$). The highest percentage of increase was found in knowing the daily recommendations for calcium intake, knowing the most important time frame for building strong bones, and knowing vitamin D is found in salmon. Overall, most parents and girls at pretest (80%) knew consuming foods high in calcium and vitamin D builds strong bones while drinking sodas did not build strong bones. Sadler et al. (2013) reported an increase among BodyWorks participants in the perceived value of calcium and vitamin D rich foods and preventing bone diseases such as osteoporosis, while no significant benefits were reported from the pretest or posttest data on the same items.

Computer-based Strategies

Rydell et al. (2005) developed a Web-based component of a nutrition and physical activity behavioral intervention to promote bone health in preadolescent girls. Thirty Girl Scout troops in the Minneapolis area were randomized to either an intervention or control group for a two year period ($n = 186$ 5th graders; 151 6th graders; 90% Caucasian). Bone health content was

presented in face-to-face interactions during 10 Girl Scout meetings. The intervention group received website training. The website content supplemental material was presented at the troop meetings. The website included a “News” section about bone health, story-based problem-solving activities, quizzes, a bulletin board, calendar of events, calcium-rich recipes, suggested bone-building activities, e-mail, and links to other bone-related websites. Those who did not have access to a computer for home-based activities were given materials in a hard-copy format. Participation in the web component was not mandatory. Use of the password-protected site was measured by an electronic tracking system.

Eighty-two percent of the 5th graders and 56% of the 6th graders accessed the website once; 48% of the 5th graders compared to 23% of 6th graders accessed the website more than once. Use of the website decreased over time. These results reveal a modest use of the web component. Use of the Internet for health-based interventions would likely require regular reinforcement and follow-up to achieve desired changes in youth (Rydell et al. (2005).

Casazza and Ciccazzo (2007) conducted a 16-week study with a convenience sample of adolescents (13-18 years old) to compare the outcomes of two health education intervention programs’ Computer Based Intervention (CBI) to Traditional Educational Intervention (TDI). The researchers explored the question as to whether CBI was more effective than TDI in changing behaviors related to promoting healthy lifestyles and preventing the comorbidities of childhood obesity.

Three schools with similar demographics were chosen for the intervention study. One school was assigned to be in the CBI, one school was assigned to be in the TDI, and one school was assigned to be in the Control Group (CON). Eight standardized techniques were utilized by trained facilitators to collect the data. Casazza and Ciccazzo (2007) specifically looked at

whether CBI or TDI would have a greater effect on behavior changes : improved body mass index (BMI) or healthy body weight for height, dietary habits improved as demonstrated by a 24 hour food frequency recall questionnaire, an increase in knowledge, physical activity increases as measured by the physical activity questionnaire, an increase in perceived self-efficacy as it related to dietary and physical activity, and an increase in perceived social support.

The final study results indicated that the computer-based method of education was more effective in changing health behaviors of adolescents than the traditional educational methods. Both intervention groups showed knowledge gains but the CBI group showed more positive lifestyle changes and dietary behaviors (decreased fat consumption and meal skipping and increased dairy consumption) along with increased physical activity and decreased BMI.

Overall, computer-based education is gaining popularity because it is readily accessible all hours of the day, is tailored for individuality, enables quick feedback, and allows the adolescent to be an actively involved learner rather than a passive learner as is the case with the TDI. However, Casazza and Ciccazzo (2007) note that a “multi-component” educational model approach may be the preferred method for educating adolescents even though the CBI had an overall greater change in behavior. In addition, to engage adolescents in healthy lifestyle educational modalities to reduce obesity and comorbidities, nursing educators and others will need to focus on individual learning styles that focus on practical activities combined with a supportive environment that encourages and promotes healthy lifestyle changes.

Hamel and Robbins (2012) conducted a systematic review to examine the effectiveness of computer and web-based interventions on improving eating behavior and diet-related physical outcomes in children and adolescents. All 15 studies included in this review were either randomized controlled trails or quasi-experimental. The majority of the interventions were

school-based (n = 10) with teacher involvement; three were home-based with parental involvement; and one took place in a youth service agency. The duration of the interventions ranged from one class session to two academic years. Eleven of the 15 studies found significant improvements in self-reported eating behaviors (such as increased fruits and vegetables, lower fat content, decrease in soda intake), dietary knowledge, and physical outcomes (such as lower BMI).

The authors described several factors they considered important to the success of the computer/web-based interventions. A few of the reported studies incorporated individual tailoring or personalized feedback into the interventions. This was intended to enhance the relevance of the information given to each participant. The school environment provided the greatest access to the computers, along with more structure and social support to the lessons. Sustainability of positive outcomes is difficult, therefore continued post-intervention follow-up by primary care providers was recommended.

Health improvement programs must be specifically tailored to the needs and learning styles of our youth. Traditional nutrition education uses a “teach by telling” approach, which does provide valuable information and resources. Research indicates, however, that health education is more likely to be effective when it is behaviorally focused (Casazza & Ciccazzo, 2006). Computer-based programs can provide relevance, reinforcement, and interaction that both allow for feedback and teach strategies for behavioral change. Computers allow learners to access and assimilate information at their own pace. Nutrition researchers and educators have concluded that integrating computer-based nutrition education with traditional education offers a higher probability that the information will be read and remembered, provides more motivation towards change, and is perceived as a more personalized approach to learning. Innovations in the

use of interactive technologies that are behaviorally focused can be an effective means for improving the health of our young people.

Family-based Interventions

Much of the recent literature on family-based strategies reviewed for this project focused on weight management for the obese child and behavior and environment management skills for the parents. These studies were often conducted in small group settings; none were conducted in a short-term primary care clinic visit setting that targeted bone health. Therefore principles of family-based lifestyle interventions were described by the researcher to support the tailoring of strategies within the short time constraints of this project.

Family involvement is an essential component of health promotion and treatment protocols in pediatric care settings (Steele, Steele, & Cushing, 2012; Steele, Steele, & Hunter, 2009; Wrotniak, Epstein, Paluch, & Roemmich, 2005). For overweight and obese children and their parents, successful intervention programs employ a multifaceted approach to behavior change that includes diet and exercise education and behavior modification strategies (e.g., self-monitoring, stimulus control, and goal setting) (Spear et al., 2007).

West, Sanders, Cleghorn, and Davies (2010) evaluated a lifestyle-specific parenting program (Group Lifestyle Triple P) on multiple child and parent outcomes. One-hundred-and-one families with overweight and obese 4- to 11-year-old children participated in an intervention or waitlist control condition. The 12-week intervention consisted of nine 90-minute group sessions led by a psychologist and three 20-minute telephone sessions, both involving parents exclusively. To help parents acquire new knowledge and skills, all sessions used an active skills training process (e.g., demonstrating and rehearsing skills) within a self-regulation framework (e.g., self-selecting goals and self-evaluating progress). Each parent received a workbook

summarizing the session content, and suggested between-session tasks. The parent-only approach was associated with significant reductions in child BMI z score and weight-related problem behavior both at the end of the intervention, and one year post-intervention. Parents reported increased confidence in managing children's weight-related behavior, and less frequent use of inconsistent or coercive parenting practices.

Hovell et al. (2009) conducted a two group randomized controlled trial to test the effects of parent and child training designed to increase calcium intake, bone loading physical activity, and bone density. The children (n=117) were healthy 10-13 year olds. Children and parents were randomly assigned to diet and exercise (experimental) or injury prevention (control) interventions. Children were taught in eight weekly classes how to engage in bone loading physical activities, eat calcium-rich foods, or avoid injuries. Parents were taught behavior management techniques to modify children's behavior. Measures at baseline and at 3, 9, and 12 months included 24-hour diet and physical activity recalls and bone mineral density by dual energy x-ray absorptiometry.

Both genders in the experimental group had a higher proportion meeting the daily calcium intake recommendation (1300 mg per day) at every point of assessment posttest than did their control counterparts. Both boys and girls in the experimental group experienced an approximate 25% increase in calcium consumption from baseline to posttest, although the girls did not attain the same mean level of intake as boys. Self-reports of dietary intake, however, have considerable limitations.

A significantly higher percentage of boys in the experimental group met the physical activity recommendation (10 minutes per day, 5 days per week) at 3 months compared to boys in the control group. Among boys in the experimental group, fewer met the recommendation at 9

and 12 months compared to 3 months. A lower percentage of boys in the control group met the recommendation than did boys in the experimental group at all points of assessment except at 12 months, where a higher- percentage of the control met the recommendation compared to experimental. Among girls, the experimental group reported higher percentages of meeting the high impact physical activity recommendation at each post-baseline assessment, although not significantly.

Experimental boys accrued 4.1% in total hip BMD compared to 2.2% for controls ($p = .053$) as well as accruing 5.0% in femoral neck BMD compared to 2.4% for controls ($p = .041$). Other skeletal sites were not significantly different. Girls' BMD accrued at a higher rate than boys. However, there were no significant differences in the percent increase between experimental girls and controls at any bone site.

Ewing et al. (2009) conducted a family-based behavioral intervention pilot project that was developed as a first step in addressing the challenges of managing obese children in the primary care setting. The objectives of the project were to a) train pediatric providers in the basics of pediatric weight management and the use of brief motivational counseling skills with parents and children to assist them in healthy behavior change; b) assess the feasibility, acceptability, and potential utility of offering an evidence-informed, family-based behavioral intervention in a primary care office to obese children and their parents; and c) train professional practice-based nursing staff to deliver the intervention in an effort to assure sustainability.

Seventy-three obese children (8-12 years old) with body mass index (BMI) of $\geq 85^{\text{th}}$ percentile and accompanied by a parent were enrolled in the 11 session (8 weekly group sessions followed by 3 monthly individual sessions) five-month behavioral program that utilized the KidStride: Kids Striving to Improve Diet and Exercise intervention. Providers gained new

knowledge through a two part training: a) 30-minute self-study packet; and b) two, 1-hour, face-to-face skills training sessions with one of the investigators as the trainer. The Stoplight Food Reference Guide, nutritional value of foods and appropriate portion sizes were the focus of the instruction given to the children and adults. The adults were further instructed and coached on effective parenting strategies that assisted them in supporting their child's behavioral changes.

Outcomes of the project were assessed through measures of attendance, compliance with self-monitoring behaviors by the children, changes in weight and BMI, and parent satisfaction. The families who attended at least 6 of 8 group sessions and 1 of 3 follow-up sessions were defined as "completers" (51%). Children in the completer group showed a significant reduction in BMI at 8 weeks and at 5 months after enrollment; children in the completer group had a lower BMI at 12 months post-study enrollment than children in the non-completer group ($P = .08$) but the differences were not statistically significant. Children ($n = 24$) reported an average decrease of 57% in the number of "red foods" consumed each day from 9.3 to 4.2 ($P = .023$). Seventy-five percent of parents of completers reported that the Stoplight Food Reference Guide was the most helpful component of the intervention program; 67% of parents reported that their children had taken on more responsibility for making healthier food choices; 50% of parents reported dissatisfaction with the amount of self-monitoring homework required in the program. Many parents requested the inclusion of recipes and wanted to have physical activity as part of the weekly meetings for the children. The investigators suggested that non completers were at a long-term higher risk for worse obesity related comorbidities than completers as data reported significant differences in baseline child weight, parent weight, and economic status defined by insurer (commercial vs. medical assistance).

It is widely known that as early as age eight, unhealthy eating behaviors and decreased activity that lead to overweight and obesity may already be well established. Therefore, the authors emphasize the importance of early introduction of healthy eating and activity interventions in the primary care setting to prevent overweight and obesity related comorbidities.

Steele et al. (2012) examined factors affecting adherence in family-based intervention protocols for childhood obesity. Based on principles from the Transtheoretical Model of behavioral change (Prochaska & DeClemente, 1983), targeted “decisional balance” as an indicator of the readiness to change. Decisional balance is described as how a person weighs the advantages and disadvantages associated with changing a specific behavior. The likelihood of change is enhanced when an individual identifies more positive aspects of change than negative.

The aims of the study were to describe the relation between parent and child decisional balance profiles and pre-intervention weight status (i.e., BMI and BMI percentile), examine the relation between parent and child decisional balance profiles, and examine the impact of parent and child decisional balance profiles on child weight post-treatment.

The participants included children (7-18 years old) with a BMI >85th percentile with at least one participating parent (n=37). The weight loss program used in this study was adapted from Epstein’s (1996) multi-component family-based intervention consisting of nutrition, exercise and behavior education. The program goals for behavioral lifestyle changes included cue control, self-monitoring, praise, modeling and reinforcement/contracting. Parents and children acquired new knowledge for developing healthy eating habits, benefits of everyday physical activity, and calculating caloric expenditures. The 10-week treatment sessions occurred once a week for 1½ hours and were conducted by masters or doctoral prepared therapists.

The Decisional Balance Measure for Weight (O'Connell & Velicer, 1988) was used to assess participants' decisional balance (assessment of advantages vs. disadvantages) for losing weight before the treatment started. The Decisional Balance Measure for Weight is a 20-item measure designed to evaluate an individual's comparisons of the positive and negative aspects related to the decision to lose weight. In this investigation, Cronbach's alphas indicated adequate to good reliability for the parent advantages (.88), parent disadvantages (.78), child advantages (.85), and child disadvantages (.79) subscales. Outcomes measuring the child's change in percentage over ideal BMI were obtained at 10 weeks (Time 2) from the percentage over ideal BMI at the initial intake (Time 1). Height was measured at Time 1 and Time 2.

Children showed a more positive decisional balance profile (i.e., more advantages than disadvantages) at pre-intervention than did participating parents. Parents described their children as having a more positive decisional balance profile than themselves. Children experienced a reduction of 5.5% overweight in 10 weeks. The participating child's total decisional balance score was the single best predictor of child outcomes. Children who evidenced a more positive decisional balance profile at pretreatment experienced better treatment outcomes than those who began with more negative profiles.

Pre-intervention child weight status was significantly related to the child advantages and total decisional balance scores. The authors suggested that children who were more obese were consequently more aware of the negative consequences associated with their weight status and, therefore, perceived more value in losing weight. Children who focused on the advantages of engaging in weight loss behaviors may be more willing to take the necessary steps to do so, even if their parents are not as equally willing to make important changes in both their own behaviors or in the home environment that will facilitate weight loss. This study indicated that a child's

readiness to change can play an important role in the treatment of pediatric obesity (Steele et al. 2012).

Many factors play a role in children's successful health outcomes. Anticipatory guidance provided by health care providers during a pediatric clinic office visit can increase parents' knowledge and even change their behavior (Regalado & Halfon, 2001; Nelson, Wissow & Cheng, 2003). Improvement in cognitive and behavioral outcomes are most evident when HCPs utilize effective communication skills, are knowledgeable, and can implement a systematic parental assessment process that identifies parents' motivation in changing behaviors, agreeing on behavioral objectives and completing recommended specialty referrals (Schor, 2007; Whitlock, Orleans, Pender, & Allen, 2002).

Parental involvement and consensus-building between parent and provider are especially key in changing children's health (Schor, 2007). Schor (2007) pointed out that it is logical then, to measure the effectiveness of parent education by the changes in parents' knowledge, attitudes, and behaviors rather than by their children's health status changes.

The content and processes of child preventative care are strengthened when community epidemiology, child developmental needs, and family individual circumstances and priorities are considered. To address these factors, Schor (2009) recommends standardizing procedures: 1) regularly ask parents to complete questionnaires prior to each visit to identify concerns or issues that need to be discussed; 2) during preventive care visits, utilize structured screening instruments that assess child development, family psychosocial risks, adolescent risk behaviors, individual strengths, and current and historical family health problems; 3) create individualized preventive care plans that have been developed from collected patient information and modify as

indicated with any additional health care changes; and 4) enhance the skills of providers in using family-centered, motivational, and strength-based techniques.

Health care professionals representing various disciplines should provide team-based health care educational interventions during the pediatric health care visit. To extend educational interventions, pediatric practices could partner and work collaboratively with other providers in the community, childcare facilities, schools, and/or homes (Schor, 2009). Parents' consistent education and involvement with their child's health care is recognized as the primary factor contributing to best overall health outcomes.

Recommendations for Pharmacological Treatment of Vitamin D Deficiency

Bone health scientist and endocrinologist Dr. Michael Holick, M. D. from the Boston University School of Medicine has written numerous articles to describe vitamin D and calcium physiology, the detection of vitamin D deficiency, the prevalence of vitamin D deficiency, and evidence-based guidelines for the prevention and treatment of osteoporosis. (Holick, 2007; Holick, 2010; Holick et al., 2011; Holick, 2012a). Vitamin D deficiency is not an uncommon problem in children and adults. In fact, vitamin D deficiency can begin in utero and vitamin D deficient children can experience rickets, growth retardation, and skeletal deformities leading to increased risk of hip fractures as an adult. Obesity is identified as one of the many causes of vitamin D deficiency. Excess body fat entraps vitamin D, thus reducing the availability of vitamin D for the transport of dietary calcium into the bloodstream (Holick, 2007).

Holick et al. (2011) were commissioned by the Clinical Guidelines Subcommittee of The Endocrine Society to conduct systematic reviews of the literature to inform its key clinical practice guidelines for the evaluation, treatment, and prevention of vitamin D deficiency. The 8-person expert Task Force reviewed current literature on vitamin D physiology and prevalence,

causes and consequences of vitamin D deficiency, and sources of vitamin D. Recommendations were made for a) diagnostic procedure, b) dietary intakes of vitamin D for patients at risk for vitamin D deficiency, and c) treatment and prevention strategies. The task force provided a rating of the strength of each recommendation and the quality of the evidence reviewed.

The task force recommended using the serum circulating 25(OH) D level to evaluate vitamin D status in patients who are at risk for vitamin D deficiency. Obese children (BMI > 30 kg/m²) are considered at risk. Vitamin D deficiency is defined as a 25(OH) D below 20 ng/ml (50 nmol/liter), and vitamin D insufficiency as a 25(OH) D of 21–29 ng/ml (525–725 nmol/liter). The task force recommends target vitamin D blood serum levels should be at 30–100 ng/ml.

The recommended dietary allowances of vitamin D for children age 1-18 years is 600 IU/d to raise the blood level of 25(OH) D consistently above 30 ng/ml. (Holick et al., 2011; Holick, 2012b) suggests obese children should be given at least two to three times more vitamin D for their age group to satisfy their body's increased vitamin D requirement. For treatment of children aged 1–18 years who are vitamin D deficient, the task force recommends 2000 IU/d of vitamin D2 or vitamin D3 for at least 6 weeks or with 50,000 IU of vitamin D2 once a week for at least 6 weeks to achieve a blood level of 25(OH) D above 30 ng/ml followed by maintenance therapy of 600-1000 IU/d (Holick et al., 2011; Holick, 2012b). The maintenance dose for obese patients should be two or three times higher (Holick et al., 2011; Holick, 2012b).

Agency Description

Setting

The Healthy Horizon Children's Center (HHCC) is a credentialed specialized primary health care clinic located in central Kentucky and is part of Paragon Family Practice's Pediatric Care of Lexington (PCL). PCL is a privately held for-profit primary care clinic that has been

owned and operated for at least five years by G W Management (doing business as Paragon Family Practice). G W Management owns up to five primary care clinics throughout the central Kentucky region. Healthy Horizon Children's Center was created by Dr. Martha Hawkins, DNP, CPNP in October, 2010 to improve the health of Kentucky's youth. In addition, Dr. Hawkins expanded her primary care services to include Paragon Family Practice's Crab Orchard Primary Care located in rural Lincoln County. The implementation of the proposed Bone Health Promotion interventions was a vital tool in educating the clinic's staff along with children, adolescents, and families for life-long healthier eating behaviors, lifestyles and improvement of vitamin D levels.

Target Population

Pediatric Care of Lexington (PCL) has about 1,000 pediatric patients of which 50 % are male, 50% are female and 51% are obese (ages 11-13 years old). PCL patients are 40% Caucasian, 40% African American, and 20% Arabic, Asian and Hispanic. Up to 99 % of the PCL pediatric population are covered by Medicaid health insurance, with the remaining 1 % covered by private insurance. HHCC has enrolled about 15 obese male and female patients (ages 11-13 years old). Paragon's administrative medical staff consists of two medical directors and one clinical director. PCL/ HHCC has one office manager, one certified medical assistant, one part-time pediatric nurse practitioner (HHCC clinical director, Dr. Martha Hawkins, DNP, CPNP), one full-time pediatric nurse practitioner, one part-time psychiatric nurse practitioner and one part-time Licensed Clinical Social Worker. The bone health promotion intervention provided increased knowledge and health awareness surrounding healthy eating and lifestyles that increased overall health and improved vitamin D and calcium levels. Crab Orchard Primary Care is a family practice clinic with about 1500 patients of which 20% are children (150-209). The

majority of the school-age children attend the elementary school across the street. Approximately 99% of the children are Caucasian, with about 10% representing the traditionalist Amish Christian Church religion. The majority of the Crab Orchard Primary Care patient population receives insurance coverage by either Medicaid or Kentucky Children's Health Insurance Program (KCHIP). The Amish sector is self-pay with less than 1% of the overall patient population covered by third-party insurance. All patients are encouraged to make health care visit appointments but are also seen on a "walk-in" for urgent care or other primary care services.

Hawkins' (2010) original Childhood Obesity Primary Care Clinical Pathway (95th Percentile) was modified to include vitamin D and calcium rich foods, vitamin D and calcium supplementation recommendations, self-efficacy, and educational weight-loss and bone health promotion strategies. The modified clinical pathway (see Appendix C) provided the current 2011 Endocrine Society's Clinical Practice Guidelines. The guidelines recommended daily vitamin D requirements for youth of up to at least 2-3 times more vitamin D for their age (up to 4000 IU/d) as compared to normal weight children (600-1000 IU/d) (Holick et al., 2011).

Congruence of Capstone Project to Selected Organization's Mission, Goals and Strategic Plan

The HHCC's mission is to provide concentrated, interdisciplinary management of childhood obesity and obesity related comorbid conditions in a primary care setting (Dr. Martha Hawkins, personal communications, February 6, 2015). The HHCC's vision is to reduce the rates of childhood obesity and complication from obesity-related comorbid conditions. Specifically, HHCC's goal is to attain a reduction in obesity related comorbid conditions within five years (aligning with Kentucky's five year goal of reducing obesity related comorbid conditions). HHCC's purpose statement is to maintain treatment to obese youth in resource-limited settings

through a specialty obesity primary care clinic format. The strategic plan included increasing awareness and adaptation of healthy lifestyle choices, decreasing overall BMI and waist circumference, completing vitamin D diagnostic testing, and managing comorbid conditions through the implementation of Dr. Hawkins' (2010) original Childhood Obesity Primary Care Clinical Pathway (95th Percentile).

Description of Stakeholders

The primary stakeholders for the pilot project included Pediatric Care of Lexington/HHCC's staff and other Paragon Primary Care clinics. In addition, other primary stakeholders were patients (youth), families, interprofessional providers of patient care, and additional administrative/billing staff responsible for cost, outcomes and quality of Paragon's PCL/HHCC healthcare services.

Statement of Mutual Agreement with Agency

The Statement of Mutual Agreement is included in Appendix D.

Project Design

The project focused on interventions for promoting bone health in a primary care setting. Structural changes involved expansion of the existing clinical pathway for the treatment of obesity and forms associated with documentation and communication of adherence to the pathway. Process changes involved engagement of clinic staff/providers, patients, and families in education and activities that target bone health. The objectives of the project included implementation of the infrastructure and processes for physiological monitoring, consistent parameter-based vitamin D & calcium supplementation, family education, and coaching, along with evaluation of the impact of change on patients/parents and the primary care delivery system.

The project involved the education of clinic providers on current evidence-based guidelines from the Endocrine Society for screening, monitoring, and treating bone health issues in obese youth (Holick et al., 2011). Strategies for integration and adaptation of these interventions into practice were addressed collaboratively with the clinic team. Family-based interventions included education about bone physiology, risks, healthy eating, and physical activity with goal setting and coaching. Community and web-based resources for learning were also explored.

Project Methods

Description of Evidence-based Intervention

The evidence-based interventions were: 1) revisions of the clinical pathway related to bone health parameters; 2) monitoring levels of vitamin D & calcium in clinic patients; and 3) implementation of family-based strategies to educate and coach patients and families about bone health promotion.

Procedure

IRB approval. Approval was obtained for the project from the Eastern Kentucky Institutional Review Board (IRB). Paragon's Family Practice administrator approved the project for completion at two Paragon Family Practice primary care clinics: Pediatric Care of Lexington: Pediatric Primary Care and HHCC clinic; and Crab Orchard Primary Care: Primary Care and HHCC clinic. Prior to subjects' participation in the project, parent or caregiver consent forms and child assent forms were obtained (see Appendix E and Appendix F). Explanation of the project's bone promotion intervention, goals, and objectives were presented to the participants and families prior to obtaining consent.

Measures and instruments. After written approval from Dr. Jean Martin (see Appendix G), one of the Healthy Bones Knowledge Questionnaire (HBKQ) developers, the participants' baseline knowledge about osteoporosis and associated risk factors was measured by the HBKQ (Martin, et al., 2004). The HBKQ pre and posttest consisted of a 33 item multiple choice girl's version and a 35 item multiple choice boys' version (see Appendix A [female] and Appendix B [male]).

Implementation. The clinic director recruited the participants and their families during their routine HHCC or Well Child checkup. During the recruitment phase, the project was explained and questions answered. Information provided to the participants and their families consisted of: a) a bone promotion intervention and a take-home binder containing Best Bones Forever educational activities and lessons plans; b) completion of a pre (first project day) and posttest (eight week final project day) bone health knowledge questionnaire; c) the project duration of eight weeks; d) a follow-up phone call at week four by the project leader to answer questions and provide encouragement to work through the education binder of BBF activities and lesson plans; e) routine labs ordered by clinic director on first project day and at the eight week final project day; and f) an eight week final project day appointment scheduled on a regular HHCC follow-up clinic day.

A retrospective audit of participants' charts was conducted by the project leader to assess pre-implementation demographic data and serum vitamin D and calcium levels (if previously obtained). If not previously obtained, then were ordered by the clinic director on the first project day (pre-intervention implementation day).

Lessons and learning activities selected for this project focused on three main topics: (a) bone development and the role of vitamin D and calcium; (b) healthy eating; and (c) physical

activity. The educational content for participants and families was derived from the *Best Bones Forever (BBF)* campaign (Sadler et al., 2013) web site (www.bestbonesforever.org). The BBF reading and interactive materials were organized in a three-ring binder for each participant and family to use in their homes. These materials were also available on the Best Bones Forever web site. To promote consensus-building and provide anticipatory guidance as emphasized by Schor (2009), the project leader engaged the family in the identification of the importance of healthy lifestyle changes (Steele et al., 2012) and the barriers to these changes. The participants and families were assisted in setting individual goals related to engagement with and pace of learning activities and adherence to recommended bone health interventions (West et al., 2010). These mutually agreed upon goals were documented in the modified Weight Management and Bone Promotion Action Plan (see Appendix H). The adults were coached on effective parenting strategies that would assist them in their support of the participant's behavioral changes (Ewing et al., 2009).

During the first project clinic session, the project leader or clinic director gave a description of the bone health promotion intervention, an overview of the education binder materials, and the expected home-based bone promotion learning activities. Access to web-based materials was explored. Then, the participant was administered the pretest Healthy Bones Knowledge Questionnaire (HBKQ) (See Appendices A[female] and B[male]). The HBKQ 33 items (female version) or the 35 items (male version) took approximately 10 minutes to complete.

In addition, the serum vitamin D and calcium levels were ordered either during the HHCC intake, Well Child check, or routine HHCC follow up visits. The modified clinical

pathway provided vitamin D parameters (Table 1) and normal calcium blood serum levels (Table 2) for reference for hypovitaminosis vitamin D and calcium blood serum levels.

Table 1

Vitamin D parameters: Vitamin D 25 (OH) Blood Serum Levels

	Males Age 1-18 years old	Females Age 1-18 years old
Vitamin D Deficiency	<20 ng/ml	<20 ng/ml
Vitamin D Insufficiency	21-29 ng/ml	21-29 ng/ml
Vitamin D Sufficiency	>30 ng/ml	>30 ng/ml
Vitamin D (Ideal) Maintenance Levels	40-60 ng/ml	40-60 ng/ml
Vitamin D (Safe) up to	100 ng/ml	100 ng/ml

Note. ng/ml = Adapted from Evaluation, treatment, and prevention of vitamin D deficiency: an Endocrine Society clinical practice guideline by Holick et al., 2011.

Table 2

Normal Calcium blood serum levels

Age	Male	Female
1-6 years	8.8-10.6	8.5-10.3
7-12 years	8.7-10.3	8.5-10.3
13-15 years	8.5-10.2	8.4-10.2
16-18 years	8.4-10.3	8.6-10.3

Note. Adapted from healthcare.uiowa.edu

The final project visit was scheduled eight weeks after the first project visit. At this visit, the participant was administered the post-test HBKQ.

Results

A total of five youth were recruited to participate in the project. Only one participant returned for the 8-week follow-up visit. Therefore, the other participants were given the post-test HBKQ over the phone. One participant could not be reached by phone for the post-test HBKQ.

Description of Participants

All five participants were English-speaking 5th and 6th graders; three girls and two boys. Other demographics are found in Table 3.

Table 3

Frequency of Gender, Race, and Grade Level

<u>Gender</u>	
Male	2
Female	3
<u>Race</u>	
Caucasian	2
African American	3
<u>Grade Level *</u>	
5 th grade	3
6 th grade	1

Note: Grade level not obtained for one participant

As shown in Table 4, the mean age of participants was 10.60 years \pm 1.34. The mean BMI of participants was 34.83 \pm 4.40.

Table 4

Mean Age and BMI of Participants (n=5)

Variable	M±SD
Age	10.60± 1.34
BMI	34.83±4.40

Note: Considered obese for this age group: BMI: Girls: 23.5; Boys: 22.5. Adapted from www.nccd.cdc.gov

Knowledge Scores

There were 33 questions on the HBKQ female version and 35 questions on the male version. The scores of the HBKQ are reported in percentage of questions answered correctly. The HBKQ pre-test group had a mean score of 11.40 ±2.30, the post-test group mean score was 12.75±5.90. The percent correct mean increase in HBKQ post-test scores was 4.48% reflecting a slight gain in bone health promotion knowledge.

Table 5

Mean Pre- and Post-test HBKQ Scores

HBKQ	Raw Score Mean±SD	% Correct Mean±SD
Pre-test (n=5)	11.40±2.30	33.85 ± 0.0751
Post-test (n=4)	12.75±5.90	38.33 ± 0.1830

Vitamin D and Calcium Levels

One female participant had a pre-test vitamin D level of 25.4 ng/ml, which is considered vitamin D insufficient (range 21-29 ng/ml). Another female participant had a post-test vitamin D

level of 24.1 ng/ml, also insufficient. These findings suggest that two of the five female HHCC participants had vitamin D insufficiency, which is consistent with Harel et al.'s (2011) report that described the prevalence of low vitamin D status in obese girls as 100%. One female participant's pre-test calcium serum level of 10.1 (normal range 8.5-10.3) and post-test calcium serum level of 10.2 demonstrated a 1% increase.

Discussion

This capstone project provided new evidence-based structural components and processes to target bone health in at-risk obese children. The HHCC staff were provided with education to raise awareness of current recommendations for monitoring and treating pre-osteopenic conditions. Mechanisms for guiding, documenting, and tracking clinical data were implemented. According to the clinic director and staff, the project's Childhood Obesity Primary Care Clinical Pathway (95th percentile) (see Appendix C) and Weight Management and Bone Promotion Action Plan (see Appendix H) provided bone health promotion that directly supported the HHCC mission and vision statements: (a) concentrated interdisciplinary management of childhood obesity and obesity related comorbid conditions in a primary care setting; and (b) tools for continued evaluation of the declining rates of obesity related complications and comorbid conditions to more closely reflect Kentucky's state average (within 5 years of initiation). The project increased staff, participants' and families' awareness of bone promotion healthy lifestyle choices, encouraged adaptation of bone promotion healthy lifestyle dietary modifications and physical exercises, provided evidence-based bone promotion interventions through the modified agency forms and provided agency with BBF binders (which can be duplicated for future HHCC patients and families).

The participants and families responded favorably to the initiation of the project. One family member stated: “I want my children to eat healthier and have strong bones. I want to learn how to have healthier bones and not develop osteoporosis, too.” Other responses included: “the BBF website is cool”; “I would like to have healthy bones”; “milk helps me be healthy”; “the BBF website looks easy”; “all the girls in the family need to know how to eat healthier to have healthy bones”; “I wish I had known earlier how to eat healthier for my bones”; “once we read through the bone healthy teaching sheets, we can make changes that will affect all women in our family”; “we have osteoporosis in our family and we all want healthier bones”; and “very helpful program material and we continue to refer to the bone health binder educational lessons and activities.”

The one mutual goal setting and documentation encounter provided the opportunity to engage the participant and family during the participant’s regularly scheduled HHCC appointment. King’s (1971, 1981) Theory of Goal Attainment provided the underpinning tenets of communication, interaction and transaction with patient, family and project leader. Mutually agreed upon weight and bone promotion goals and outcomes were developed, documented in the Weight Management and Bone Promotion Action Plan (see Appendix H), and signed. A copy was sent home with the participant and family.

The selected project conceptual framework highlighted the one mutual goal setting and documentation transaction between provider and patient... This positive outcome is supported by Schor (2009), who suggests preventive health care counseling and education is paramount to the promotion of healthy lifestyles early in life to prevent adult onset health problems. In addition, Magee et al. (2008), Martin et al. (2004), and Rafferty et al. (2011) reported the importance of youth healthy lifestyle education development to ensure lifelong healthy lifestyles. Similarly,

Casazza and Ciccazzo (2006) and Rydell et al. (2005) found that healthcare professionals are influential. Thus, bone health promotion knowledge development is expanded through individualized educational sessions (mutual agreement & goal setting session) focused on the participants and families (Barlow, 2007; Casazza & Ciccazzo, 2006; Rydell et al., 2005). As for knowledge improvement, there was a slight improvement in knowledge gained. The HBKQ has not been tested extensively in this age group; however, no other instruments were found for this purpose.

The vitamin D levels were found to be insufficient and became a significant clinical finding as a risk indicator. An important barrier identified was the lack of vitamin D and calcium levels. The causative factor identified was that the laboratory services were not located within the same building or in close proximity to the HHCC clinic. Therefore, time, convenience and transportation were significant barriers and risk for the parent. Even though the lab order was generated by the clinic director the day of the HHCC visit and given to the parent, the parent found it inconvenient to complete the vitamin D and calcium lab on that same day. Consequently, the vitamin D pre and posttest values were not completed by any of participants. Only one participant had a pre and posttest calcium level (had a posttest vitamin D but no pretest).

Implications

Even though participants and families did not gain significant improvement in bone health knowledge or increased vitamin D and calcium levels, there was overall improved bone health knowledge awareness. This awareness was verbalized by the participants and families, and confirmed by the HHCC clinic director and staff. The sustainability of the project's evidence-based strategies to prevent and manage vitamin D and calcium deficiency in obese

youth was enhanced by the integration of the guidelines into existing agency forms and documentation. The clinic staff gained awareness of multifaceted approaches that can contribute to patient's and family's knowledge of bone health and lifestyle modifications. In addition, the web-based BBF campaign's education activities and plans (available on-line) promotes on-going bone promotion interactive lessons. The HHCC modified clinical pathway (see Appendix C) and modified Weight Management and Bone Promotion form (see Appendix H) targeted participants and families to engage in evidence-based bone promotion interventions that included, healthy eating, physical exercise, coaching tools and vitamin D and calcium monitoring/supplementation guidelines.

The bone health promotion program could be improved by the commitment to support staff and other providers in the consistent integration and evaluation of the modified HHCC documents. Overall, the bone health behavioral changes can be reinforced and sustained more effectively by engagement of staff through continued education and knowledge acquisition of the modified clinic bone promotion documents. (Wells, Manuel & Cuning, 2011).

The HHCC patient and families would benefit most from consistent bone health promotion continuity of care and the HHCC staff would benefit most by understanding the bone promotion process and goals. The modified forms strengthened the staff's knowledge base from the addition of the bone promotion strategies, which clearly defined the monitoring, education and evaluation process.

Summary/Conclusion

Youth are known to have issues of unhealthy eating patterns, which lead to obesity related comorbidities that include poor bone health and later in life osteoporosis. The need for pediatric primary care bone health promotion through healthy lifestyles evidence-based

interventions targeted to youth and families has been validated through the literature review and synthesis. Future pediatric primary care bone health promotion projects focused on the effectiveness of the integration of consistent vitamin D and calcium monitoring in clinics with on-site laboratory services may contribute to improved bone health outcomes and healthier lifespans.

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Appendix A

Healthy Bones Knowledge Questionnaire (female version)

_____ ID No.

Osteoporosis (os-tee-o-po-ro-sis) is a condition in which the bones become very brittle and weak so that they break easily.

Below is a list of things which may or may not affect a person's chance of getting osteoporosis. We wish to learn what you know or may not know about osteoporosis risk factors. It helps to know if you're not sure about some factors. Please read each statement, then place a check in the box to show if you think that a person is:

MORE LIKELY TO GET OSTEOPOROSIS or

LESS LIKELY TO GET OSTEOPOROSIS or the statement

HAS NOTHING TO DO WITH OSTEOPOROSIS or

You are NOT SURE

	More Likely	Less Likely	Nothing to do with	Not Sure
1. Having big bones.				
2. Stopping periods for 6 months				
3. Not eating or drinking milk products each day				
4. Eating a diet high in dark green vegetables like broccoli or collard greens				
5. Having a mother that is not as tall as she used to be				
6. Having a grandmother who has a hunchback				
7. Being a woman				
8. Being a man				
9. Being an African American woman				
10. Having ovaries surgically removed				
11. Taking cortisone (steroids) pills or shots for a long time				
12. Exercising 3-4 times a week for 20-30 minutes at a time				
13. Having poor posture				
14. Being underweight				
15. Being overweight				
16. Being anorexic				
17. Being on a diet (but not anorexic)				

For the next group of questions, choose one answer from several choices. Be sure to choose only one answer. If you think there is more than one correct answer, choose the best answer. If you are not sure, just choose “Not sure”.

18. Which of the following exercises is the best way to reduce a person’s chance of getting osteoporosis?
- Swimming
 - Walking briskly
 - Doing kitchen chores, such as washing dishes or cooking
 - Not sure
19. Which of the following exercises is the best way to reduce a person’s chance of getting osteoporosis?
- Bicycling
 - Yoga
 - Housecleaning
 - Not sure
20. How many days a week do you think a person should exercise to strengthen the bones?
- 1 day a week
 - 2 days a week
 - 3 days a week
 - Not sure
21. What is the LEAST AMOUNT OF TIME a person should exercise on each occasion to strengthen the bones?
- Less than 15 minutes
 - 20-30 minutes
 - More than 45 minutes
 - Not sure
22. Exercise makes bones strong, but it must be hard enough to make breathing:
- Just a little faster than normal
 - So fast that talking is not possible
 - Much faster, but talking is possible
 - Not sure
23. Which of the following exercises is the best way to reduce a person’s chance of getting osteoporosis?
- Jogging or running for exercise

- b. Bicycling
 - c. Bowling
 - d. Not sure
24. Which of the following activities is the best way to reduce a person's chance of getting osteoporosis?
- a. Cleaning up a room?
 - b. Dancing
 - c. Playing a musical instrument
 - d. Not sure
25. Which of these foods give a person the most calcium?
- a. Apple
 - b. Cheese
 - c. Cucumber
 - d. Not sure
26. Which of these foods give a person the most calcium?
- a. Watermelon
 - b. Corn
 - c. Canned sardines
 - d. Not sure
27. Which of these foods give a person the most calcium?
- a. Chicken
 - b. Baked or refried beans
 - c. Grapes
 - d. Not sure
28. Which of these foods give a person the most calcium?
- a. Strawberries
 - b. Cabbage
 - c. Yogurt
 - d. Not sure

29. Which of these foods give a person the most calcium?
- Grapefruit
 - Ice cream
 - Radishes
 - Not sure
30. Which of the following is the recommended amount of calcium intake for a teenage girl?
- 600mg daily
 - 1300 mg daily
 - 2500 mg daily
 - Not sure
31. How many 8 ounce glasses of milk (the amount in a school lunch milk carton) must a teenage girl drink each day to meet the recommended amount of calcium?
- 2-3
 - 4-5
 - 6 or more
 - Not sure
32. Which of the following is the best reason for taking a calcium supplement?
- If a person skips breakfast
 - If a person does not get enough calcium from diet
 - If a person drinks only skim or non-fat milk
 - Not sure
33. Which vitamin is necessary for calcium absorption?
- Vitamin A
 - Vitamin C
 - Vitamin D
 - Not sure

Kim, Horan, & Gendler, modified Kim, Gendler, Martin, Coviak, Rodrigeis-Fisher

Appendix B

Healthy Bones Knowledge Questionnaire (male version)

_____ ID No.

Osteoporosis (os-tee-o-po-ro-sis) is a condition in which the bones become very brittle and weak so that they break easily.

Below is a list of things which may or may not affect a person's chance of getting osteoporosis. We wish to learn what you know or may not know about osteoporosis risk factors. It helps to know if you're not sure about some factors. Please read each statement, then place a check in the box to show if you think that a person is:

MORE LIKELY TO GET OSTEOPOROSIS or

LESS LIKELY TO GET OSTEOPOROSIS or the statement

HAS NOTHING TO DO WITH OSTEOPOROSIS or

You are NOT SURE

	More Likely	Less Likely	Nothing to do with	Not Sure
1. Having big bones				
2. Being tall				
3. Being short				
4. Not eating or drinking milk products each day				
5. Eating a diet high in dark green vegetables like broccoli or collard greens				
6. Having a father that is not as tall as he used to be				
7. Having a grandfather who has a hunchback				
8. Being a woman				
9. Being a man				
10. Being African American				
11. Having low male hormones				
12. Taking cortisone (steroids) pills or shots for a long time				
13. Exercising 3-4 times a week for 20-30 minutes at a time				
14. Having poor posture				
15. Being underweight				
16. Being overweight				
17. Being anorexic				
18. Being on a diet (but not anorexic)				

For the next group of questions, choose one answer from several choices. Be sure to choose only one answer. If you think there is more than one correct answer, choose the best answer. If you are not sure, just choose “Not sure”.

19. Which of the following exercises is the best way to reduce a person’s chance of getting osteoporosis?
- Swimming
 - Doing yard work
 - Jogging
 - Not sure
20. Which of the following exercises is the best way to reduce a person’s chance of getting osteoporosis?
- Bicycling
 - Doing warm-up stretches
 - Changing oil in car
 - Not sure
21. Which of the following exercises is the LEAST likely to reduce a person’s chance of getting osteoporosis?
- Computer games
 - Soccer
 - Basketball
 - Not sure
22. How many days a week do you think a person should exercise to strengthen the bones?
- 1 day a week
 - 2 days a week
 - 3 days a week
 - Not sure
23. What is the LEAST AMOUNT OF TIME a person should exercise on each occasion to strengthen the bones?
- Less than 15 minutes
 - 20-30 minutes
 - More than 45 minutes
 - Not sure
24. Exercise makes bones strong, but it must be hard enough to make breathing:
- Just a little faster than normal

- b. So fast that talking is not possible
 - c. Much faster, but talking is possible
 - d. Not sure
25. Which of the following exercises is the best way to reduce a person's chance of getting osteoporosis?
- a. Jogging or running for exercise
 - b. Bicycling
 - c. Bowling
 - d. Not sure
26. Which of the following activities is the best way to reduce a person's chance of getting osteoporosis?
- a. Cleaning up a room?
 - b. Dancing
 - c. Playing a musical instrument
 - d. Not sure
27. Which of these foods give a person the most calcium?
- a. Apple
 - b. Cheese
 - c. Cucumber
 - d. Not sure
28. Which of these foods give a person the most calcium?
- a. Watermelon
 - b. Corn
 - c. Canned sardines
 - d. Not sure
29. Which of these foods give a person the most calcium?
- a. Chicken
 - b. Baked or refried beans
 - c. Grapes
 - d. Not sure
30. Which of these foods give a person the most calcium?
- a. Strawberries
 - b. Cabbage

- c. Yogurt
 - d. Not sure
31. Which of these foods give a person the most calcium?
- a. Grapefruit
 - b. Ice cream
 - c. Radishes
 - d. Not sure
32. Which of the following is the recommended amount of calcium intake for a teenage boy?
- a. 600mg daily
 - b. 1300 mg daily
 - c. 2500 mg daily
 - d. Not sure
33. How many 8 ounce glasses of milk (the amount in a school lunch milk carton) must a teenage girl drink each day to meet the recommended amount of calcium?
- a. 2-3
 - b. 4-5
 - c. 6 or more
 - d. Not sure
34. Which of the following is the best reason for taking a calcium supplement?
- a. If a person skips breakfast
 - b. If a person does not get enough calcium from diet
 - c. If a person drinks only skim or non-fat milk
 - d. Not sure
35. Which vitamin is necessary for calcium absorption?
- a. Vitamin A
 - b. Vitamin C
 - c. Vitamin D
 - d. Not sure

Kim, Horan, & Gendler, modified Kim, Gendler, Martin, Coviak, Rodrigeis-Fisher

Appendix C

Modified Childhood Obesity Primary Care Clinical Pathway (95th Percentile)

Childhood Obesity Primary Care Clinical Pathway (95th Percentile)

Child's Name DOB Initiation Date

**BMI 95th
Percentile**



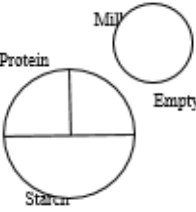


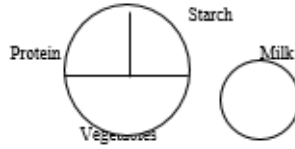

**Assess readiness
to change.
Date
Initials**

**Complete H&P
Date
Initials**

Readiness to change Date Initials

Complete H&P Date Initials

ASSESSMENT	PLAN																		
<p>Ht, Wt, BMI, WC, B/P, VS (See chart) *Assess B/P (<90th percentile ht/wt/gender)</p> <p>Assess medications Date <input type="text"/> Initial <input type="text"/></p> <p>Assess stage of readiness for change Date <input type="text"/> Initial <input type="text"/></p> <p>Rapid dietary assessment measure Date <input type="text"/> Initial <input type="text"/></p> <p>Assess social/environmental barriers to change Date <input type="text"/> Initials <input type="text"/></p> <p>Assess screen time Date <input type="text"/> Initial <input type="text"/></p> <p>Assess physical activity Date <input type="text"/> Initial <input type="text"/></p> <p>Provider Signature <input type="text"/> Initials <input type="text"/></p> <p>CMA Signature <input type="text"/> Initials <input type="text"/></p>	<p>UA Date <input type="text"/> Next due <input type="text"/></p> <p>CMP Date <input type="text"/> Next due <input type="text"/></p> <p>FLP Date <input type="text"/> Next Due <input type="text"/></p> <p>Fasting Insulin Date <input type="text"/> Next Due <input type="text"/></p> <p>HgA1C Date <input type="text"/></p> <p>**Vitamin D 25 (OH)D Next Due <input type="text"/></p> <p>***Calcium Next Due <input type="text"/></p> <p>3-4 yr olds- (UA, CMP Q2 yrs, FLPx1 then Q3yrs) 5-7yr olds (UA, CMP yearly, FLPx1 then Q3 yrs) ≥8yrs (UA, CMP,* FLP, **Vitamin D 25 (OH)D, Fasting Insulin, Free T4, TSH yearly)</p> <p>*If FLP has ≥1 abnormalities, repeat in 1 month, if values remain abnormal, refer to Pediatric cardiology and advance to risk factor pathway</p> <p>**If Vitamin D level is <30nmol/L-Initiate Vitamin D replacement Check levels in 1 month. Then, every 3 months if any changes in Vitamin D replacement dosages. When Vitamin D levels met, check levels every 6 months. Vitamin D level can be non-fasting</p> <p>*** If calcium levels are below the recommended levels (see Calcium table below) Check levels in 1 month. Then, every 3 months if any changes in calcium replacement dosages. When calcium levels met, check levels every 6 months. Calcium levels will be fasting (drawn as part of the comprehensive metabolic panel (CMP).</p>																		
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="3">Calcium serum blood levels</th> </tr> <tr> <th>Age</th> <th>Male</th> <th>Female</th> </tr> </thead> <tbody> <tr> <td>1-6 years</td> <td>8.8 - 10.6</td> <td>8.5 - 10.3</td> </tr> <tr> <td>7-12 years</td> <td>8.7 - 10.3</td> <td>8.5 - 10.3</td> </tr> <tr> <td>13-15 years</td> <td>8.5 - 10.2</td> <td>8.4 - 10.2</td> </tr> <tr> <td>16-18 years</td> <td>8.4 - 10.3</td> <td>8.6 - 10.3</td> </tr> </tbody> </table> <p>Note: Adapted from healthcare.uiowa.edu</p>	Calcium serum blood levels			Age	Male	Female	1-6 years	8.8 - 10.6	8.5 - 10.3	7-12 years	8.7 - 10.3	8.5 - 10.3	13-15 years	8.5 - 10.2	8.4 - 10.2	16-18 years	8.4 - 10.3	8.6 - 10.3
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Name _____	DOB _____																																									
<p>Education Diet/Nutrition</p> <ol style="list-style-type: none"> Given fast food guide Date _____ Initials _____ Initiated education about eating out Date _____ Initials _____ Initiate education about healthy food choices Date _____ Initials _____ <p>Choose foods high in fiber, vitamins and minerals and low in fat such as beans, peas, lentils, dark green vegetables (broccoli, cabbage, spinach, greens) Limit pastas, dishes loaded with butter, and mayonnaise. When eating pastas, choose pastas with fresh vegetables. Choose casseroles with green beans, three-bean, or peas. Choose sweet potatoes over potatoes. Choose whole wheat bread and cornbread over white breads, biscuits and rolls. Choose fresh or steamed vegetables. Limit salad dressings creams and sauces. Make light dressings of olive oil/ vinegar. Choose lean meats, grilled or baked instead of fried. Choose fish, skinless turkey, and skinless chicken. Choose fresh fruits for desserts. Limit serving sizes of cobblers, pies or cakes, candy, junk food to recommended serving size.</p> <p>Teach the plate method of determining portions for older children Date _____ Initials _____</p> <p>Teach the fist method of determining portions for younger children Date _____ Initials _____</p> <ol style="list-style-type: none"> Encourage drinking a glass of water 30 minutes prior to meals and 4-6 glasses of water/d Date _____ Initials _____ Choose unsweetened drinks like unsweetened tea, diet sodas and limit juice to 4-8 ounces 100% fruit juice Date _____ Initials _____ 	<p>Portion Size</p> <div style="text-align: center;">  </div> <p>Breakfast</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Fruit</p> </div> <div style="text-align: center;">  </div> <div style="text-align: center;">  <p>Milk</p> </div> </div> <p>Lunch/Dinner</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Fruit</p> </div> <div style="text-align: center;">  </div> <div style="text-align: center;">  <p>Milk</p> </div> </div>	<p>Nutrition Labels</p> <p>Initiated education about reading food labels Date _____ Initials _____</p> <p>Amount per serving Date _____ Initials _____</p> <p>Nutrients Date _____ Initials _____</p> <p>Serving Size Date _____ Initials _____</p> <p>Percent Daily Value Date _____ Initials _____</p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2">Estimated Energy Requirements</th> </tr> <tr> <th colspan="2">Girls</th> </tr> </thead> <tbody> <tr> <td>3-8 years</td> <td>$135.3 - (30.8 \times \text{age } \{Y\}) + \text{PA} \times (10.0 \times \text{weight } \{kg\}) + 934 \times \text{height } \{m\} + 20$ kcal</td> </tr> <tr> <td>9-18 years</td> <td>$135.3 - (30.8 \times \text{age } \{Y\}) + \text{PA} \times (10.0 \times \text{weight } \{kg\}) + 934 \times \text{height } \{m\} + 25$ Kcal</td> </tr> </tbody> </table> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2">Physical Activity (PA)</th> </tr> <tr> <th colspan="2">Girls</th> </tr> </thead> <tbody> <tr> <td>Sedentary</td> <td>PA=1.00</td> </tr> <tr> <td>Low active</td> <td>PA=1.13</td> </tr> <tr> <td>Active</td> <td>PA=1.26</td> </tr> <tr> <td>Very Active</td> <td>PA=1.42</td> </tr> </tbody> </table> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2">Estimated Energy Requirements</th> </tr> <tr> <th colspan="2">Boys</th> </tr> </thead> <tbody> <tr> <td>3-8 years</td> <td>$88.5 - (61.9 \times \text{age } \{Y\}) + \text{PA} \times (26.7 \times \text{weight } \{kg\}) + 903 \times \text{height } \{m\} + 20$ kcal</td> </tr> <tr> <td>9-18 years</td> <td>$88.5 - (61.9 \times \text{age } \{Y\}) + \text{PA} \times (26.7 \times \text{weight } \{kg\}) + 903 \times \text{height } \{m\} + 20$ kcal</td> </tr> </tbody> </table> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2">Physical Activity (PA)</th> </tr> <tr> <th colspan="2">Boys</th> </tr> </thead> <tbody> <tr> <td>Sedentary</td> <td>PA=1.00</td> </tr> <tr> <td>Low active</td> <td>PA=1.16</td> </tr> <tr> <td>Active</td> <td>PA=1.31</td> </tr> <tr> <td>Very Active</td> <td>PA=1.56</td> </tr> </tbody> </table>	Estimated Energy Requirements		Girls		3-8 years	$135.3 - (30.8 \times \text{age } \{Y\}) + \text{PA} \times (10.0 \times \text{weight } \{kg\}) + 934 \times \text{height } \{m\} + 20$ kcal	9-18 years	$135.3 - (30.8 \times \text{age } \{Y\}) + \text{PA} \times (10.0 \times \text{weight } \{kg\}) + 934 \times \text{height } \{m\} + 25$ Kcal	Physical Activity (PA)		Girls		Sedentary	PA=1.00	Low active	PA=1.13	Active	PA=1.26	Very Active	PA=1.42	Estimated Energy Requirements		Boys		3-8 years	$88.5 - (61.9 \times \text{age } \{Y\}) + \text{PA} \times (26.7 \times \text{weight } \{kg\}) + 903 \times \text{height } \{m\} + 20$ kcal	9-18 years	$88.5 - (61.9 \times \text{age } \{Y\}) + \text{PA} \times (26.7 \times \text{weight } \{kg\}) + 903 \times \text{height } \{m\} + 20$ kcal	Physical Activity (PA)		Boys		Sedentary	PA=1.00	Low active	PA=1.16	Active	PA=1.31	Very Active	PA=1.56
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<p>Cardiovascular Prehypertension</p> <p>*Measure B/P in R upper arm with correct sized cuff B/P values consistently above the 90th percentile for height, weight, gender and age but below the 95th percentile or greater than 120/80 in adolescents.</p> <p>Risk Factor/Co- morbidity Specific Treatment</p> <p>1. Confirmed by 3 separate readings at the 90th percentile for ht, wt, and gender, on 3 separate visits including at least 1 reading from outside the clinic. 1. Date []/ []/ [] 2. Date []/ []/ [] 3. Date []/ []/ []</p> <p>Reading from outside the clinic []/ []/ [] Done on []/ []/ []</p> <p>2. Comprehensive assessment for cardiovascular risk factors: Lipid profile CMP (See Lab section) 3. Step up non- pharmacological treatment including weight management, dietary modification, and exercise. 4. Specific dietary recommendations include a no salt- added diet with more fresh fruits and vegetables, low- fat dairy and low fat protein. An example of such a diet is the Dietary Approaches to Stop Hypertension Diet (DASH diet). 5. Monitor blood pressure monthly until stable (at least 3 months after <90th percentile) then Q6 months 6. May play competitive sports in the absence of end- organ damage</p>	<p>Cardiovascular Hypertension</p> <p>Measure B/P in R upper arm with correct sized cuff B/P values above the 95th percentile or greater than 120/80 in adolescents.</p> <p>Risk Factor/Co- morbidity Specific Treatment</p> <p>1. Confirmed by 3 separate readings on 3 separate visits >90th percentile for ht, wt, gender, including at least 1. Date []/ []/ [] 2. Date []/ []/ [] 3. Date []/ []/ []</p> <p>Reading from outside the clinic []/ []/ [] Done on []/ []/ []</p> <p>2. Comprehensive assessment for cardiovascular risk factors: Lipid profile CMP (See Lab section) 3. Continue lifestyle management techniques. 4. Initiate cardiology consult for potential pharmacological management 5. If office- based dipstick UA reveals proteinuria, confirm via urine microanalysis. If proteinuria is confirmed, repeat UA in 2 weeks. If Proteinuria persists, refer to nephrology. 6. Monitor B/P Monthly 7. Nephrology consult in all children with confirmed HTN ≤10 years of age</p>	<p>Consults</p> <p>Cardiology Consult Date Ordered []/ []/ []</p> <p>Date Reviewed with family []/ []/ []</p> <p>Ophthalmology consult to monitor for retinopathy Date Ordered []/ []/ []</p> <p>Date Reviewed with family []/ []/ []</p> <p>Nephrology consult to monitor renal damage and in all children ≤10 years of age to rule out renal parenchymal disease Date Ordered []/ []/ []</p> <p>Date Reviewed with family []/ []/ []</p>
<p>Cardiovascular Dyslipidemia</p> <p>History Familial Hyperglycemia <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Specify Type []/ []/ []</p>	<p>Treatment Quick reference</p> <p>Centile T. Cholesterol LDL Acceptable <75 <170 <110 Borderline 75th- 95th 170- 199 110- 130 Elevated >95 >200 >130</p> <p>1. FLP starting at 8 years old 2. If abnormal, repeat in 1 month to verify 3. If levels are borderline for age and gender, encourage lifestyle interventions with dietary changes and increased activity for 6 months Date 6 month period began []/ []/ [] 4. If levels are elevated refer to lipid management specialist (i.e. pediatric cardiology in our area)</p>	<p>Consults</p> <p>Cardiology Consult Date Ordered []/ []/ []</p> <p>Date Reviewed with family []/ []/ []</p>

Name		DOB				
Respiratory/Obstructive Sleep Apnea						
Snoring	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	Treatment 1. 2- month trial of inhaled corticosteroids Steroids Start 2. Failure of nasal steroids- - 3. Sleep study Order date Reviewed with family date 4. Referral to ENT	Consults ENT Referral Order date Reviewed with family Date
Enuresis	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date		
Daytime sleepiness	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date		
Difficulty falling asleep and staying Asleep	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> yes <input type="checkbox"/> No Date		
Respiratory/Asthma (increase awareness of need for surveillance for asthma in overweight and obese children)						
Cough	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	Treatment 1. Initiate asthma action plan 2. Spirometry Date Reviewed with family Date 3. Inhaled corticosteroid of choice Drug Date 4. Rescue inhaler or NEB Q4H PRN Medication Route of administration	Asthma Consults Asthma/allergy/ Pulmonology consult Order date Reviewed with family date
Wheeze	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date		
Shortness of Breath	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date		
Unexplained night time cough	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date		

Name		DOB				
Metabolic Pre- Diabetes Mellitus (pre- Type II DM) fasting blood sugar ≥ 100 mg/dl ≤ 120 mg/dl or impaired gtt or 2- hr postprandial ≥ 140 - 199mg/d						
Acanthosis Nigricans	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	Treatment Pre-diabetes Treatment 1. Initiate diabetic diet 2. Increase physical activity 3. Any two of the following risk factors: Family history of type 2 diabetes in first- or second-degree relative Race/ethnicity (Native American, African American, Hispanic American, Asian American, Pacific Islander) Signs of insulin resistance or conditions associated with insulin resistance (Acanthosis Nigricans, hypertension, dyslipidemia, polycystic ovary syndrome). Age for initiation of screening: 10 years or at onset of puberty if puberty occurs at a younger age 4. FSBS at home 3- 4 times weekly with at least (2) 2- hr postprandial readings and one in the morning and one at bedtime 5. CMP, FLP, Fasting insulin, t4, TSH (See Lab section) 6. GTT every 2 years starting at 10 years old Date Ordered Date Reviewed with family Next due	Consults: Pre-diabetes Endocrinology Referral Order date Reviewed with family Date
Striae	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date		
Polydipsia/ Increased thirst	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date		
Polyuria/Increased urination	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date		
Polyphagia/Increased appetite	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date		
Unexplained weight loss	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date		
Menstrual abnormalities	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA Date	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA Date	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA Date	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA Date		
Type 2 Diabetes Mellitus random blood sugar ≥ 200 (provisional), labs outside above listed ranges, monitor children for sings/symptoms of combine T1 & Treatment 1. Initiate diabetic diet 2. Initiate diabetic education 3. Increase physical activity 4. Multiple daily finger stick blood sugars at home (at least 2 per day- (1) 2- hr post prandial and (1) either in the morning before eating or one at bedtime) 5. Labs every 3 months (CMP, Fasting insulin, HgA1c) 6. Consider drawing GAD and Islet cell antibodies 7. Initiate Metformin in children ≥ 12 years. Consider pediatric endocrinology and cardiology consult. 8. Immediate referral to pediatric endocrinology and cardiology for children < 12 years 9. Ophthalmology consult 10. Consider Nephrology consult 11. Monthly visits until blood sugars are stable then Q3 months 12. Target HgA1c 7.0 in children 6- 18 years old 13. Monitor for nocturnal hypoglycemia in children ≤ 7 years (50% asymptomatic) 2DM Consults Endocrinology Date : Cardiology Date : Ophthalmology Date : Nephrology Date Reviewed with family Reviewed with family Reviewed with family Reviewed with Date Date Date Date						

Name		DOB				
Reproductive Early pubertal development (≤ 8 years in girls, ≤ 9 years in boys) History of early pubertal development <input type="checkbox"/> Yes <input type="checkbox"/> No						
Acanthosis Nigricans	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	Treatment Premature puberty- boys and girls Referral to pediatric endocrinology Female 1. Keep menstrual cycle calendar 2. NSAIDS- begin 24- 48 hours prior to onset of menstrual period and continue through 48 hours of cycle then PRN 3. Consider pelvic ultrasound 4. Consider low- estrogen oral contraceptives for menstrual cycle regulation 5. Consider Metformin Start 500mg QD, increase as necessary Males 1. Teach the importance of good hygiene 2. Carefully assess condition of skin on penile shaft for evidence of breakdown (push fat pad back away from penis for full visualization)	Consults Women's Health/Gynecology Date Reviewed with family Date Endocrinology Date Reviewed with family Date
Acne	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date		
Perineal skin breakdown	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date		
Females						
Male pattern hair distribution	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date		
Irregular/absent menstrual periods	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date		
Painful periods	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date		
Truncal obesity	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date		
Males						
Suprapubic fat pad obscuring penis	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date		
Psychological						
On grade level	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	Treatment 1. Counseling 2. Encourage extracurricular activities 3. Evaluate for depression 4. Consider SSRIs 5. Evaluate for eating disorder 6. Evaluate for learning disability if not on grade level (testing through the school system). Request to be made in writing to School Board for evaluation for LDs in reading, writing, mathematics, and expressive/receptive language disorder	Consults Mental Health Consult Date Reviewed with family Date
Can name friends	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date		
High risk sexual behavior	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date		
Alcohol consumption	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date		
Recreational drug use	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date		
Tobacco use Binging/purging Anorexia	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date		

Name		DOB			
Gastrointestinal					
Daytime enuresis	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	Treatment Constipation/Encopresis 1. Increase water in diet 2. Increase fiber in diet to age + 5grams 3. Polyethylene Glycol/ Miralax Miralax for constipation (given routinely for at least six months until bowel muscle tone is restored) 4. Behavioral controls: Daily toilet time 20 minutes after a meal (the same meal) for 10 minutes with no toys or books to distract child. 5. Increase exercise/mobility 6. Consider Peds Peds GI consult Enuresis 1. Behavioral controls for reducing fluids taken in evening hours 2. Urinalysis 3. Maintain good hydration during the day 4. No Caffeine 5. Timed voids Q1- 2 hours 6. Consider DDAVP/Imipramine for nighttime enuresis 7. Consider bladder antispasmodics for daytime enuresis. Abdominal Pain 1. Smaller more frequent meals 2. Bland diet 3. Upright positioning 30- 60 minutes after eating 4. Consider reflux medication 5. Consider Abdominal Ultrasound for fatty liver disease and/or cholelithesis
Nighttime enuresis	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	
Constipation	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	
Encopresis	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	
Abdominal pain	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	
Consults					
Urology Date Reviewed with family Date Gastroenterology Date Reviewed with family Date					

Name		DOB			
Musculoskeletal/Joint Pain					
Back pain	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	Treatment 1. NSAIDS 2. Heat x 20 minutes alternate with ice x 20 minutes TID PRN 3. Mild muscle relaxer 4. Physical Therapy Date Location 5. Adjunct Therapy 6. Review Vit D levels 7. If on Vit D replacement therapy, validate patient compliance. 8. Order Vit D levels if no recent labs (in last 3 months). 9. X-rays to R/O stress FXs, bone deformities, osteomalacia 10. Orthopedic referral	Consults Physical Therapy Date Reviewed with family Date
Hip/Thigh pain	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date		
Knee pain	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date		
Throbbing Bone Pain	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date		
Hip pain radiating to thigh or knee	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	Treatment 1. Bilateral hip x-rays to rule out slipped capital femoral epiphyses 2. NSAIDS 3. Heat x 20 minutes alternate with Ice x 20 minutes TID PRN 4. Physical Therapy 5. Orthopedics referral 6. Adjunct Therapy	Consults Orthopedics Date Reviewed with family Date
Diagnosed Slipped capital epiphysis	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date		
Foot pain	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	Treatment 1. NSAIDS 2. Podiatry referral 3. Adjunct Therapy	Consults Podiatry Date Reviewed with family Date
Flat feet	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date		
Joint Disease	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	<input type="checkbox"/> Yes <input type="checkbox"/> No Date	Refer to Shriner's Hospital	Shriner's Date Reviewed with Family Date

Appendix D

Statement of Mutual Agreement



Eastern Kentucky University
Department of Baccalaureate and Graduate Nursing Doctor
of Nursing Practice Program

Statement of Mutual Agreement for Capstone Project

The purpose of a Statement of Mutual Agreement is to describe the agreement between a designated clinical agency and the DNP student regarding the student's Capstone Project.

I. General Information

Student Name: Kay G. Wilson MSN, APRN
Project Title: Bone Health Promotion for Obese Children and Adolescents: A Primary Care Intervention
Agency: Healthy Horizon Children's Center: Obesity Clinic
Agency Contact: Dr. Martha D. Hawkins DNP APRN CPNP

II. Brief description of the project

The purpose of the proposed project is to implement evidence-based bone health promotion components in a primary care setting for obese children and adolescents. The project focuses on providing specific prescriptive guidelines for practitioners, and education activities with interactive support for obese children and their families to assist with lifestyle changes.

The evidence-based interventions are: 1) revisions to the clinical pathway related to bone health parameters; 2) monitor levels of vitamin D and calcium among clinic patients; and 3) use of family-based strategies to educate and coach patients and families about bone health.

The educational content for participants and families is derived from the Best Bones Forever (BBF) Campaign (Sadler, et al., 2013) (<http://www.bestbonesforever.org>) a web site owned and maintained by the Office on Women's Health, U.S. Department of Health and Human Services. Learning activities selected for this project focus on three main topics: a) bone development and the role of vitamin D and calcium; b) healthy eating; and c) physical activity. The Best Bones Forever reading and interactive materials will be available to the participants through a take-home three-ring binder and are also available on the BBF web site (<http://www.bestbonesforever.org>).

The expected project outcomes include: a) increasing bone health promotion awareness among the HHCC staff, participants and families; b) adoption of bone health promotion healthy lifestyle choices; and c) improving vitamin D and calcium blood levels. The project leader's role and on-site activities will include:

- Bone Health Promotion Project introduction staff meeting on the morning of the first project day;



Eastern Kentucky University
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- Collection of data from a retrospective chart review of the patient medical record: age, gender, ethnicity, education level, height, weight, BMI, and results of vitamin D and calcium blood levels (pre & post BBF education intervention).
- Post BBF education intervention chart review of vitamin D and calcium blood levels;
- administration of the Healthy Bones Knowledge Questionnaire (HBKQ) to the participants (pre and post BBF education intervention);
- perform the data collection of the HBKQ responses (pre & post BBF intervention)
- Meet with HHCC participants, parents and guardians during their regularly scheduled primary care clinic appointment to introduce, explain, and discuss the bone health promotion project (weeks 1 & 8).

The project leader will have access to HHCC participants' medical records that Dr. Martha Hawkins, DNP, clinical director, has referred for the project. The nondisclosure or confidentiality of the project's participants' demographic and clinical information will be maintained according to the Agency's and the Health Insurance Portability and Accountability Act of 1996 (HIPAA) guidelines. Confidentiality of the participants' HBKQ responses will be maintained through anonymity. Individual results will be shared with Healthy Horizon Children's Center: Obesity Clinic director or staff as needed to demonstrate clinical improvement.

There are no products resulting from the DNP Capstone Project with potential market value.

III. Agreement of written and oral communication

Student agrees to acknowledge support of Healthy Horizon Children's Clinic staff and patients in all written and verbal dissemination. All data will be reported in aggregate form only.

IV. Required Signatures:

K. J. Williams DNP
Student

5-27-2015
Date

Cathy Velotto
Capstone Advisor

5/22/2015
Date

Dr. Martha Hawkins DNP APRN CPNP
Agency Representative

5/22/15
Date



Appendix E

Parent/Caregiver Permission Form For Minor's Participation in a Project Bone Health Promotion for Youth: A Primary Care Intervention

We would like to invite your child to take part in a project about building healthy bones for a lifetime and preventing the crippling disease osteoporosis. Your child is invited to participate because your child is either attending the Healthy Horizons Children's Center or Crab Orchard Primary Care. It is known that youth who are not eating healthy or regularly exercising, may develop weakened bones over the years.

Who is doing the project?

The person who is doing the project is Kay G. Wilson, a student at Eastern Kentucky University in the Doctor of Nursing Practice Program. She is being supervised in this project by Eastern Kentucky faculty advisor, Dr. Cathie Velotta, PhD, RN.

What is the purpose of the project?

The purpose of this project is to provide bone health education for at-risk youth.

Where is the project going to take place and how long will it last?

The project procedures will be conducted at Healthy Horizons Children's Center and Crab Orchard Primary Care. Each session will take about 30 minutes. The total amount of time your child will be asked to volunteer for this project is 30 minutes each at two regularly scheduled clinic visits plus an at home bone health education learning activities and plans (about 30 minutes per week). In addition, I will make a phone call to you mid-way through the project (about 4 weeks) to check on your child's progress with the education activities.

What will my child be asked to do?

Your child will be asked to fill out 1 questionnaire that will be given at the beginning of the project and again at the end of the project. The day the Healthy Bones Knowledge questionnaires are filled out, I will be seeing your child and explaining how your child is going to learn about healthy eating behaviors and building healthy bones for the future. Then, during the weeks you are in the project, your child will work through the lesson plans located in the binder that was given to your child on the first project day. Each week there will be different learning activities that will teach your child how to build healthy bones through healthy eating and exercise. Regularly scheduled medical follow-up visits will be made at your clinic (Healthy Horizons Children's Clinic or Crab Orchard Primary Care). I will see you and your child two times during the eight week project time period.

Are there reasons why my child should not take part in this project?

The only reason your child should not take part in this project is if you choose not to participate or the child requests not to participate.

What are the possible risks and discomforts?

To the best of our knowledge, the things your child will be doing have no more risk of harm than he or she would experience in everyday life.

Although we have made every effort to minimize this risk, your child may find some questions we ask to be upsetting or stressful. Sometimes youth become upset when talking about changing eating behaviors or other changes that may take place as healthy eating behaviors become part of your everyday routine. If, so, we can tell you and your child about some health care professionals who may be able to help your child with these feelings.

Will my child benefit from taking part in this project?

There is no guarantee that your child will get any benefit from taking part in this project. However, some people have experienced changes to healthier eating habits and become more energetic when eating and learning about healthier lifestyles while learning more about bone health. We cannot and do not guarantee your child will receive any benefits from this project.

Does my child have to take part in the project?

If you decide to allow your child to take part in the project, it should be because your child really wants to volunteer. Your child will not lose any rights he or she would normally have if you choose not to allow him or her to volunteer. If your child participates and either of you change your mind later, your child can stop at any time during the project and still keep the benefits and rights he or she had before volunteering.

If I don't want my child to take part in the project, are there other choices?

If you do not want your child to take part in the project, there are other choices such as the education binder containing bone health information, and learning activities that will be available for you to use at home. If your child participates in the project, the benefit of personal coaching by the project leader will increase the likelihood of your child being more successful at changing unhealthy eating behaviors to healthy eating behaviors that encourage healthier lifestyles and promote bone health

What will it cost for my child to participate?

There are no costs associated with taking part in this project.

Will my child receive any payment or reward for taking part in the project?

Your child will not receive any payment or reward for taking part in this project.

Who will see the information my child gives?

Your youth's information will be combined with information from other youth taking part in the project. When we write up the project results to share with other health care professionals, we will write a report that will combine and summarize all the project information. Your child will not be identified in these written materials.

We will make every effort to prevent anyone who is not on the project team from knowing that your child gave us information, or what that information is. For example, your child's name will be kept separate from the information he or she gives, and these two things will be stored in different places under lock and key.

However, there are some circumstances in which we may have to show your child's information to other people. For example, the law may require us to show your child's information to a court or to tell authorities if we believe your child have been abused or is a danger to him/herself or someone else). Also, we may be required to show information that identifies your child to people who need to be sure we have done the project correctly; these would be people from such organizations as Eastern Kentucky University

Can my child's taking part in the project end early?

If your child decides to take part in the project, he or she still has the right to decide at any time that he or she no longer wants to participate. Your child will not be treated differently if he or she decides to stop taking part in the Project.

The individuals conducting the project may need to end your child's participation in the project. They may do this if your child is not able to follow the directions they give him or her, if they find that your child's being in the project is more risk than benefit to him or her, or if the agency decides to stop the project early for unforeseen reasons.

What happens if my child gets hurt or sick during the project?

If you believe your child is hurt or if your child gets sick because of something that is done during the project, you should call Kay G. Wilson, MSN APRN at 859-221-2829 immediately. It is important for you to understand that Eastern Kentucky University will not pay for the cost of any care or treatment that might be necessary because your child gets hurt or sick while taking

part in this Project. That cost will be your responsibility. Also, Eastern Kentucky University will not pay for any wages that might be lost as a result of this project.

Usually, medical costs that result from projects-related harm cannot be included as regular medical cost. Therefore, the costs related to your child's care and treatment because of something that is done during the project will be your responsibility. You should ask your insurer if you have any questions about your insurer's willingness to pay under these circumstances.

What if I have questions?

Before you decide whether to accept this invitation for your child to take part in the project, please ask any questions that might come to mind now. Later, if you or your child have questions about the project, you can contact the project leader, Kay G. Wilson, APRN, at 859-622-3636. If you have any questions about your child's rights as a project volunteer, contact the staff in the Division of Sponsored Programs at Eastern Kentucky University at 859-622-3636. We will give you a copy of this form to take with you.

What else do I need to know?

You will be told if any new information is learned which may affect your child's condition or influence your willingness to continue allowing your child to take part in this project.

I have thoroughly read this document, understand its contents, have been given an opportunity to have my questions answered, and give permission for my child to participate in this project if he/she chooses to participate.

Parent/Caregiver's Name Date

Child's Name Date

Parent/Caregiver's Signature Date

Witness Signature Date

Appendix F

Assent Form for Child's Participation in a Project (for children between the ages of 7 and 12)

Bone Health Promotion for Youth: A Primary Care Intervention

I would like to ask for your help in a learning program for healthy bones. Your bones are growing very quickly and need healthy foods, vitamin D and calcium and exercise to prevent weak bones when you grow older. If you decide to participate in this learning program, you will be asked to

- Come to your regular clinic visit
- Answer questions about healthy bones
- Work on learning activities about healthy bones at home

Your parents know that I am asking you if you want to participate, but it is up to you to decide if you want to do this. You should not feel pressured to participate, and no one will be upset with you if say no. Even if you say yes now but decide you want to stop later, no one will be upset with you. All you have to do is tell me that you want to stop.

You and your family will be learning more about making strong bones for a healthy future!

If you want to participate, you can write your name on the line below. If you have any questions, please ask me before you sign. If you do not want to participate, please do not write your name.

Child's Signature

Date

Witness Signature

Date

Appendix G

Written Approval from Dr. Jean Martin



March 6, 2014

Kay, G. Wilson, APRN
Certified Adult and Family Nurse Practitioner
Doctor of Nursing Practice Student
Eastern Kentucky University
Richmond, Kentucky

Dear Kay,

Thank you for your interest in the Healthy Bones Knowledge Questionnaire (HBKQ). You have my permission to use the instrument. Please keep us informed of any publications and/or presentations and send us an abstract or summarize your study results when completed.

I wish you much success with your study.

Sincerely,

Jean Martin, PhD, RN, CPNP
Associate Professor
Kirkhof College of Nursing
Cook-DeVos Center for Health Science
Grand Valley State University
301 Michigan St. NE
Grand Rapids, MI 49503

Phone: 616-331-7167
Fax: 616-331-2510
E-mail: martinj@gvsu.edu

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3/7/14

Appendix H

Weight Management and Bone Promotion Action Plan

Name _____ DOB _____

Weight Management Action Plan		Date																					
Current		Goal		Reviewed	New Goal																		
Weight		Weight																					
BMI		BMI																					
Percent IBW		Percent IBW																					
Waist circumference		Waist circumference																					
Blood pressure		Blood pressure																					
Blood sugar or HgA1c		Blood sugar or HgA1c																					
Bone Promotion Action Plan																							
Current		Goal		Reviewed	New Goal																		
Vitamin D 25 (OH) level		Vitamin D 25 (OH) level																					
Calcium Level		Calcium Level																					
				<table border="1"> <thead> <tr> <th colspan="3">Calcium serum blood levels</th> </tr> <tr> <th>Age</th> <th>Male</th> <th>Female</th> </tr> </thead> <tbody> <tr> <td>1-6 years</td> <td>8.8 - 10.6</td> <td>8.5 - 10.3</td> </tr> <tr> <td>7-12 years</td> <td>8.7 - 10.3</td> <td>8.5 - 10.3</td> </tr> <tr> <td>13-15 years</td> <td>8.5 - 10.2</td> <td>8.4 - 10.2</td> </tr> <tr> <td>16-18 years</td> <td>8.4 - 10.3</td> <td>8.6 - 10.3</td> </tr> </tbody> </table>		Calcium serum blood levels			Age	Male	Female	1-6 years	8.8 - 10.6	8.5 - 10.3	7-12 years	8.7 - 10.3	8.5 - 10.3	13-15 years	8.5 - 10.2	8.4 - 10.2	16-18 years	8.4 - 10.3	8.6 - 10.3
Calcium serum blood levels																							
Age	Male	Female																					
1-6 years	8.8 - 10.6	8.5 - 10.3																					
7-12 years	8.7 - 10.3	8.5 - 10.3																					
13-15 years	8.5 - 10.2	8.4 - 10.2																					
16-18 years	8.4 - 10.3	8.6 - 10.3																					
Current		Goal		Reviewed	New Goal																		
Vitamin D Supplement		Vitamin D Supplement																					
Calcium Supplement		Calcium Supplement																					
Nutritional Sources of vitamin D and calcium		Nutritional Sources of vitamin D and calcium																					
Bone building specific activities		Bone building specific activities																					

Patient/Parent Signature _____

Provider Signature _____

