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Obesity and Cancer


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Introduction

Obesity has become the second leading preventable cause of disease and death in the United States, trailing only tobacco use. Weight control, dietary choices, and levels of physical activity are important modifiable determinants of cancer risk. If multi-factorial approaches to prevention and management are not implemented, obesity will likely become the leading modifiable cause of death in the coming years. Physicians have a key role in integrating these approaches into clinical care and advocating for systemic prevention efforts. This article provides: 1) an introduction to the epidemiology and magnitude of childhood and adult obesity; 2) the relationship of overweight/obesity to cancer and other chronic diseases, 3) potential mechanisms postulated to explain these relationships; 4) a review of recommended obesity treatment and assessment guidelines for adults, adolescents and children; 5) multi-level prevention strategies, and; 6) an approach to obesity management in adults utilizing the Chronic Care Model.

Epidemiology and Problem Magnitude

Overweight in adults is defined as a body mass index (BMI) of 25 to 29.9 kg/m², and obesity as a BMI of ≥ 30 kg/m². In children and adolescents, obesity is defined as a level that is ≥ 95 percentile, replacing the older terminology of “overweight”, and overweight as a BMI in the 85th to 94th percentile, replacing “at risk of overweight”.

The increasing prevalence of obesity in the United States is well known and is now considered of epidemic proportion. Given the current trends in weight gain, nearly 75% of adults are predicted to be overweight by 2015. In 1980, only 15% of the adult population of the U.S. was classified as obese. The National Health and Nutrition Examination Survey (NHANES) data from 2003-04 show that 66% of the adult population ages 20-74 is overweight (BMI >25) and almost 33% is obese (BMI \geq 30). (1) The trend in obesity among youth is dramatic with an increase from approximately 5% in 1963-1970 to 17% in 2003-2004, with more than 25 million children and youth now obese or overweight. (1)

According to *F as in Fat Report: How Obesity Policies are Failing in America* (2), the 2008 follow-up analysis of the 2004-2006 Behavioral Risk Factor Surveillance Survey (BRFSS) conducted by the Trust For America's Health and the Robert Wood Johnson Foundation, obesity rates have continued to rise in 31 states and have not dropped in a single state. The U.S. Department of Health and Human Services (DHHS) in Healthy People 2010, the National Objectives for Improving Health, set a national goal to reduce adult obesity levels to fifteen percent in every state by the year 2010; for children and adolescents, the goal is five percent or less. (3)

Race, ethnicity and socioeconomic status disproportionately affect the development of obesity. A systematic meta regression analysis conducted by Wang & Bedouin (4) using NHANES and BRFSS data as well as the Youth Risk Behavior Surveillance System (YRBSS) and the National Longitudinal Survey of Adolescent Health found that some minorities and low socioeconomic (SES) groups such as Non-Hispanic Black women and children, Mexican-American women and children, low SES Black men, white women and children, and Native

Americans and Pacific Islanders are disproportionately affected. According to Wang and Bedouin:

“The NHANES data show a dramatic increase in the prevalence of overweight and obesity across all populations and a declining disparity of obesity across SES groups over the past decade. This finding indicates that individual characteristics are not the dominant factor to which the rising obesity epidemic is ascribed, i.e., social and environmental factors might have a more profound effect in influencing individuals’ body weight status than do individual characteristics such as SES” (4 - page 19).

Consequences

The consequences of obesity encompass a variety of physical, social and economic factors affecting individuals and society. The adverse health effects of obesity have created enormous direct and indirect health care costs. According to 2002 data from the U.S. Department of Health and Human Services, the economic costs related to obesity were estimated at over 117 billion dollars. A study examining the relationships of BMI in young adulthood and middle age to subsequent health care expenditure at ages 65 years and older found average annual and cumulative Medicare charges were significantly higher for individuals, both men and women, with a higher baseline BMI (5). Wang and Dietz estimate that hospital costs of treating children for obesity-associated conditions rose from \$35 million to \$127 million from 1979-81 to 1997-99 (6). Having a BMI \geq 35 is an independent risk factor for frequent utilization of adult visits to Family Medicine practices (7).

There is strong evidence that weight loss reduces risk of further complications for persons with diabetes and cardiovascular disease, and improves blood pressure, and blood glucose and cholesterol levels.

Well-controlled clinical trials have demonstrated that lifestyle modification can decrease blood pressure (8, 9), prevent or forestall development of type 2 diabetes (10, 11) and reduce

other risk factors for cardiovascular disease (12, 13). The health benefits of weight loss and increased physical activity are well established (14). Modest weight loss, of 5-10%, is associated with significant improvement in blood pressure, lipoprotein profile, glucose tolerance and insulin sensitivity (15). Physical activity has similar benefits on cardiovascular risk factors. The inverse association between physical activity and cardiovascular disease risk is mediated in substantial part by known risk factors, particularly inflammatory/hemostatic factors and blood pressure (16).

Obesity and Cancer

Many factors that contribute to cancer deaths are preventable. It has been estimated that from 50-70% of cancer deaths are related to preventable risk behaviors; 30% of cancer deaths can be attributed to tobacco use and more than 30% to poor nutrition (17). There is also expanding evidence of the role of obesity in cancer development, treatment and survival. A recent review and meta-analysis of prospective observational studies showed an association between increased BMI and certain cancers by sex. In men, increased BMI was strongly associated with esophageal adenocarcinoma, thyroid, colon and renal cancers. Weaker associations were seen between increased BMI and malignant melanoma, multiple myeloma, rectal cancer, leukemia and non Hodgkin's lymphoma in men. In women, strong associations were seen between endometrial, gallbladder, renal cancers and esophageal adenocarcinoma. Weaker associations with women's increased BMI were seen for leukemia, thyroid, post menopausal breast, pancreas, and colon cancers and non Hodgkin's lymphoma (18). Further, for gynecologic cancers, another review found an adverse affect of obesity on endometrial cancer survival (19). Calle, Rodriquez, Thurmond and Thun, (20) prospectively studied a population of more than 900,000 adults who were free of cancer at enrollment in 1982, where there were 57,145 deaths form cancer during 16 years of follow-up. The authors controlled for risk factors

other than weight in a multivariate proportional hazards models. In both men and women, body-mass index was significantly associated with higher rates of death due to cancer of the esophagus, colon and rectum, liver, gallbladder, pancreas, and kidney: the same was true for death due to non-Hodgkin's lymphoma and multiple myeloma. Significant trends for increasing risk with higher body-mass index values were observed for death from cancers of the stomach and prostate in men and for death from cancers of the breast, uterus, cervix, and ovary in women. On the basis of associations observed in this study, the authors estimated that current patterns of overweight and obesity in the United States could account for 14 percent of all deaths from cancer in men and 20 percent of those in women.

Researchers are considering the biochemical/physiologic implications of obesity in the development of chronic diseases and cancer. In the development of atherosclerosis and diabetes, obesity has been studied as a form of epidemic inflammation that predisposes the body to other forms of epidemic inflammation known to be involved in these disease states (21). For cancer, the relationships are evolving and may be site and gender specific. Multiple mechanisms being studied include chronic hyperinsulinemia/insulin resistance which is believed to create an environment favorable for tumor formation via changes in the availability of insulin growth factor (IGF) – possibly key in the development of colon and prostate cancers. In postmenopausal breast cancer, adipose tissue enzymatic activity may result in high rates of conversion of precursors to estrogen which increases endometrial cell proliferation and inhibits apoptosis. An interaction between estrogen and IGF may play a role in the development of endometrial cancer as well. The role of adipokines is also being explored. Adiponectin, secreted primarily by visceral adipose tissue is antiangiogenic and anti-inflammatory in animals. Adiponectin levels correlate inversely with BMI and hyperinsulinemia, and have been reported to have associations

with cancer in people. (21, 22), particularly colorectal cancer. Variants of the adiponectin and adiponectin receptor genes are associated with decreased colorectal cancer risk. (23). In a systematic review of adiponectin and cancer, Kelesidis, Kelesdies and Mantzoros (24) conclude that adiponectin measurements may serve as a useful screening tool for predicting risk for, and/or for early detection of obesity related cancers, and that adiponectin or its analogues may prove to be effective anticancer agents and may have important therapeutic implications

While epidemiologic studies show a relationship between obesity and cancer, only a few studies to date have looked at the impact of weight change on cancer risk. Several studies have shown relationships between weight loss and reduced cancer risk, in particular for breast and colon cancers. Harvie, et al. conducted a prospective cohort study of over 33,000 postmenopausal women in Iowa looking at change in weight (loss or gain of >5% of body weight) between 18-30 years of age, 30 years of age and menopause, and post-menopause. Those women who gained weight between 18 years and menopause had the highest rates of postmenopausal breast cancer. Women with the lowest breast cancer rates are those who maintained or lost weight in pre-menopausal years or who maintained/lost weight in pre-menopausal years and lost weight during post-menopausal years (25).

Rapp, et al (26) conducted a cohort study of 65,000 Austrian adults reviewing the relationship between weight change and multiple cancers. No relationship was observed between weight change and all cancers combined. However, an inverse association was seen between weight loss (>0.10 kg/yr) and colon cancer in men. The study controlled for multiple factors including unintentional weight loss associated with undiagnosed cancer. High weight gain was inversely associated with prostate cancer in men and positively associated with ovarian

cancer in women. BMI has been directly associated with distal colon adenomas of >1 centimeter in women (27).

In patients who have undergone gastric bypass surgery, long term mortality from any cause in a surgery group decreased by 40%, compared with that of a control group. Cause specific mortality in the surgery group decreased by 56% for coronary artery disease, by 92% for diabetes, and by 60% for cancer. (28)

Other researchers are examining forms of lifestyle modification that may lead to reduced cancer risk. In particular, there are several studies on the relationship between physical activity and reduction of breast cancer risk (25), as well as endometrial, lung, prostate cancer risk and cancer survivorship (29).

Etiology

Obesity is considered to be a disorder of energy balance in which caloric intake exceeds calories burned, through physical activity. Multiple complex reasons have led to the increased caloric intake associated with energy imbalance. These include larger portion sizes; proliferation of fast food restaurants; media campaigns/marketing that support sugary and fat-laden foods; working parents who are unable to find time or energy to cook nutritious meals; exodus of grocery stores from urban communities; reduced access to affordable fresh fruit and vegetables; and growing economic insecurity (30). Decreased physical activity has resulted from a more sedentary lifestyle fueled by television, computer and video game screen time; time demands on parents; lack of access to safe areas for physical activity, and sprawling residential neighborhoods that have increased reliance on the automobile for transportation (31). Also, cultural beliefs about body type are changing. For example, there may be a mixture of positive and negative attitudes about being overweight, especially where people who are thin are thought

to be sick, addicted to drugs, too poor to have enough to eat, or to risk wasting away in the case of food shortage or serious illness (32). Christakis and Fowler (33) performed a quantitative analysis of the nature and extent of person-to-person spread of obesity as a possible factor contributing to the obesity epidemic. They found that discernable clusters of obese persons were present in a social network at all time points, and that clusters extended to three degrees of separation. For example, a person's chances of becoming obese increased by 57% if he or she had a friend who became obese in a given interval. Among pairs of adult siblings, if one became obese, the chance that the other would become obese increased by 40%. They conclude that obesity may spread in social networks in a quantifiable and discernable pattern that depends on the nature of social ties.

Ecological Considerations in Prevention

The inclusion of built and social environment concepts in national public health planning and local community planning processes provides a framework for review of interventions to combat obesity (34). Multiple authors, groups, organizations and funders are currently addressing the built and social environment as a determinant of obesity. Recent Public Health journals have devoted entire issues to the many dimensions of the built environment, providing a framework for prevention, intervention, research and policy change. The September 2003 issues of the *American Journal of Public Health* and the *American Journal of Health Promotion* (35) were focused on the built environment, health, and community design. The issues included the work of experts from diverse disciplines and highlighted research related to the way communities are built and physical activity (biking/walking, traffic safety, children's health, and air quality); and to the connection between the *Smart Growth* movement and health; and the "sense of place" as a public health construct. This work is leading to local changes in social

policy from smoking bans to creating walk and bikeways, community gardens, and providing increased access to nutrition information, and healthy, affordable food. Nationally, several programs, interventions and guidelines have been developed that likely will impact the obesity epidemic through diffusion of best practices and modification of the built environment. These include the *Community Preventive Services Task Force's* (36) study that includes programs shown to be effective in increasing physical activity at the population level: Robert Wood Johnson's *Active Living by Design Program* (37), the *Design for Active Living Program* of the American Society of Landscape Architects (38), the *Smart Growth Network* (39), the *Project for Public Spaces* (40), the U.S. Department of Health and Human Services' *STEPS to A Healthier US* program (41), and the Kellogg Foundation's *Food and Fitness Initiative* (42).

Advocates for modifications in the built environment also stress the importance of urban farming and gardening, increased access to supermarkets, and affordable food, change in beverage policies in schools, day care facilities, and worksite wellness programs/policies.

Role of Primary Care Providers in Obesity Prevention and Management

Health care providers can and should be primary motivators and monitors of behavior change in individuals and families (43). However, obese individuals receive advice to lose weight only 50% of the time (44). Only 34% of adults seeing a physician in the prior year reported being counseled about physical activity at their last physician visit (45). Overweight and obese patients want more help with weight management than they are currently getting from their family physicians (46). Disparities exist in professional advice to lose weight - the lower the patient's income and educational attainment, the less likely the provider is to offer advice to lose weight (47). African Americans, compared with Whites, have significantly lower odds of receiving weight advice counseling (48). The finding that providers under-diagnose obesity by

relying on appearance and not BMI highlights the importance of teaching and modeling the use of BMI to diagnose overweight/obesity(49). Health care providers fail to address obesity for a variety of reasons including, “clinical inertia” or the failure to initiate or intensify therapy when indicated (50); lack of time, perceived non-compliance of participants, and lack of training in counseling and motivating participants to change behavior (51). Adults who have had a routine physician check-up and who report receiving medical advice to lose weight were much more likely to try and lose weight, compared to adults who had a checkup but did not receive medical advice to lose weight (52). While clinical guidelines exist for obesity assessment and management in children and adults (53, 54) they are not routinely used.

Clinical Approaches

Managing Overweight and Obese Adults –

Every 5 years, The American Cancer Society publishes Nutrition and Physical Activity Guidelines to serve as a foundation for its communication, policy, and community strategies, and represent the most current scientific evidence related to dietary and activity patterns and cancer risk. (55) In addition, a strategy based on the National Heart, Lung and Blood Institute’s (NHLBI) guidelines (53) on obesity offers clinicians an easily adapted blueprint for incorporating information about weight and physical activity into their discussions with adult patients. These guidelines are based on a systematic review of the published literature and are highlighted below.

A variety of effective options exist for the management of overweight and obese patients, including dietary therapy approaches such as low-calorie diets and lower-fat diets, altering physical activity patterns, behavior therapy techniques, pharmacotherapy, surgery, and

combinations of these techniques. Treatment of overweight should focus on altering dietary and physical activity patterns to prevent development of obesity and to produce moderate weight loss. Treatment of obesity should focus on substantial weight loss over a prolonged period. The presence of co-morbidities in overweight and obese patients should be considered when deciding on treatment options. Treatment of the overweight or obese patient is a two-step process: assessment and treatment management.

1. Assessment Phase – When assessing a patient for risk status and as a candidate for weight loss therapy, clinicians should consider the patient’s BMI, waist circumference, and overall risk status. The BMI, which describes relative weight for height, is significantly correlated with total body fat content, and should be used to assess overweight and obesity and to monitor changes in body weight. In addition, measurements of body weight alone can be used to determine efficacy of weight loss therapy. Weight classifications by BMI, are shown below (53):

	Obesity Class	BMI
Underweight		<18.5
Normal Weight		18.5-24.9
Overweight		25-29.9
Obesity	I	30 –34.9
	II	35 – 39.9
	III	<u>≥ 40</u>
Extreme Obesity		

Waist circumference is positively correlated with abdominal fat content, which is also a risk factor for development of the metabolic syndrome. The presence of excess fat in the abdomen that is out of proportion to total body fat is an independent predictor of risk factors and morbidity. It provides a clinically acceptable measurement for assessing a patient’s abdominal fat content before and during weight loss treatment. Sex-specific cutoffs can be used to identify increased relative risk for the development of obesity-associated risk factors in most adults with

a BMI of 25-34.9 – men with a waist circumference > 102cm (>40 inches), and women with a waist circumference >88cm (>35 inches) are at high risk.

Risk Status – Assessment of the patient’s absolute and relative risk status requires examination of the presence of: a) disease conditions such as established coronary artery disease, other atherosclerotic diseases, type 2 diabetes, and sleep apnea; b) cardiovascular risk factors such as cigarette smoking, hypertension, high risk LDL-cholesterol (≥ 160 mg/dL), low HDL-cholesterol (35 mg/dL), impaired fasting glucose (110-125mg/dL), and family history of premature CHD (definite myocardial infarction or sudden death at or before age 55 years of age in father or other male first degree relative, or at or before 65 years of age in mother or other first degree female relative). The Table below classifies overweight and obesity by BMI, waist circumference & associated disease risk.

Disease risk (for type 2 diabetes, hypertension, and CVD) relative to normal weight and waist circumference

	BMI	Obesity Class	Men \leq 40 in. Women \leq 35 in	Men > 40 in. Women > 35 in
Underweight	<18.5			
Normal Weight	18.5-24.9			
Overweight	25-29.9		Increased	High
Obesity	30 –34.9	I	High	Very High
	35 – 39.9	II	Very High	Very High
Extreme Obesity	≥ 40	III	Extremely High	Extremely High

Patient Motivation – When assessing a patient’s motivation to lose weight the following factors should be evaluated: reasons and motivations for weight loss; previous history of weight loss attempts; support of family/friends; work site support; patient knowledge about causes of obesity and relationship to disease risk; attitude towards physical activity; and barriers to success (time, financial concerns).

Helping patients change behavior is an important role for primary care providers. Behavior change interventions are especially useful in addressing lifestyle modification for disease prevention and long-term disease management in obesity. Behavior change is rarely, if ever, a simple single event. The Trans-theoretical Model, also known as the Stages of Change Model, is a useful way of understanding a patient’s readiness to make a change and for selecting appropriate interventions and advice (56). Behavior therapy, based on the Stages of Change Model can also incorporate models/theories such as motivational interviewing techniques.

The Trans-theoretical Model describes change as a process involving progress through a series of five stages: pre-contemplation, contemplation, preparation, action and maintenance. In addition to the five stages of change, TTM focuses on ten processes of change, the pros and cons of changing (decisional balance), self-efficacy, and temptation. TTM is based on critical assumptions about the nature of behavior change and the interventions that can best facilitate change. These critical assumptions are (57):

- Multiple theories need to be considered in order to address complex behavioral changes. In addition to the trans-theoretical model, and other theories such as the Health Belief Model, Social Cognitive Theory and Motivational Interviewing may be useful in assisting clients to make changes.
- Behavior change occurs over time and progresses through stages
- The majority of at-risk populations are not ready to make changes and therefore will not benefit from traditional health promotion action-oriented programs
- Specific processes and principles of change should be applied at specific stages if progress through the stages is to occur

The literature supports “patient-treatment matching” a concept that suggests that interventions should differ depending on the individual patient’s readiness to make behavioral changes (58). For example, individuals who are not interested in becoming physically active require different interventions/messages than individuals who are trying to maintain their physical activity. “Patient-treatment matching” requires using a tailored approach based on the patient’s stage of change as well as other factors such as self-efficacy. Research has indicated that targeted and tailored approaches based on the stage of change model are effective for promoting physical activity and nutritional lifestyle changes. The focus of the office visit or counseling session is not to convince the patient to change behavior, but to help the patient move along the stages of change by matching the intervention and message to the patient’s assessed stage of change. ***Precontemplation*** is the stage in which people do not intend to take action in the foreseeable future, usually the next 6 months. People in this stage may be uninformed or under- informed about the consequences of their behavior, or they may have tried to change multiple times and become discouraged about their ability to change. These clients may be seen as resistant, not motivated to change, not ready for therapy or health promotion programs and considered “hard to reach”. Clients may avoid reading about or talking about their high-risk behavior. To move from pre-contemplation to contemplation, the individual’s awareness of the pros of changing the behavior must increase. Strategies that may assist in the process of change include consciousness raising, dramatic relief, and environmental reevaluations.

- Consciousness raising includes finding and learning new information that will support the healthy behavior change and enrich understanding of the causes, consequences and treatments for a given health behavior/problem. Interventions that support consciousness raising include confrontation, feedback, reading articles, and media campaigns.
- Dramatic relief helps the client to experience the negative emotions (e.g., fear, anxiety or worry) that accompany unhealthy behaviors through psychodrama, role playing, personal testimonies and media campaigns. While the initial emotional response may be increased for the patient, it is usually reduced as they are able to modify their behavior.

- Environmental reevaluation helps the client to understand and/or appreciate the negative impact of the unhealthy behavior on his/her proximal social and physical environment.

Contemplation is the stage in which people intend to make changes within the next 6 months. Clients are more aware of the pros and particularly the cons of their behavior. To move from contemplation to preparation the cons of making a behavioral change must decrease for the client. Clients may be ambivalent about change and become “stuck” in this stage that is often characterized by procrastination/chronic contemplation. People in this stage are not ready for traditional health promotion programs that are action oriented. In addition to the processes of change discussed above, clients in this stage may benefit from self-reevaluation (i.e., realizing that the behavior change is an important part of one’s identity as a person). Interventions that assist the client in imagining themselves as a person with and without the unhealthy behavior are helpful in this stage. Healthy role models, value clarification and imagery are important techniques in this stage.

Preparation is the stage in which clients indicate they intend to make a behavioral change in the next month. These individuals have a plan of action and may have taken some action during the past year. These individuals are ready for an action-oriented program such as smoking cessation classes and weight management programs. To progress from the preparation to the action stage, the pros of making the change must outweigh the cons. In addition to self-reevaluation, strategies that encourage self-liberation are key. Self-liberation suggests clients believe they can change and are firmly committed to making the change. Self-efficacy, the confidence that one can engage in a given healthy behavior across challenging situations, is a key indicator in the preparation stage.

Action is the stage in which people have made specific behavioral changes in their lifestyle within the past 6 months. In this stage, the client must achieve sufficient change to reduce risk of disease (for example weight loss and increased physical activity). Again, self-liberation is a key process in this stage of behavioral change. Social support, in the form of buddy systems, counselor telephone calls and family support, is also important in this stage.

Maintenance is the stage in which people strive to prevent relapse but do not apply change processes as frequently as do people in the action stage. Concerns about relapse decrease and self-efficacy about being able to continue lifestyle changes increases. The maintenance

stage ranges from about the time an individual has made a given change for 6 months and continues to 5 years or longer. Processes important to this stage include counter-conditioning, helping relationships, reinforcement management and stimulus control.

- Counter-conditioning – acquisition of healthier behaviors that can substitute for problem behaviors such as relaxation techniques, positive self-statements, and assertion.
- Reinforcement management – self-changers rely on rewards more than punishment. Strategies that increase reinforcement of a behavior such as contingency contracts, rewards such as buying new clothes, and group recognition increase the likelihood that a given behavior will be repeated.
- Stimulus control removes cues for unhealthy behaviors and prompts healthier behaviors. Strategies include the use of icons on refrigerators (such as a picture of fruits and vegetables) to act as reminders, environmental re-engineering such as reorganizing room furniture so you can no longer eat in front of the television, and self-help groups/support groups that support change.

The chart below summarizes the Trans-theoretical Model concepts (59).

Stage of Change	Characteristics	Techniques
Pre-contemplation	Not currently considering change in the next 6 months: “Ignorance is bliss” “weight is not a concern for me”	Validate lack of readiness Clarify: decision is theirs Encourage re-evaluation of current behavior Encourage self-exploration, not action Explain and personalize the risk
Contemplation	Ambivalent about change: “Sitting on the fence” Intends to take action within the next 6 months but not considering change in the next month “My weight is a concern for me, but I am not ready or willing to begin losing weight within the next month”	Validate lack of readiness Clarify: decision is theirs Encourage evaluation of pros and cons of behavior change Identify and promote new, positive outcome expectations
Preparation	Some experience with change and are trying to change: “Testing the waters”	Identify and assist in problem solving re: obstacles Help patient identify social support

	Planning to act within one month; has taken some behavioral steps in this direction “I am concerned about my weight and the benefits of trying to lose weight outweigh the drawbacks for me. I plan to start a weight loss program within the next month.”	Verify that patient has underlying skills for behavior change Encourage small initial steps
Action	Practicing new behavior for less than six months	Focus on restructuring cues and social support Bolster self-efficacy for dealing with obstacles Combat feelings of loss and reiterate long-term benefits
Maintenance	Continued commitment to sustaining new behavior (more than 6 months and up to 5 years)	Plan for follow-up support Reinforce internal rewards Discuss coping with relapse
Relapse	Resumption of old behaviors “fall from grace”	Evaluate trigger for relapse Reassess motivation and barriers Plan stronger coping strategies

Motivational Interviewing

Patients at the pre-contemplation and contemplation stages can be challenging. Motivational Interviewing techniques have been found to be most effective in Health Behavior Change when used in combination with the stages of change model. (56) Motivational Interviewing techniques have been effective for treating alcohol and drug problems, patients with diabetes, hypertension and bulimia.

Motivational Interviewing incorporates empathy and reflective listening with key questions so that patient counseling is patient centered and directive. (60) The goal for patients in the pre-contemplative and contemplative stages is to assist patients in thinking about making a behavioral change. Patients in these stages often exhibit ambivalence and resistance and may remain stuck in these stages for a long time. Resistance may signal a patient’s internal conflict between his/her current behavior and the desired behavior. Patients in these stages may be argumentative, hopeless or in denial. A common phrase used by patients in the contemplative stage is “yes, but...”. Patients exhibiting resistance may also exhibit the following behaviors: negating (blaming, disagreeing, excusing, minimizing, claiming impunity, pessimism,

reluctance, unwillingness to change), arguing (challenging, discounting, hostility), interrupting, and ignoring (inactivity such as not taking medications or filling a prescription).

Motivational Interviewing can be useful in helping people to resolve issues of resistance and ambivalence. Empathy, validation, praise and encouragement are particularly important for patients who are ambivalent if change is to occur. Below are several Motivational Interviewing strategies that can be used for people in the pre-contemplation and contemplation stages to encourage health behavior change

Questions and techniques for patients in the Pre-contemplation and Contemplation Stages include: – (59)

Stage of Change	Motivational Interviewing Questions/Techniques
Pre-contemplation: goal is to help patient to begin thinking about change	<ul style="list-style-type: none"> • What would have to happen for you to know that this is a problem? • What warning signs would let you know that this is a problem? • Have you tried to change in the past?
Contemplation: goal is to assist patient to examine benefits and barriers to change (pros and cons)	<ul style="list-style-type: none"> • Why do you want to change at this time? • What were the reasons for not changing? • What would keep you from changing at this time? • What are the barriers today that keep you from change? • What might help you with that aspect? • What things (people, programs and behaviors) have helped in the past? • What would help you at this time? • What do you think you need to learn about changing?
Preparation, Action and Maintenance: Assist patients to address the barriers to full fledged action	<ul style="list-style-type: none"> • Continue to explore patient ambivalence. • Focus on behavioral skills • Continue to ask about successes and difficulties • Praise and encourage patient efforts

Readiness to Change Ruler

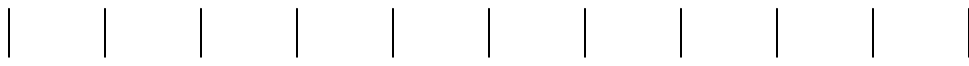
The Readiness to Change Ruler is a simple line bounded on the left end by “not prepared to change” and on the right by “ready to change”. Patients are asked to mark on the line their current position in the change process. Health providers should ask patients about why they did not place the mark further to the left (elicits motivational statements) and what it would take to move the line further to the right (elicits barriers). Providers can ask patients for suggestions about how to overcome an identified barrier and actions that can be taken prior to the next visit. The Ruler is a useful tool when resistance is encountered, can elicit change talk, and can evaluate concepts of importance and confidence.

Using the Motivational Readiness Ruler

On the line below, mark where you are now on this line that measures your likelihood to try and change your diet to lose weight

Are you not prepared to change, already changing, or somewhere in the middle?

0 1 2 3 4 5 6 7 8 9 10



Not Prepared

Already Changing

To Change

Core Questions:

- How important is this change for you?
- How confident are you that you can make this change if you want to?
- Why did you choose a ____, not a 1?
- What would have to happen for it to be a _____? (next highest number from what stated)

- If the patient's mark is on the left side of the line:
 - How will you know when it's time to think about changing?
 - What signals will tell you to start thinking about changing?
 - What qualities in yourself are important to you? What connection is there between those qualities and "not" considering a change?

- If the patient's mark is somewhere in the middle:
 - Why did you put your mark there and not further to the left?
 - What might make you put your mark a little further to the right?
 - What are the good things about the way you're currently trying to change?
 - What are the not so good things?
 - What would be the good result of changing?
 - What are the barriers to changing?

- If the patient's mark is on the right side of the line:

- Pick one of the barriers to change and list some things that could help you overcome this barrier
- Pick one of those things that could help and decide to try it by specific date.
- If the patient has taken a serious step in making a change:
 - What made you decide on that particular step?
 - What has worked in taking this step?
 - What helped it work?
 - What could help it work even better?
 - What else could help?
 - Can you break that helpful step down into smaller pieces?
 - Pick one of those things that could help and decide to try it by specific date.
- If the patient is changing and trying to maintain that change:
 - Congratulations! What's helping you?
 - What else would help?
 - What are your high-risk situations?
- If the patient has relapsed - "fallen off the wagon":
 - What worked for a while?
 - Don't kick yourself – long-term change almost always takes a few cycles. What did you learn from the experience that will help you when you give it another try?

2) Management Phase Evaluation - The general goals of weight loss and management are: 1) at a minimum, to prevent further weight gain; 2) to reduce body weight; and 3) to maintain a lower body weight over the long term. (53)

Initially, patients should be encouraged to reduce body weight by approximately 10% from baseline. If this is achieved, further weight loss can be attempted, if indicated. A reasonable time line for a 10% weight reduction is 6 months. For overweight patients with BMIs between 27 and 35, a decrease of 300 to 500 calories per day will result in weight losses of about ½ to 1 pound per week and a 10% weight loss in 6 months.

For patients with BMI > 35, a decrease of 500 to 1,000 calories per day will lead to weight losses of about 1 to 2 pounds per week and a 10% weight reduction in six months. More rapid weight loss has been associated with increased risk of gall stones and electrolyte abnormalities.

Combined therapy, also known as lifestyle therapy, should be tried for at least six months before pharmacotherapy should be considered. Pharmacotherapy should be considered only if a person has not lost 1 pound per week after 6 months of combined lifestyle therapy. In addition, pharmacotherapy should be considered as an adjunct to lifestyle therapy for patients who have a BMI of 30 kg/m² and have no concomitant obesity-related factors or diseases. Pharmacotherapy may also be considered for patients with BMI of 27 with hypertension, dyslipidemia, CHD, type 2 diabetes and sleep apnea. Only patients at increased health risk due to excessive weight should use weight loss medications; they are not appropriate for cosmetic weight loss. At this time, studies do not support short-term use of medications and the risk/benefit ratio of long term use of medications can not be predicted since not enough long term data is available on prescribed drugs. (53)

To be effective, weight management techniques must consider the needs of individual patients (culture, perspectives, socioeconomic status, desire/motivation to lose weight) and include the patient in setting goals. (53)

A Guide for Selecting Treatment

Treatment	BMI category				
	25-26.9	27-29.9	30-34.9	35-35.9	≥40
Diet, physical activity, and behavior therapy	With co-morbidities	With co-morbidities	+	+	+
Pharmacotherapy		With co-morbidities	+	+	+

Surgery			With co-morbidities
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The + represents the use of indicated treatment regardless of co-morbidities.

- Prevention of weight gain with lifestyle therapy is indicated in any patient with a BMI ≥ 25 even without co-morbidities. Weight loss is recommended for patients with BMI between 25 and 29.9 or a high waist circumference if two or more co-morbidities are present.
- Lifestyle therapy/Combined therapy (low calorie diet, physical activity and behavior therapy) is the most successful intervention for weight loss and maintenance.
- Consider pharmacotherapy only if patient has not lost one pound per week after six months of combined lifestyle therapy

Dietary Therapy: A low calorie diet (LCD) is recommended and should be consistent with the National Cholesterol Education Program's Step 1 or Step 2 Diet (50). The LCD Step 1 diet modifies caloric intake and reduces saturated fat, total fat, and cholesterol intake. The diet is based on current recommendations for sodium and fiber intake. The LCD Step 1 diet along with physical activity helps reduce weight and prevent/manage co-morbidities.

Mediterranean and low carbohydrate diets may be effective alternatives to low fat diets. More favorable effects on lipids (with a low carbohydrate diet) and on glycemic control (with the Mediterranean diet) suggest that personal preferences and metabolic considerations might inform individualized tailoring of dietary interventions. (61)

A deficit of 500 to 1,000 kcal/day is recommended for 1-2 pound loss/week. In general, women desiring weight loss should aim for 1000 to 1200 calories per day and men should aim for 1200 to 1600 calories per day. Women over 165 pounds who exercise regularly may also aim for the 1200-1600 daily calorie intake. If a patient reports hunger on either diet, it may be prudent to

increase caloric intake by 100 to 200 calories per day to encourage compliance. Diets with very low caloric content (less than 800 calories/day - VLCD) should be avoided. VLCDs require monitoring by specialists and nutritional supplementation. Clinical trials show LCDs are as effective as VLCDs in producing weight loss after one year. Diets should be tailored to meet patient food preferences, but dietary education should include: energy value of foods; fats, carbohydrates and proteins; proper use of nutrition labels to determine calories and food composition; information on purchasing food with attention to caloric content; healthier food preparation; avoiding high calorie, high carbohydrate high fat foods; portion control; and limiting alcohol use.

Realistically, only a few key dietary habits can be discussed in a primary care setting. The Patient Centered Assessment and Counseling for Exercise and Nutrition (PACE) curriculum can be used as the basis for lifestyle counseling (62). PACE addresses three nutritional areas with the greatest impact for health and weight loss: balancing calories in and out; decreasing fat intake; and increasing fruits, vegetable and fiber intake.

Decrease Dietary Fats: Diets high in fat contribute to a number of health conditions including CHD, diabetes, and cancer (colon, prostate, rectal and endometrial) and high blood cholesterol. Current recommendations include: a) percent of daily calories from fat should not exceed 30% and saturated fat should not account for more than 10%; b) limit high fat foods particularly those from animal sources; and c) some dietary fat is necessary for good health, as fats supply energy and essential fatty acids, and promote absorption of fat-soluble vitamins A, D, E, and K.

Increase Fruits, Vegetables, and Fiber: According to the Surgeon General's Report on Nutrition and Health, 1988 (63): a) fruit and vegetable consumption protects against lung, breast, colon, prostate, bladder, oral, stomach and cervical cancer. However, a more recent study of a large cohort of men and women found that increased fruit and vegetable consumption was associated with

a modest although not statistically significant reduction in the development of major chronic disease. The benefits appeared to be primarily for cardiovascular disease and not for cancer. (64)

People who eat diets high in plant foods have lower risk of cardiovascular disease, probably in part, due to lower consumption of animal fats and cholesterol; b) diets high in complex carbohydrates (including those high in fiber, fruits and vegetables) improve glucose tolerance and use of insulin; and c) a diet high in potassium and low in sodium (such as one high in fruits/vegetables) may help to reduce risk of stroke and hypertension. Current USDA guidelines from the food guide pyramid suggest a total of 9 servings of fruits and vegetables daily.

Physical Activity - Healthy adults can begin a moderate-intensity exercise program without a complicated medical evaluation. The NIH and Surgeon General recommend that individuals with cardiovascular disease, previously inactive men over age 40 and women over age 50 with multiple cardiovascular risk factors should have a physical examination prior to starting a *vigorous* exercise program. Problems, such as obesity or musculoskeletal problems, may influence recommendations for physical activity. Some patients may require further evaluation before initiating a physical activity program. (65)

Patients should be counseled to include warm-up, cool down and some stretching before and after exercising. It is recommended that they start with simple, low intensity exercises and gradually increase intensity and time. Initially, decreasing the amount of sedentary time (screen time) and increasing physical activity as part of daily living may be the appropriate goal for many obese people. These activities may include taking the stairs more often, increase walking, and standing while doing household chores. Patients should be encouraged to make small changes such as parking farther away, getting off the bus one stop earlier, and taking stairs instead of elevators. A daily walking regimen should be encouraged with a gradual increase in the intensity of walking speed and the amount of time walked. In addition patients should incorporate FITT principles and guidelines into their exercise programs (increase frequency of physical activity, increase intensity of

exercise, increase amount of time of exercise sessions and include different types of exercise such as flexibility, strength/resistance training, and aerobic activity).

Patients should be instructed to monitor the intensity of exercise using target heart rate as a guideline, and be advised to stop exercising if pain or faintness occurs.

FITT (Frequency, Intensity, Type, and Time)

	Frequency	Intensity	Type	Time
Moderate-Intensity	Daily or at least 5 times/week Start gradually and build to recommended frequency	50-70% of Maximum Heart Rate for age* Ex: brisk walking (one mile in 15-20 minutes) Initial intensity depends on patient's current fitness level, age, health status, weight and personal preferences	Rhythmic, repetitive, large muscle groups Ex: walking, swimming, dancing, biking, gardening Patient should enjoy activity and be able to maintain	Accumulate at least 30 min/day (can be 3 intervals of 10 minutes each or a single 30 minute session) Must exercise 150-210 minutes/wk start with 10 minutes and gradually build to recommended 30 minutes
Vigorous Intensity	3-5 days/week	60-90% Maximum heart rate for age*	Ex: race walking, jogging, lap swimming, aerobic dancing, fast cycling, jumping rope, singles tennis, basketball	20-40 minute sessions 60 minutes/week

***Maximum Heart Rate = 220 - age**

Activity Type	Examples
Very light	Increased standing activities, room painting, yard work, ironing, cooking
Light	Slow walking (24 min/mile), garage work, house cleaning, child care, golf,
Moderate	Walking (15 min/mile), weeding/gardening, cycling, tennis, dancing

Maintenance of a lower body weight over the long term - Experience shows that weight will be regained after six months unless weight maintenance strategies are put into place that include diet therapy, physical activity and behavior therapy. There is a general perception that almost no one

succeeds in long term maintenance of weight loss. However, research has shown that approximately 20% of overweight individuals are successful at long term weight loss when defined as posing at least 10% of initial body weight and maintaining the loss for at least one year (66) Daily weighing appears to be an important aspect of weight loss maintenance and is not associated with adverse psychological effects. (67,68) Combined therapy with a low calorie diet, increased physical activity, and behavior therapy, along with continued contact with the health care provider for education, support and medical monitoring, provides the most successful intervention for weight loss and maintenance. Successful weight maintenance is defined as a regain of weight that is less than 6.6 pounds in 2 years and a sustained weight reduction in waist circumference of at least 1.6 inches. Combined therapy must be continued indefinitely to maintain weight loss. The longer the weight maintenance phase can be sustained, the better the prospects for long term weight reduction. Pharmacotherapy may be helpful during the weight maintenance phase. Patients using pharmacotherapy should have a follow-up visit two to four weeks after initiating medication, then monthly for three months, and then every three months for the first year. After the first year, the health care provider will determine the schedule for follow-up visits to monitor weight, blood pressure, pulse, blood tests, discuss side effects and answer patient questions.

2) **Managing Overweight and Obese Children and Adolescents** - An Expert Committee has published recommendations regarding the prevention, assessment, and treatment of child and adolescent overweight and obesity (54). These recommendations support a shift from simple identification of obesity, which often occurs when the condition is obvious and intractable, to **universal assessment**, universal preventive health messages, and early intervention.

The Committee recommends that clinicians advise patients and their families to adopt and maintain the following specific eating, physical activity, and sedentary behaviors: limiting consumption of sugar sweetened beverages; encouraging consumption of diets with recommended quantities of fruits and vegetables – 9 servings per day; limiting television and screen time – the American Academy of Pediatrics recommends no television viewing before 2

years of age and thereafter no more than 2 hours of television viewing per day; eating breakfast daily; limiting eating out at restaurants, particularly fast food restaurants; encouraging family meals; and limiting portion size. They also stress the importance of parent's participation in weight control programs. They also recommend enhancing office practices to: 1) routinely document BMI; 2) establish procedures to deliver obesity prevention messages to all children; 3) establish procedures to address children who are overweight and obese; 4) involve and train interdisciplinary teams; and 5) audit charts to establish baseline practices, to help set goals for improvement, and then to measure the improvement over time.

The Committee also recommends that:

Clinicians can support school and community programs that help prevent obesity through local, state, or national advocacy, and they can encourage patients' families to voice their preference to their schools through parent-teacher organizations or school board meetings or directly to principals, teachers and after-care program directors. To improve the community environment, providers can advocate for the establishment and maintenance of safe parks and recreation centers, and they can urge local grocery stores to offer healthy, low-cost food that is consistent with the most common cultures of the community members. (54 - p S174-175)

Case Study – Clinic Community Intervention Program (CCIP)

In, 2006, Thomas Jefferson University's Center of Excellence (COE) in Obesity Research instituted the Clinic Community Intervention Project (CCIP), utilizing the Chronic Care Model in the management of obesity in adults 18 and older.

Obesity and its associated co-morbidities are chronic disorders. As with other chronic disorders, effective clinical management of obesity requires that clinical practices be organized to facilitate provider compliance with clinical care guidelines, and to assist participants in developing and implementing strategies for self management and behavior change (69).

Although it has not been applied specifically to the management of obesity, Wagner’s Chronic Care Model (CCM) has successfully been employed in diverse settings, including those serving low -income minority patients to treat asthma, congestive heart failure, diabetes and depression. (70-73) The CCM provides an excellent framework for integrating disease self-management with key components of clinical care (74). It should be possible to extrapolate to obesity the successes of the evidence-based CMM in multiple other disorders (75).

The following model identifies the essential elements of a health care system that encourage high-quality chronic disease care (76)



The CCM provides a framework for integrating support for patients to engage in healthy lifestyles with a clinical care model that improves provider identification and management of obesity, hypertension, dyslipidemia, and other obesity-related co-morbidities. In the application of the CCM, the patient support component includes a clinic based Lifestyle Counselor, and also linkage to community based programs designed to assist patients to develop healthy lifestyles

through improvements in diet, physical activity and planned exercise. The CCIP uses the CCM as a framework for obesity management by conducting provider education and performance monitoring, providing self-management support through a lifestyle counselor, and linking participants to community based resources and programs.

Two model health care teams were created, one in the Philadelphia Department of Public Health's Health Center #6 and the other within Jefferson Family Medicine Associates (JFMA). These teams function within the systems of care at the existing delivery sites. To facilitate optimal function of these teams, training was provided to all site personnel who are directly involved with patients. Each team includes Primary Care Providers, a Lifestyle Counselor, and a Community Health Educator.

In Year 1, as part of ongoing quality improvement initiatives at (PDPH) and JFMA, the COE staff developed a half-day Obesity Training Module for Health Center 6 and JFMA providers targeting physicians, registered nurses, nurse practitioners, and physician assistants. Training content included: (1) an overview of the COE -- background, purpose, and objectives; epidemiology of obesity and co-morbidities with emphasis on target neighborhoods; health and health outcome disparities that the COE plans to address; (2) a description of the CCIP -- rationale (including examples of successful implementations at other sites) for using the CCM, method of implementation in CCIP, evaluations, expected outcomes; (3) evidence based guidelines for identification and management of obesity, hypertension, dyslipidemia, glucose intolerance/type 2 diabetes; 4) training on obtaining height, weight, BMI and weight circumference; (5) evidence for effectiveness of healthy diet and physical activity/exercise in lowering blood pressure and decreasing cardiovascular disease risk factors; specific dietary and

physical activity behaviors; and (6) potential personal, cultural, environmental, and socioeconomic barriers to initiation and maintenance of healthy dietary and activity behaviors.

During standard office visits, the primary providers identify potentially eligible patients (BMI \geq 30) and offer them the opportunity to participate in the CCIP beginning with an appointment to see a Lifestyle Counselor for an individual dietary and physical activity assessment and counseling session. Efforts are made to schedule appointment with the Lifestyle counselor at the same clinic visit, or as soon as feasible thereafter. The Counselor interviews the patient, and adds to the patient record the following: waist circumference; target weight; number and ages of all household residents; weight loss attempt history, nutrition/weight loss knowledge, attitudes, and behaviors; a Readiness-To-Change assessment and physical activity assessment using the International Physical Activity Questionnaire (77). An assessment of patients' current diet content uses the Nutrition Assessment Tools (NATS) (78). A copy of the assessment records is placed in the patient chart. The patient is counseled based on stage of change and motivational interviewing constructs, and given linguistically and culturally relevant educational materials. The Lifestyle Counselor and patient develop and sign a Personal Action Plan that reflects treatment options and patient preference, self-management strategies, goals, problem solving and a timeline for follow-up. The Lifestyle Counselor refers each participant to a Community Health Educator for a Community-Based Education Program (CBEP) -. The Lifestyle Counselor contacts the patient in four-six weeks for an update on the personal action plan. All participants are encouraged to initiate calls to the Lifestyle Counselor for on-going support and advice. Patients return to the clinic 3, 6, 9, and 12 months following the initial visit with the Lifestyle Counselor. Participants with associated co-morbidities are managed by their primary providers in accordance with established guidelines reviewed and presented in the

provider orientation, based on obesity guidelines and reimbursement policies. In addition, individuals with diagnosed diabetes, or in whom diabetes is diagnosed in the course of the CCIP, are referred to an already established Diabetes Group Management program at Jefferson or Health Center 6. At subsequent medical visits, patients see the Lifestyle Counselor and the primary medical care provider (physician, nurse practitioner, the physician's assistant) as indicated for management of co-morbidities. Weight, calculated BMI, and blood pressure are obtained and recorded in the patient's record for all patients. Medically indicated laboratory studies are obtained in each of these visits and primary medical care providers initiate or modify care as appropriate every 6 months in Years 2 and 3. The Lifestyle Counselor also schedules annual primary care visits and makes a reminder call and/or send a post card one week prior to the scheduled visit. The Primary Provider or Lifestyle Counselor obtains weight, height measurement and compute BMI at least annually on all participants. All Lifestyle Counselor encounters are charted and communicated to the primary care provider. All participants at the initial intake are given a culturally and linguistically appropriate community resource guide containing comprehensive information about nutrition and physical activity programs available in neighborhoods, including programs provided by COE partners and their community networks.

The Community-Based Education Program (CBEP), a component of the CCM is a comprehensive, community-based, family-centered, group weight stabilization/ reduction program. COE partners developed a curriculum consisting of four 1.5 to 2 hour free group weight management sessions conducted over a 4-6 month period. In the first month, programs are held weekly, in the second and third months, biweekly, and in the fourth and fifth month, monthly. The program focuses on lifestyle redesign and skill building. Participants set goals that support their personal action plan. Topics addressed include: using the food guide pyramid,

reading food labels, healthy meal planning, supermarket tours, shopping on a budget, cooking healthy for a family demonstrations, healthy snacking, dining out, healthier shopping at corner stores, and integrating physical activity into daily life. A digital scale is provided at each class for those wishing to weigh themselves. Each participant in the program is given a pedometer to raise awareness about and encourage physical activity (79). The Community Health Educator also monitors participant attendance, retention and completion rates (daily attendance and follow-up with “no-shows”); supports participants in goal-setting and implementing personal action plans; catalogues community based nutrition and physical activity resources in targeted neighborhoods and prepare a neighborhood resource guide; coordinates with the Lifestyle Counselor; refers participants to community programs that can augment lifestyle changes; and performs pre/post intervention data collection in collaboration with the Lifestyle Counselor.

A summary of the data for the first 151 CCIP participants enrolled between October 2006 and June 2007 (i.e., those for who at least one year has elapsed since enrollment) follows.

Participants were enrolled at two sites (90 at JFMA and 61 at HC6), and were between 18 and 45 years of age (mean = 34) and mostly female. Physical activity data both at baseline and at 9 months were available for 27 participants. Despite small changes in physical activity and diet, among the 27 participants with height and weight data at baseline and 9 months, weight decreased by an average of about 11 lbs ($p = 0.002$). Average BMI also decreased from 40.2 kg/m^2 at baseline to 38.4 kg/m^2 at 9 months, corresponding to a mean absolute decrease of 1.8 kg/m^2 ($p = 0.002$) and a mean relative decrease of 4% ($p = 0.003$). Enrollment and evaluation continues. Currently, 545 individuals have been enrolled.

SUMMARY – The social, medical and economic consequences of the obesity epidemic are enormous. An ecological approach to prevention and a systematic clinical and counseling approach, based on current guidelines, will be required to reverse the growing epidemic. Providers can integrate these approaches into daily practice by identifying, assessing, counseling and treating using a patient-centered approach that is based on, and tailored to a patient's readiness and motivation to change. Clinicians can advocate for systems and policy changes to support adult and youth overweight prevention, and management. They can support changes in school policies such as health beverages and food choices, and required physical activity. They can encourage modifications in the built environment that support physical activity, and can advocate for healthy, affordable food that is accessible to all their patients. Lastly, clinicians can support legislation that supports healthier lifestyles and requires insurers to support obesity related counseling and education.

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References

1. Available at:
http://www.cdc.gov/nchs/products/pubs/pubd/hestats/overweight/overwght_adult_03.htm
Children's data. Accessed October 10th, 2008
2. Available at: healthyamericans.org/reports/obesity2008/Obesity2008Report.pdf Accessed October 10th, 2008
3. Available at: www.healthypeople.gov/ Accessed October 11th 2008
4. Wang Y, Beydoun MA. The obesity epidemic in the United States – gender, age, socioeconomic, racial/ethnic, and geographic characteristics: a systematic review and meta-regression analysis. *Epidemiologic Reviews* 2007; 1-23

5. Daviglius ML, Liu K, Yan LL, Pirzada L, Manheim I, Manning W, et al. Relation of body mass index in young adulthood and middle age to Medicare expenditures in older age. *JAMA* 2004; 292:2743-9
6. Wang G, Dietz WH. Economic burden of obesity in youths aged 7-17 years"1979-1999. *Pediatrics* 2002; 109: E81
7. Rohrer JE, Adamson SC, Furst JW. Obesity and medical visits in Family Medicine, *Dis Manage Health Outcomes* 2007; 15: 309-313
8. Appel LJ, Moore TJ, Obarzanek E, Vollmer WM, Svetkey LP, Sacks FM, Bray GA, Vogt TM, Cutler JA, Windhauser MM, Lin PH, Karanja N. A clinical trial of the effects of dietary patterns on blood pressure. *N Engl J Med* 336:1117-1124, 1997.
9. Sacks FM, Svetkey LP, Vollmer WM, Appel LJ, Bray GA, Harsha D, Obarzanek E, Conlin PR, Miller ER 3rd, Simons-Morton DG, Karanja N, Lin PH. Effects on blood pressure of reduced dietary sodium and the Dietary Approaches to Stop Hypertension (DASH) diet. *N Engl J Med* 344:3-10, 2001.
10. Diabetes Prevention Program Research G. Reduction in the incidence of type 2 diabetes with lifestyle intervention or Metformin. *NEJM* 2002;.346:393-403
11. Tuomilehto J, Lindstrom J, Eriksson JG, Valle TT, Hamalainen H, Ilanne-Parikka P, Keinanen-Klukaanniemi S, Laakso M, Louheranta A, Rastas M, Salminen V, Uusitupa M. Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. *NEJM* 2001; 344:1343-1350
12. Miller ER, 3rd, Erlinger TP, Young DR, Jehn M, Charleston J, Rhodes D, Wasan SK, Appel LJ. Results of the Diet, Exercise, and Weight Loss Intervention Trial (DEW-IT). *Hypertension*, 2002; 40:612-618.
13. Appel LJ. Lifestyle modification as a means to prevent and treat high blood pressure. *J Am Soc Nephrol* 2003; 14:S99-102.
14. Manson JE, Skerrett PJ, Greenland P, VanItallie TB. The escalating pandemics of obesity and sedentary lifestyle. *Arch Inter Med*, 2004 164:249-258.
15. Hardman AE. Interaction of physical activity and diet: implications for lipoprotein metabolism. *Public Health Nutr*, 1999; 2: 369-376.
16. Mora S, Cook N, Buring JE, Ridker PM, Lee IM. Physical activity and reduced risk of cardiovascular events: potential mediating mechanisms. *Circulation* 2007; 116:2110-18.
17. Eng TR, Butler WT, editors. *The Hidden Epidemic*. Washington DC; National Academy press, 1997
18. Renhan, AG, Tyson, M., Egger, M., Heller, RF & Zwahlen, M. Body-mass index and incidence of cancer: a systematic review and meta-analysis of prospective observational studies. *Lancet*. Vol 371 February 16, 2008: 569-578
19. Lane, G. Obesity & gynaecological cancer. *Menopause International*. 14(1):33-7 2008 March.
20. Calle EE, Rodriquez C, Walker-Thurmond KC and Thun MJ. Overweight, obesity, and mortality form cancer in a prospectively studied cohort of U.S. adults. *NEJM* 2003; 348 (17): 1625-1638.
21. Nathan, C. Epidemic inflammation: pondering obesity. *Molecular Medicine*. 12(7-8):485-92, 2008 Jul-Aug.
22. Renehan AG, Roberts, DL, Dive, C. Obesity and cancer: pathophysiological and biological mechanisms. *Archives of Physiology & Biochemistry*. 114(1):71-83, 2008 February

23. Kaklamani VG, Wisinski KB, Sadim SC, Gulden C, Do A, Offitt K, Baron JA, Ashan H, Mantzoros C, Pasche B. Variants of the adiponectin (ADIPOQ) and adiponectin receptor 1 (ADIPOR1) genes and colorectal cancer risk. *JAMA* 2008; 300 (13): 1523-1531.
24. Kelesidis I, Kelesides T and Mantzoros CS. Adiponectin and cancer: a systematic review. *British Journal of Cancer* 2006; 94: 1221-1225
25. Harvie, M, et al. Association of Gain and Loss of Weight before and after Menopause with Risk of Postmenopausal Breast Cancer in the Iowa Women's Health Study. *Cancer Epidemiology Biomarkers, Prevention* 2005; 14(3):656-61
26. K. Rapp, J. Klenk, H. Ulmer, H. Concin, G. Diem, W. Oberaigner and J. Schroeder. Weight change and cancer risk in a cohort of more than 65 000 adults in Austria. *Annals of Oncology* 2008; 19(4):641-648
27. Giovannucci. Physical activity, obesity and risk of colorectal adenoma in women (US). *Cancer Causes Control* 1996; 7(2):_253-63,
28. Adams TD, Gress RE, Smith SC, Halverson RC, Simper SC, et.al. Long term mortality after gastric bypass surgery. *NEJM* 2007; 357 (8): 753-761
29. Lee I, Oguma Y. Physical Activity. In: Schottenfeld, D and Fraumeni JF, eds. *Cancer Epidemiology and Prevention*. 3rd ed. New York: Oxford University Press, 2006
30. Available at: <http://www.cancer.gov/cancertopics/factsheet/physical-activity-qa/print?page=&keyword=> Accessed October 11th, 2008.
31. The Future of Children Vol 16 No 1, Spring 2006. Woodrow Wilson School of Public and International Affairs and the Brookings Institution.
32. Jain A. Why don't low income mothers worry about their preschoolers being overweight? *Pediatrics* 2001;107 (5): 1138-46
33. Christakis NA, Fowler JH. The spread of obesity in a large social network over 32 years. *NEJM* 2007; 357:370-379)
34. Brisbon N, Plumb J, Brawer R, Paxman D. The asthma and obesity epidemics - the role played by the built environment - a Public Health perspective - *Journal Allergy and Clinical Immunology* 2005; 115: 1024-1028
35. September 2003 issues of the *American Journal of Public Health* and the *American Journal of Health Promotion*
36. Recommendations to increase physical activity. *Am J Prev Med* 2002;22:67-104
37. Available at: <http://www.activelivingbydesign.org>. Accessed October 1st, 2008
38. Available at: <http://www.asla.org/lamonth/index.html>. Accessed September 20th, 2008
39. Available at: <http://www.smartgrowth.org/sgn/default.asp>. Accessed October 1st, 2008
40. Available at: <http://www.pps.org/info/aboutpps/about>. Accessed September 25, 2008
41. Available at: <http://www.healthierus.gov/stpes>. Accessed September 20th, 2008
42. Available at: <http://www.wkkf.org/default.aspx?tabid=75&CID=383&NID=61&LanguageID=0>. accessed October 1st, 2008
43. McTigue KM, Harris R, Hemphill B, Lux L, Sutton S, Bunton AJ, Lohr KN. Screening and interventions for obesity in adults: summary of the evidence for the United States Preventive Services task Force. *Ann Intern Med* , 2003; 139: 933-949
44. Jackson JE, Doescher MP, Saver BG, Hart LG. Trends in professional advice to lose weight among obese adults, 1994 to 2000. *J Gen Intern Med* 2005; 20: 814-818
45. Wee CC, McCarthy EP, Davis RB, Phillips RS. Physician counseling about exercise. *JAMA* 1999; 282: 1583-1588,

46. Potter MB, Vu JD, Croughan-Minihane M. Weight management: what patients want from their primary care physicians? *J Fam Pract* 2001;50:505-12
47. Franks P, Fiscella K, Meldrum S. Racial disparities in the content of primary care office visits. *J Gen Intern Med* 2005; 20: 599-603,
48. Sciamanna C, Tate DF, Lang W, Wing RR. Who reports receiving advice to lose weight? Results from a multi-state survey. *Arch Intern Med* , 2000; 160: 2334-2339
49. Lemay CA, Cashman S, Savageau J, Fletcher K, Kinney R, Long-Middleton E. Underdiagnosis of obesity at a community health center. *J Am Board Fam Pract* 2003; 16: 14-21,
50. Phillips LS, Branch WT, Jr., Cook CB, et al. Clinical Inertia. *Ann Intern Med.* 2001; 135(9):825-834.
51. Bish C, Blanck HM, Seruda M, et.al. Diet and physical activity behaviors among Americans trying to lose weight: 2000 Behavioral Risk Factor Surveillance System. *Obes Res* 2005;13:596-607
52. Kreuter MW Chheda SG, Bull FC. How does physician advice influence patient behavior? Evidence for a primary effect. *Arch Fam Med* 2000; 9(5):426-433
53. National Institutes of Health, National Heart Lung, Blood Institute, Obesity Education Initiative. Available at: http://www.nhlbi.nih.gov/guidelines/obesity/obs_gdlns.htm. Accessed October 2nd, 2008
54. Expert Committee Recommendations Regarding the prevention, Assessment, and Treatment of Child and Adolescent Overweight and Obesity: Summary Report. *Pediatrics* 2007; 120:S164-S192
55. Kushi LH, Byers T, Doyle C, Bandera EV, McCullough M, et.al. American Cancer Society guidelines on nutrition and physical activity for cancer prevention: reducing the risk of cancer with healthy food choices and physical activity. *CA-A Cancer Journal for Clinicians* 2006; 56 (5): 254-281
56. Zimmerman GL, Olsen CG, Bosworth MF. A “stage of change” approach to helping patients change behavior. *American Family Physician* 2000; 61: 1409-1416
57. Health Behavior and Health Education. Glanz K, Rimer BK, Viswanath K eds. San Francisco, Josey-Bass, 2008
58. Marcus B, Lewis B. Physical activity and stages of motivational readiness for change model- President’s Council on Physical Fitness and Sports. Series 4, no.1, March 2003
59. Available at: http://www.cellinteractive.com/ucla/physician_ed/stages_change.html. Accessed October 2, 2008
60. Miller WR, Rollnick S., Motivational interviewing: preparing people to change addictive behavior. New York: Guildford, 1991: 191-202.
61. Shai I, Schwarzfuchs D, Henkin Y, Shahar DR, Witkow S, et.al. Weight loss with a low carbohydrate, Mediterranean, or low fat diet. *NEJM* 2009; 359 (3): 229-241
62. Patient Centered Assessment and Counseling for Exercise and Nutrition (PACE), San Diego State University, San Diego Center for Health Interventions, 2001
63. U.S. Department of Health and Human Services (1988) The Surgeon General’s Report on Nutrition and Health 1988 Public Health Service Washington, DC.
64. Hsin-Chia H, Joshipura KJ, Jiang R, Hu FB, Hunter D, et.al. Fruit and vegetable intake and risk of major chronic disease. *Journal of the National Cancer Institute* 2004;96(21):1577- 1584

65. American College of Sport Medicine's *Guidelines for Exercise Testing and Prescription*, 5th edition. Baltimore: Williams and Wilkins, 1995.)
66. Wing R, Phelan S. Long term weight loss maintenance. *Am J Clin Nutr* 2005; 82(suppl): 222S-225S.
67. Wing R, Tate DF, Gorin AA, Raynor HA, Fava JL, Machan J. "STOP Regain": Are there negative effects of daily weighing? *Journal of Consulting and Clinical Psychology* 2007;75 (4): 652-656
68. Wing R, Tate DF, Gorin AA, Raynor HA, Fava JL. *NEJM* 2009;355 (15): 1563-1571
69. Noel PH, Pugh JA. Management of overweight and obese adults. *BMJ* 325:757-761, 2002.
70. Wagner EH, Austin BT, VonKorff M. Organizing care for patients with chronic illness. *Milbank Q.* 74: 511-514, 1996.
71. Wagner EH. Chronic disease management: what will it take to improve care for chronic illness? *Eff Clin Pract* 1:2-4, 1998.
72. Wagner EH, Austin BT, Davis C, Hindmarsh M, Achaefer J, Bonomi A. Improving chronic illness care: translating evidence into action. *Health Affairs* 20: 64-78, 2001.
73. Fisher EB, Brownson CA, O'Toole ML, Shetty G, Anwuri VV, Glasgow R. Ecological approaches to self-management: the case of diabetes. *AJPH.*2005; 95:1523-1535.
74. Glasgow RE, Orleans CT, Wagner EH, Curry SJ, Solberg LI. Does the chronic care model serve as a template for improving prevention? *Milbank Q* 79:579-612, 2001.
75. Available at: <http://www.improvingchroniccare.org/change/model/componenets.html>. Accessed October 9, 2008
76. Craig CL, Marshall AL, Sjostrom M, Bauman AE, Booth ML, Ainsworth BE, Pratt M, Ekelund U, Yngve A, Sallis JF, Oja P. International physical activity questionnaire: 12-country reliability and validity. *Med Sci Sports Exerc* 2003; 35:1381-1395
77. Willett WC, Sampson L, Stampfer MJ, Rosner B, Bain C, Witschi J, Hennekens CH, Speizer FE. Reproducibility and validity of a semi quantitative food frequency questionnaire. *Am J Epidemiol* 1985; 122:51-65,
78. Stovitz S, Van Wormer JJ, Center BA, Lindstrom-Bremer K. Pedometers and brief counseling: increasing physical activity for patients seen at a Family Practice Clinic. *Med Sci Sports Exerc* 2004;36:241-245