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Obesity: Risk factors, complications, and strategies for sustainable long-term weight management

Sharon M. Fruh,  PhD, RN, FNP-BC (Professor)

College of Nursing, University of South Alabama, Mobile, Alabama

Keywords

Obesity; nurse practitioner communication; weight management; health; effects.

Correspondence

Sharon M. Fruh, PhD, RN, FNP-BC, College of Nursing, Room 3064, University of South Alabama, 5721 USA Drive North, Mobile, AL 36688.

E-mail: sfruh@southalabama.edu

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Disclosure

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Introduction

Obesity is an increasing, global public health issue. Patients with obesity are at major risk for developing a range of comorbid conditions, including cardiovascular disease (CVD), gastrointestinal disorders, type 2 diabetes (T2D), joint and muscular disorders, respiratory problems, and psychological issues, which may significantly affect their daily lives as well as increasing mortality risks. Obesity-associated conditions are manifold; however, even modest weight reduction may enable patients to reduce their risk for CVD, diabetes, obstructive sleep apnea (OSA), and hypertension among many other comorbidities (Cefalu et al., 2015). A relatively small and simple reduction in weight, for example, of around 5%, can improve patient outcomes and may act as a catalyst for further change, with sustainable weight loss achieved through a series of incremental weight loss steps. In facilitating the process of losing weight for patients, nurse practitioners play an essential role. Through assessing the patient's risk, establishing realistic weight-loss targets, providing motivation

Abstract

Background and Purpose: The aims of this article are to review the effects of obesity on health and well-being and the evidence indicating they can be ameliorated by weight loss, and consider weight-management strategies that may help patients achieve and maintain weight loss.

Methods: Narrative review based on literature searches of PubMed up to May 2016 with no date limits imposed. Search included terms such as “obesity,” “overweight,” “weight loss,” “comorbidity,” “diabetes,” “cardiovascular,” “cancer,” “depression,” “management,” and “intervention.”

Conclusions: Over one third of U.S. adults have obesity. Obesity is associated with a range of comorbidities, including diabetes, cardiovascular disease, obstructive sleep apnea, and cancer; however, modest weight loss in the 5%–10% range, and above, can significantly improve health-related outcomes. Many individuals struggle to maintain weight loss, although strategies such as realistic goal-setting and increased consultation frequency can greatly improve the success of weight-management programs. Nurse practitioners have key roles in establishing weight-loss targets, providing motivation and support, and implementing weight-loss programs.

Implications for Practice: With their in-depth understanding of the research in the field of obesity and weight management, nurse practitioners are well placed to effect meaningful changes in weight-management strategies deployed in clinical practice.

and support, and supplying patients with the necessary knowledge and treatment tools to help achieve weight loss, followed by tools for structured lifestyle support to maintain weight lost, the nurse practitioner is ideally positioned to help patient's achieve their weight-loss—and overall health—targets.

The obesity epidemic

The World Health Organization (WHO) defines overweight and obesity as abnormal or excessive fat accumulation that presents a risk to health (WHO, 2016a). A body mass index (BMI) ≥ 25 kg/m² is generally considered overweight, while obesity is considered to be a BMI ≥ 30 kg/m². It is well known that obesity and overweight are a growing problem globally with high rates in both developed and developing countries (Capodaglio & Liuzzi, 2013; WHO, 2016a, 2016b).

In the United States in 2015, all states had an obesity prevalence more than 20%, 25 states and Guam had obesity rates >30% and four of those 25 states (Alabama,

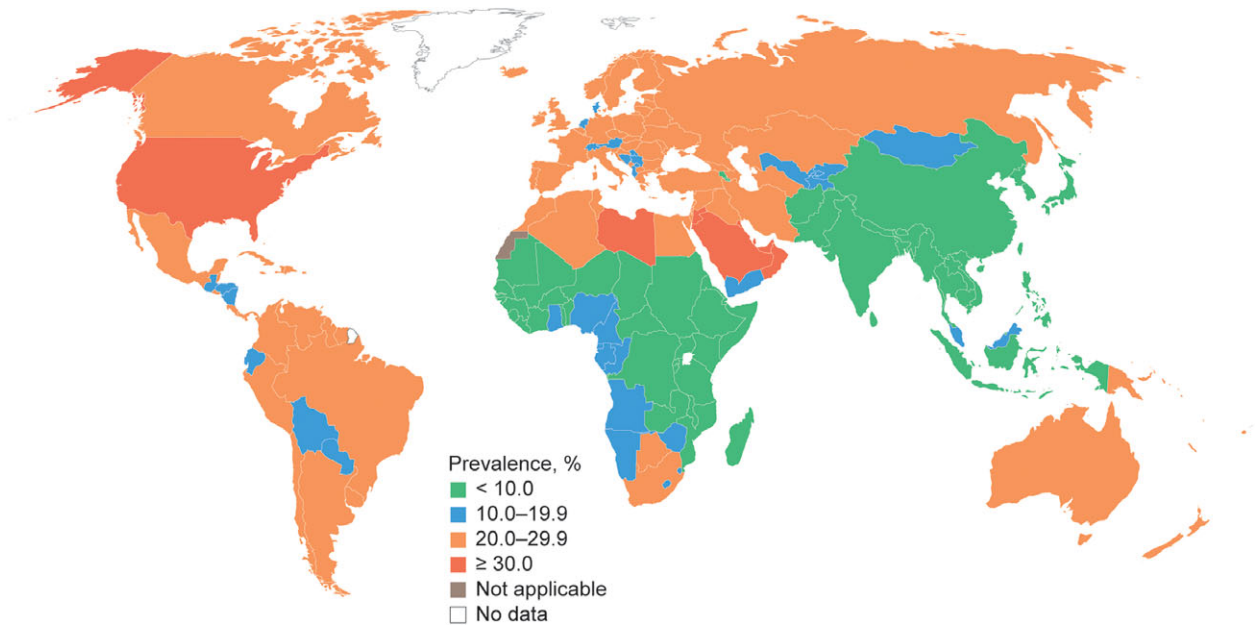


Figure 1 U.S. obesity epidemic 2015.

Source. Figure adapted from Centers for Disease Control and Prevention (CDC). Retrieved from <https://www.cdc.gov/obesity/data/prevalence-maps.html>.

Louisiana, Mississippi, and West Virginia) had rates >35% (Centres for Disease Control and Prevention, 2016; Figure 1). Approximately 35% and 37% of adult men and women, respectively, in the United States have obesity (Yang & Colditz, 2015). Adult obesity is most common in non-Hispanic black Americans, followed by Mexican Americans, and non-Hispanic white Americans (Yang & Colditz, 2015). Individuals are also getting heavier at a younger age; birth cohorts from 1966 to 1975 and 1976 to 1985 reached an obesity prevalence of $\geq 20\%$ by 20–29 years of age, while the 1956–1965 cohort only reached this prevalence by age 30–39 years (Lee et al., 2010). Additionally, the prevalence of childhood obesity in 2- to 17-year-olds in the United States has increased from 14.6% in 1999–2000 to 17.4% in 2013–2014 (Skinner & Skelton, 2014). Childhood obesity is an increasing health issue because of the early onset of comorbidities that have major adverse health impacts, and the increased likelihood of children with obesity going on to become adults with obesity (50% risk vs. 10% for children without obesity; Whitaker, Wright, Pepe, Seidel, & Dietz, 1997).

Association of obesity with mortality and comorbid disease

Mortality

Obesity is associated with a significant increase in mortality, with a life expectancy decrease of 5–10 years

(Berrington de Gonzalez et al., 2010; Kuk et al., 2011; Prospective Studies Collaboration et al., 2009). There is evidence to indicate that all-cause, CVD-associated, and cancer-associated mortalities are significantly increased in individuals with obesity, specifically those at Stages 2 or 3 of the Edmonton Obesity Staging System (EOSS; Kuk et al., 2011; Figure 2). Mortality related to cancer is, however, also increased at Stage 1, when the physical symptoms of obesity are marginal (Figure 2). Recently, a large-scale meta-analysis that included studies that had enrolled over 10 million individuals, indicated that, relative to the reference category of 22.5 to <25 kg/m², the hazard ratio (HR) for all-cause mortality rose sharply with increasing BMI (The Global BMI Mortality Collaboration, 2016). For a BMI of 25.0 to <30.0 kg/m², the HR was 1.11 (95% confidence interval [CI] 1.10, 1.11), and this increased to 1.44 (1.41, 1.47), 1.92 (1.86, 1.98), and 2.71 (2.55, 2.86) for a BMI of 30.0 to <35.0, 35.0 to <40.0, and 40.0 to <60.0 kg/m², respectively.

Comorbidities

Obesity is a chronic disease that is associated with a wide range of complications affecting many different aspects of physiology (Dobbins, Decorby, & Choi, 2013; Guh et al., 2009; Martin-Rodriguez, Guillen-Grima, Marti, & Brugos-Larumbe, 2015; summarized in Table 1). To examine these obesity-related morbidities in detail is beyond the scope of this review and therefore only a brief overview of some of the key pathophysiological processes is included next.

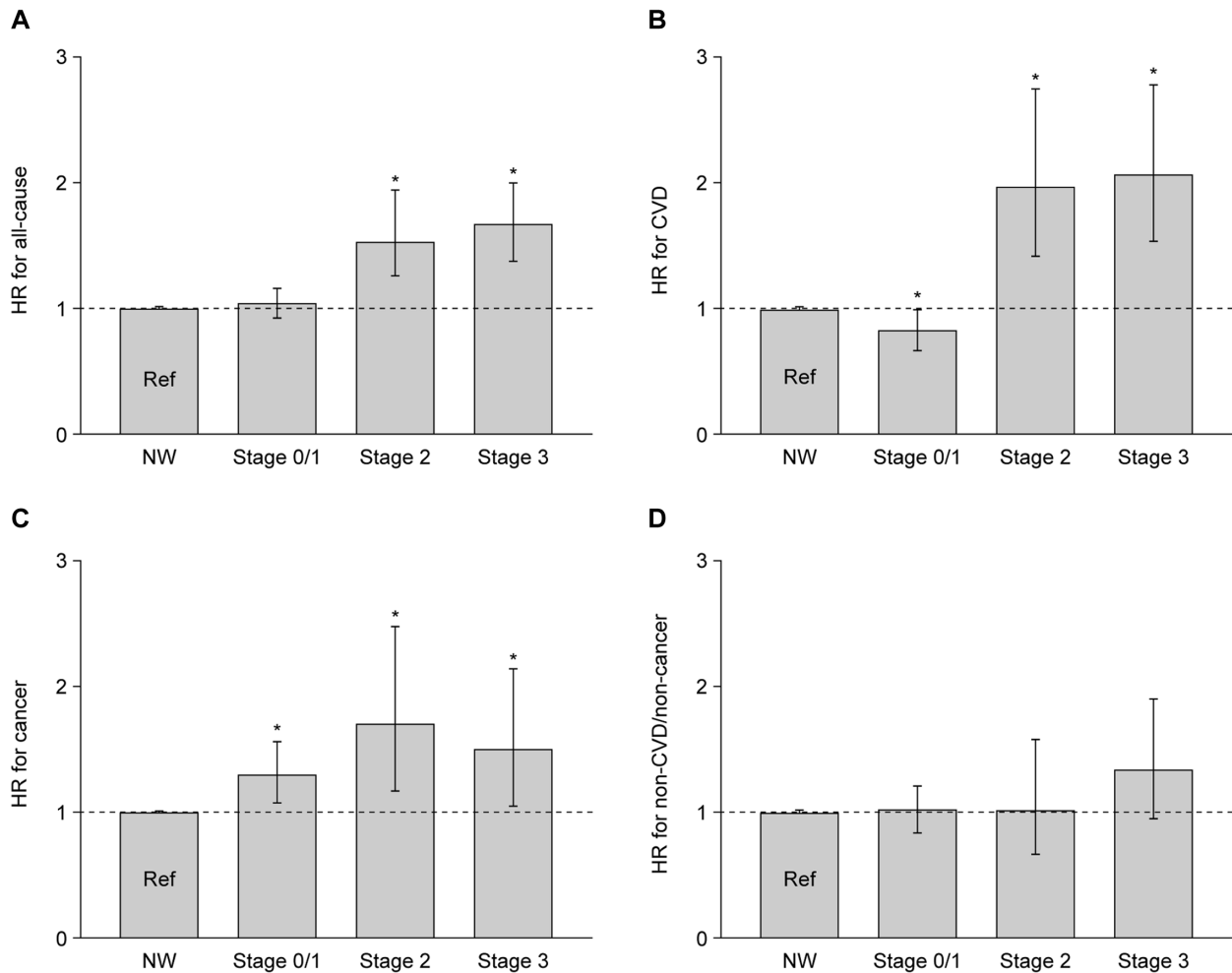


Figure 2 Association between EOSS stage and risk of all-cause (A), CVD (B), cancer (C), and non-CVD or noncancer mortality (D) in men and women. © 2011. Source. Reproduced with permission from NRC Research Press, from Kuk et al. (2011). CVD, cardiovascular disease; NW, normal weight.

The progression from lean state to obesity brings with it a phenotypic change in adipose tissue and the development of chronic low-grade inflammation (Wensveen, Valentic, Sestan, Turk Wensveen, & Polic, 2015). This is characterized by increased levels of circulating free-fatty acids, soluble pro-inflammatory factors (such as interleukin [IL] 1β , IL-6, tumor necrosis factor [TNF] α , and monocyte chemoattractant protein [MCP] 1) and the activation and infiltration of immune cells into sites of inflammation (Hursting & Dunlap, 2012). Obesity is also usually allied to a specific dyslipidemia profile (atherogenic dyslipidemia) that includes small, dense low-density lipoprotein (LDL) particles, decreased levels of high-density lipoprotein (HDL) particles, and raised triglyceride levels (Musunuru, 2010). This chronic, low-grade inflammation and dyslipidemia profile leads to vascular dysfunction, including atherosclerosis formation, and impaired fibrinolysis.

These, in turn, increase the risk for CVD, including stroke and venous thromboembolism (Blokhin & Lentz, 2013).

The metabolic and cardiovascular aspects of obesity are closely linked. The chronic inflammatory state associated with obesity is established as a major contributing factor for insulin resistance, which itself is one of the key pathophysiologies of T2D (Johnson, Milner, & Makowski, 2012). Furthermore, central obesity defined by waist circumference is the essential component of the International Diabetes Federation (IDF) definition of the metabolic syndrome (raised triglycerides, reduced HDL cholesterol, raised blood pressure, and raised fasting plasma glucose; International Diabetes Federation, 2006).

Obesity is also closely associated with OSA. To start, a number of the conditions associated with obesity such as insulin resistance (Ip et al., 2002), systemic inflammation, and dyslipidemia are themselves closely associated with

Table 1 Morbidities associated with obesity (Hamdy, 2016; Petry, Barry, Pietrzak, & Wagner, 2008; Pi-Sunyer, 2009; Sakai et al., 2005; Smith, Hulsey, & Goodnight, 2008; Yosipovitch, DeVore, & Dawn, 2007)

| Class of event | Comorbidities associated with obesity |
|---|---|
| Cancer/malignancy | Postmenopausal breast, endometrial, colon and rectal, gallbladder, prostate, ovarian, endometrial renal cell, esophageal adenocarcinoma, pancreatic, and kidney cancer |
| Cardiovascular | Coronary artery disease, obesity-associated cardiomyopathy, essential hypertension, left ventricular hypertrophy, cor pulmonale, accelerated atherosclerosis, pulmonary hypertension of obesity, dyslipidemia, chronic heart failure (CHD), left ventricular hypertrophy (LVH), cardiomyopathy, pulmonary hypertension, lymphedema (legs) |
| Gastrointestinal (GI) | Gall bladder disease (cholecystitis, cholelithiasis), gastroesophageal reflux disease (GERD), reflux esophagitis, nonalcoholic steatohepatitis (NASH), nonalcoholic fatty liver disease (NAFLD), fatty liver infiltration, acute pancreatitis |
| Genitourinary | Stress incontinence |
| Metabolic/endocrine | Type 2 diabetes mellitus, prediabetes, metabolic syndrome, insulin resistance, and dyslipidemia |
| Musculoskeletal/orthopedic | Pain in back, hips, ankles, feet and knees; osteoarthritis (especially in the knees and hips), plantar fasciitis, back pain, coxavera, slipped capital femoral epiphyses, Blount disease and Legg-Calvé-Perthes disease, and chronic lumbago |
| Neurological and central nervous system (CNS) | Stroke, dementia idiopathic intracranial hypertension, and meralgia paresthesia |
| Obstetric and perinatal | Pregnancy-related hypertension, fetal macrosomia, very low birthweight, neural tube defects, preterm birth, increased cesarean delivery, increased postpartum infection and pelvic dystocia, preeclampsia, hyperglycemia, gestational diabetes (GDM) |
| Skin | Keratosis pilaris, hirsutism, acanthosis nigricans, and acrochondons, psoriasis, intertrigo (bacterial and/or fungal), and increased risk for cellulitis, venous stasis ulcers, necrotizing fasciitis, and carbuncles |
| Psychological | Depression, anxiety, personality disorder, and obesity stigmatization |
| Respiratory/pulmonary | Obstructive sleep apnea (OSA), Pickwickian syndrome (obesity hypoventilation syndrome), higher rates of respiratory infections, asthma, hypoventilation, pulmonary emboli risk |
| Surgical | Increased surgical risk and postoperative complications, deep venous thrombosis, including wound infection, pulmonary embolism, and postoperative pneumonia |
| Reproductive (Women) | Anovulation, early puberty, polycystic ovaries, infertility, hyperandrogenism, and sexual dysfunction |
| Reproductive (Men) | Hypogonadotropic hypogonadism, polycystic ovary syndrome (PCOS), decreased libido, and sexual dysfunction |
| Extremities | Venous varicosities, lower extremity venous and/or lymphatic edema |

OSA, and concurrently, the obesity-associated deposition of fat around the upper airway and thorax may affect lumen size and reduce chest compliance that contributes to OSA (Romero-Corral, Caples, Lopez-Jimenez, & Somers, 2010).

The development of certain cancers, including colorectal, pancreatic, kidney, endometrial, postmenopausal breast, and adenocarcinoma of the esophagus to name a few, have also been shown to be related to excess levels of fat and the metabolically active nature of this excess adipose tissue (Booth, Magnuson, Fouts, & Foster, 2015; Ehemann et al., 2012). Cancers have shown to be impacted by the complex interactions between obesity-related insulin resistance, hyperinsulinemia, sustained hyperglycemia, oxidative stress, inflammation, and the production of adipokines (Booth et al., 2015). The wide range of

morbidities associated with obesity represents a significant clinical issue for individuals with obesity. However, as significant as this array of risk factors is for patient health, the risk factors can be positively modified with weight loss.

Obesity-related morbidities in children and adolescents

As was referred to earlier, children and adolescents are becoming increasingly affected by obesity. This is particularly concerning because of the long-term adverse consequences of early obesity. Obesity adversely affects the metabolic health of young people and can result in impaired glucose tolerance, T2D, and early-onset metabolic syndrome (Pulgaron, 2013). There is also strong support in the literature for relationships between childhood

obesity and asthma, poor dental health (caries), non-alcoholic fatty liver disease (NAFLD), and gastroesophageal reflux disease (GERD; Pulgaron, 2013). Obesity can also affect growth and sexual development and may delay puberty in boys and advance puberty in some girls (Burt Solorzano & McCartney, 2010). Childhood obesity is also associated with hyperandrogenism and polycystic ovary syndrome (PCOS) in girls (Burt Solorzano & McCartney, 2010). Additionally, obesity is associated with psychological problems in young people including attention deficit hyperactivity disorder (ADHD), anxiety, depression, poor self-esteem, and problems with sleeping (Pulgaron, 2013).

Modest weight loss and its long-term maintenance: Benefits and risks

Guidelines endorse weight-loss targets of 5%–10% in individuals with obesity or overweight with associated comorbidities, as this has been shown to significantly improve health-related outcomes for many obesity-related comorbidities (Cefalu et al., 2015; Figure 3), including T2D prevention, and improvements in dyslipidemia, hyperglycemia, osteoarthritis, stress incontinence, GERD, hypertension, and PCOS. Further benefits may be evident with greater weight loss, particularly for dyslipidemia, hyperglycemia, and hypertension. For NAFLD and OSA, at least 10% weight loss is required to observe clinical improvements (Cefalu et al., 2015).

Importantly, the weight-loss benefits in terms of comorbidities are also reflected in improved all-cause mortality. A recent meta-analysis of 15 studies demonstrated that relatively small amounts of weight loss, on average 5.5 kg in the treatment arm versus 0.2 kg with placebo from an average baseline BMI of 35 kg/m², resulted in a substantial 15% reduction in all-cause mortality (Kritchevsky et al., 2015).

Cardiovascular health

Weight loss is associated with beneficial changes in several cardiovascular risk markers, including dyslipidemia, pro-inflammatory/pro-thrombotic mediators, arterial stiffness, and hypertension (Dattilo & Kris-Etherton, 1992; Dengo et al., 2010; Goldberg et al., 2014; Haffner et al., 2005; Ratner et al., 2005). Importantly, weight loss was found to reduce the risk for CVD mortality by 41% up to 23 years after the original weight-loss intervention (Li et al., 2014; Figure 4). Evidence including the biological effects of obesity and weight loss, and the increased risk for stroke with obesity indicates that weight loss may be effective for primary- and secondary-stroke prevention (Kernan, Inzucchi, Sawan, Macko, & Furie, 2013).

Type 2 diabetes

Three major long-term studies, the Diabetes Prevention Program (DPP), the Diabetes Prevention Study (DPS), and the Da Qing IGT and Diabetes (Da Qing) study, have demonstrated that modest weight loss through short-term lifestyle or pharmacologic interventions can reduce the risk for developing T2D by 58%, 58%, and 31%, respectively, in individuals with obesity and prediabetes (DPP Research Group et al., 2009; Pan et al., 1997; Tuomilehto et al., 2001). Long-term benefits were maintained following the interventions; for example, in the DPP, the risk reduction of developing T2D versus placebo was 34% at 10 years and 27% at 15 years following the initial weight-loss intervention (DPP Research Group, 2015; DPP Research Group et al., 2009). Weight loss increased the likelihood of individuals reverting from prediabetes to normoglycemia (DPP Research Group et al., 2009; Li et al., 2008; Lindstrom et al., 2003, 2006; Tuomilehto et al., 2001), and also improved other aspects of glycemic

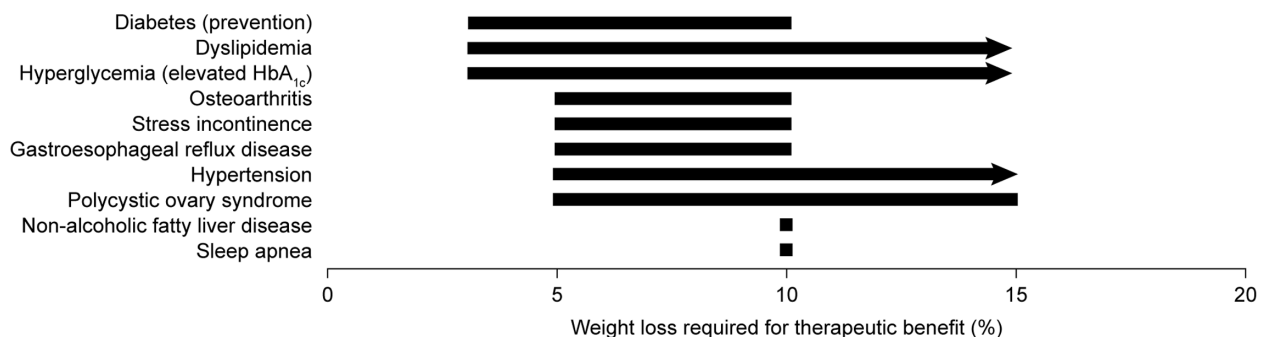


Figure 3 Benefits of modest weight loss. Lines demonstrate the ranges in which weight loss has been investigated and shown to have clinical benefits. Arrows indicate that additional benefits may be seen with further weight loss.

Source. Figure adapted from Cefalu et al. (2015).

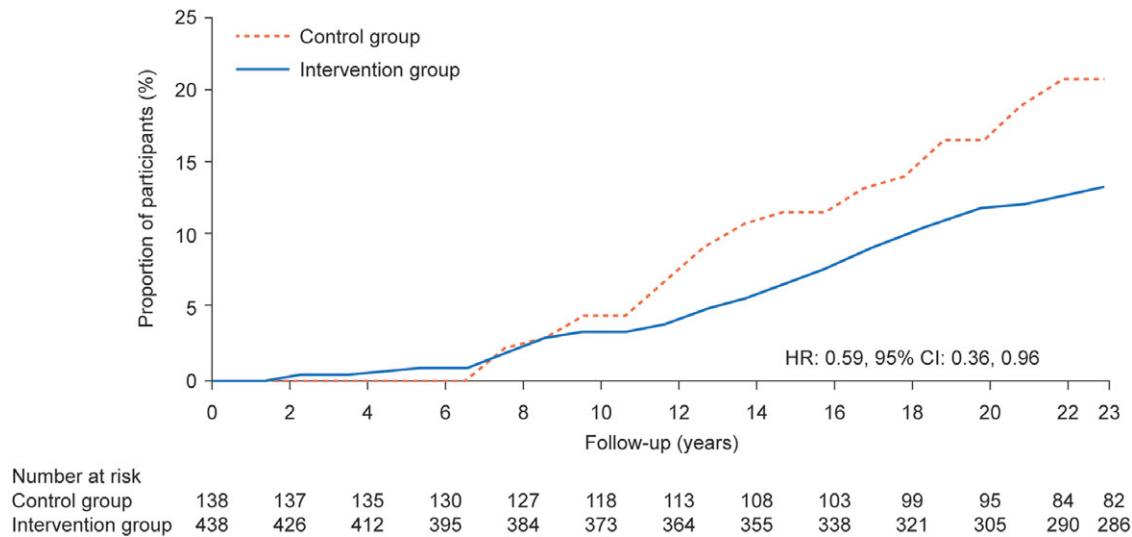


Figure 4 Reduction in cardiovascular mortality with modest weight reduction. Cumulative incidence of CVD mortality during 23 years of follow-up in the Da Qing study (Li et al., 2014). Figure © 2014 Elsevier.

Source. Reproduced with permission from Li et al. (2014).

control including fasting and postprandial glucose, and insulin sensitivity (Haufe et al., 2013; Li et al., 2008).

Sleep apnea

Data indicate that weight loss is beneficial, although not curative, in patients with obesity who experience OSA. Meta-analyses of patients who underwent treatment with either intensive lifestyle intervention (Araghi et al., 2013) or bariatric surgery (Greenburg, Lettieri, & Eliasson, 2009) demonstrated improvements in apnea-hypopnea index (AHI) following treatment. In the first of these meta-analyses, in randomized controlled trials, lifestyle intervention lead to a mean reduction in BMI of 2.3 kg/m², which was associated with a decrease in mean AHI of 6.0 events/h. As expected, weight loss was much higher in the second meta-analysis that investigated the effect of bariatric surgery on measures of OSA, and this was associated with greater reductions in AHI; the mean BMI reduction of 17.9 kg/m² resulted in AHI events being reduced by a mean of 38.2 events/h. Once these improvements in AHI have occurred, they seem to persist for some time, irrespective of a certain degree of weight regain. In one study, an initial mean weight loss of 10.7 kg resulted in a persistent improvement in AHI over a 4-year period despite weight regain of approximately 50% by Year 4 (Kuna et al., 2013).

Cancer

Intentional weight loss of >9 kg reduced the risk for a range of cancers including breast, endometrium, and

colon in the large-scale Iowa Women's Health Study (Parker & Folsom, 2003). The overall reduction in the incidence rate of any cancer was 11% (relative risk, 0.89; 95% CI 0.79, 1.00) for participants who lost more than 9 kg compared with those who did not achieve a more than 9 kg weight loss episode. Additionally, weight loss in participants with obesity has been established to be associated with reductions in cancer biomarkers including soluble E-selectin and IL-6 (Linkov et al., 2012).

Additional health benefits

The substantial weight loss associated with bariatric surgery has been shown to improve asthma with a 48%–100% improvement in symptoms and reduction in medication use (Juel, Ali, Nilas, & Ulrik, 2012); however, there is a potential threshold effect so that modest weight loss of 5%–10% may lead to clinical improvement (Lv, Xiao, & Ma, 2015). Similarly, modest weight loss of 5%–10% improves GERD (Singh et al., 2013) and liver function (Haufe et al., 2013). A study utilizing MRI scanning to examine the effects of weight loss on NAFLD has reported a reduction in liver fat from 18.3% to 13.6% ($p = .03$), a relative reduction of 25% (Patel et al., 2015). Taking an active role in addressing obesity through behavioral modifications or exercise can also reduce the symptoms of depression (Fabricatore et al., 2011), improve urinary incontinence in men and women (Breyer et al., 2014; Brown et al., 2006), and improve fertility outcomes in women (Kort, Winget, Kim, & Lathi, 2014).

Additionally, weight loss can reduce the joint-pain symptoms and disability caused by weight-related osteoarthritis (Felson, Zhang, Anthony, Naimark, & Anderson, 1992; Foy et al., 2011).

Mitigating risks

Despite the array of benefits, weight loss can also be linked with certain risks that may need to be managed. One such example is the risk for gallstones with rapid weight loss, which is associated with gallstone formation in 30%–71% of individuals. Gallstone formation is particularly associated with bariatric surgery when weight loss exceeds 1.5 kg/week and occurs particularly within the first 6 weeks following surgery when weight loss is greatest. Slower rates of weight loss appear to mitigate the risk for gallstone formation compared to the general population but may not eliminate it entirely; as was noted in the year-long, weight-loss, SCALE trial that compared liraglutide 3.0 mg daily use to placebo and resulted in gallstone formation in 2.5% of treated subjects compared to 1% of subjects taking placebo. For this reason, the risk for cholelithiasis should be considered when formulating weight-loss programs (Weinsier & Ullmann, 1993).

Strategies to help individuals achieve and maintain weight loss

Rogge and Gautam have covered the biology of obesity and weight regain within another section of this supplement (Rogge & Gautam, 2017), so here we focus on some of the clinical strategies for delivering weight loss and weight loss maintenance lifestyle programs. Structured lifestyle support plays an important role in successful weight management. A total of 34% of participants receiving structured lifestyle support from trained-nursing staff achieved weight loss of $\geq 5\%$ over 12 weeks compared with approximately 19% with usual care (Nanchahal et al., 2009). This particular structured program, delivered in a primary healthcare setting, included initial assessment and goal setting, an eating plan and specific lifestyle goals, personalized activity program, and advice about managing obstacles to weight loss. Additionally, data from the National Weight Control Registry (NWCR), which is the longest prospective compilation of data from individuals who have successfully lost weight and maintained their weight loss, confirm expectations that sustained changes to both diet and activity levels are central to successful weight management (Table 2). Therefore, an understanding of different clinical strategies for delivery-structured support is essential for the nurse practitioner.

Table 2 Lifestyle factors associated with achieving and maintaining weight loss

| Action | Percentage |
|--|------------|
| Modified food intake | 98 |
| Increased physical activity ^a | 94 |
| Exercised on average for 1 h each day | 90 |
| Ate breakfast every day | 78 |
| Weighed themselves weekly | 75 |
| Watched less than 10 h of television weekly | 62 |
| Lost weight with the help of a weight-loss program | 55 |

Note. Data from (NWCR, 2016).

^aWalking was the most common activity undertaken.

Realistic weight-loss targets

From the outset, a patient's estimate of their achievable weight loss may be unrealistic. Setting realistic weight-loss goals is often difficult because of misinformation from a variety of sources, including friends, media, and other healthcare professionals (Osunlana et al., 2015). Many individuals with obesity or overweight have unrealistic goals of 20%–30% weight loss, whereas a more realistic goal would be the loss of 5%–15% of the initial body weight (Fabricatore et al., 2007). Promoting realistic weight-loss expectations for patients was identified as a key difficulty for nurse practitioners, primary care nurses, dietitians, and mental health workers (Osunlana et al., 2015). Visual resources showing the health and wellness benefit of modest weight loss may thus be helpful (Osunlana et al., 2015). Healthcare practitioners should focus on open discussion about, and re-enforcement of, realistic weight-loss goals and assess outcomes consistently according to those goals (Bray, Look, & Ryan, 2013).

Maintaining a food diary

The 2013 White Paper from the American Nurse Practitioners Foundation on the Prevention and Treatment of Obesity considers a food diary as an important evidence-based nutritional intervention in aiding weight loss (ANPF). Consistent and regular recording in a food diary was significantly associated with long-term weight-loss success in a group of 220 women (Peterson et al., 2014). This group lost a mean of 10.4% of their initial body weight through a 6-month group-based weight-management program and then regained a mean of 2.3% over a 12-month follow-up period, during which participants received bimonthly support in person, by telephone, or by e-mail (Peterson et al., 2014). Over the 12-month follow-up, women who self-monitored consistently ($\geq 50\%$ of the extended-care year) had a mean weight loss of 0.98%, while those who were less consistent

(<50%) gained weight (5.1%; $p < .01$). Therefore, frequent and consistent food monitoring should be encouraged, particularly in the weight-maintenance phase of any program.

Motivating and supporting patients

Motivational interviewing is a technique that focuses on enhancing intrinsic motivation and behavioral changes by addressing ambivalence (Barnes & Ivezaj, 2015). Interviews focus on “change talk,” including the reasons for change and optimism about the intent for change in a supportive and nonconfrontational setting, and may help individuals maintain behavioral changes.

For patients that have achieved weight loss, the behavioral factors associated with maintaining weight loss include strong social support networks, limiting/avoiding disinhibited eating, avoiding binge eating, avoiding eating in response to stress or emotional issues, being accountable for one’s decisions, having a strong sense of autonomy, internal motivation, and self-efficacy (Grief & Miranda, 2010). Therefore, encouraging feelings of “self-worth” or “self-efficacy” can help individuals to view weight loss as being within their own control and achievable (Cochrane, 2008).

Strengthening relationships with patients with overweight or obesity to enhance trust may also improve adherence with weight-loss programs. Patients with hypertension who reported having “complete trust” in their healthcare practitioner were more than twice as likely to engage in lifestyle changes to lose weight than those who lacked “complete trust” (Jones, Carson, Bleich, & Cooper, 2012). It may be prudent to ensure the healthcare staff implementing weight-loss programs have sufficient time to foster trust with their patients.

Continued support from healthcare staff may help patients sustain the necessary motivation for lifestyle changes. A retrospective analysis of 14,256 patients in primary care identified consultation frequency as a factor that can predict the success of weight-management programs (Lenoir, Maillot, Guilbot, & Ritz, 2015). Individuals who successfully maintained $\geq 10\%$ weight loss over 12 months visited the healthcare provider on average 0.65 times monthly compared with an average of 0.48 visits/month in those who did not maintain $\geq 10\%$ weight loss, and 0.39 visits/month in those who failed to achieve the initial $\geq 10\%$ weight loss ($p < .001$; Lenoir et al., 2015).

Educational and environmental factors

It is important to consider a patient’s education and environment when formulating a weight loss strategy as

environmental factors may need to be challenged to help facilitate weight loss. A family history of obesity and childhood obesity are strongly linked to adult obesity, which is likely to be because of both genetic and behavioral factors (Kral & Rauh, 2010). Parents create their child’s early food experiences and influence their child’s attitudes to eating through learned eating habits and food choices (Kral & Rauh, 2010). Families can also impart cultural preferences for less healthy food choices and family food choices may be affected by community factors, such as the local availability and cost of healthy food options (Castro, Shaibi, & Boehm-Smith, 2009). Alongside this, genetic variation in taste sensation may influence the dietary palate and influence food choices (Loper, La Sala, Dotson, & Steinle, 2015). For example, sensitivity to 6-n-propylthiouracil (PROP) is genetically determined, and PROP-tasting ability ranges from super taster to nontaster. When offered buffet-style meals over 3 days, PROP nontasters consumed more energy, and a greater proportion of energy from fat compared with super tasters. So it is possible that a family’s genetic profile could contribute to eating choices. To address behavioral factors, it is important to ensure that families have appropriate support and information and that any early signs of weight gain are dealt with promptly.

A healthy home food environment can help individuals improve their diet. In children, key factors are availability of fresh fruit and vegetables at home and parental influence through their own fresh fruit and vegetable intake (Wyse, Wolfenden, & Bisquera, 2015). In adults, unhealthy home food environment factors include less healthy food in the home and reliance on fast food ($p = .01$) are all predictors of obesity (Emery et al., 2015).

Family mealtimes are strongly associated with better dietary intake and a randomized controlled trial to encourage healthy family meals showed a promising reduction in excess weight gain in prepubescent children (Fulkerson et al., 2015). Another study showed that adolescents with any level of baseline family meal frequency, 1–2, 3–4, and ≥ 5 family meals/week, had reduced odds of being affected by overweight or obesity 10 years later than adolescents who never ate family meals (Berge et al., 2015). Community health advocates have identified the failure of many families to plan meals or prepare food as a barrier to healthy family eating patterns (Fruh, Mulekar, Hall, Fulkerson et al., 2013). Meal planning allows healthy meals to be prepared in advance and frozen for later consumption (Fruh, Mulekar, Hall, Adams et al., 2013) and is associated with increased consumption of vegetables and healthier meals compared with meals prepared on impulse (Crawford, Ball, Mishra, Salmon, & Timperio, 2007; Hersey et al., 2001).

The role of the nurse practitioner

The initial and ongoing interactions between patient and nurse practitioner are keys for the determination of an effective approach and implementation of a weight loss program and subsequent weight maintenance. The initial interaction can be instigated by either the nurse practitioner or the patient and once the decision has been made to manage the patient's weight, the evaluation includes a risk assessment, a discussion about the patient's weight, and treatment goal recommendations (American Nurse Practitioner Foundation, 2013). Across this process, it may be advantageous to approach this using objective data and language that is motivational and/or nonjudgmental. Patients may struggle with motivation, and therefore, ongoing discussions around the health benefits and improvements to quality of life as a result of weight loss may be required (American Nurse Practitioner Foundation, 2013). It may be valuable to allocate personalized benefits to the weight loss such as playing with children/grandchildren (American Nurse Practitioner Foundation, 2013). Treatment approaches encompass non-pharmacological and pharmacological strategies; however, it is important to remember that any pharmacological agent used should be used as an adjunct to nutritional and physical activity strategies (American Nurse Practitioner Foundation, 2013). Pharmacotherapy options for weight management are discussed further in the article by Golden in this supplement.

Conclusions/summary

The importance of obesity management is underscored both by the serious health consequences for individuals, but also by its increasing prevalence globally, and across age groups in particular. Obesity promotes a chronic, low-grade, inflammatory state, which is associated with vascular dysfunction, thrombotic disorders, multiple organ damage, and metabolic dysfunction. These physiological effects ultimately lead to the development of a range of morbidities, including CVD, T2D, OSA, and certain cancers along with many others, as well as causing a significant impact on mortality.

However, even modest weight loss of 5%–10% of total body weight can significantly improve health and well-being, and further benefits are possible with greater weight loss. Weight loss can help to prevent development of T2D in individuals with obesity and prediabetes and has a positive long-term impact on cardiovascular mortality. Beneficial, although not curative, effects have also been noted on OSA following >10% weight loss. In addition, weight loss reduces the risk for certain cancer types and has positive effects on most comorbidities including asthma, GERD,

liver function, urinary incontinence, fertility, joint pain, and depression.

Weight-loss programs that include realistic weight loss goals, frequent check-in, and meal/activity diaries may help individuals to lose weight. Setting realistic weight-loss goals can be difficult; however, visual resources showing the health and wellness benefit of weight loss may be helpful in discussing realistic goals, and help motivate the patient in maintaining the weight loss. Techniques such as motivational interviewing that focus on addressing resistance to behavioral change in a supportive and optimistic manner may help individuals in integrating these changes to allow them to become part of normal everyday life and thus help with maintaining the weight loss. Positive reinforcement in terms of marked early-weight loss may also assist in improving adherence, so this should be a key goal for weight-loss programs. Encouraging feelings of "self-worth" or "self-efficacy" can help individuals to view weight loss as being within their own control.

Nurse practitioners play a major role in helping patients achieve weight loss through all aspects of the process including assessment, support, motivation, goal-setting, management, and treatment. With their in-depth understanding of the research in the field of obesity and weight management, nurse practitioners are well placed to effect meaningful changes in the weight-management strategies deployed in clinical practice.

List of helpful resources

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| The Obesity Action Coalition (OAC): www.obesityaction.org | This site has educational resources for providers and patients. It also has information on advocacy for patients. |
| Stop Obesity Alliance: https://stopobesityalliance.org/ | This site has many helpful resources to help prevent obesity bias and helpful educational materials for patients. It also has an excellent tool to help providers discuss the topic of obesity with patients. |
| UConn Rudd Center: www.uconnruddcenter.org/weight-bias-stigma | This site is an excellent resource for providers in clinical practice. This site has modules to help providers improve obesity management. |

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