



Unintentional weight loss is common among older adults and is associated with significant adverse health outcomes, increased mortality, and progressive disability. The diagnosis is often associated with an underlying illness; however, in as many as one in four older adults with unintentional weight loss, no obvious medical cause can be identified. A variety of nonpharmacologic interventions may improve energy intake and lead to weight gain. The most common approach to the treatment of weight loss among older adults is consumption of high-energy/protein oral supplements between meals as a means of increasing daily energy intake. Involving other health professionals, including a dietitian, may be helpful in the assessment and management plan. In addition, a number of pharmacologic treatments have been investigated, but the potential benefit of these treatments remains unclear.

Key words: weight loss, older adults, malnutrition, oral nutritional supplementation, megestrol

An Approach to the Nonpharmacologic and Pharmacologic Management of Unintentional Weight Loss Among Older Adults

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Introduction

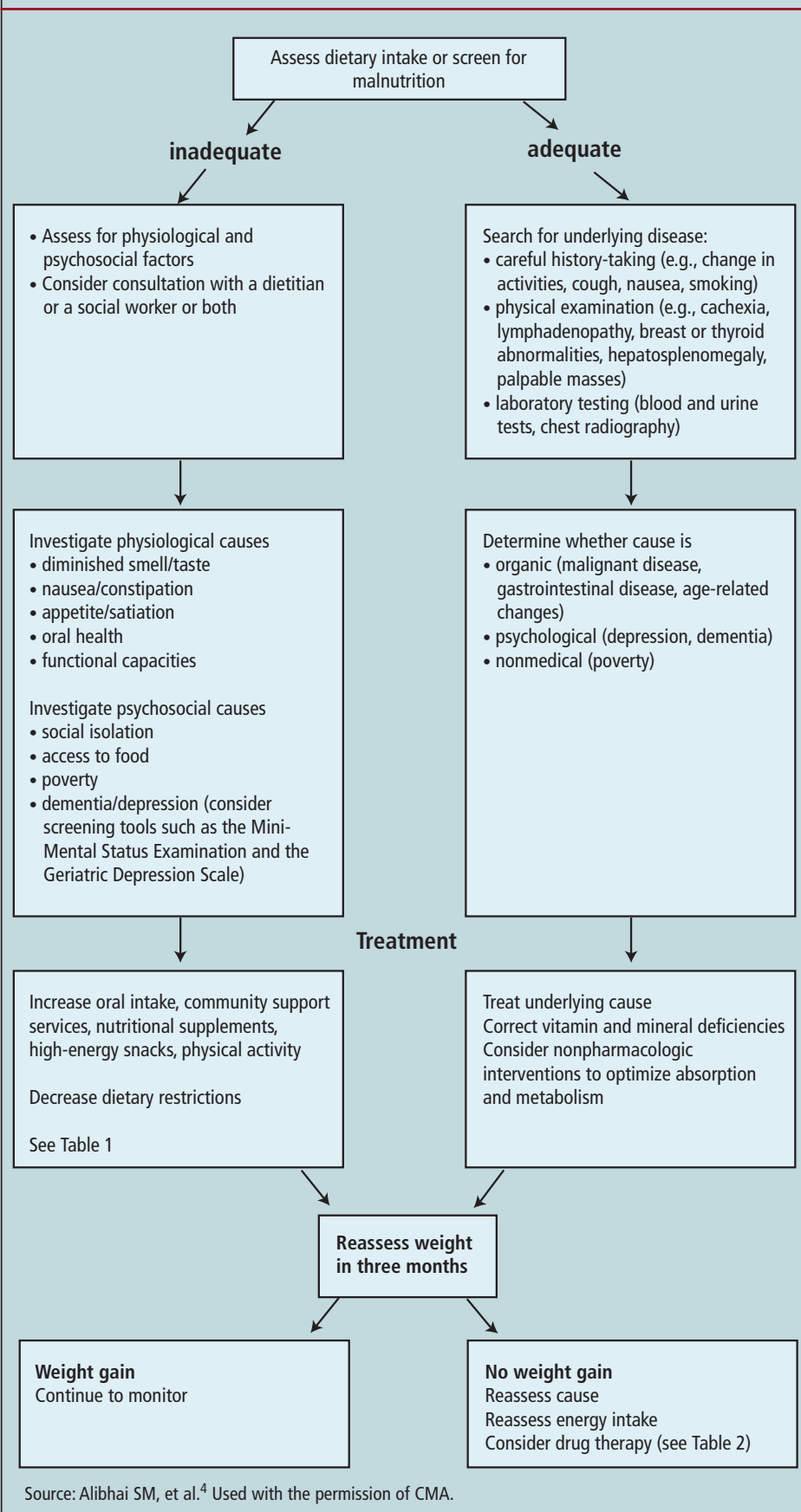
Unintentional weight loss among older adults is a problem commonly encountered in clinical practice. As discussed in the first part of this article,¹ clinically significant weight loss is typically defined as a decrease of >5% of usual body weight over six to twelve months² and has been associated with a decline in functional status, quality of life, and with increased morbidity and mortality. After the age of 70, some weight loss may be attributed to the aging process itself. Studies of healthy older adults report that weight loss of approximately 0.1–0.2 kg per year due to aging alone is considered normal.³ The decline in body weight experienced with age, therefore, is quite small, and clinicians should be careful not to dismiss weight loss as natural without carefully ruling out other medical and social causes.

The causes of weight loss among older adults frequently depend on the presence of underlying health problems and/or poor nutritional status. Although up to one in four patients present with no identifiable cause, weight loss is often a

symptom of one or more diagnosed or undiagnosed illnesses (the most common being depression and gastrointestinal illnesses, e.g., peptic ulcer disease or motility disorders, and cancer).⁴ Medication side effects such as anorexia, dry mouth, dysgeusia, dysphagia, and nausea can also contribute significantly to weight loss among older adults, as can social problems such as poverty and isolation.

Once weight loss has been established, older individuals should undergo a complete physical examination, screening lab tests, and evaluation, using common assessment tools for prevalent disorders such as dementia and depression. When no evidence of an organic disorder is present, weight loss due to primary malnutrition (i.e., resulting from inadequate food intake) must be considered as a contributor. The routine use of nutritional screening tools, especially those that are solely questionnaire-based and can be completed by the patient or primary caregiver, provides an effective way to identify those at the greatest nutritional risk and may aid in timely treatment (discussed in part one of this series).

Figure 1: The Assessment and Treatment of Weight Loss in Older Adults



This article is the second installment of a two-part clinical review of unintentional weight loss among older adults. Portions of this article are reviewed in greater detail elsewhere.⁴

Strategies for Managing Unintentional Weight Loss

The first priority in managing weight loss is to systematically identify and treat the underlying causes (Figure 1). However, as stated above, up to one in four older adults experiencing weight loss have no discernable medical cause. For these individuals in particular, as well as for all older individuals with weight loss, treatment often requires access to good nutrition. Table 1 lists several important nonpharmacologic strategies that can be implemented to prevent or treat malnutrition and enhance food intake. Factors associated with poor diet such as poverty, poor dental health, difficulty chewing or swallowing, vision or hearing loss, arthritis, stress (e.g., illness or death of a loved one), and unhappiness should be targeted.^{5,6} It is prudent to involve a dietitian and a social worker to assist with assessment and management, particularly in cases where no obvious pathologic cause has been identified. In addition, a physiotherapist may help older adults increase their physical activity levels as a means of stimulating appetite and increasing energy intake and muscle mass.⁷⁻¹⁰

The use of oral nutritional supplements, such as high-energy and high-protein drinks, is a common strategy for reversing weight loss and increasing food intake. Studies have shown that short-term supplementation has resulted in improvements in body weight status and other nutritional parameters; however, long-term supplementation data are somewhat limited.¹¹⁻¹⁴ Counselling and encouraging patients to consume supplements in addition to their usual food intake rather than as a replacement of that intake is essential, since weight gain is confined to those who actually increase their energy intake.^{12,14} Advising patients to consume supplements between meals, rather than with the meal, may help min-

Table 1: Nonpharmacologic Interventions for Unintentional Weight Loss

Intervention	Rationale	Evidence
Minimize dietary restrictions ^{33,34}	Restricted diets are often energy-poor, have poor palatability, and are not always medically indicated	Older adults on restricted diets are at higher risk of weight loss ^{35–37}
Optimize caloric intake Maximize intake with high-energy foods at the best meal of the day; ^{33,34} Eat smaller meals more often; Eat of favourite foods and snacks; Provide finger foods	May increase total daily energy intake by minimizing gastric distension seen with large meals and increasing the amount of food	Many older adults, especially those with dementia, consume the majority of their daily calories at breakfast; ^{38,39} providing favourite foods led to reversal of malnutrition and return of appetite among severely anorectic, malnourished older adults; ⁴⁰ providing increased finger foods at mealtime increased food consumption and led to cessation of weight loss in individuals with dementia ⁴¹
Optimize and vary dietary texture ⁴²	Varying textures and enhancing chewing and palatability of foods may stimulate positive feedback to eat more and minimize fatigue associated with chewing	In one study of supervised individuals with dementia, altering food texture based on observed preferences led to increased food intake and weight maintenance; ⁴² diversity of food texture was highly valued by adults with congenital anosmia, who may be at high risk of weight loss ⁴³
Avoid gas-containing foods ³³	High gas-containing foods may lead to gastric distension with air and earlier satiety	
Ensure adequate oral health ^{33,44}	Poor oral hygiene and dry mouth are risk factors for decreased oral intake	Improved ability to detect sweet and salty tastes was found after professional oral hygiene therapy 3 times weekly for 5 weeks among subjects compared to controls but no difference in energy intake ⁴⁵
Take high-energy and nutritionally dense supplements or add fats or oils to usual foods	Increased energy intake may increase weight; nutrient-dense foods (more energy per gram) may avoid satiety-related limitations in intake	Daily energy intake and weight gain significantly increased within 3–6 weeks in malnourished older adults ^{8,11,14,46} and decreased falls without impact on other functional measures; ¹¹ oral supplements were associated with lower mortality and shorter length of stay but not lower risk of complications; ¹⁷ studies were not restricted to older adults with weight loss
Take supplements between meals	May minimize appetite suppression and compensatory decreased intake of foods	Providing liquid supplements at least 60 minutes prior to a meal was associated with less appetite suppression and greater overall energy intake than when liquid supplements were provided immediately prior to a meal in healthy older individuals ¹⁵
Eat in company or with assistance ^{33,44}	May lead to enhanced enjoyment of meals and increased energy intake; many older adults need assistance with taking their meals because of physical or cognitive disabilities	

Table 1, continued: Nonpharmacologic Interventions for Unintentional Weight Loss

Intervention	Rationale	Evidence
Use flavour enhancers	May counteract age-related increase in smell and taste thresholds (components of anorexia of aging)	Intake of most enhanced foods was increased and immune function and grip strength improved, ⁴⁷ hunger increased and energy intake and weight gain improved; ⁴⁸ studies were not restricted to individuals with weight loss
Participate in regular exercise	Promotes muscle hypertrophy and gain in lean-body mass; may stimulate appetite	Improvements were seen in strength and muscle volume, especially with resistance exercises; ⁷ increased energy intake and/or weight gain occurred ⁸⁻¹⁰
Take a multiple vitamin supplement daily ³³	Most older adults with weight loss have one or more nutritional deficiencies ⁴⁹	Equivocal evidence showed association between multivitamin supplementation and reduced infections ⁵⁰
Use community nutritional support services ^{44,51}	Functional limitations related to supply, preparation and consumption of food greatly reduce the capacity of older adults to have access to sufficient food of good quality	Meals-On-Wheels programs improved dietary intake of older recipients ⁵²

RCT = randomized, controlled trial
 Source: Alibhai SM, et al., 2005.⁴ Used with the permission of CMA.

imize appetite suppression and facilitate increased overall intake.¹⁵ Although supplement use has been associated with short-term weight gain and improvements in biochemical, anthropometric, and quality of life parameters in a number of trials, the long-term beneficial effects on health, ability to function, and survival in undernourished older adults are yet to be consistently demonstrated.^{11,16} A systematic review of 49 randomized and quasi-randomized trials showed a mean percentage weight gain of 2.3% (95% confidence interval [CI] 1.9–2.7) with protein-energy supplementation. In addition, the review found a reduction in mortality (Relative Risk 0.74, CI 0.59–0.92) among older adults who received protein-energy supplements, irrespective of whether they had weight loss.¹⁷

The question of whether a multiple vitamin/mineral supplement should be recommended needs to be addressed. Indeed, many older adults, both institutionalized and community-dwelling, consume too little food to meet their vita-

min and mineral needs¹⁸ and, therefore, improving food intake should be the first line of defense against vitamin and mineral deficiency. Older adults who consume oral supplements rich in micronutrients as a regular part of their diet are less likely to require additional vitamin/mineral supplements. Due to the high nutrient density of oral supplements, improvements in vitamin and mineral intakes are measurable in patients consuming these products, even in those who do not show increases in energy intake.^{12,14} Vitamin and mineral supplements should be considered for those individuals among whom improvements in food intake are not observed, emphasizing products with a broad spectrum of vitamins and minerals rather than a limited composition, since low food intake generally leads to multiple nutrient deficiencies.

Pharmacologic Therapy to Reverse Weight Loss

The evidence supporting pharmacologic agents for the treatment of weight loss is

limited to mostly small, uncontrolled studies, and the benefits are generally restricted to a small gain in weight without significant decreases in morbidity and mortality or improved function and quality of life. Various pharmacologic agents, including orexigenic (appetite-stimulating) and anabolic medications, have been used to improve appetite or cause weight gain in subjects with weight loss. Most of these agents have harmful side effects, particularly for frail older adults, which limit their usefulness. Only four have been studied in randomized trials among older adults (Table 2). The synthetic progestational agent megestrol acetate is best associated with weight gain in well-designed, randomized trials in populations of patients with cancer or HIV infection.^{19,20} Evidence for its use with older adults is limited to two randomized trials and some case series.^{19,21-23} A recent randomized trial among older adults with reduced appetite after hospitalization²⁴ showed no significant differences in appetite or weight gain between subjects receiving

Table 2: Results of Trials of Pharmacologic Interventions to Treat Weight Loss in Older Adults

Trial	No. of patients	Patient Characteristics	Intervention	Outcome measures	Intervention	Control	P-value	Comments
Brocker et al. ²⁵	185	Community-dwelling adults over age 65, recovering from acute illness or surgery; weight loss not necessary	Ornithine oxoglutarate (OGO) 10 g in food twice daily vs. placebo for 2 months	Weight	1.7 + 0.5 kg	1.2 + 0.7 kg	<0.001	Randomized, double-blind trial; greater improvements in quality of life, appetite, activities in daily living with OGO; well-tolerated; primary outcome measure not specified; OGO not licensed as a drug in Canada but available in health food stores; no subsequent published trials
Chu et al. ²⁹	20	Adults age 70 or older with body weight <80% ideal for height, BMI <19, and low albumin	Recombinant human growth hormone (rHGH) 0.09 IU/kg 3x week or placebo for 4 weeks	Lean body mass and 5-metre walking time	1.4 kg	-0.1 kg	Not significant at 4 weeks; p=0.009 at three weeks; no difference at 8 and 12 weeks follow-up	Randomized double-blind; high refusal rate (56%); short duration of therapy; costly; no serious adverse effects; rHGH associated with better walking time than placebo; in a double-blind placebo-controlled RCT among older adults assigned to hemodialysis, rHGH led to gains in fat-free mass and decreased total body fat but no change in BMI compared to placebo ⁵²
Volicer et al. ²⁶	15	Adults (mean age 73) with Alzheimer's disease who were refusing food	Dronabinol 2.5 mg 2x daily or placebo for 6 weeks	Weight gain, agitation	7.0 ± 1.5 lb in first 6 weeks	4.6 ± 1.3 lb in first 6 weeks	Not significant; energy intake unchanged across groups and over time	Double-blind, cross-over; only 11 subjects completed study; numerous central nervous system side effects

Table 2 continued: Results of Trials of Pharmacologic Interventions to Treat Weight Loss in Older Adults

Trial	No. of patients	Patients	Intervention	Outcome measures	Intervention	Control	P-value	Comments
Yeh et al. ²³	51	Adults age 55 or older living in long-term care with $\geq 5\%$ loss of body weight in previous 3 months or 20% below ideal body weight	Megestrol acetate (MA) 800 mg daily or placebo for 12 weeks	Weight gain appetite improvement at 12 and 25 weeks	1.05 \pm 1.0kg at 12 weeks 2.95 \pm 1.4kg at 25 weeks	0.91 \pm 0.7kg at 12 weeks -0.45 \pm 0.9kg at 25 weeks	>0.2 at 12 weeks 0.043 at 25 weeks	Randomized double-blind; analyses not intention to treat; 18 drop-outs; appetite and weight continued to improve after 12 weeks of MA; no change in depression scores; 11 adverse events in MA group versus eight events in placebo group; no impact on survival; no other RCTs in older adults but extensive studies in individuals with cancer or HIV infection

BMI=body mass index; HIV=human immunodeficiency virus; RCT=randomized, controlled trials

Source: Alibhai SM, et al., 2005.⁴ Used with the permission of CMA.

megestrol acetate and placebo. Only one published clinical trial has demonstrated weight gain among older adults taking megestrol acetate²³ while a study by Reuben *et al.* contained alarming evidence of harmful side effects often linked with the drug, including deep venous thrombosis (DVT) and pulmonary embolus. Of the 35 subjects taking the drug, one was lost to follow-up and two had DVT, one with multiple pulmonary emboli. There were no reported DVTs in the placebo group.²⁴

Ornithine oxoglutarate or ornithine alphaketoglutarate, typically used to improve nutritional status in burn and other trauma patients, led to weight gain among older adults in one randomized trial²⁵ but has not been studied in other trials. In addition, no randomized trials of either cyproheptadine or dronabinol among older adults with weight loss have been conducted, although dronabinol has been studied in one trial involving individuals with dementia who were

refusing food.²⁶ Both medications are associated with significant side effects, particularly central nervous system toxicity.²⁶⁻²⁸ Among anabolic agents, a four-week randomized trial of human growth hormone in 20 undernourished older adults demonstrated slightly faster weight gain and improved walking time in those receiving the hormone compared to the placebo group. However, after four weeks, between-group differences in weight were no longer statistically significant.²⁹ Use of human growth hormone in other settings has been associated with increased mortality.³⁰ Several small clinical studies and crossover trials of androgenic agents have also been conducted but have shown little effect on weight gain.^{28,31} Other pharmacologic approaches, such as anticytokine therapies, antiepileptic therapies, and anti-inflammatory medications, are being investigated.^{28,32}

Regardless of the type of treatment strategy that is employed, it is important

for the clinician and patient to set short-term and long-term goals together and for the clinician to continue to monitor and reevaluate the patient's progress on a regular basis (Figure 1). It is reasonable for the clinician to reassess the patient within three months of instituting nonpharmacological therapy. Patients should be sure to share information with their clinician regarding how their appetite may have changed, whether they have complied with the treatment, and whether they are experiencing any new symptoms or side effects. Clinicians should continue to check for new or changing symptoms that may be clues to possible underlying illnesses causing the weight loss and, if necessary, explore different treatment options.

Conclusion

Unintentional weight loss is common among older adults and is associated with significant adverse health outcomes, increased mortality and progressive

Key Points

Clinicians should be careful not to dismiss weight loss as a natural consequence of the aging process without carefully ruling out other medical, social, and drug-related causes.

Up to one in four older adults experiencing weight loss have no discernable medical cause, and for many in this group, treatment often requires enabling access to good nutrition.

Dietitians and social workers may be of great help in the assessment and management of older adults with unintentional weight loss.

Short-term studies have shown that the use of oral nutritional supplements, such as high-energy and high-protein drinks, is a common and effective therapeutic strategy, but data on the value of long-term supplementation are somewhat limited.

The evidence supporting pharmacologic agents for the treatment of weight loss is limited, and most of these agents have harmful side effects.

The clinician and patient should set short-term and long-term weight maintenance/gain goals together, and the clinician is advised to monitor and reevaluate the patient's progress on a regular basis.

disability. The diagnoses are quite heterogeneous and may include reduced food intake, organic causes, or psychological disorders; however, among many older adults, no obvious medical cause can be identified. A variety of non-pharmacologic interventions may improve energy intake and lead to weight gain. In some cases, access to quality nutrition is the main issue. The most common approach to the treatment of weight loss among older adults is consumption of high-energy/high-protein oral supplements between meals as a means of increasing daily energy intake. The role for pharmacotherapy remains limited at present.



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References

- Smith KL, Greenwood C, Payette H, et al. An approach to the diagnosis of unintentional weight loss in older adults. *Geriatrics Aging* 2006;9:679–85.
- Wallace JI, Schwartz RS. Epidemiology of weight loss in humans with special reference to wasting in the elderly. *Int J Cardiol* 2002;85:15–21.
- Chumlea WC, Garry PJ, Hunt WC, et al. Distributions of serial changes in stature and weight in a healthy elderly population. *Hum Biol* 1988;60:917–25.
- Alibhai SM, Greenwood C, Payette H. An approach to the management of unintentional weight loss in elderly people. *CMAJ* 2005;172:773–80.
- Keller HH, Ostbye T, Bright-See E. Predictors of dietary intake in Ontario seniors. *Can J Public Health* 1997;88:305–9.
- Payette H, Gray-Donald K, Cyr R, et al. Predictors of dietary intake in a functionally dependent elderly population in the community. *Am J Public Health* 1995;85:677–83.
- Borst SE. Interventions for sarcopenia and muscle weakness in older people. *Age Ageing* 2004;33:548–55.
- de Jong N, Chin APMJ, de Graaf C, et al. Effect of dietary supplements and physical exercise on sensory perception, appetite, dietary intake and body weight in frail elderly subjects. *Br J Nutr* 2000;83:605–13.
- Fiatarone MA, O'Neill EF, Ryan ND, et al. Exercise training and nutritional supplementation for physical frailty in very elderly people. *N Engl J Med* 1994;330:1769–75.
- Meredith CN, Frontera WR, O'Reilly KP, et al. Body composition in elderly men: effect of dietary modification during strength training. *J Amer Geriatr Soc* 1992;40:155–62.
- Gray-Donald K, Payette H, Boutier V. Randomized clinical trial of nutritional supplementation shows little effect on functional status among free-living frail elderly. *J Nutr* 1995;125:2965–71.
- Kronold M, Coleman PH, Bradley CL, et al. Subjectively healthy elderly consuming a liquid nutrition supplement maintained body mass index and improved some nutritional parameters and perceived well-being. *J Am Diet Assoc* 1999;99:1542–8.
- Lipschitz DA, Mitchell CO, Steele RW, et al. Nutritional evaluation and supplementation of elderly subjects participating in a “meals on wheels” program. *JPEN J Parenter Enteral Nutr* 1985;9:343–7.
- Payette H, Boutier V, Coulombe C, et al. Benefits of nutritional supplementation in free-living, frail, undernourished elderly people: a prospective randomized community trial. *J Am Diet Assoc* 2002;102:1088–95.
- Wilson MM, Purushothaman R, Morley JE. Effect of liquid dietary supplements on energy intake in the elderly. *Am J Clin Nutr* 2002;75:944–7.
- Volkert D, Hubsch S, Oster P, et al. Nutritional support and functional status in undernourished geriatric patients during hospitalization and 6-month follow-up. *Aging Clin Exp Res* 1996;8:386–95.
- Milne AC, Potter J, Avenell A. Protein and energy supplementation in elderly people at risk from malnutrition. *Cochrane Database Syst Rev* 2002(3):CD003288.
- Wendland BE, Greenwood CE, Weinberg J, et al. Malnutrition in institutionalized seniors: the iatrogenic component. *J Amer Geriatr Soc* 2003;51:85–90.
- Karcic E, Philpot C, Morley JE. Treating malnutrition with megestrol acetate: literature review and review of our experience. *J Nutr Health Aging* 2002;6:191–200.
- Ottery FD, Walsh D, Strawford A. Pharmacologic management of anorexia/cachexia. *Semin Oncol* 1998;25(2 Suppl 6):35–44.
- Castle S, Nguyen C, Joaquin A, et al. Megestrol acetate suspension therapy in the treatment of geriatric anorexia/cachexia in nursing home patients. *J Amer Geriatr Soc* 1995;43:835–6.
- Jackobs MK. Megestrol acetate: a medical nutrition therapy tool to affect positive weight outcomes in the elderly [abstract]. *J Amer Dietetic Assoc* 1999;99(9 Suppl):A–119.
- Yeh SS, Wu SY, Lee TP, et al. Improvement in quality-of-life measures and stimulation of weight gain after treatment with megestrol acetate oral suspension in geriatric cachexia: results of a double-blind, placebo-controlled study. *J Amer Geriatr Soc* 2000;48:485–92.
- Reuben DB, Hirsch SH, Zhou K, et al. The effects of megestrol acetate suspension for elderly patients with reduced appetite after hospitalization: a phase II randomized clinical trial. *J Amer Geriatr Soc* 2005;53:970–5.
- Brocker P, Vellas B, Albaredo JL, et al. A two-centre, randomized, double-blind trial of ornithine oxoglutarate in 194 elderly, ambulatory, convalescent subjects. *Age Ageing* 1994;23:303–6.
- Volicer L, Stelly M, Morris J, et al. Effects of dronabinol on anorexia and disturbed behavior in patients with Alzheimer's disease. *Int J Geriatr Psychiatry* 1997;12:913–9.
- Kardinal CG, Loprinzi CL, Schaid DJ, et al. A controlled trial of cyproheptadine in cancer patients with anorexia and/or cachexia. *Cancer* 1990;65:2657–62.
- Morley JE. Orexigenic and anabolic agents. *Clin Geriatr Med* 2002;18:853–66.

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29. Chu LW, Lam KS, Tam SC, et al. A randomized controlled trial of low-dose recombinant human growth hormone in the treatment of malnourished elderly medical patients. *J Clin Endocrinol Metab* 2001;86:1913–20.
30. Takala J, Ruokonen E, Webster NR, et al. Increased mortality associated with growth hormone treatment in critically ill adults. *N Engl J Med* 1999;341:785–92.
31. Gherondache CN, Dowling WJ, Pincus G. Metabolic changes induced in elderly patients with an anabolic steroid (oxandrolone). *J Gerontol* 1967;22:290–300.
32. Hamerman D. Molecular-based therapeutic approaches in treatment of anorexia of aging and cancer cachexia. *J Gerontol A Biol Sci Med Sci* 2002;57:M511–8.
33. Bouras EP, Lange SM, Scolapio JS. Rational approach to patients with unintentional weight loss. *Mayo Clin Proc* 2001;76:923–9.
34. Huffman GB. Evaluating and treating unintentional weight loss in the elderly. *Am Fam Phys* 2002;65:640–50.
35. Buckler DA, Kelber ST, Goodwin JS. The use of dietary restrictions in malnourished nursing home patients. *J Amer Geriatr Soc* 1994;42:1100–2.
36. Kayser-Jones J, Schell ES, Porter C, et al. A prospective study of the use of liquid oral dietary supplements in nursing homes. *J Amer Geriatr Soc* 1998;46:1378–86.
37. Newman AB, Yanez D, Harris T, et al. Weight change in old age and its association with mortality. *J Amer Geriatr Soc* 2001;49:1309–18.
38. Young KW, Binns MA, Greenwood CE. Meal delivery practices do not meet needs of Alzheimer patients with increased cognitive and behavioral difficulties in a long-term care facility. *J Gerontol A Biol Sci Med Sci* 2001;56:M656–61.
39. Young KW, Greenwood CE. Shift in diurnal feeding patterns in nursing home residents with Alzheimer's disease. *J Gerontol A Biol Sci Med Sci* 2001;56:M700–6.
40. Winograd CH, Brown EM. Aggressive oral refeeding in hospitalized patients. *Am J Clin Nutr* 1990;52:967–8.
41. Soltesz KS, Dayton JH. The effects of menu modification to increase dietary intake and maintain the weight of Alzheimer residents. *Am J Alzheimers Dis Other Demen* 1995;10:20–3.
42. Boylston E, Ryan C, Brown C, et al. Increasing oral intake in dementia patients by altering food texture. *Am J Alzheimers Dis Other Demen* 1995;10:37–9.
43. Doty R. Food preference ratings of congenitally anosmic humans. In: Kare M, Maller O, eds. *Chemical Senses and Nutrition*. New York: Academic Press; 1977:315–25.
44. Reife CM. Involuntary weight loss. *Med Clin North Am* 1995;79:299–313.
45. Langan MJ, Yearick ES. The effects of improved oral hygiene on taste perception and nutrition of the elderly. *J Gerontol* 1976;31:413–8.
46. Olin AO, Osterberg P, Hadell K, et al. Energy-enriched hospital food to improve energy intake in elderly patients. *JPEN J Parenter Enteral Nutr* 1996;20:93–7.
47. Schiffman SS, Warwick ZS. Effect of flavor enhancement of foods for the elderly on nutritional status: food intake, biochemical indices, and anthropometric measures. *Physiol Behav* 1993;53:395–402.
48. Mathey MF, Siebelink E, de Graaf C, et al. Flavor enhancement of food improves dietary intake and nutritional status of elderly nursing home residents. *J Gerontol A Biol Sci Med Sci* 2001;56:M200–5.
49. Gray-Donald K, Payette H, Boutier V, et al. Evaluation of the dietary intake of homebound elderly and the feasibility of dietary supplementation. *J Am Coll Nutr* 1994;13:277–84.
50. Dangour AD, Sibson VL, Fletcher AE. Micronutrient supplementation in later life: limited evidence for benefit. *J Gerontol A Biol Sci Med Sci* 2004;59:659–73.
51. Position of the American Dietetic Association: nutrition, aging, and the continuum of care. *J Am Diet Assoc* 2000;100:580–95.
52. Roy MA, Payette H. Meals-on-Wheels improves energy and nutrient intake in a frail free-living elderly population. *J Nutr Health Aging* 2006;10:554–60.
53. Johannsson G, Bengtsson BA, Ahlmen J. Double-blind, placebo-controlled study of growth hormone treatment in elderly patients undergoing chronic hemodialysis: anabolic effect and functional improvement. *Am J Kidney Dis* 1999;33:709–17.