

BMJ (Published 29 March 2011)

Cite this as: BMJ 2011; 342:d1732

Investigation and management of unintentional weight loss in older adults

1. Jenna McMinn, foundation year 2, medicine¹, - Queen Elizabeth National Spinal Injuries Unit, Southern General Hospital, Glasgow
2. Claire Steel, specialist trainee year 6 in medicine for the elderly², - Department of Medicine for the Elderly, Monklands Hospital, Airdrie, UK
3. Adam Bowman, consultant physician³ - Department of Medicine for the Elderly, Glasgow Royal Infirmary, Glasgow

Summary points

- **Unintentional weight loss is common in elderly people and is associated with considerable morbidity and mortality**
- **Weight loss is clinically relevant if more than 5% of body weight is lost over 6-12 months, although smaller losses may be important in frail elderly people**
- **Causes can be classified as organic (malignant and non-malignant), psychological, social, or unknown**
- **Drugs should be reviewed because side effects often contribute to weight loss**
- **All patients should be assessed by a dietitian and screened for depression and cognitive impairment**
- **If initial history, examination, and investigations are normal, three months of “watchful waiting” is preferable to further blind investigations**

Unintentional weight loss occurs in 15-20% of older adults (those over 65) and is associated with increased morbidity and mortality.¹ Clinical and epidemiological studies have reported even higher prevalence in certain populations, with as many as 27% of community dwelling elderly people and 50-60% of nursing home residents being affected.

Weight loss may be the presenting problem or an incidental finding during a consultation for other reasons. There are no published guidelines on how to investigate and manage patients with unintentional weight loss, and responses range from doing nothing (if it is viewed as a normal part of the ageing process) to extensive blind investigation because of the fear that it represents underlying cancer.

Observational studies have shown that in as many as 25% of cases no identifiable cause is found, despite extensive investigation.³ It is not clear how far clinicians should go to investigate older patients with unintentional weight loss in the absence of an obvious medical cause.

We review the available evidence (mainly epidemiological and observational studies) and outline a structured approach to investigation and management of the older patient with unintentional weight loss.

Sources and selection criteria

We searched the literature for current clinical or best practice guidelines, trials, reviews, and relevant publications. We used online resources including the Cochrane and TRIP databases, Medline, and Google in addition to specific sites such as the Scottish Intercollegiate Guidelines Network (SIGN),¹ the National Institute for Health and Clinical Excellence (NICE), and the British Geriatrics Society.

We then performed Medline and Google searches, using keywords “unintentional”, “weight loss”, and “elderly”. The term “unintentional” was also substituted with “involuntary” and “unexplained” to expand our search. We later performed further specific searches to explore particular aspects of this article.

When is unintentional weight loss clinically important?

Age related physiological changes occur in elderly people and contribute to the so called “anorexia of ageing.” These include a reduction in lean body mass, bone mass, and basal metabolic rate; reduced sense of taste and smell; and altered gastric signals leading to early satiation.⁵ However, observational studies of healthy older adults report this normal age related weight loss to be only 0.1-0.2 kg a year,⁶ and most elderly patients maintain weight over a reasonably long period of 5-10 years.⁷ Substantial weight loss should not be dismissed as natural age related change and should be investigated.

Although no universally accepted definition of clinically important weight loss exists, most observational studies define it as a 5% or more reduction in body weight over 6-12 months. To take into account the variability of baseline weight, weight loss is best expressed as a percentage rather than an absolute value; a loss of 2-3 kg is less important in a 90 kg patient than in a frail elderly patient who is underweight already.

Reported mortality within 1-2.5 years of clinically important weight loss ranges from 9% to 38%,^{1 w2} and those particularly at risk include frail elderly people,^{w1} those with low baseline body weight,^{w3} and elderly patients recently admitted to hospital.^{1 7}

Substantial weight loss has been shown to be associated with an increased risk of in-hospital and disease related complications,⁹ increased disability and dependency,⁷

higher rates of admission to residential home or nursing home,^{w1} and poorer quality of life.^{w4} At the extreme, cachexia (the disproportional loss of skeletal muscle rather than body fat, which leads to skeletal and cardiac muscle wasting, loss of visceral protein, and alterations in physiological functions including impaired immunity and a systemic inflammatory response) contributes to adverse outcomes through increased rates of infection, poor wound healing, pressure sores, reduced response to medical treatment, and increased risk of mortality.^{10 w5}

Weight loss in elderly people significantly increases the rate of hip bone loss and the risk of hip fracture. In a prospective cohort study of 6785 elderly women, weight loss—both intentional and unintentional—of 5% or more from baseline weight (regardless of whether baseline weight was low or normal) almost doubled the risk of subsequent hip fracture (odds ratio 1.8, 95% confidence interval 1.43 to 2.24) compared with those with stable or increasing weight.¹¹

What can cause unintentional weight loss in older adults?

Although involuntary weight loss in younger adults often has a medical cause, in older patients causes are more diverse, with psychiatric and socioeconomic factors playing an important part.

Prospective and retrospective studies from Germany, Belgium, Israel, the United States, and Spain have looked at patients who were investigated for involuntary weight loss to determine the common causes and their relative frequency (table 1) The studies varied considerably in terms of country, age of patients (most were not confined to the elderly), length of follow-up, and the type of patients recruited. However, cancer, non-malignant gastrointestinal disease, and psychiatric problems (particularly dementia and depression) were consistently among the most common causes of unintentional weight loss).

Table 1

Observational studies of causes of unintentional weight loss (see below)

Several aids have been devised to enable doctors to consider the many possible causes of unintentional weight loss in older patients. These include the “9 Ds of weight loss in the elderly”¹⁴ and “meals on wheels”¹⁵ mnemonics (box 1). Our approach is to group the possible causes of weight loss into organic (malignant and non-malignant), psychosocial, and unknown causes.

Box 1 Mnemonics for causes of unintentional weight loss in elderly people

9 Ds of weight loss in elderly

- Dementia
- Depression

- Disease (acute and chronic)
- Dysphagia
- Dysgeusia
- Diarrhoea
- Drugs
- Dentition
- Dysfunction (functional disability)
- (Don't know was later added as a 10th "D")^{w7}

Meals on wheels

- M: Medication effects
- E: Emotional problems (especially depression)
- A: Anorexia nervosa, alcoholism
- L: Late life paranoia
- S: Swallowing disorders
- O: Oral factors (such as poorly fitting dentures, caries)
- N: No money
- W: Wandering and other dementia related behaviours
- H: Hyperthyroidism, hypothyroidism, hyperparathyroidism, hypoadrenalism
- E: Enteric problems
- E: Eating problems (such as inability to feed self)
- L: Low salt, low cholesterol diet
- S: Stones, social problems (such as isolation, inability to obtain preferred foods)

Organic causes of unintentional weight loss in elderly people (see below)

Psychosocial

Published observational studies (summarised in table 1) report that psychiatric problems, particularly dementia and depression, are the main cause of unexplained weight loss in 10-20% of elderly patients. This figure rises to 58% in nursing home residents.¹⁷

Cognitive impairment

Patients with cognitive impairment who are agitated or have a tendency to “wander” can expend substantial energy. Others may forget that they have to eat or become suspicious and paranoid about food.¹ Self feeding skills are lost with the progression of Alzheimer’s disease and dysphagia may develop.^{w9}

Depression

Depression can lead to weight loss because of loss of appetite or reduced motivation to buy and prepare food. Depression is more commonly associated with weight loss in elderly people than in younger adults,^{w10} and it was associated with increased mortality in a systematic review of elderly patients (>65 years) living in the community (estimated odds ratio for mortality with depression of 1.73, 1.53 to 1.95).¹⁸

Reported rates of depression in the community vary dramatically according to a systematic review of 34 community based studies of the prevalence of depression in later life (>55 years), but they can be as high as 35%, depending on the criteria used to define depression.¹⁹ Even higher prevalences have been reported in institutionalised elderly patients^{w7 w10}

Socioeconomic factors

Poverty or social isolation may contribute to weight loss in elderly people through inadequate food intake and malnutrition.²⁰ Physical or cognitive impairment may prevent elderly people from shopping for themselves and may reduce the availability of preferred foods. Inability to cook or feed themselves may further contribute to insufficient food intake because they may rely on family members or carers, who may visit at erratic times.

Unknown

The cause of weight loss remained unknown in 16-28% of patients in published prospective and retrospective observational studies, despite extensive investigation over periods ranging from six months to three years.^{3 4 8 12 13} This may be because elderly patients often have multiple comorbidities rather than one serious illness, are on multiple drugs, and may have psychological or social problems. Each individual

factor might not be sufficient to cause substantial weight loss, but the cumulative effect of all the factors might result in clinically important weight loss.

All studies that have assessed prognosis in elderly patients with unintentional weight loss have found that patients who fall into this category of “unknown cause” have a much better prognosis than those diagnosed with cancer,^{3 12} and no worse than that of patients diagnosed with non-malignant causes.³ Cancers diagnosed in the setting of involuntary weight loss usually have a poor prognosis because they are often advanced by the time weight loss becomes apparent.⁴

How is unintentional weight loss in older adults investigated?

We present our approach to investigation, which is based on an extensive literature review (fig 1 [↓](#)). We know of no clinical guidelines or standardised system for investigating this common and complex problem.

Evaluation of unintentional weight loss in elderly people

Initial evaluation of the patient involves a detailed history, clinical examination, and baseline investigations. The findings should be used to guide further investigation.

History

Try to establish the exact amount of weight loss over a specified time. Questions about appetite may help elucidate whether the weight loss is caused by inadequate

energy intake or has occurred despite an adequate intake. A corroborative history from relatives or carers may help in patients with cognitive impairment.

Previous and current medical history may identify conditions that could have led to weight loss (see table 2) and drugs that may contribute via their side effects.

Social history may elicit information on alcohol intake (which might contribute to malnutrition or vitamin deficiency) and smoking (a risk factor for cancer and other organic diseases). It is important to elucidate the patient's social circumstances. Who does he or she live with? Who buys and prepares the food? Is there any home help or help from family members?

A history that includes a review of systems may elicit additional symptoms that might direct further investigation.

In addition, screen all patients for cognitive impairment and depression using standardised assessment tools.^{21 22} w11

Some authors recommend a nutritional assessment only when no evidence of organic disease is found.^{1 8} We believe, however, that all elderly patients presenting with unintentional weight loss should undergo nutritional assessment by a dietitian. This is because malnutrition has a high prevalence in elderly people and might still be present even when an organic cause of the weight loss is found.

We suggest that patients seen in primary care (by general practitioners)—where facilities (and time) for assessing cognitive function, mood, and nutritional status are not always readily available—should be referred to specialists in the care of older people.

Physical examination

In patients with unintentional weight loss a full physical examination should aim to exclude major cardiovascular and respiratory illnesses, as well as abdominal masses, organomegaly, prostate enlargement, and breast masses that may indicate cancer. Palpable lymphadenopathy could indicate infection, cancer, or haematological disease. Examine the mouth to exclude any obvious dental problems, poor oral hygiene, dry mouth, or lesions that may make chewing and swallowing difficult or painful.

Baseline investigations

Baseline investigations for all patients should include bloods tests (full blood count, urea and electrolytes, liver function tests, thyroid function tests, C reactive protein, glucose, and lactate dehydrogenase), chest radiography, urinalysis, and faecal occult blood testing.^{1 4 12 13 23} The rationale behind these baseline tests is explained in box 2.

Baseline tests for investigating unexplained weight loss in older people

Blood tests

Full blood count

- Anaemia is suggestive of an organic cause of weight loss,¹³ and it should prompt further investigations, which will depend on the type of anaemia (microcytic, macrocytic, etc). A raised white cell count may also suggest organic disease (malignant, infectious, or inflammatory processes) and was felt to be an important variable in several observational studies that assessed likelihood of a malignant or other organic cause of unintentional weight loss^{4 13}

Urea and electrolytes

- Although the published studies do not seem to find this a particularly helpful test in predicting an organic versus non-organic cause for weight loss,^{4 13} it is a reasonable investigation to perform at this stage and abnormal results may point towards an organic cause

Liver function tests, including γ -glutamyl transpeptidase and albumin

- Normal liver function tests make serious organic causes for weight loss less likely, particularly cancer, which is usually advanced by the time weight loss occurs.⁴ Alkaline phosphatase is particularly useful because it can be raised when liver or bone disease is present. One observational study found that alkaline phosphatase >300 IU/L increased the likelihood of a malignant cause of weight loss (odds ratio 14.7) and serum albumin >35 g/L reduced the likelihood (0.11)¹³

Thyroid function tests

- Hyperthyroidism is a common endocrinal cause of weight loss

C reactive protein and erythrocyte sedimentation rate

- Normal test results make a serious organic cause for the weight loss less likely. In one observational study, C reactive protein was raised in 91% of patients subsequently diagnosed with malignancy, and in 69% of patients with non-malignant organic disease.⁴ In another study,¹³ a raised erythrocyte sedimentation rate was associated with an increased likelihood of malignancy (2.9, 1.7 to 5.1). Erythrocyte sedimentation rate can also be raised in other organic disorders including systemic inflammatory disorders. A raised erythrocyte sedimentation rate or C reactive protein would therefore point towards a possible organic cause for the weight loss

Serum glucose

- Uncontrolled diabetes is a common endocrinal cause of weight loss

Lactate dehydrogenase

- Lactate dehydrogenase >500 IU/L is associated with an increased likelihood of a malignant cause of involuntary weight loss (26.9)¹³

Chest radiography

- Chest radiography should be performed in all patients to identify respiratory disease, including malignant and non-malignant causes^{1 4}

Urinalysis

- Urinalysis is included in almost all studies as part of the initial evaluation and is non-invasive and inexpensive; however, the published studies do not specify its diagnostic benefit as part of the initial evaluation of elderly patients with unintentional weight loss, only that it is of less value than other investigations⁴

Faecal occult blood analysis

- Because of the high proportion (about a third) of patients with an underlying gastrointestinal disorder,³ whether malignant or non-malignant, such analysis is a reasonable first line investigation. It is non-invasive (compared with endoscopy), and although it is not particularly sensitive or specific, a positive result would prompt further investigation of the gastrointestinal tract (such as endoscopy or colonoscopy)

Tumour markers are not useful diagnostic tests; they should not be used as part of the initial evaluation and may be misleading.^{1 24} Their role is in monitoring response to treatment in patients with cancer or detecting tumour recurrence early after treatment. Abnormal findings on initial evaluation should be used to guide further investigations into the cause of the weight loss.

If the history, examination, and baseline investigations are all normal, published evidence suggests that further investigation is not warranted immediately and that three months' "watchful waiting" is advisable, rather than a blind pursuit of additional, more invasive or expensive investigations. Because organic disease is found only rarely in patients with normal results from physical examination and laboratory tests, this waiting period is unlikely to have an adverse outcome.^{3 4}

Although three scoring systems have been developed to help clinicians identify which patients with weight loss are likely to have a physical or malignant cause rather than a psychological or social cause,^{8 13 23} none of these has been validated in independent populations presenting with weight loss.

Should a negative baseline reassure?

The claim that a negative baseline evaluation should reassure the clinician of the lack of serious underlying disease is based on only small non-randomised studies. Most of these are also not limited to elderly patients (in the UK defined as >70 years of age). However, most authors agree that in elderly patients with clinically relevant

unintentional weight loss, major organic (and especially malignant) diseases are highly unlikely when a thorough baseline evaluation is normal, and that in this setting a watchful waiting approach may be preferable to undirected and invasive testing.^{1 3 4 13 23}

There is currently no evidence that blind computed tomography scanning is helpful in investigating such patients. Disadvantages of blind computed tomography scanning include high costs (with low yield) and the likelihood of finding “incidental-omas.”

Several studies have used abdominal ultrasound as part of their initial evaluation, although they did not comment on its usefulness in this role, noting only that 27% of patients with underlying cancer had hepatomegaly on examination and a similar percentage had palpable masses.⁴ Abnormal findings on examination (or abnormal liver function tests) would have prompted further investigation anyway.

Gastrointestinal disorders (malignant and non-malignant) account for about a third of all causes of unexplained weight loss in studies of adults of all ages, so some authors advocate upper gastrointestinal endoscopy in patients as a first line investigation.³ However, because endoscopy is invasive and not without risk (particularly for elderly patients), we think that it should be reserved for patients in whom it is indicated on the basis of history, examination, or baseline investigations (such as a history of gastrointestinal bleeding or evidence of iron deficiency anaemia).

In one study where patients with a normal baseline evaluation underwent further investigations including computed tomography and endoscopy, only one additional diagnosis was made (a patient diagnosed with lactose intolerance).⁴

Managing unexplained weight loss in elderly people

The primary principle of management is to identify and treat any underlying causes. Optimal management often requires multidisciplinary assessment (doctors, dentists, dietitians, speech therapists, physiotherapists, occupational therapists, social services).^{20 w12} We strongly suggest reviewing drugs in an attempt to eliminate those whose side effects may contribute to weight loss.

If a psychiatric cause of weight loss, such as depression, is suspected we recommend assessment by a psychogeriatrician or psychologist. In such cases, consider treatment with an antidepressant because depression is a potentially reversible cause of weight loss.^{w12}

If the initial baseline evaluation is negative, we suggest that patients are reassessed after three months to establish if any further symptoms or signs have developed and to check their weight. In the interim, because evidence to support any drug treatment is lacking,^{1 20} a variety of non-drug based interventions can be used (outlined in box 3).

Box 3 Non-drug based interventions for unexplained weight loss in elderly patients

Optimise food intake

- Encourage the patient to eat smaller meals more often
- Encourage the patient to eating favourite foods and snacks, and minimise dietary restrictions (which are often energy poor and less palatable, therefore cause increased risk of weight loss in elderly patients)^{2 w13 w14}
- High energy foods should be eaten at the main meal of the day (elderly people, particularly those with dementia, tend to consume most of their daily energy at breakfast)²⁵
- Optimise and vary dietary texture—this is of particular benefit in patients with dementia²⁶
- Eating in company or with assistance is useful. Eating in company has been suggested to improve enjoyment of meals and therefore increase intake.² Many elderly people have physical or cognitive disabilities that impair their ability to feed themselves without assistance or prompting
- Community nutritional support services (such as “meals on wheels” programmes) are recommended for elderly patients in the community to improve dietary intake

Oral nutritional supplements if recommended by the dietitian

- Oral nutritional supplements (such as high energy drinks) have been shown to increase daily energy intake and weight gain, although evidence that they result in long term benefit in terms of health, functional ability, and survival in undernourished elderly patients is limited
- Supplements should be taken between meals to avoid appetite suppression and decreased intake of food at meal times²⁰

Daily multivitamin tablet

- There is little evidence that this leads to a reduction in weight loss. However, it is recommended by some authors because of the high prevalence of nutritional deficiencies in elderly people

Ensure adequate oral health

- Problems with dentition and oral health are commonly overlooked causes of weight loss^{w15}

Regular exercise or physiotherapy

- Regular exercise (particularly resistance training) is also recommended for frail elderly patients because it stimulates appetite and prevents sarcopenia. Physiotherapy may help achieve this in some patients

Tips for non-specialists

- General practitioners and non-specialist hospital doctors should perform the initial history, examination, and baseline investigations
- Refer any abnormality suggesting a possible organic cause for the weight loss to the appropriate specialty
- If no obvious cause is found, the referrer can undertake the three months of watchful waiting or refer to secondary care (medicine for the elderly), where facilities for multidisciplinary assessment are often better
- If the initial evaluation and watchful waiting are undertaken by primary care, repeat the history, examination, and investigations at the end of this period. If no cause is identified and the patient is still losing weight, refer to secondary care

Further research and unanswered questions

- Most published studies are based on small numbers of patients, focus on unintentional weight loss in adults of all ages, and many are more than 10 years old
- Studies focusing on elderly people are needed—ideally multicentre studies with large numbers of patients and with longer follow-up periods to see whether additional diagnoses are made and whether these patients continue to lose weight
- If the patient is referred to secondary care, weight loss persists or progresses but no cause has been identified after three months of watchful waiting, what then?
- Should we continue to assess at regular three monthly intervals? Should we consider blind investigations?

Investigation and management of unintentional weight loss in older adults

Table 1

Observational studies of causes of unintentional weight loss

Study	Follow-up of patients (months)	Mean age	Most common cause of	Unknown
		(years)	weight loss	cause of weight loss
Prospective German study of 158 men and women in secondary care ³	25-36	68 (SD 14)	Cancer (24%) especially gastrointestinal (53% of cancers)	16%
			Non-malignant gastrointestinal disorders (19%)	
			Endocrine disease (11.4%)	
			Psychological (10.8%)	
			Cardiopulmonary disease (10.1%)	
Prospective Belgian study of 101 men and women in secondary care ⁴	≥6	64 (SD 13)	Malignancy (22%) especially gastrointestinal (45% of cancers)	28%
			Psychological (16%)	
			Non-malignant GI disorders (15%)	
			Infectious diseases (8%)	
			Systemic inflammatory disorders (4%)	
Prospective study from the US of 91 men, mostly inpatients ⁸	12	58 (SD 18)	Malignancy (19%)	26%
			Non-malignant gastrointestinal disorders (14%)	
			Psychiatric disorders (9%)	
			Cardiovascular disease (9%)	
			Alcohol related disease (8%)	
Retrospective Israeli study of 154 male and female inpatients ¹²	30	64 (range 27-88)	Malignancy (36%)	23%
			Non-malignant gastrointestinal disorders (17%)	

Study	Follow-up of patients (months)	Mean age (years)	Most common cause of weight loss	Unknown cause of weight loss
			Psychiatric disorders (10%)	
			Endocrine disease, infectious disease, renal disease (4% each)	
Retrospective study of 50 male and female outpatients in the US ^{w6}	24	>63	Psychiatric (20%)	24%
			Malignancy (16%)	
			Non-malignant gastrointestinal disorders (11%)	
			Endocrine disease (9%)	
			Neurological disease (7%)	
Retrospective study of 236 inpatients and 92 outpatients in the US ¹³	>12	65 (SD 17)	Malignancy (35%)	6% (although 30 patients were lost to follow-up)
			Psychiatric (24%)	
			Non-malignant gastrointestinal disorders (8.8%)	
			Endocrine disease (7%)	
			Rheumatic disease (7%)	

SD=standard deviation.

Investigation and management of unintentional weight loss in older adults

Table 2

Organic causes of unintentional weight loss in elderly people ^{1 3 4 8 12 13 w6*}

Causes	Comments
Cancer (16-36%)*	
Gastrointestinal malignancy	About 50% of cancers that present with weight loss are gastrointestinal in origin ^{3 4}
Other cancers (most often lung, lymphoma, prostate, ovarian, or bladder)	Non-gastrointestinal cancers present less commonly with involuntary weight loss, which tends to be a later feature
Non-malignant organic disorders	
Gastrointestinal disorders (11-19%):	

Causes	Comments
These include motility or swallowing disorders, peptic ulcers, gallstones, mesenteric ischaemia, and malabsorption disorders such as coeliac disease	Mechanisms contributing to weight loss include dysphagia, chronic nausea, pain related to eating (leading to food avoidance), and malabsorption
Other chronic diseases:	
These include congestive cardiac failure and other cardiac diseases (2-9%), chronic obstructive pulmonary disease and other respiratory diseases (6%), endocrine disease (4-11%), neurological disorders (2-7%), end stage renal failure (4%), connective tissue diseases (2-4%), and chronic or /recurrent infection (2-5%)	Any disease that increases metabolic demand or leads to a catabolic state can lead to weight loss despite a normal food intake; weight loss is often an indicator of disease severity in chronic disease ¹ ; elderly patients often do not fully regain weight lost because of acute stressful events, so a history of recurrent infections may lead to serious weight loss
Oral and dental problems:	
Poor dentition, ill fitting dentures, xerostomia (dry mouth)—often as a result of drugs	Often overlooked by the medical profession, but can lead to serious weight loss as a result of inadequate energy intake; the number of oral and dental problems has been shown to be an important predictor of weight loss at one year ^{w8}
Side effects of drugs†	
Anorexia (antibiotics, digoxin, opiates, selective serotonin reuptake inhibitors, anticonvulsants, antipsychotics, amantadine, metformin, benzodiazepines), nausea and vomiting (antibiotics, bisphosphonates, digoxin, dopamine agonists, levodopa, opiates, selective serotonin reuptake inhibitors, tricyclics), dry mouth (anticholinergics, loop diuretics, antihistamines), altered taste or smell (angiotensin converting enzyme inhibitors, calcium channel blockers, propranol, spironolactone, iron, anti-parkinsonian drugs (levodopa, pergolide, selegiline), opiates, gold, allopurinol), dysphagia (bisphosphonates, antibiotics, levodopa,	This is a particular problem in elderly patients because of the prevalence of polypharmacy, which in itself is known to interfere with taste and cause anorexia ¹⁶ ; drugs such as sedatives and opiate analgesics may interfere with cognition and affect the patient's ability to eat

Causes	Comments
gold, iron, non-steroidal anti-inflammatory drugs, potassium)	

*Percentages are based on the published studies referenced above.

†Drugs listed are only a few examples of commonly used drugs that cause these side effects and this is not intended to be a comprehensive list

<http://www.bmj.com/content/342/bmj.d1732/T2.expansion.html>