

Module 31.1

Nutrition in Anorexia Nervosa

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Learning Objectives

- To understand the diagnostic criteria for anorexia nervosa (AN) and how to differentiate it from other eating disorders;
- To carry out an adequate assessment and diagnosis of nutritional status;
- To become aware of the medical complications that occur in AN and how to manage them;
- To become familiar with the techniques of nutritional support in AN, particularly in the severely undernourished patient;
- To learn how to prevent and treat the refeeding syndrome for which AN patients have a high risk.

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Key Messages

- Anorexia Nervosa is a psychiatric illness which frequently becomes chronic and may be accompanied by severe medical and nutritional complications;
- The prognosis of Anorexia Nervosa is improved by early diagnosis and treatment;

- Nutritional support is an essential element in the integrated treatment of AN;
- The worse the degree of malnutrition, the more cautious and gradual should be the refeeding process, in order to avoid the refeeding syndrome to which AN patients are especially vulnerable;
- For optimal management AN requires a multidisciplinary team with broad experience in the field. It is recommended that patients be managed in specific eating disorders clinics.

Introduction

Eating disorders are classified in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) and also in the World Health Organization Classification of Mental and Behavioural Disorders (ICD-10) as anorexia nervosa (AN) and bulimia nervosa (BN), on the basis of the groups of symptoms with which they present (1,2) (see Table 1).

Table 1. Eating disorders (2) (F50)

World Health Organization. Classification of Mental and Behavioural Disorders (ICD-10). Geneva: World Health Organization, 1992.

F50.0 Anorexia nervosa
F50.1 Atypical anorexia nervosa
F50.2 Bulimia nervosa
F50.3 Atypical bulimia nervosa
F50.4 Overeating associated with other psychological disturbances
F50.5 Vomiting associated with other psychological disturbances
F50.8 Other eating disorders
F50.9 Eating disorder, unspecified

Some other patients may also have a mixture of eating disorder symptoms and signs that cannot be categorized as either AN or BN and are diagnosed as eating disorder not otherwise specified (ED-NOS).

As a psychiatric illness, anorexia nervosa (AN) is an eating disorder that occurs most commonly in adolescent girls and young women. It is characterized by disturbances in eating behaviour, excessive concern about body shape or weight and deliberate weight loss. The patient often denies symptoms and is reluctant to seek treatment, being prone to present with severe medical and nutritional complications.

Although the fundamental causes of AN remain unknown, there is growing evidence that the interaction of socio-cultural, genetic and biological factors may contribute to its causation, as do less specific psychological mechanisms in a vulnerable personality. The disorder is accompanied by undernutrition of varying severity, with resulting secondary endocrine and metabolic changes and alterations of body function.

Eating disorders have been reported in up to 4% of adolescents and young adults. Both anorexia and bulimia nervosa are more commonly seen in females with estimates of male-to-female ratio ranging from 1:6 to 1:10 (3-6).

Regarding outcome, long-term follow-up shows recovery rates ranging from 44 to 76%. Mortality (up to 20% in some studies) is primarily from cardiac arrest or suicide. Data from Lowe B et al showed that after a 21-year follow-up of an AN cohort, 51% of the patients were found to be fully recovered, 21% were partially recovered, and 10% still met full diagnostic criteria for AN. Sixteen per cent were deceased, due to causes related to anorexia nervosa, giving a standardized mortality rate of 9.8. In this study, a low body mass index and a greater severity of social and psychological problems were identified as predictors of a poor outcome (7). A more recent study based on a global 12-year eating disorder's outcome score found that 7.7% of individuals had died. Predictors of an unfavourable outcome were the presence of sexual problems, impulsivity, long duration of inpatient treatment, and long duration of the eating disorder (8).

Favourable prognostic factors, apart from being treated by an experienced multidisciplinary team, are insight with an admission of illness and an improved self-esteem. Unfavourable factors are initial severe undernutrition, presence of purging, failure to respond to previous treatment, some co morbidities, disturbed family relationships and parental conflicts.

2. Diagnosis

2.1. Clinical History

For a definite diagnosis of AN, all the DSM-IV or ICD-10 criteria (1,2) are required. See Tables 2 and 3 to check the criteria that must be fulfilled. There are 2 subtypes of AN:

- Restricting Type. In this type, weight loss is accomplished through dieting, fasting, or increased physical activity; these patients do not usually indulge in binge eating or purging.

- Binge-Eating/Purging Type. These individuals present with binge eating, purging or both, associated with other symptoms of anorexia nervosa. The term purging includes not only vomiting, but also the misuse of laxatives, enemas and diuretics.

Table 2. Diagnostic Criteria for Anorexia Nervosa (1)

Adapted from: American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision DSM-IV-TR. Washington, DC, American Psychiatric Association, 2000.

- 1 Refusal to maintain weight at or above a minimally normal weight for age and height (e.g., more than 15 percent below ideal body weight).
- 2 Intense fear of weight gain or becoming obese, even though underweight.
- 3 Disturbance in the way in which one's body weight or shape is experienced, undue influence of body weight or shape on self-evaluation, or rejection of the seriousness of the current low body weight.
- 4 In postmenarcheal females, amenorrhea, i.e., the absence of at least three successive menstrual cycles.
- 5 Types:
 - Restricting Type:** during the current episode of Anorexia Nervosa, the person has not regularly engaged in binge-eating or purging behaviour (i.e., self-induced vomiting or the misuse of laxatives, diuretics, or enemas).
 - Binge-Eating/Purging Type:** during the current episode of Anorexia Nervosa, the person has regularly engaged in binge-eating or purging behaviour.

There are also some incomplete forms of AN, defined as *Atypical Anorexia Nervosa*. In this case, some important features of AN may be absent, e.g. weight loss or amenorrhea, although other symptoms are fairly characteristic of AN.

Other features associated with AN may be depressive symptoms with social isolation, insomnia, hypersomnia, gloomy mood or even irritability. All these may due to a depressive disorder but may also be secondary to undernutrition, as amenorrhea, constipation, cold intolerance, lethargy or even hyperactivity. Some other psychiatric comorbidities such as personality or obsessive-compulsive disorders may be also present. The Binge-Eating/Purging Types are more prone to manifest impulse-control disorders and abuse of alcohol or other drugs.

2.2. Physical Examination

Most of the physical signs in AN are secondary to malnutrition. In addition to emaciation, there may also present dryness of the skin, acrocyanosis and lanugo (fine hair) on the arms and trunk. Hypotension, hypothermia, and bradycardia may be detected; abdominal examination and neurological examination are also important to rule out other causes of weight loss or vomiting. Patients who cause purging by vomiting may have

gingivitis, enamel erosion of the anterior teeth (figure 1), parotid gland enlargement (figure 2) and, less frequently, scars on the dorsum of the hand and knuckles (Russell's sign) because of abrasion when vomiting is induced (figure 3).



Figure 1. Gingivitis and enamel erosion in a patient with Anorexia Nervosa (purging type).



Figure 2. Parotid enlargement in a patient with Anorexia Nervosa (purging type).



Figure 3. Russell's sign in a patient with Anorexia Nervosa (purging type).

Hypercarotenaemia is uncommon but may be evidenced by a yellowing of the skin, specially in the hands (figure 4). When micronutrient deficiencies are present, these may accompany with the classical features of these conditions (see module on Micronutrient deficiencies).



Figure 4. Hypercarotenaemia in a patient with Anorexia Nervosa.

2.3. Nutritional Assessment

In AN there is a moderate to severe reduction in food intake leading to severe depletion of body energy stores and wasting of adipose tissue. After some days of adaptation to a hypocaloric diet, energy is derived mainly from fat stores leading to ketosis. This is mediated by a fall in insulin levels and an increase in catabolic hormones (see module on starvation 5.1) There is relative sparing of protein stores, and the blood concentrations of visceral proteins such as albumin are usually normal unless there is an accompanying inflammatory process e.g. infection. However, in severe nutritional depletion (BMI < 15) muscle as well as fat mass becomes progressively depleted. Individuals with a current weight below 70% of ideal or very rapid recent weight loss should be admitted to hospital for acute and prolonged nutritional care. Among children, linear growth must to be monitored, as height may be stunted by the illness; BMI, and expected weight for height are also important parameters in careful follow-up to detect any relapse.

Total Body Water may be normal as a percentage of current weight, reduced by vomiting, purging or diuretics, or even increased in cases of excessive water intake (taken to fake real weight gain or to calm appetite) and sometimes resulting in severe hyponatremia. There may also be a positive salt and water balance associated with refeeding, with overexpansion of the extracellular fluid compartment and oedema.

Body composition may be estimated by means of electrical impedance. Unfortunately, this method may be unreliable when hydration is altered, as is frequent in eating disorders. Body fat can also be evaluated using anthropometrics measurements e.g. triceps, suprailliac or subscapular skinfolds. To calculate the loss of muscle mass, creatinine-height index may be an useful tool, if renal failure or rhabdomyolysis are not present. Regular weighing, however, remains the mainstay of monitoring in this condition. The same scales should be used each time and these should be regularly calibrated and maintained. Individuals should be weighed at the same time and under the same conditions each day, preferably in the morning after urinating and before breakfast. Some patients try to make themselves appear heavier than they really are by carrying and hiding heavy objects or by drinking disproportionate amounts of liquid before weighing. It is important to control and detect this cheating.

Resting energy expenditure is often significantly reduced in proportion to the loss of lean body mass. In spite of this, total energy expenditure may be initially similar to that in normal individuals, because the decrease in resting energy expenditure is offset by an increase in physical activity. In severe cases exhaustion and emaciation reduce the drive to hyperactivity and the patients become calm and even apathetic.

2.4. Laboratory tests, Cardiac and Image findings

Although some individuals with AN do not exhibit laboratory abnormalities, the starvation and purging (vomiting, laxatives, herbs, diuretics) features of this disorder can affect most systems and produce abnormal laboratory results.

Haematology:

Leukopaenia and mild anaemia are common; macro or microcytosis may occur if specific deficiencies are present; thrombocytopenia occurs rarely.

Chemistry:

Dehydration may be reflected by an elevated blood urea nitrogen (BUN). Conversely, serum creatinine may be low, reflecting a low muscle mass. Liver function tests may be slightly elevated. Hypercholesterolemia is frequent. Hypophosphataemia, hypomagnesaemia and hypozincaemia are occasionally found and are often induced by refeeding. Induced vomiting may lead to a metabolic alkalosis hypochloraemia and hypokalaemia, and laxative abuse may cause a hypokalaemic acidosis. A high blood amylase of salivary origin is regularly seen in those with vomiting and may drive us to do an erroneous diagnosis of pancreatitis. This may need to be ruled out by abdominal ultrasound or lab tests such as serum lipase (9).

There may be a decrease in total and free T4 and T3, and an increase in rT3 similar to the findings in sick euthyroid syndrome. There is an increase in GH secretion with a decrease in IGF-1 levels. There is increased urinary free cortisol and serum cortisol levels but without elevated ACTH levels, disturbances that resemble those observed in depression, which should be eliminated as an alternative cause (10). In females, low serum estrogen levels are present, and males have low levels of serum testosterone. There is a regression of the hypothalamic-pituitary-gonadal axis in both sexes that resembles that normally seen in prepubertal or pubertal individuals. For these reasons amenorrhea is a frequent condition in AN patients with malnutrition (a BMI of 17 is usually the critical level below which periods stop and above which they return during refeeding); nevertheless a beta-hCG test is recommended to rule out pregnancy in patients with prolonged amenorrhea.

ECG and Echocardiography:

Adaptative sinus bradycardia is frequent, but arrhythmias are rarely observed. Other ECG abnormalities include decreased voltage and QT interval prolongation (11), increased QT dispersion and non-specific T wave abnormalities. Echocardiography shows decreased left ventricular mass and often a diminished thickness of cardiac walls (12,13); pericardial effusions are occasionally found.

Electroencephalography:

With significant fluid and electrolyte disturbances the electroencephalogram may show diffuse abnormalities, reflecting a metabolic encephalopathy.

Chest X-ray:

Order after placing a nasogastric tube to make sure it is adequately positioned. It may also be useful in the presence of specific respiratory or cardiac symptoms such as cough, chest pain or dyspnoea.

Brain imaging:

An increase in the ventricular-brain ratio secondary to starvation is often seen. Brain imaging usually returns to normality after restoration of nutritional status.

Dual-energy X-ray absorptiometry (DEXA):

DEXA represents the gold standard method for evaluating bone mass. The earlier AN and undernutrition affects a patient, and the longer she / he suffers from them, the greater the impact on bone mineral density (BMD) and the risk of osteopenia, osteoporosis and bone fractures. The World Health Organization has defined osteopenia as a deviation of between 1-2.5 SDs below the mean peak bone mass for age and gender in BMD. Similarly, osteoporosis is diagnosed when BMD is greater than 2.5 SDs below the mean standardised values (figure 5). DEXA should be performed in all AN individuals with under nutrition, amenorrhoea and suspected osteopenia, and should be repeated every 1-2 years to check BMD evolution or effects of specific therapy.

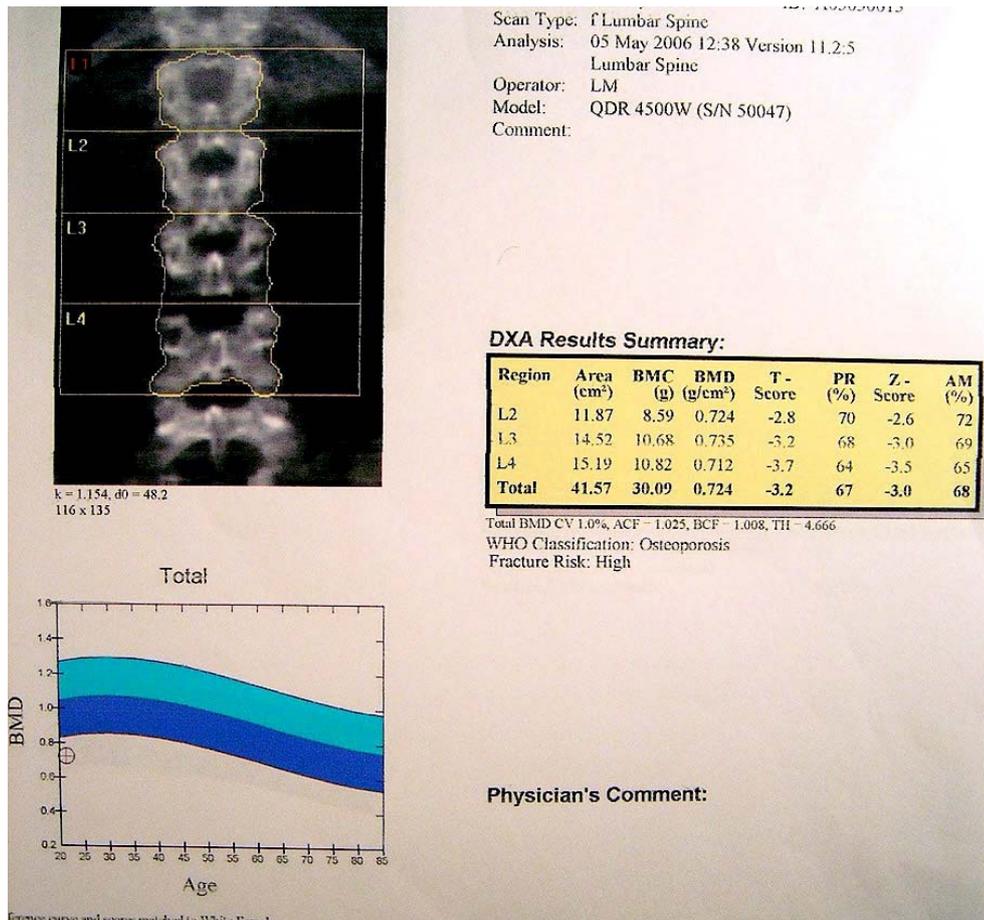


Figure 5. DEXA scan showing osteoporosis signs in a young female suffering from anorexia nervosa.

2.5. Differential diagnosis

2.5.1. Psychiatric Diseases.

Many depressive symptoms may be secondary to the physiological effects of severe weight loss. There may be also associated depressive or obsessional symptoms, as well as features of a personality disorder, which can make differentiation from eating disorders difficult. Some frequent comorbid conditions include major depressive disorder or dysthymia, bipolar disorder, obsessive-compulsive disorder, sexual abuse and substances abuse (14-17). Among primary psychiatric illnesses unaccompanied by an eating disorder, individuals commonly do not show fear of increased caloric intake or weight gain.

2.5.2. Somatic Diseases.

Somatic causes of anorexia and /or weight loss in young patients that must be distinguished from AN include wasting and infectious diseases, brain tumors, malignancy and intestinal disorders. To differentiate AN from primary gastrointestinal (GI) disease may be not an easy task as GI disorders are common in AN patients. Inflammatory bowel disease, peptic disease, coeliac disease, other malabsorptive syndromes and motility disorders such as achalasia may simulate AN. However, it is possible to rule out these processes by using the DSM IV / ICD diagnostic criteria to confirm an eating disorder and, if uncertainty persists, a formal clinical protocol must be implemented to look for a somatic disease.

3. Medical Complications

Most medical complications in eating disorders are related to starvation, undernutrition, or purging and can be reversed by appropriate refeeding or cessation of purging. AN is characterized by progressive deterioration in the function of many organs. Symptoms or signs such as weakness, hypothermia, hypotension, bradycardia, presence of lanugo, neuropathies and amenorrhea, are associated with severe malnutrition: menses typically recommence within six months of achieving 90 percent of the ideal body weight (18).

Patients with eating disorders frequently have gastric emptying abnormalities, causing bloating, postprandial fullness, or a distended stomach (figure 6). Complications related to self-induced vomiting are salivary gland enlargement, erosion of dental enamel, high serum amylase, GI bleeding and Russell's sign. Gastric dilation may occur and even gastric perforation and peritonitis have been occasionally reported (19). Diuretics or laxative manipulation may cause dehydration, impair renal function, or electrolyte disturbances, and induce metabolic encephalopathies, seizures, arrhythmias and myopathies.

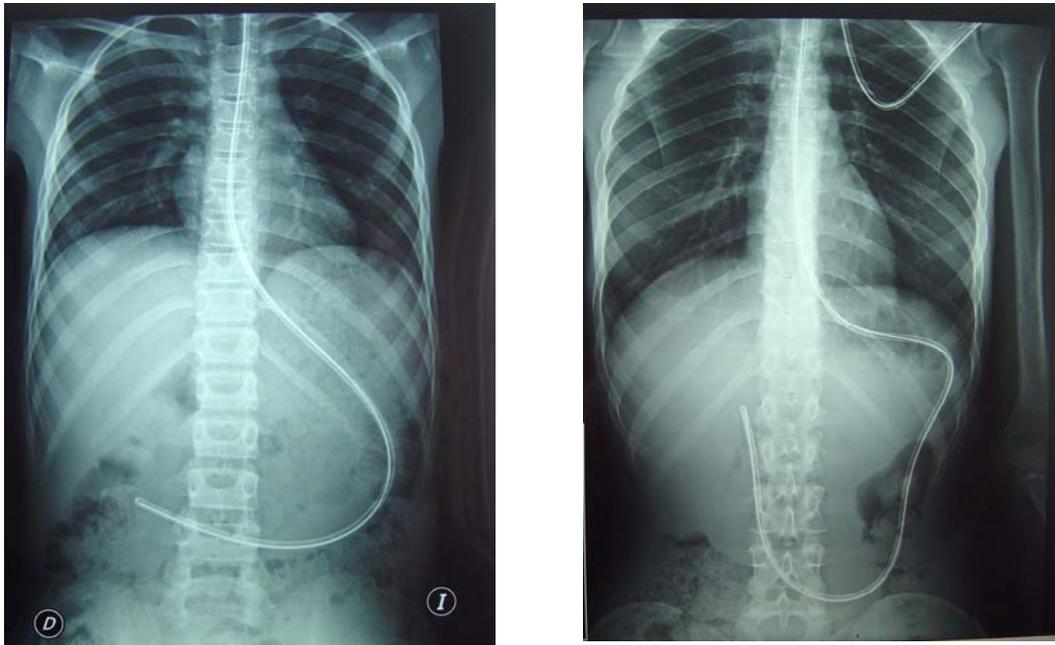


Figure 6. Enlarged Stomach X-Ray Images in two young Patients with Anorexia Nervosa.

Osteopenia is one of the most severe complications of AN and probably one of the more difficult to reverse (20-21). Individuals with longstanding AN frequently show osteopenia or osteoporosis resulting from low calcium and vitamin D intake and absorption, reduced oestrogen and increased cortisol secretion. Altered body composition, particularly

reduced lean body mass, may be also an important contributor to the pathogenesis of osteopenia in this setting. A study comparing bone density in AN females to that in women with hypothalamic amenorrhea, matched for the duration of amenorrhea and onset of menarche, found that bone density was reduced in both groups, but to a significantly greater amount in women with AN, suggesting that oestrogen deficiency was not the sole cause of bone loss; moreover, in multivariate analysis bone density was most significantly correlated with lean body mass (22).

4. Nutritional Therapy

4.1. Therapeutic Team

Ideally, patients with eating disorders should be managed by a multidisciplinary team, expert and trained in this field, and including a psychiatrist, nutritionist MD, dietician, psychologist, nurse and social worker. The GP also has an important role in providing continuing care in the community and working closely with the specialist team (23). It is important to have clear protocols and goals as well as good communication between everybody concerned.

4.2. Aims of Nutritional Support

The goals of treatment are

1. to restore patients to as near normal nutritional status as possible and to establish healthy eating patterns,
2. to treat medical complications,
- 3 to correct core dysfunctional thoughts related to the eating disorder and to prevent relapses and,
4. to provide counselling and family support.

4.3. Nutritional Rehabilitation

Management involves an integrated plan combining nutritional rehabilitation, psychotherapy and medication (24-25). The American Psychiatric Association guidelines for the treatment of patients with eating disorders state that a program of nutritional rehabilitation should be established for all patients with AN (26), including weight gain and the development of normal eating habits. Nutritional support should be appropriate to the nutritional status of the patient and may be given orally, by nasogastric tube, by gastrostomy or more rarely by the parenteral route.

Oral feeding is always preferred because it has the fewest potential complications and it will be the route of feeding on discharge (27). It is the most important element in the nutritional rehabilitation process of AN individuals and should be maintained even in the case of severely malnourished patients, even if combined initially with artificial nutrition. It requires a planned intervention intended to reduce the fear and stress of eating and to improve nutritional status. In one study, patients with AN were found to significantly overestimate their intake by an average of 460 kcal per meal, compared with normal-weight participants, who underestimated their meal consumption by about 60 kcal (28). The dietician has a vital role in planning the meals, providing nutritional education, counselling the patient helping them to achieve dietary and weight goals. Further information on the role of dietician in the treatment of eating disorders is detailed in a recently ADA report (29).

Other options for oral refeeding include temporary supplementation of regular meals with liquid supplements (generally energetic to 1,5-2 Kcal/ml). This may help to control fear of food intake and also the achievement of nutritional and weight goals. As with nasogastric feeding, oral intake should be increased slowly to avoid the refeeding syndrome (see below). In less severe cases, managed as outpatients,, oral intake should start at 30 to 40 kcal/kg actual body weight (1000 to 1600 kcal/day) and be advanced progressively, to achieve a weight gain of around 0.5 kg per week.

As mentioned above, osteopenia is one of the most serious complications of AN. To prevent it, it is important to ensure a dietary intake which allows normal growth, development and bone mineralisation during adolescence. This means ensuring a normal growth curve and restoring menses as quickly as possible. The Society for Adolescent Medicine's recommendations include weight gain, 1200 to 1500 mg/day of elemental calcium, and a multivitamin providing 400 IU of vitamin D (30). Some authors report that estrogen replacement alone does not reverse osteoporosis or osteopenia, and unless there is weight gain, it does not prevent further bone loss. Other pharmacological approaches to the treatment of osteoporosis in this setting are interesting, but further well designed and controlled studies are needed before these can be recommended. Clinical experience suggests that documenting early osteopenia and making patients aware of it may help to motivate those who do not readily acknowledge having the disease (31).

In some cases, where malnutrition is very severe, it may be necessary to begin the process of refeeding by artificial means, usually by nasogastric tube. Parenteral nutrition is almost never indicated and is reserved for those individuals in whom the GI tract cannot be used. These procedures should be carried out on an inpatient basis. The American Society of Parenteral Enteral Nutrition (ASPEN) has made and scored some recommendations for patients with eating disorders (32).

4.4. Criteria for Hospitalisation

There are no controlled trials that have evaluated the criteria for hospitalisation in patients with eating disorders, although there is some consensus of expert opinion in this respect. Admission is indicated in 2 main groups of patients: admission for medical management, where there is no expectation of ongoing change, and admission for treatment, where change is expected to occur (33). Haemodynamic, metabolic and nutritional status determine not only the need for artificial nutrition but also the criteria for hospitalisation. The most common criterion for admission is a body weight less than 70-75 % of estimated ideal weight, (correlating in adults with a BMI < 16-17 kg/m²). The rate of weight loss is also important: a loss in the past 3 months of >10-20 % or in the past 6 months of >20-30% suggests the need for hospitalisation (34).

The following summary of the Society for Adolescent Medicine indications for hospitalisation may be useful (30):

- Severe malnutrition
- Dehydration. Electrolyte disturbances
- Cardiac dysrhythmia
- Physiologic instability (severe bradycardia, hypotension, hypothermia, orthostatic changes in pulse or blood pressure)
- Arrested growth and development
- Failure of outpatient treatment
- Acute food refusal. Uncontrollable bingeing and purging
- Acute medical complication of malnutrition
- Acute psychiatric emergencies
- Comorbid diagnosis that interferes with the treatment of eating disorders

Some other authors have published similar guidelines regarding hospitalization (17,35).

4.5. Inpatient Treatment

4.5.1. Introduction

People with anorexia nervosa requiring inpatient treatment should be admitted to a setting that can provide the skilled implementation of refeeding with careful physical monitoring (particularly in the first few days of refeeding) in combination with psychosocial interventions (36). Inpatients should receive treatment in a specific eating disorders unit with the best options for medical and psychiatric care. Alternatively, hospitalization can be on either a medical or psychiatric ward, depending upon the age

and medical status of the patient and local resources. In this setting, skilled nurses play an important role: As patients may cheat or be resistant to being refeed, and nurses “live” with patients in a 24-h basis, they can enforce eating requirements and be a key to a favourable outcome. The hospital unit must be also experienced in the care and refeeding of the anorexic patient and have guidelines or a protocol for the management of eating disorders patients. Admission to hospital units that specialize in the care of patients with eating disorders produces better outcomes than hospitalization in general medical units (37). Additionally, most patients accept being hospitalized on a voluntary basis but sometimes, compulsory or involuntary commitment to a psychiatric ward may be necessary. Fortunately, short-term outcomes among patients who have been involuntarily committed are similar to those among patients admitted voluntarily (38). The goals for both in-patient and out-patient treatment are: to promote metabolic recovery; to restore a healthy body weight; to reverse the medical complications of the disorder and to improve eating behaviours and psychological functioning. Nutritional support is crucial for achieving these goals, particularly the first two. Also most, but not all of the medical complications, are reversible by nutritional rehabilitation (39). It also reduces, but does not completely abolish apathy, lethargy, and food-related obsessions (31).

4.5.2. The Refeeding Process

Although some patients respond to a contract for oral refeeding alone, in severe cases it may be necessary to combine this with artificial feeding, at least initially. Even with artificial feeding it is important to have some oral intake which can be gradually increased. This helps to control the distress and fear of eating and also establishes the normal method of feeding that will be continued after discharge. Recommended stages for nutritional support in AN are summarized in Table 3.

Before starting enteral nutrition, severe malnutrition must be confirmed and disturbances or deficiencies in fluids and micronutrients must be corrected. Energy requirements must be estimated (e.g. Harris Benedict equation) or measured (e.g. indirect calorimetry). If estimated through Harris Benedict it is important to remember that this equation will overestimate the requirements of a severely malnourished individual. Direct measurements have consistently shown reduced resting energy expenditure in such patients. (41-42). If we also consider the metabolic and cardiovascular instability of such patients and the risk of refeeding syndrome, it is important to initiate feeding cautiously and to begin with a low intake. ASPEN guidelines recommend that specific nutritional support be initiated at no more than 70% of predicted REE (32) or 30 kcal /kg/day. Clinical experience has led many of us to start at an even lower level of 10-20 kcal/kg, at least for the first 2-3 days.

The following are recommended:

- a) Initial calories lower than usual;
- b) Use actual weight and not ideal weight for calculations of energy needs;
- c) If severe malnutrition, start with no more than 20-30 Kcal / kg actual weight and never higher than 1000 Kcal per day;
- d) A protein intake of 15-20% of total energy is nutritionally correct;
- e) The higher the degree of malnutrition, the lower should be the rate of increase in energy intake.

After starting at a low level, energy intake should not be increased by more than 300 kcals every four days. Later, when the patient is stable and the risk of the refeeding syndrome has passed, the calorie intake can be increased faster by up to 50 kcal /kg per day to a level sufficient to give slow steady weight gain of about 1 kg per week. Note however, that patients may gain weight quickly early in the refeeding process because of fluid retention and an initially low metabolic rate (43-44).

Enteral nutrition is usually administered by constant infusion over 24h. Later, when oral intake has increased significantly (e.g.: to 1000-1500 kcal per day), it may be tapered and delivered overnight using a concentrated polymeric formula (1,5 kcal /ml), releasing the patient for daytime meals unaffected by simultaneous tube feeding. The transition to total oral refeeding is gradual. Finally, when oral intake is near 100% of the theoretical

requirements, enteral nutrition is stopped and the nasogastric tube removed. In this transitional period, an oral supplement after meals may help to ensure that nutritional targets are met.

Table 3. Suggested Staging for Nutritional Support in Anorexia Nervosa

Adapted from: Miján A et al. Nutrición artificial en los trastornos de la conducta alimentaria. In: Miján A. Nutrición y Metabolismo en trastornos de la conducta alimentaria. Ed Glosa, Barcelona, 2004 (40) .

<ol style="list-style-type: none">1. Confirm Anorexia Nervosa (DSM IV / ICD 10)2. Nutritional Assessment \Leftarrow Severe Malnutrition (+)3. Correct micronutrient deficiencies. Maintain some oral feeding +4. Sign up Artificial Nutrition if necessary. Supplement with micronutrients4. Measure / Estimate Nutritional Requirements5. Selection of enteral / parenteral route for feeding6. Choice composition / formulation of Artificial Feed7. Assign method of administration of Artificial Feeding (continuous, intermittent, gravity, pump...)8. Start Artificial Feed. <u>Do not interrupt oral feeding!</u>9. Check acceptance of and compliance with Artificial Feed10. Check for an early onset of refeeding syndrome.11. Identify complications12. Increase Artificial Feeding slowly and gradually. <u>Do not interrupt oral feeding!</u>13. Clinical / Psychiatric + goals carried out14. Reduce 24h Artificial Feeding or switch to night-time feeding15. Increase oral feeding up to 24h adequacy (RDA, DRI)13. Stop Artificial Feed. Consider to add oral supplements14. Hospital discharge. Prescribe a standard oral diet15. Follow-up individuals as an outpatient / day-hospital basis <p>Note: Theory and notions on a regular and healthy diet must be implemented and maintained through steps 1-15</p>	<p style="text-align: right;">START AN</p>  <p style="text-align: right;">STOP AN</p>
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During the refeeding process, the following management protocol should be implemented:

- a) Check daily morning weights, vital signs, fluid balances and physical exams to detect fluid overload, cardiac failure, oedema or bloating.
- b) Monitor BUN, creatinine and serum electrolyte levels.
- c) Utilize stool softeners and not laxatives for constipation.
- d) Maintain a close supervision and restricted access to bathrooms for at least 2 hours after meals.
- e) Patients with eating disorders frequently have gastric emptying abnormalities, causing bloating, postprandial fullness. This usually improves with refeeding, but sometimes treatment with pro-motility agents is necessary. Domperidone or metoclopramide are useful in treating early satiety, abdominal discomfort, and esophageal reflux. Both drugs have the potential for producing extrapyramidal side effects. However, only a small

amount of dompedidone crosses the blood-brain barrier, so it is much less likely to cause central side effects (27).

f) Micronutrient status may be sub clinically deficient in some individuals. During the refeeding process micronutrient needs increase. Moreover, in the initial phases of enteral nutrition, the low rate of feeding may not give enough micronutrients to replace previous deficits or to meet maintenance requirements. Initial feeding should therefore be associated with daily mineral and micronutrient supplements. In particular feeding should be accompanied by appropriate supplements of thiamine, phosphate, potassium and other minerals. This is an acceptable management as long as the patient has adequate renal function and there are no other contraindications.

4.5.3. Psychiatric / Psychological approach

Psychosocial treatments are also employed during hospitalization. Models used include cognitive behavioural techniques and dynamic expressive-supportive therapy. A Cochrane review that included small trials of psychotherapy in anorexia nervosa found that the data were insufficient to allow the recommendation of any specific psychotherapy (45). Group therapy and support groups may be useful as adjunctive treatment and for prevention of relapse.

Pharmacotherapy of anorexia nervosa has been discouraging. There have been few controlled trials, and most have demonstrated efficacy only in the treatment of comorbidities such as depression and obsessive-compulsive disorder (46). Controlled trials and observational studies (47-48) have shown that selective serotonin-reuptake inhibitors (SSRIs) are ineffective in speeding up weight gain in starved patients. However there are some data suggesting that antidepressants may help maintain weight gain in successfully treated patients (49-50).

4.5.4. Discharge and follow-up

Longer initial hospitalization has been shown to be cost-effective (51). The final target body weight indicating discharge depends on initial body weight, length of stay, number of previous hospitalizations, existence of medical complications and comorbid psychiatric illnesses. Typically, malnourished patients should be discharged once 80-90% ideal body weight has been achieved. One study examined outcomes after hospitalization and found that those patients who were allowed to stay in the hospital until they had recovered their necessary weight (90-92 % ideal body weight) had a better outcome compared with those who did not reach this target and were discharged earlier (52).

Once discharged, the length of outpatient follow-up for physical monitoring and psychological treatment should typically be at least 12 months, although some authors recommend that individuals should remain in treatment for one to two years after weight restoration to reduce the risk of relapse (31).

4.6. Prevention and Treatment of Refeeding Syndrome

A potential risk of nutritional support is the refeeding syndrome, characterized by fluid and electrolyte, cardiac, haematological and neurological complications. The refeeding syndrome has a number of features which may occur singly or in combination: (1) Severe hypophosphatemia (heart failure, delirium, rhabdomyolysis, and seizures) due to the sudden demands for glucose phosphorylation in a phosphate depleted patient (53). Hypophosphatemia can result in impaired energy stores due to depletion of ATP and in tissue hypoxia due to reduced levels of erythrocyte 2,3-DPG (44). (2) Heart failure may also occur because myocardial function is depressed due to hypophosphatemia and myocardial atrophy, and cannot meet the increased demand imposed by refeeding. The problem is also exacerbated if initial salt and water intake is excessive and the extracellular fluid volume is expanded. The risk of heart failure in these patients is higher in the first two weeks of refeeding. The combination of reduced cardiac contractility and refeeding edema may explain this finding (54-55). (3) Hypokalemia may be present because insulin secretion, in response to a brisk carbohydrate stimulus, shifts potassium into cells. (4) Hypomagnesemia is another potential disturbance which, in addition to

hypokalaemia, may cause arrhythmias. (5) Deficiency of thiamine, an essential coenzyme in glycolysis, is often present sub clinically in malnourished patients and can develop into a full blown deficiency syndrome with the reintroduction of carbohydrate. This may present as 'wet beriberi' or heart failure or as 'dry beriberi' or acute Wernicke's encephalopathy. These conditions should be prevented by giving appropriate daily supplements of thiamine combined with other micronutrients.

Refeeding syndrome has been reported in about 6 percent of hospitalized adolescents with AN (56). It is most likely to occur in those AN patients who are severely malnourished and receive a brisk and large load of energy substrates, particularly carbohydrates. Parenteral nutrition is more likely to produce a refeeding syndrome but it also can occur in those receiving enteral nutrition. In some patients, vigorous oral refeeding alone may also produce a refeeding syndrome with oedema and electrolyte changes.

The best way to treat refeeding syndrome is to prevent it keeping a slow and progressive initial administration of energy substrates, a limited carbohydrate load and avoidance of a high sodium intake. Careful monitoring of body weight, urine output and heart rate may give early warning of its onset. Signs of peripheral edema, heart failure or altered mental status must be watched for and, during the first few days, phosphorus, magnesium and electrolyte levels as well as renal function must be checked very closely. Deficiencies should be corrected before starting refeeding. Supplements of micronutrients (vitamins and electrolytes) must be administered as needed and patients who develop hypophosphatemia or any other deficiency should be vigorously repleted. In severely malnourished patients with probable preexisting deficiencies and no contraindications, supplements of phosphates, thiamine, potassium and a multivitamin product should be given routinely and increased according to monitored values.

5. Summary

Anorexia nervosa (AN) is an eating disorder that occurs most commonly in adolescent girls and young women. It is characterized by disturbances in eating behaviour, excessive concern about body shape or weight and deliberate weight loss, being prone to refute symptoms. Although the fundamental causes of AN remain unknown, there is a growing evidence that the interaction of sociocultural, genetic and biological factors may contribute to its causation. The prevalence of AN among women is approximately about 0.5 to 3.7 percent. This disorder presents a frequent evolution to chronic forms and may be associated with acute or continual medical complications. Favourable prognostic factors include an early diagnosis and treatment as well as being managed by an experienced, multidisciplinary team.

Severe undernutrition is frequent, with secondary endocrine and metabolic disturbances. There is usually an intense depletion in muscle mass and adipose tissue, both weight and BMI are significantly reduced and bone loss emerges when medium-long term care; consequently nutritional rehabilitation is essential for its treatment. Goals of nutritional therapy include to restore patients a healthy nutritional status, to determine standard eating patterns, to treat medical complications and to prevent relapses. Nutritional support should be appropriate to the nutritional status of the patient and may be given orally, by nasogastric tube, by gastrostomy or more rarely by the parenteral route.

A potential risk of nutritional support is the refeeding syndrome, characterized by fluid and electrolyte, cardiac, haematological and neurological complications. The best way to treat refeeding syndrome is to prevent it keeping a slow and progressive initial administration of energy substrates, a limited carbohydrate load and avoidance of a high sodium intake. Specific recommendations for nutritional support include to initiate it at no more than 70% of predicted REE and to use actual weight and not ideal weight for calculations of energy needs.

Longer initial hospitalization has been shown to be cost-effective and malnourished patients should be discharged once 80-90% ideal body weight has been achieved. Once discharged, the length of outpatient follow-up for physical monitoring and psychological treatment should typically be at least 12 months, although some authors recommend that individuals should remain in treatment for one to two years after weight restoration to reduce the risk of relapse.

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