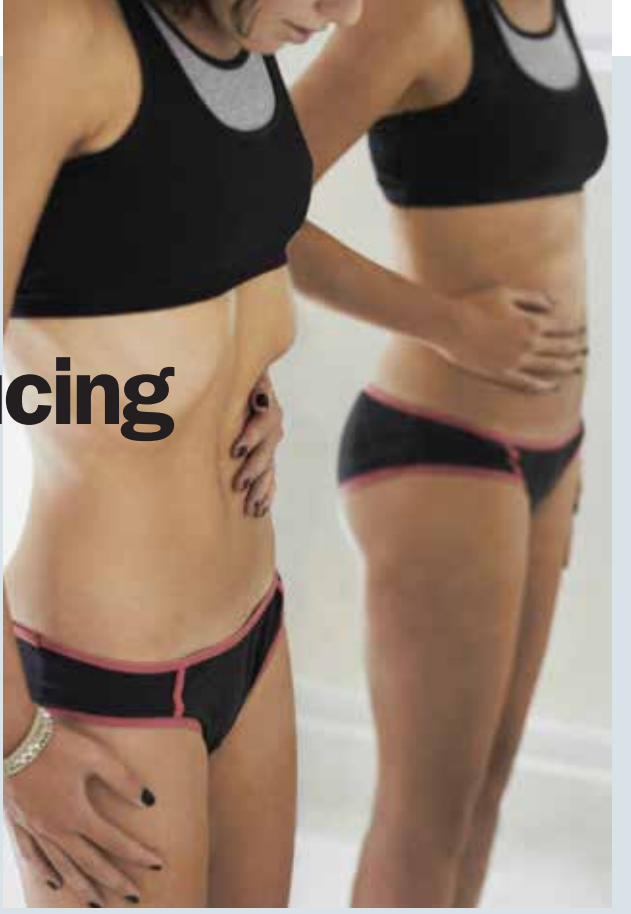
An adolescent with low and reducing body weight and amenorrhoea



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This section is about the immediate management and investigation of an acute presentation in general practice. It is inspired by, but not based on, a real patient situation.

Chloe, aged 16 years, is small for her age and looks underweight. She is dressed in baggy clothes and has been brought to see you by her mother because of her weight loss. They moved to your area several weeks ago and Chloe has for the past six months been under the intermittent care of a psychologist and a nutritionist specialising in eating disorders.

Her mother comes into the consultation with Chloe but says it is only to fill you in on some details. She does not know how much weight Chloe has lost but says this has been a problem for over a year, and that Chloe's old school friends used to say she was 'chunky'. Chloe says she is just trying to become 'healthy' but her mother is concerned that Chloe has been exercising more than she should for some time and that, since the move, she is deliberately not eating carbohydrates. Her mother is also concerned that Chloe's periods ceased many months ago. Her mother then leaves the room.

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You ask Chloe how she is feeling about coming to see you. She tells you she understands her mother means well but that there isn't a problem.

How would you approach this consultation?

Answer: Chloe needs to be carefully assessed, including determining if she has an eating disorder or is developing one. Medically inappropriate weight loss is always a serious medical issue, and primary organic conditions as well as primary psychiatric conditions need to be considered as causes.

You must make it clear to Chloe that the only information you will pass on to her mother without her express consent is that pertaining to her health, should something serious be uncovered. This includes drug use, physical or sexual abuse and any need for urgent medical treatment, such as hospitalisation or referral to a specialist. It is necessary to get Chloe's agreement to this before the consultation goes further because, being 16 years old, she may be viewed legally as mature enough to refuse advice. This could create a difficult and untenable situation for you as the treating doctor.

Any questions need to be phrased carefully and without suggestion of interrogation or blame. Chloe will likely only discuss such things if she is comfortable with you and feels respected. One way to start the consultation is to discuss how rude the kids at school were and how upsetting their comments may have been to Chloe. You could then enquire whether she is happy with her current appearance or would like to change anything; for example, is she happy with her current body weight?

What further questions would you like to ask Chloe over the course of the consultation?

Answer: It would be useful to ask Chloe the questions listed below.

- How much weight does she think she has lost, and over what time period? Is she using any techniques to help herself lose weight – does she vomit or purge, use laxatives or take any medications?
- What is her favourite type of exercise? How often does she exercise and is she using this as a way to lose weight?
- Does she always count calories and/or restrict certain food groups that she feels are unhealthy? Does she conceal her eating habits from her family because she feels they don't understand?
- Does she feel depressed or anxious? Does she relate well to her family members and does she have friends? Has she ever harmed herself as a stress release or for any other reason? Does she feel suicidal?
- Does she feel tired, or has she noticed reduced exercise tolerance? Is she more

susceptible to cold? Does she have any problems with her bowels, any nausea, diarrhoea or constipation? Were her periods normal until they stopped?

Chloe says she doesn't know how much weight she has lost but she feels healthier for it. She denies vomiting and laxative or medication use. She says she feels anxious about the recent move and that is why she has cut carbohydrates from her diet; she feels bloated when she eats them now. Her diet is otherwise healthy. She does not feel suicidal. She restricts calories to 1000 calories a day because she says that this 'round figure' suits her height and activity levels; she has been doing this and exercising for stress relief for about an hour a day for over two years. Her first period was at age 13 years and they were fairly regular for about a year until they ceased some 18 months ago.

What would you look for when examining Chloe?

Answer: You would like to measure Chloe's height to help to assess her growth. You need to take her temperature, blood pressure and pulse, and listen to her chest to ensure she has no cardiovascular compromise from malnutrition. Her thyroid should be examined, and so should her head and arms (for hair fragility, lanugo, subcutaneous fat and muscle mass). Her teeth and tongue should be inspected (for caries and ulcers from vomiting). Has she normal sexual development? Her abdomen should be palpated, ideally not through her clothes, if she will agree to this. At the end of the examination you would like to weigh her (with her permission). Her approach to the examination will help you assess her for eating disorders, body dysmorphic disorder and self-harm.

The examination is consistent with your suspicion that Chloe has the eating disorder anorexia nervosa. She refuses to let you examine her undressed and you feel she is not being completely honest with you about her eating and exercising habits. She looks very underweight clinically and on measurement is 34.2 kg by scales with clothes on and 150.1 cm tall (short for her age), giving her a body mass index (BMI) of 15.2 kg/m^2. Her oral temperature is 35.6°C (normal range, 35.8 to 37.2°C), pulse rate is 56 beats per minute and blood pressure is 90/49 mmHg. She is mildly dehydrated clinically. You suspect this problem has been going on for a long time.

What investigations would you organise for Chloe?

Answer: The first test you organise would be either a urine or a blood pregnancy test. Because you are concerned about Chloe having an eating disorder, you then need to arrange measurement of blood urea, electrolytes and creatinine levels (to help determine if she is likely to be vomiting or purging and the degree of metabolic instability) and levels of blood glucose, calcium, phosphorous and magnesium, and also liver function tests and a full blood count. You would organise tests for nutritional status, such as a vitamin B_{12} level, red cell folate level, iron studies, a 25-hydroxyvitamin D (25-OH vitamin D) level and coeliac serology. You would organise endocrinological tests to exclude a thyroid disorder and hypoadrenalism.

Chloe's loss of periods is likely to be due to her low weight causing secondary hypogonadism, termed 'hypothalamic amenorrhoea', but this should be confirmed by testing her follicle stimulating hormone (FSH), luteinising hormone (LH) and serum oestradiol levels especially, and also her serum progesterone level. This will help to exclude polycystic ovarian syndrome and will exclude primary ovarian insufficiency (formerly known as premature ovarian failure). A serum prolactin level should also be measured to exclude hyperprolactinaemia causing secondary amenorrhoea.

She must have an ECG to assess the bradycardia. She may agree to elective bone mineral densitometry.

You organise various investigations urgently for Chloe. The results show:

- ***she is not pregnant***
- ***she has an electrolyte disturbance: serum sodium, 133 mmol/L (normal range, 135 to 145 mmol/L); potassium, 2.4 mmol/L (normal, 3.5 to 5.5 mmol/L); chloride, 95 mmol/L (normal, 95 to 110 mmol/L)***
- ***she has a mild anaemia: haemoglobin level of 109 g/L (normal for women, 115 to 150 g/L)***
- ***she has raised liver enzymes: alkaline phosphatase (ALP), 185 IU/L (normal, 45 to 115 IU/L); aspartate aminotransferase (AST), 30 IU/L (normal under 35 IU/L); alanine aminotransferase (ALT), 55 IU/L (normal under 40 IU/L).***

Practice points

- Amenorrhoea in young women is commonly caused by hypothalamic amenorrhoea due to 'hypothalamic stressors' from severe weight loss, intercurrent significant medical illness, eating disorders and/or excessive exercise.
- When investigating patients with amenorrhoea, always consider pregnancy, polycystic ovarian syndrome, prolactinoma and the rare condition primary ovarian insufficiency.
- Osteoporosis in women with amenorrhoea and eating disorders requires referral to an endocrinologist (if the patient agrees).
- In eating disorders, tests should be arranged for nutritional status and instability (blood electrolytes especially potassium, magnesium and phosphate, vitamin B_{12}, red cell folate, iron studies, coeliac serology, 25-OH vitamin D, corrected and free calcium) and serum prolactin, TSH, pregnancy test, FSH, LH, serum oestrogen and progesterone, in addition to a full blood count, liver function tests and urea and electrolytes measurement.
- If a patient with an eating disorder is bradycardic, an ECG should be arranged and haemodynamic stability assessed in case hospital admission is required.
- Other indications for acute hospital admission of patients with eating disorders include marked hypokalaemia or recalcitrant severe low body weight (BMI below 15 kg/m^2) with ongoing weight loss.

Other results are:

- ***blood glucose level, 3.2 mmol/L (normal, 4 to 6 mmol/L fasting)***
- ***magnesium level, 0.65 mmol/L (normal, 0.70 to 1.0 mmol/L)***
- ***phosphate level, 0.84 mmol/L (normal, 0.8 to 1.4 mmol/L)***
- ***vitamin B_{12} level, 205 nmol/L (normal, 200 to 600 nmol/L)***
- ***blood calcium level, 2.10 mmol/L (normal, 2.25 to 2.55 mmol/L)***
- ***thyroid stimulating hormone (TSH) level, 6.5 IU/L (normal, 0.5 to 3.5 IU/L)***
- ***plasma cortisol level, 748 nmol/L (normal, 140 to 700 nmol/L)***
- ***25-OH vitamin D level, 42 nmol/L (normal, over 60 nmol/L)***
- ***ferritin level, 9 g/L (healthy normal, over 30 g/L)***
- ***coeliac serology is normal***
- ***serum prolactin level is normal.***

Her sex hormone studies show low blood LH and FSH levels and early follicular phase range oestradiol and progesterone levels (thus each also low), which suggests hypothalamic hypogonadotrophic amenorrhoea. Her ECG confirms a sinus bradycardia of 58 beats per minute. She also has a low bone mineral density (BMD) z score of -1.8 at both the hip and spine.

How do you interpret these results?
Answer: Chloe has biochemical evidence of significant malnutrition (severe hypokalaemia, and hypocalcaemia, hypomagnesaemia and hyponatraemia), and given the clinical picture this is likely to be from vomiting or purging in addition to anorexia. She is anaemic, probably from several contributing factors, including iron deficiency, vitamin B_{12} deficiency and anaemia of chronic disease. Her liver function tests suggest a very mild hepatitic picture, but the ALP is likely to be raised because of her age (she is still growing). She is unlikely to be hypothyroid and free T4 and free T3 level measurement should be arranged; an isolated raised TSH is not uncommon in cases of severe malnutrition. The mildly elevated plasma cortisol helps to exclude hypoadrenalism, and the elevation is due to intercurrent physiological stress from her eating disorder.

Her loss of periods is evidence of hypothalamic hypogonadotropic amenorrhoea. You would expect her serum oestrogen and progesterone to be at nonovulating levels. This would put Chloe at risk of osteoporosis in time, in addition to the current malnutrition and vitamin D deficiency, and her current BMD is already somewhat reduced.

What should you do next for Chloe?
Answer: Chloe needs to be admitted immediately to a hospital that specialises in eating disorders. She is bradycardic, has severe hypokalaemia and is mildly dehydrated and hypothermic, all of which need careful correction. She is not willing to take any oral potassium supplement, nor will she boost oral fluid intake. It is not safe for her to be managed as an outpatient in this setting.

Chloe attends the emergency department voluntarily, after your explaining to her and her mother that she needs assessment, including cardiac monitoring, intravenous fluids and electrolytes and probably also nutritional therapy. She appears to be 'nonchalant' about the concern of others for her wellbeing but is willing to follow your medical advice.

What further endocrinological investigations and management will be important in Chloe's rehabilitation?
Answer: After parenteral rehydration, potassium therapy and then enteral therapy via nasogastric tube feeding, Chloe will be at risk of refeeding syndrome and will need careful electrolyte, vitamin, mineral (including phosphate) and calorie replacement. She will need her bone age and bone density assessed, as she is growth retarded and at risk of not reaching peak bone density. Patients with anorexia nervosa typically do not agree to the use of sex hormone replacement or the oral contraceptive pill to prevent further bone loss because they fear weight gain and fluid retention. However, this is important management should there be reduced bone density.

Specialist eating disorder psychiatric and psychological care are critical in the multidisciplinary care of patients with an eating disorder to not only make the formal diagnosis but also develop and individualise the primary inpatient cognitive behavioural therapy program. The psychological support role becomes most important as the physical condition of the patient is stabilised. A consistent approach across the team is required in setting boundaries in, for example, the level of physical activity while an inpatient, the refeeding regimen and ward privileges. In addition, antipsychotic and antidepressant medications have in some cases been shown to reverse the cognitive dysfunction that develops with anorexia nervosa, and may also reduce anxiety and obsessional thought disorder. Psychological counselling is highly important in the recovery process and to reduce relapse risk.

Anorexia nervosa of the degree that Chloe has is unlikely to improve spontaneously in the near future. Given the apparent long duration of Chloe's illness, the prognosis is guarded.

Outcome: Chloe is admitted to hospital. After some days of medical stabilisation and initial refeeding, she is transferred to a private psychiatric hospital for ongoing refeeding and for cognitive behavioural therapy. In total, her inpatient care lasts seven weeks.

She sees you shortly after hospital discharge and although she has gained weight and height, she is still underweight (BMI, 17.9 kg/m^2) and has some inappropriate thought processes, feeling she is 'too fat' and 'too heavy'. She has stopped taking the low-dose oral contraceptive pill because she felt bloated. Her periods have not yet returned.She remains under the regular care of a nutritionist specialising in eating disorders, a psychologist and a psychiatrist.

You have an agreement with Chloe, aligned with her psychiatric team care and ambulatory program, that should she relapse from her behavioural goals and body weight targets then she will need to be readmitted to hospital. This parameter setting and multidisciplinary ambulatory care plan appears to be motivation for Chloe to continue to eat small amounts frequently. **ET**

COMPETING INTERESTS: None.