PHYSICAL COMPLICATIONS OF EATING DISORDERS

Although eating disorders present challenging psychological issues for professionals, short-term and long-term physical complications are also commonplace. Here, the author looks at some of these physical health risks.

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Anorexia Nervosa (AN) is the most lethal psychiatric condition, and cause of death is roughly half due to suicide and half due to physical complications. Therefore, perhaps more than any other health condition, patients living with eating disorders require support psychologically and physically. Primary care health professionals are uniquely situated and skilled to administer both of these aspects of care – and to help with the coordination of the other necessary professionals (such as psychiatrists, therapists, dietitians and medical teams). Primary care professionals may also find themselves confronted with patients where diagnoses have not been made, and need to assess physical risk. They may also need to support patients refusing to engage with mental health services.

As the psychological background to eating disorders, their classification and epidemiology has been reviewed elsewhere in this series, this review will focus on the physical aspects of eating disorders – in particular highlighting the key clinical concerns that should alert for medical intervention. Physical consequences of AN primarily result from the state of underweight, or excessive weight loss; though can also be due to compensatory behaviours such as purging. This article will look at: complications that tend to be more acute, or semi-acute leading to medical instability from significant weight loss (and are therefore potentially the most lethal); and complications associated with a chronic, compensated underweight. Firstly however, it is important to consider underweight.

What is underweight?
Before addressing cut-offs, thresholds and ways of defining underweight, it is important to emphasise that conceptually, underweight is a ‘state of existence where inadequate nutrition has led to a weight (and more specifically weight-for-height) which is insufficient for physical and psychological wellbeing’. It can occur at any time during the life cycle, but the consequences of it will vary by stage. The important issues that relate to growth in eating disorders are discussed later.

The World Health Organization has provided definitions of thinness using a grading system based on body mass index (BMI – calculated by weight (in kg) divided by the square of height (in meters). Underweight is defined as a BMI <18.5, and less than 17 indicates severe or moderate thinness. In children and adolescents (aged 5-19), because of variation in BMI over age,centiles or standard deviations (Z-scores) are recommended, with a BMI for age and sex less than 2 standard deviations (equal to less than the 2nd centile) and below 3 standard deviations. BMI charts are readily available online, and UK growth charts have been harmonized with WHO data. Professionals working with adults and children with eating disorders, including the published research, frequently refer to BMI as ‘percentage expected’ or ‘% median BMI’. This simply means defining an individual’s BMI as a percentage of the average or age and sex. An example of calculations and terminology is shown in the case study in Figure 1.

Though it is important to have pragmatic cut-offs, clearly using one size fits all definitions for an entire population which is normally distributed is problematic. Some individuals will naturally exist at the lower end of BMI, and falling to lower BMI may not affect them in the same way that it would someone who normally exists further up. Where possible pre-morbid weight data for individual patients can be helpful in trying to understand what a normal weight for them demands (see chronic underweight and weight restoration below). However, this can also be frequently challenging. For example, in the UK many people may not not have recently measured their weight. Also, in cases of AN, there is a drive for thinness, going back to a pre-morbid weight, which, for a person with AN, can be most undesirable. Finally, some patients may well have been overweight before developing their eating disorder. While BMI has been criticized in its use in overweight for a lack of differentiation between muscle and fat, at the low weight of the spectrum this argument is less relevant.

Acute and semi-acute physical manifestations of severe underweight with medical instability
When weight loss is acute and significant, many patients become decompensated and develop features of medical instability ie, serious, and potentially life-threatening clinical evidence of the detrimental effects of acute underweight. Key clinical features of medical instability in AN are shown in Table 1, and a case illustration is provided in Figure 1. The most common clinical findings relate to the cardiovascular system –
namely bradycardia and hypotension. Bradycardia is thought to be a compensatory mechanism to protect the heart and fits alongside a general reduction in metabolism. Low blood pressure, and in particular postural hypotension (a drop in more than 10-15mmHg on standing) represents inadequate systolic function and is a concerning finding.

Far too often cardiovascular observations are not sought for or documented. Such observations are also important in the monitoring of patients with AN who are underweight, or continuing to lose weight. Also, in a recent surveillance study of children under the age of 13 with eating disorders, 40% displayed evidence of medical instability (bradycardia, hypotension, hypothermia or dehydration) and were above the 2nd centile for BMI – which is a potent reminder that weight status itself is a poor proxy for stability. Any patient who is suspected of losing weight should have these areas looked for. This is because rate of weight loss and trajectory, as well as weight itself, are important factors in the aetiology of instability. Children and adults with AN are also frequently hypothermic – it is unclear whether this is due to lack of fat storage, low metabolic rate or co-existing thyroid dysregulation. In reality it is likely a combination of all three.

Patients with acute underweight should have an ECG to look for the presence of arrhythmia and prolonged QTc time. However the most common finding is a sinus bradycardia in keeping with the mechanisms mentioned above.

There are now a number of guidelines to support health professionals in the community and within hospital settings. In the UK, the MARSIPAN (Management of really sick inpatients with AN) and its paediatric counterpart, Junior MARSIPAN, are available for free download on the Royal College Of Psychiatrist’s website and readers are directed there, in particular the risk tables for criteria.4,5

Blood tests for the investigation of severe underweight should focus on consequences of underweight as well as other medical diagnoses (see Table 2). As eating disorders are often covert and relatively common compared to many other medical pathologies which also cause weight loss, AN must be kept high on the differential diagnosis list. Primary health professionals have a key role in avoiding multiple tests. In AN, bloods will invariably be normal while underweight, and will not become abnormal until re-feeding occurs. A common pitfall is to use blood tests rather than degree of malnutrition and presence of signs of medical instability.

### Management of acute underweight

The treatment of acute underweight is urgent and safe nutritional support. The location for this nutritional support depends on how unwell the patient is, and also often depends on local service provision. Acute medical environments (both paediatric and adult) are frequently poorly set-up for the re-feeding of patients with AN, though the provision of such service is increasingly

<table>
<thead>
<tr>
<th>Complication</th>
<th>Comments</th>
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<tbody>
<tr>
<td>Bradycardia / QTc prolongation</td>
<td>Check ECG (differentiate from heart block)</td>
</tr>
<tr>
<td>Hypotension (often postural)</td>
<td>Lying and standing BP important. Use standardised BP centiles for age</td>
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<tr>
<td>Dehydration</td>
<td>Avoid rapid fluid in those with cardiac compromise. Urea will often be raised</td>
</tr>
<tr>
<td>Electrolyte disturbance</td>
<td>Not always Potassium, Ca, Mg, Na can be affected. Beware electrolyte abnormalities in those with ECG arrhythmia. Consider IV replacement in those who are thought to be frequently purging</td>
</tr>
<tr>
<td>Hypothermia</td>
<td>Can also effect ECG</td>
</tr>
<tr>
<td>Cuts or other evidence of self-harm</td>
<td>Always consider risk of self-harm in the medical assessment</td>
</tr>
<tr>
<td>Haematological</td>
<td>Anaemia itself is rare, though beware haematoconcentration due to dehydration. Thrombocytopenia and neutropenia are all documented in malnutrition. Re-establishing nutrition is the best treatment</td>
</tr>
<tr>
<td>Thyroid</td>
<td>Should be checked in all who have lost weight or behaviour changed. Usually TSH is normal with low T3 due to malnutrition</td>
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### FIGURE 1: CASE EXAMPLE

A 13 year old girl presented to her general practitioner with her mother. She had a three month history of reduced eating, and was eating only small amounts per day. She had also been observed to have started running for an hour each evening after school. She had not had a period for two months. Her parents felt she had lost weight but had no previous weights to compare. None were recorded in her GP records. She had no other symptoms but was constipated.

On examination she seemed withdrawn and looked thin. Her abdominal examination was normal but she had fine lanugo across her back and her ribs were clearly visible, as were other bony prominences. Her resting pulse was 45 and she had a 20mmHg drop in her blood pressure on standing. She felt cold and her temperature was 35.6 degrees Celsius.

Her height was 156cm and weight in the GP surgery 30kg. Therefore her BMI was 12 (well below the <0.4th centile on BMI growth chart). The 50th centile BMI for a girl aged 13 is 19, therefore her % median BMI or % expected height is 63%. (13/19) A BMI % below 70% is less than 3 standard deviations (or Z-score) and equates to severe underweight using WHO standards, and she also had features of medical instability.

Her initial blood tests were all normal, but she was found to have a prolonged QT time on ECG.

Her GP was highly suspicious of an eating disorder, and because of her medical status she was referred on the same day of presentation, and admitted to a local acute paediatric service where she received slow and graded re-feeding, safely. It took four weeks for her cardiovascular observations to return to normal, after which time she was transferred to an inpatient eating disorder unit. She was subsequently managed by a local CAMHS team, with regular reviews by her GP for weight monitoring and family support.
being addressed and refined nationally. Many (in fact the majority) of adults and children are nutritionally rehabilitated in the community, though for those with severe underweight (<70% weight for height, <3SD) an inpatient setting may be safer. The two important factors about location are mental health (or the inability to take the required amount of food to gain weight in a home environment and the requirement for specialist support) and risk of the re-feeding syndrome.

The re-feeding syndrome is a relatively rare, but potentially lethal biochemical and clinical consequence associated with the resumption of calories in severely malnourished individuals. As calories are reintroduced, phosphate levels may fall and lead to cardiac and neurological sequelae. This requires careful (daily for five days) monitoring of electrolytes and adequate treatment. There is little evidence for

<table>
<thead>
<tr>
<th>Condition</th>
<th>Investigation</th>
<th>Comments</th>
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<tbody>
<tr>
<td>Underweight and weight loss regardless of condition (including AN)</td>
<td>FBC, U&amp;E, Calcium, Magnesium, phosphate, Liver function, LH, FSH (females)</td>
<td>Neutropenia and thrombocytopenia not uncommon in underweight; Low in secondary amenorrhea</td>
</tr>
<tr>
<td>Thyroid disease</td>
<td>Thyroid function</td>
<td>Thyroid abnormalities can occur in underweight alone</td>
</tr>
<tr>
<td>Diabetes Mellitus</td>
<td>Fasting blood sugar</td>
<td>Blood sugar may be low in starvation but frequently asymptomatic</td>
</tr>
<tr>
<td>Systemic Lupus Erythematous</td>
<td>ESR, CRP and FBC as screen</td>
<td>Autoimmune screen indicated if further findings – eg, arthritis</td>
</tr>
<tr>
<td>Malignancies – eg, Leukaemia</td>
<td>FBC, Others as per clinical examination findings</td>
<td>Closinder if abnormal FBC, though mild thrombocytopenia and neutropenia common in AN. Moderate – severe thrombocytopenia (platelets &lt;100) and anaemia very uncommon in AN</td>
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<tr>
<td>Gastrointestinal (coeliac, inflammatory bowel disease)</td>
<td>FBC, CRP, ESR, Coeliac screen (tissue transglutaminase) Stool calprotectin if gut symptoms suggestive of inflammatory bowel disease and weight loss</td>
<td>‘feeling full’, non-specific abdominal pain and constipation common in AN. Coeliac screen is easy, sensitive and specific blood test that should be checked in all patients with weight loss</td>
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**Chronic, compensated underweight**

The following section challenges the frequent misconception that underweight, non-weight restored patients with AN without medical instability are safe. Significant consequences may ensue from being chronically underweight, even when signs of instability are not evident.

**Growth and final height**

Adolescents follow ordered steps in puberty, and it is AN with underweight occurring in the pubertal growth spurt (which occurs prior to the onset of first menstruation in females and in mid adolescence in boys) that is most concerning for potential growth stunting. As the peak onset of eating disorders is at age 15-19, most girls will have almost completed much of their growth, but this is a key time for growth in many males. Many children and young people will demonstrate growth arrest if underweight with AN. Some will eventually catch up, but a proportion will end up stunted. There are a number of longer term adverse outcomes associated with stunting in childhood, including future cardiovascular health, cognitive development, and educational and occupational outcomes. The impact on growth and development is usually of key importance and interest to patients and their families. Referral to a paediatrician, especially one with an interest in growth, should be considered in children demonstrating growth issues, and therefore serial measures are important in primary care.

**Bone mineral density**

Risk for adversely affecting bone mineral density in females occurs after six months of amenorrhea, and most women will have some damage after two years of amenorrhea. Bone mineral accrual increases during growth spurts in adolescents, and so those with eating disorders during these times are potentially at more risk (the growth spurt occurs before menses in females). The effect upon bone mineral density in anorexia is thought to be a combination of factors, including poor nutrition, low oestrogen and a high cortisol associated with underweight. Bone mineral density in children and young people under the age of 25 should be expressed as a Z-score (equivalent to a standard deviation) relative to population norms rather than T-score (bone density reported with reference to the bone density of 35 year old of the same sex applicable to older patients). Younger children, especially pre-pubertal children, should ideally have their bone mineral density measured with correction for bone size (as small bones in children can falsely exaggerate low bone density).
MENTAL HEALTH

However this is only available at present in a number of paediatric specialist centres.

The effectiveness of discussing and demonstrating low bone mineral density in AN as a potential motivator is unclear, but many patients and families find it useful as it provides a tangible issue for discussion about the risks of remaining underweight. The key risk from low bone mineral density is risk of a fracture, but may also include fracture healing.

Prevalence of fractures in AN has been reported as 30% in adult patients with AN, and adult patients with AN have been reported to have a seven-fold increased risk of non-spinal fractures compared to healthy women. Cumulative incidence of a fracture at 40 years post diagnosis of AN is 57%. Recent evidence also suggests that any young person with AN is at greater risk of a fracture compared to someone without, independent of measured bone mineral density values.

When weight loss is acute and significant, many patients become decompensated and develop features of medical instability

The main focus in prevention and treatment of low bone mineral density in AN is weight restoration, though even with this, bone mineral density may never recover. A systematic review has shown that oral oestrogen (such as the OCP) does not lead to increased bone density. Oestrogen patch therapy at 100mcg, with a monthly prescription of progesterone (to avoid unopposed oestrogen therapy) increases bone density while not affecting body composition. This should ideally be done by a specialist with an interest in children because of the risk of premature fusion of growth plates by oestrogen and possible stunting. It should not be given to girls with bone ages under 15. Although it is important to maximize calcium and vitamin D in diet for patients with AN there is no evidence that supplementation will improve low bone mineral density in AN as a potential motivator.

Brain growth

Studies of brain size in AN show decrease in matter on scans, and this is concerning in adolescence when normal brain growth is significant. Although there is little evidence, it is generally felt that patient engagement with therapy and recovery requires weight restoration (though the two are closely linked). Certainly very underweight patients with AN, especially acutely, will demonstrate reduced cognition, engagement and diminished problem solving skills.

Establishing a healthy weight in a chronic setting: what is weight restoration?

Conventionally, 95% of the average (median/50th centile) is used as an aim for weight restoration. This is also called 95% of the expected weight. While this is appropriate for many patients, some will grow above and below it, in keeping with BMI being a normally distributed variable among the population.

Goals for weight restoration should be an important part of therapy, and it is important to be consistent between team members. The words “target weights” should be avoided, especially in growing children where heights continue to increase (thus requiring weights to rise to meet a certain BMI). Using percentage of an average BMI is helpful because this will never change (though the average BMI and weight required will). An alternative approach is to aim for rejoining a pre-morbid BMI of weight centile, and there is some evidence for the success of this in resumption of menstruation. This can be quite problematic as frequently a pre-morbid weight is either unknown, or is unpopular with patients with AN (especially if this was complicated by obesity).

Conclusions and recommendations

Although AN is a primary mental health diagnosis, physical complications are important and are a key cause of morbidity and mortality. Team working is essential for patients with AN, but primary care physicians are commonly at the centre of such teams, and must review patients and be the gatekeeper to pick up and direct a need for more urgent medical care. The consequences of AN are mainly due to underweight, and recognizing acute instability in particular is vital. Long term consequences of chronic underweight can also be profound, especially for children and young people who are still growing.

References