Dietetic Obesity Management Interventions in Adults: Evidence Review and Clinical Application

BDA Obesity Specialist Group

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Introduction

The Purpose of this Document

This document was initially developed in 2007 following the publication of evidence-based guidance from NICE[1] and SIGN[2] on the management of overweight and obesity. It considered how to specifically and pragmatically relate these recommendations to dietetic obesity management for adults in the one to one setting. In so doing it suggested a framework for the obesity management dietetic consultation grounded in evidence while also proposing practical solutions in those under-researched areas where specific recommendations were unavailable.

Understandably over the last decade there have been substantial changes to the evidence base, new obesity guidance documents, and developments in service design and clinical practice which merit inclusion in this latest version. As with the previous discussion paper this document does not set out to suggest dietetic approaches to obesity management that are static and immovable. Rather it aims to facilitate ongoing discussion amongst the dietetic profession about how best to evolve our practice in light of new evidence, to consider how to address areas of practice with a limited evidence base, and how to develop or continue to enhance our communication skills so the best quality of patient care can be provided.

This document focuses on the one to one dietetic consultation given this is the most common form of dietetic contact and the focus of skills and practice training for undergraduate and postgraduate students. This is not to undermine the importance of alternative or complimentary forms of intervention e.g. group work, which merit separate guidance and consideration.

The Changing Obesity Agenda

1. Over the last ten years there has been a number of developments in the commissioning and design of obesity services that have created potential opportunities, but also challenges, for the dietetic profession and for obesity management more broadly.

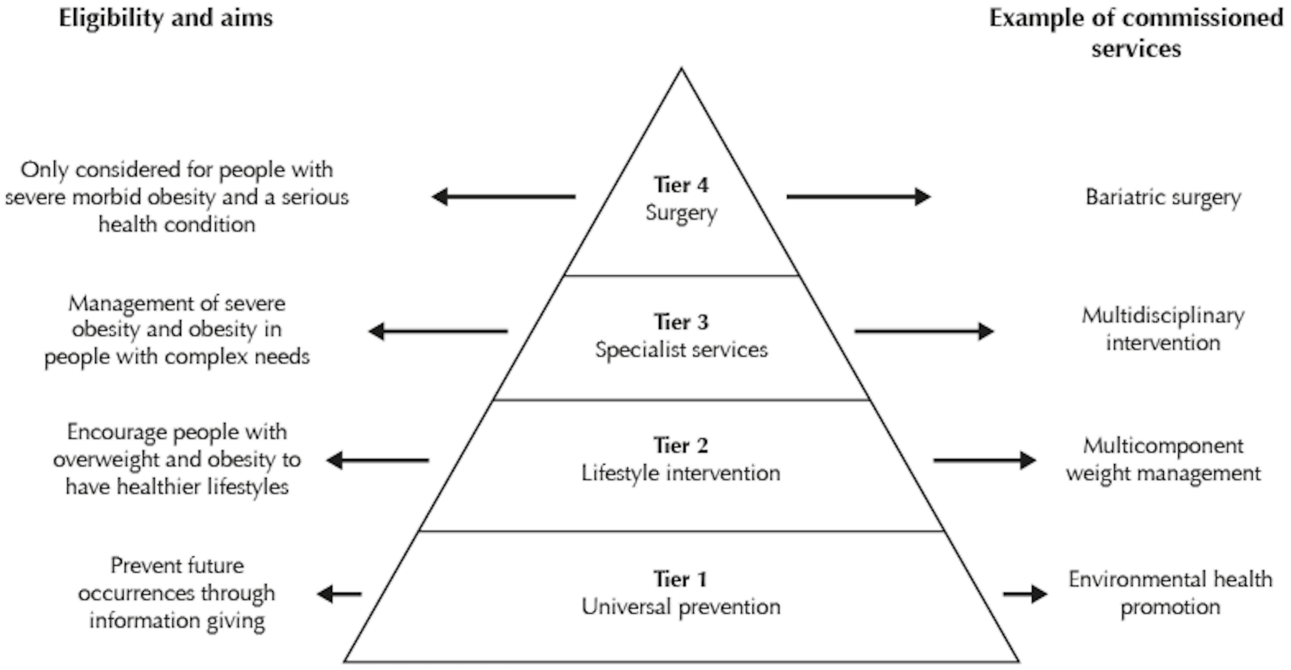
   In 2013 the Department of Health defined the Obesity Care Pathway, describing tier 3 as specialist multidisciplinary services [Figure 1] for those with severe and complex obesity and in the same year the NHS Commissioning Board recommended tier 3 services should be provided for those with severe and complex obesity[3]. This was consolidated in 2014 when the updated NICE guidance included tier 3 as an essential component of the bariatric surgery pathway[4]. The Commissioning guidance in 2014 and 2017 from the Royal College of Surgeons and the British Obesity & Metabolic Surgery Society decreed all those with severe & complex obesity must be treated in medical multidisciplinary tier 3 services including those potentially progressing to bariatric surgery[5,6].

   The inclusion of tier 3 services as an essential component of the obesity pathway raised the profile and importance of specialist services and the role of lifestyle modification, and should over the long term strengthen the design of effective care pathways. However, in the immediate aftermath a number of difficulties were evident. Across the UK inadequate tier 3 provision was identified[7], with some areas totally devoid of services. Where services were available there was variability in elements of the pathway such as the content and mode of delivery[7]. These difficulties were compounded by a lack of clarity on who was responsible for funding services and although the recent devolution of commissioning for tier 4 adult obesity services to CCG's in 2016/17 may in theory address some of these issues in England it remains to be seen whether this is the case [8].

2. A number of organisations, including the World Obesity Federation, have now recognized obesity as a chronic, relapsing, progressive disease[9]. There are strong moves away from viewing the causes of obesity as simply eating too much and exercising too little and instead recognizing the complex web of socio-psycho-biological factors that underpin why people overeat, under-exercise and gain excess weight. This is important on a number of levels but most notably in addressing weight bias and discrimination so widespread in healthcare and wider society. With a more sophisticated understanding of the broad range of causal factors [psychological, biological and societal] involved in the development of obesity there is a need for a comparable degree of sophistication in the assessment and staging of the disease. We need to move away from guiding towards and allocating treatment based on BMI and weight alone and recognize the need to identify when obesity is associated with disease, dysfunction and disability [see page 20 'Moving beyond BMI][10].

3. There has been an explosion in the role of social media and health technology in the provision of diet, nutrition and weight management advice. Unfortunately many individuals using social media or information technology to promote dietary messages may not be adequately qualified. Although increasing numbers of dietitians are filling this social media space there is a need to expand our presence to ensure evidence based messages dominate the agenda and dilute the misinformation peddled by pseudo experts[11].

Figure 1 The UK Obesity Care Pathway, 2013 DOH



The Structure of the Document

This document takes the reader through the dietetic consultation as it generally occurs in practice. From the initial referral and appointment scheduling, to the first meeting with the patient* through to the choice of treatment options and consideration of maintenance strategies. At each stage it considers the evidence, highlighting recommendations where they exist, providing examples from practice where appropriate and suggests a range of possible options where evidence is unclear.

Aims & Objectives of Dietetic Weight Management Interventions

Before we begin to discuss the dietetic obesity management intervention it is important to first establish the overall aims and associated objectives of dietetic care. This allows us to consider what motivates us as practitioners, to consider the therapeutic approach and our vision for patient care, as well as clarifying our specific role in this process.

Aim of Dietetic Care

To devise and deliver dietetic obesity management care, based on current evidence and best practice, which helps the individual to make and maintain positive lifestyle changes that are best suited to their particular needs and expectations and which promote a healthier weight for the individual.

*The term patient is used throughout this document for consistency but it is recognized that in different settings the term client may be more relevant for some readers.

Possible Objectives of Dietetic Care

1. Qualities of the Dietitian

    To demonstrate to patients the ability to work in an empathetic and non-judgmental manner and recognise the needs of individual patients

2. Preparation and Planning

    To carefully consider the important principle of “first do no harm” and to avoid any potential negative consequences of treatment

    To consider the patient’s cultural, economic and social needs and preferences in the tailoring of treatments and the choice of options available.

    To gather optimal background information on the patient typically through a robust referral system

3. Developing Patient Skills for Weight Loss

   To integrate a patient–centred behavioural approach based on sound theory and evidence from the world of behavioural medicine

   To work with patients towards regulating eating patterns and adopting healthier food choices

   To help patients recognise the important role of physical activity and work towards reducing sedentary behaviours and incorporating increased activity where possible

   To help the patient develop the knowledge and skills needed to implement and maintain changes in both eating and activity behaviors

   To contribute towards improved patient confidence through the development of achievable goals and helpful skills

4. Developing Patient Skills for Weight Maintenance

   To help patients recognise the importance of weight maintenance following weight loss

   To help patients in the development of a meaningful set of skills [cooking, shopping, meal planning, problem solving and coping strategies] and a support network that will contribute towards longer term maintenance of changed behaviours

5. Clinical Indicators

   To help patients achieve a clinically significant weight loss, [5-10% reduction from baseline over a 6-12 month period], and/or a reduction in waist circumference and/or improved body composition

   To work with patients, through clinically relevant lifestyle changes, towards improving the management of co-morbidities and risk factor reduction

6. Audit

   To monitor and evaluate the outcomes of dietetic interventions to facilitate and inform future practice or service developments

7. Continuing Professional Development

   To be familiar with current evidence relating to lifestyle treatments and consider this while tailoring interventions to meet the needs of individual patients

   To reflect on own dietetic practice, consider own skill mix and identify and address any areas requiring professional development

8. Working with Others

   To recognise the value of dietetic care in the context of the wider obesity management field and to acknowledge the skills and expertise of other professionals and organisations.

The Referral Process & Criteria

It is recognised that the precise criteria set for receiving referrals for obesity management will vary from one dietetic service to another depending on local priorities, resources and expertise.

However actively managing the referral process is an important aspect of optimising the utilisation of dietetic time and skills as well as ensuring patients are directed towards the most appropriate and helpful services. Accepting referrals for patients whose needs would be best met elsewhere or accepting incomplete referrals with insufficient supporting information may have a negative impact on patient satisfaction, attendance and expectations as well as the dietitian's satisfaction with the process and outcomes of treatment. Working collaboratively with referrers to improve the referral process may have the additional benefit of enhancing other health professionals' understanding of the dietitian's role in the management of obesity.

The following referral criteria are suggested as a baseline for considering who might benefit most from specialist dietetic support:

- Priority should be given to those with increased medical risk e.g. metabolic syndrome, CVD risk, diabetes, sleep apnoea
- Patients receiving or being considered for pharmacotherapy
- Patients who have already received comprehensive tier 2 weight management advice and support but who require additional support
- Patients who are overweight where the referrer believes the patient would benefit from the expertise a dietitian has to offer [assuming the referrer has conveyed a helpful understanding of what this might entail]
- BMI and waist circumference are an important aspect of referral criteria but should not be used rigidly. Encourage referrers to consider the impact of obesity on disease, dysfunction and disability and the possibility of using the EOSS staging criteria[10], see section Moving beyond BMI for further details. Some degree of flexibility and professional judgment should be allowed for those patients who may benefit from dietetic support but who fall outside classic cut offs and referral criteria. Clearly individual services will need to set their own BMI and waist circumference criteria that take account of local referral needs as well as published evidence.

Service Design and Organisation

Appointment systems: Treatment Duration, Length of Consultation and Frequency of Contact

How to organise and structure weight management services is clearly important in the current NHS environment where time and resources are limited. It may also have important implications for the outcomes achieved as poorly designed services which fail to meet the needs of those participating are likely to lead to suboptimal outcomes.

Unfortunately our understanding of the programme characteristics that predict success are limited and findings related to issues such as the length of initial and follow up consultations, attendance patterns and frequency, and the overall duration of follow up are mixed. Behavioral weight management programmes commonly have treatment durations of 8-12 sessions/weeks although debate continues about the potential value of extending beyond this minimum time[12,13]. In a recent study of primary care referrals to a UK commercial programme an extended 52 week treatment produced greater initial weight loss and clinical benefits together with less weight regain at 2 years compared to the brief intervention and the standard 12 week treatment[14]. Despite the increased costs of delivering this longer programme modeling suggested it would prove cost effective over the longer term[14].

Although the precise characteristics of successful treatment programmes are unclear, seeing an obese client on one occasion or once every six months, without any structured interim support, is an outdated practice that has limited chance of meeting either the patient or the practitioner's treatment expectations. NICE guidance recommends "regular, non-discriminatory long term follow up by a trained professional should be offered"[1,4]. Some of the older guidelines have been more specific recommending "regular review is necessary e.g. every two weeks"[15]. The American Academy of Nutrition and Dietetics recommends dietitians 'prescribe at least 14 encounters over a period of at least 6 months and for weight maintenance a monthly encounter for at least 1 year'.[16]

Importantly a recent review of behavioral weight management programmes found that contact with a dietitian was one of the key predictors of success[12] and regular support from health professionals is recognised as a central feature of comprehensive obesity management[1,17,18]. However the optimal frequency of contact is unknown and indeed a recent review failed to find more frequent contact was a predictor of more effective outcomes [12]. Little research has explored the effect of short or long consultation sessions although NICE states that there should be "adequate time in the consultation to provide information and answer questions"[1,4].

It may be helpful to draw on the strategies used in some of the large diabetes prevention studies and weight management trials of pharmaceutical agents where behavioral approaches to lifestyle treatment facilitated by well-trained practitioners produced modest long term change to weight associated with clinically relevant outcomes.

Table 1 Summary of Appointment Duration & Frequency in Various Weight Management Studies

Study	Appt Length	Appt Freq
Finnish Diabetes Prevention Trial[19]	30-60 min	Treatment: every 2-3 weeks for the 1st 3 months, monthly for next 3-4 months Maintenance: every 3 months
Diabetes Prevention Trial[20]	30-60 min	Treatment: 16 sessions over 24 months Maintenance: every 2 months + 1 phone contact
Pharmaceutical trials	30-60 min	Treatment: Every 2-4 weeks for 1st 6 months Maintenance: Every 1-3 months

These studies also highlight the importance of recognising obesity management does not cease at the end of the weight loss phase [~ 6 months for most people] and ideally a structured maintenance phase should be implemented thereafter.

For many dietetic services the capacity to meet such gold standards of input and support may prove challenging without additional funding and will certainly require innovation to allow current capacity to move towards achieving regular higher intensity follow up.

Creating services where optimal dietetic support can be provided is clearly important if we are to truly integrate a behavioral approach to managing obesity as suggested by obesity guidance documents[1,4]. However it may also be helpful to consider how we can help the patient enhance their available support networks through mapping of other support services that may be available, acceptable and potentially helpful to them in managing their obesity related behaviors. This may range from other health professional services, commercial weight management organisations which meet NICE best practice standards, peer or family support.

Continuity of Care

Unfortunately there is a lack of research exploring the impact of care provided continuously by the same dietitian compared with care delivered through a number of different dietitians on obesity related outcomes or patient experiences. NICE guidance suggests continuity of care is important and should be encouraged through meticulous record keeping[1] which is suggestive of a team approach to sustaining continuity rather than requiring the same practitioner to see the same patient at each visit and may be a practical solution where personal continuity is not possible.

However, weight maintenance research exploring the value of continued telephone support on sustained weight loss highlights the importance of the same practitioner making the contacts with little impact observed when an unknown practitioner is involved[21]

Qualitative research that has explored the importance of personal continuity in the general practitioner patient relationship suggests continuity may enhance trust[22], enablement[23] and satisfaction on the part of the patient[24] and through good background knowledge of the client the GP can improve quality of care and their job satisfaction[25]. Indeed research suggests that continuity of care is highly valued by patients and their practitioners, is central to the development of a good therapeutic relationship, becomes more important as patients get older, their health problems increase in complexity or they become socially or psychologically vulnerable[26].

At the heart of patient-centred care is the patient practitioner relationship and this can be challenging to develop over time if different practitioners are seen at each visit. Furthermore, the time invested by the practitioner [and patient] in gathering such a detailed understanding of their patient should not be overlooked and must be considered in situations where each patient can potentially be seen many dietitians. Although record keeping can capture the essence of various management issues it does nothing towards establishing rapport and trust, key elements in the therapeutic relationship.

Given a number of studies suggest personal continuity is valued by patients and practitioners it seems prudent to strive for achieving this where possible. However it should be acknowledged that where this isn't possible improved continuity may be provided through novel innovation or through small stable teams.

Skills and Competencies to Deliver Lifestyle Treatments

NICE recommends health professionals delivering weight management interventions should have the relevant competencies and have undertaken specific training, although no specific guidance on what these skills may entail are provided[1].

The American Academy of Nutrition & Dietetics has published a set of standards of practice and professional performance for dietitians working in obesity management and describes three skill levels; competent, proficient and expert [27]. This helpful document allows dietitians to assess their skill level, identify areas that may need further development and directs to appropriate training and support.

Doctors and practice nurses recognise the important role they play in managing obesity but report limited self-efficacy in obesity care, feel unskilled in their abilities to deliver dietary weight management advice[28-30] and make clear demands for obesity management training[31]. This training role is a very valuable use of the knowledge and skills of a dietitian and underlines the importance of ensuring high competence in our own abilities, skills and knowledge to allow the delivery of high quality training to other professionals. It is critical we continue to develop our abilities, reflect on our individual skills, knowledge and attitudes and how these impact on our current practice and in so doing begin to address any shortfalls in our understanding and training. This self-reflection will need to be an ongoing process and is in line with the recommendation for health professionals to be lifelong learners[32]

Attitudes to Obesity

There is now a large body of evidence illustrating the extent of negative attitudes towards obesity held by many health professionals[33-37] even those specialising in weight management[38]. Negative attitudes and stereotypes lead to the stigma, prejudice and discrimination affecting people with obesity across many aspects of their lives including the workplace, educational settings, the media and healthcare[39]. Despite research highlighting the extent of weight discrimination, data from the US suggests the situation may be deteriorating, with weight bias increasing by 66% over the last ten years[40]. Stereotypes which suggest obese people are lazy, weak willed, lack self-discipline, have no willpower and are non-compliant with obesity treatment are common[39]. Given obesity is often perceived as a self-inflicted condition it frequently results in blame and shame for the individual[41] and can have substantial psychological and physical consequences[42,43]. It is important we understand and address the consequences of weight bias and avoid the misconception that this type of blaming approach can motivate people to change their behavior[42].

Research suggests health professionals may draw on their negative beliefs to justify inaction in treating obesity; something that would be considered indefensible for many other chronic conditions[44] and may be linked with negative clinical practices[45]. Several studies have illustrated the potential for training and educational initiatives to positively influence previously held negative stereotypes of the obese[46,47]. Negative attitudes on the part of the practitioner, such as believing obesity represents a lack of willpower or self-discipline, is likely to damage the therapeutic relationship and patient experience of care and this may impact negatively on treatment outcomes. Although a survey exploring UK dietitians attitudes and practices in relation to obesity management revealed neutral to positive attitudes it did suggest that obesity was viewed less favorably than overweight[33].

Therefore, it seems prudent that dietitians periodically evaluate their attitudes and beliefs towards their patients with overweight or obesity and address any negativity through continued education and professional

peer support.

Consider testing and exploring your own attitudes and behaviors towards obesity using the links below:

http://biastoolkit.uconnruddcenter.org/module1.html

Project Implicit® http://implicit.harvard.edu/implicit/

A recent study which explored the perspectives of women with overweight and obesity on the importance of a number of stigma reducing strategies found comprehensive training of healthcare professionals was high on their list of important interventions[48].

For further training on awareness and prevention of weight bias investigate the online training course available via the University of Connecticut Rudd Centre for Food Policy and Obesity - Preventing weight bias: helping without harming in clinical practice www.uconnruddcenter.org

A series of educational videos, Busting the Bias, produced by the Canadian Obesity network may be useful in addressing some of the misconceptions about obesity in patients and health professionals. www.obesitynetwork.ca

The following strategies to reduce weight bias are useful to consider:

1) Reflect on own attitudes and behaviors.
2) Understand the complex aetiology of obesity and the many factors that can contribute to weight gain including genetics, biological and sociocultural contributors.
3) Be aware that patients may have experienced weight bias in previous healthcare interactions and ensure skills to empathize accurately and work in a non-judgmental way are suitably refined.
4) Acknowledge patients may have made substantial previous efforts to manage their weight
5) Acknowledge that the process of managing weight is challenging
6) Emphasise healthy behaviors as key outcomes rather than focusing on weight alone
7) Create welcoming and sensitive clinical environments

Consider joining the Obesity Empowerment Network www.oen.org.uk a non-profit, user led advocacy organization which aims to give people affected by obesity a public voice through empowerment.

Training and Life Long Learning

Given obesity is now recognised as a complex disease with a multitude of factors contributing to its development, it follows that its management will be challenging for the practitioner as well as the patient. As such the knowledge and skills base of practitioners needs to match this degree of treatment complexity and is likely to necessitate intensive and ongoing training and skills development. Indeed the breadth of knowledge and skills outlined in the American Academy of Nutrition & Dietetics standards of practice and professional performance in obesity management underlines the complexity of the disease and the need for comprehensive training across a range of areas. The knowledge, skills and essential qualities required by dietitians working in obesity management have also been described by the BDA obesity group in 2008[49]. More broadly a recent white paper outlined provider competencies for the prevention & management of obesity which are relevant to those working with multi-disciplinary teams[50].

Brief training interventions [4.5 hr.] in primary care have been shown to improve practitioner knowledge but

have no impact on patient weight loss outcomes[51]. However in the primary care Counterweight obesity model, 6-8 hours of initial training for practice nurses was followed by a 6-month period of clinic co-facilitation between trainer and trainee until the required level of competency had been achieved[52]. This latter approach of supporting skills development as well as knowledge acquisition may be the way forward in improving training outcomes and may ultimately impact on clinical outcomes.

Research among dietitians suggests further training in obesity management is needed although the majority of these studies were undertaken a number of years ago and training has evolved over this time. Obesity education was thought inadequate among Australian dietitian's working in weight management practices although they believed they were the best qualified professionals to help patients to manage weight[53]. A similar study in Canadian dietitians identified behavior modification skills as most in need of further training[54]. This was echoed in a survey undertaken in UK dietitians where cognitive behavioral therapy skills were highlighted as needing additional attention[55]. A more recent study among the UK dietetic profession found over 70% of respondents had undergone post registration communication skills training which they believed had been beneficial in improving relationships with patients and their capacity to cope with challenging consultations[56]. They identified a number of specific communications skills they wished to address through further training and it was clear many felt their skills training during pre-registration was inadequate[56,57].

The challenges faced in helping people to change their eating and activity behaviors are complex and it is unsurprising that some dietitians may feel their skills are not ideally matched to deliver emerging weight management approaches. Indeed it has been suggested that although behavioral modification is a widely used term, in practice it may be poorly understood with even greater confusion about how to implement such an approach in practice. Although currently there is no evidence that dietitians with greater expertise and skills in communication and behavior modification produce better clinical outcomes, research does suggest when dietitians fail to use a patient centered approach, lack empathy or used traditional advice giving patients are less likely to attend and experience less satisfaction with consultations[58].

One of the stumbling blocks in exploring possible differences in outcomes achieved by dietitians with varying expertise in communication has been the challenge of measuring communication skills in an objective and consistent way. The recent development of a validated tool which can be used in research studies and communication skills training opens up the possibility of exploring the impact of training on clinical results[59].

In dietetics the traditional approach to managing obesity has relied on a medical model of management providing expert dietary information linked to associated risk reduction and the assumption that this, together with direct persuasion, will be sufficient to instigate and sustain change. This approach is likely to work for only a limited number of people[60] and it is now well accepted that advice giving alone is insufficient to manage obesity effectively[61].Evidence from behavioral science supports the incorporation into obesity management of an integrated behavioral approach with the interpersonal skills of the practitioner being the key to effective and appropriate delivery. Indeed a number of authors have called for these skills to become a central aspect of our practice[55,62,63] with an associated need for high quality training and support at a pre and post registration stage.

Part of the difficulty for practitioners in developing the skills required for an integrated behavioral approach may relate to some of the confusion around exactly what is meant by a behavioral approach to managing weight. The terms lifestyle modification and behavioral therapy are often used interchangeably. They refer to a set of principles and techniques for modifying diet and exercise[64]. During the past 2 decades behavior therapy has become an integral part of most weight control research studies. Behavioral strategies need to be individualised and based on the specific needs of the person as no single strategy has been shown to be superior[65]. Reviews of randomised controlled trials where behavioral approaches to managing obesity have been compared to simple dietary treatment has highlighted the superiority of the former approach[66]. Current interventions include a number of strategies to help patients adhere to diet & activity changes. These include

self-monitoring, stimulus control, goal setting, problem solving, cognitive restructuring, self-rewards, relapse prevention and social support[65]

"Prior to the discovery of Behaviour Change Training, I found the weight management group frustrating and de-motivating mainly due to my perceived lack of ability to help. The discovery of an improved way of communicating with patients has transformed the weight management experience and has helped shift the focus away from purely what the patient was eating towards a more holistic view and a greater understanding of how and why food decisions are made"

Kate McCulla, Freelance Dietitian, Northern Ireland

Given the increased use of the internet for accessing nutrition information and the potential for virtual service delivery it is important to ensure we have the necessary information technology skills to embrace these new technologies and opportunities[67]. There are a large number of people providing nutrition and obesity management advice via the internet with limited qualifications and it is important we are engaged in this medium to promote appropriate evidence based messages.

Equipment and Environment Considerations

Due to the weight bias many people with overweight and obesity may have previously experienced in their day-to-day life or through a previous negative healthcare experience, levels of anxiety may be high prior to their visit to the dietitian, particularly if this is the first appointment.

Anticipating the patient's possible needs and attempting to create a physical environment that welcomes rather than challenges is an important aspect of the sensitive care of patients with obesity. The list below gives some suggestions of how the environment can be altered to accommodate the needs of the larger patient and this may make an important contribution to an improved experience.

Seating	Adequate numbers of large chairs with armrests or regular chairs without arm rests and with sufficient space between chairs to allow easy movement Consultation seating arrangement that avoids the practitioner seated behind a desk
Access	Consider the location and size of clinical rooms and the impact this may have on access for those with mobility issues
Scales	Scales with a wide base that weigh more than 200kg located in a private area and consider how wheelchair users will be weighed.
Reading material	Magazines and literature with appropriate healthy lifestyle information and if possible positive images of larger people
Temperature control	The use of portable fans in waiting areas and consultation rooms to maintain ambient temperature
Telephones	Interruptions during consultations to be minimized where possible
Fluids	Provision of drinking water where possible

Assessment

Importance of Assessment

Assessment is the foundation of good obesity management and forms the essential first step in the dietetic intervention. Without comprehensive understanding, on the part of the practitioner and the patient, of what has contributed to the development of the patient's obesity, how this impacts on their life and the factors that influence changing eating and activity behavior, it is impossible to truly tailor dietetic interventions to meet the needs of the individual.

Much of what has been written about assessment in obesity focuses on the evaluation of medical risk and the classification of excess weight and body fat distribution through body mass index [BMI] and waist circumference measurements. Although these are clearly important areas to consider [see below suggestion box] they are only a small aspect of dietetic care and have little bearing on understanding the patient's current lifestyle and the approaches most likely to be helpful in altering eating and activity behaviour. Therefore, the following sections highlight the recommendations in relation to the classification of obesity and direct to source documents if further information is required, but the primary focus is on the evidence and suggested approach to the behavioural assessment of lifestyle and the factors that may influence this.

Functions of Assessment

It may be helpful to consider the possible functions of assessment as this clarifies why certain areas[68,69] are explored and may influence the approach adopted in gathering information and enhancing understanding.

- To give the patient the opportunity to share and contemplate their thoughts and feelings in relation to their weight and how this influences their life.
- To give the patient the opportunity to acknowledge and explore previous weight loss attempts, consider what was helpful and unhelpful and to give the practitioner the opportunity to acknowledge the time and effort the patient has previously committed.
- Through active listening and an empathetic approach to help the patient feel understood and supported and in so doing develop a trusting relationship that may facilitate discussion.
- To help the patient explore and consider factors they feel may have contributed to the development and maintenance of their weight.
- To explore the patient's beliefs about their obesity and to establish if they believe weight loss is within or beyond their control To consider with the patient any helpful or unhelpful thoughts, attitudes and practices that may influence changing eating and activity behaviour
- To gather information on the patient's current lifestyle and how this links with weight control
- To examine with the patient their goals and expectations of weight loss
- To explore available support and whether this is likely to be helpful.

Building a picture of current lifestyle habits and the positive and negative influences upon these behaviours provides the groundwork on which recommendations can be based and a plan of action agreed.

It is also important to acknowledge patients may use the initial appointment as a time for evaluating the practitioner[69]. They may consider whether the practitioner is one who will be critical of their behaviour and believe they lack self-control or alternatively whether they will take the time to listen and be truly understanding and supportive of their situation. We need to recognise dietitians are commonly perceived, and sometimes promoted by other health professionals, as 'the food police' whose primary role is to chastise when the 'wrong' food choices have taken place[70,71]. This negative image needs to be redressed during the consultation and the approach to assessing lifestyle may make a significant contribution to this process.

For the purposes of this document assessment is discussed as two separate entities although in practice they are naturally integrated:

- Clinical assessment
- Behavioural assessment

Clinical Assessment

Clinical Assessment – What to Include

The following are suggested as baseline data[68] although much of this information collection will fall under the remit of the medical or nursing staff.

Measurements to Assess Risk

- BMI
- Waist circumference
- Blood pressure
- Fasting blood glucose/ HbA1c
- Fasting lipid profile
- Thyroid function

History

- Medical history (physical and psychological)
- Medications/pharmacotherapy
- Ethnicity
- Family history of T2DM, CHD, stroke, endocrine disorders
- History of gestational diabetes
- History of infertility, PCOS, hirsutism
- Contraception history
- Smoking
- Alcohol use

Blood & Urine Tests

- FBC, folic acid, B12
- Vitamin D
- LFT for NASH
- HbA1c/glucose tolerance test if appropriate
- Microalbuminuria if indicated
- Hormone profile if indicated
- Sleep studies, CXR, ECG or other tests as indicated

Classifying obesity and body fat distribution

NICE recommends the degree of overweight and obesity is defined by the values given in the table below[1,4]. However it urges caution in the interpretation of BMI and highlights the need for clinical judgement in certain groups where BMI may not be as closely correlated with adiposity compared to the general population. For example in those who are very muscular a high BMI may not be an indicator of increased adiposity as BMI fails to distinguish between fat and lean tissue[72].

Classification	BMI (kg/m^2)
Healthy weight	18.5–24.9
Overweight	25–29.9
Obesity I	30–34.9
Obesity II	35–39.9
Obesity III	40 or more

Likewise it is also important to recognise certain ethnic groups have higher metabolic and cardiovascular risks at lower BMI's than the thresholds indicated in the above table. Given this elevated risk the WHO reviewed the international BMI cut offs in 2004 to determine whether amendments were needed. They acknowledged the thresholds needed to be redefined but there was insufficient evidence to do so for all Asian groups and therefore the international BMI cut offs remain as originally defined[73,74].

The WHO did however suggest a number of action points linked to lower BMI in Asian populations as outlined in table 2.

Table 2 BMI Public Health Action Points for Asian Populations[73]

WHO Advice on BMI public health action points for Asian populations[73]		
White European populations	Asian populations	Description
Less than 18.5kg/m^2	Less than 18.5kg/m^2	Underweight
18.5-24.9kg/m^2	18.5-23kg/m^2	Increasing but acceptable risk
25-29.9kg/m^2	23-27.5kg/m^2	Increased risk
30kg/m^2 or higher	27.5kg/m^2 or higher	High risk
International Diabetes Federation Guidance on waist circumference thresholds as a measure of central obesity[75]		
European	Men	≥94cm [37inches]
	Women	≥80cm [31.5inches]
South Asian, Chinese & Japanese	Men	≥90cm [35 inches]
	Women	≥ 80cm [31.5 inches]
Ethnic south and central American	Use South Asian recommendations until more specific data available	
Sub-Saharan Africans	Use European data until more specific data are available	

In the NICE guidance on preventing type 2 diabetes in high risk individuals action was recommended when BMI reached 23kg/m^2 or greater in South Asian, Chinese, Black African and African-Caribbean populations[76]. The obesity guidance document also highlights the importance of using clinical judgement in individual cases of evaluating risk in South Asian patients[1,4].

Health risks associated with obesity should be classified according to the BMI *and* waist measurement as the latter is a good indicator of central adiposity where BMI is below 35kg/m^2 but it offers little to health risk evaluation when BMI is above 35kg/m^2 [66].

Higher cardiovascular risk factors are also evident at lower waist circumferences in Asian versus Western populations but as with BMI this differs according to the Asian population in question. As such the effects of obesity may be different at different thresholds making a single waist circumference for all Asian populations challenging[77].

However the International Diabetes Federation [IDF] and the World Health Organisation [WHO] have suggested separate cut offs in those of Asian origin, 90cm [35 inch] or more for men and 80cm [31inch] or more for women[73,78].

A standardised method of measuring waist circumference is outlined in appendix 1.

Moving beyond BMI

NICE currently recommends allocating obesity treatment based on a combination of BMI, waist circumference and the presence of comorbidities[4].

BMI classification	Waist Circumference			Comorbidities Present
	Low	High	Very high	
Overweight	1	2	2	3
Obesity I	2	2	2	3
Obesity II	3	3	3	4
Obesity III	4	4	4	4
1	General advice on healthy weight and lifestyle			
2	Diet & physical activity			
3	Diet, physical activity; consider drugs			
4	Diet & physical activity; consider drugs; consider surgery			

In practice many obesity interventions are allocated based primarily on BMI but this measure only provides information on the size of the patient and not on how severely affected they are physically, mentally or functionally by their excess weight. As such BMI is inadequate as the primary determinant of how types and intensity of treatments are allocated. This should not undermine BMI as a useful measure but it is important to recognise its limitations and consider more holistically whether and/or how a person's weight is affecting their physical, mental and functional health. The Edmonton Obesity staging criteria[10] [EOSS][see table X] is a comprehensive tool which is increasingly advocated as part of the assessment process. It has been incorporated into the 5A's of the primary care obesity management framework of the Canadian Obesity Network [www.obesitynetwork.ca/5A's], adopted by the American Society of Bariatric Physicians in their obesity algorithm [www.obesitymedicine.org] and by the Italian Society of Obesity in their obesity treatment algorithm[79]. In studies that have compared the EOSS staging criteria to BMI or waist circumference as predictors of mortality the EOSS tool has emerged as the superior indicator[80,81].

EOSS emerged from the recognition that obesity related complications and co-morbidities do not always linearly correlate with BMI[10]. In other words in clinical practice there are patients classified as overweight or Obesity I who are profoundly affected by their excess weight with, for example, type 2 diabetes, obstructive sleep apnoea and depression. Alternatively there are patients classified, according to their BMI, as stage II or III obesity but who have minimal physical, psychological or functional consequences. It has been suggested

EOSS stages 0 and 1 should be treated in primary care and the community and those most severely affected medically, psychologically and functionally with EOSS scores 2-4 should be referred to specialist centers where more intensive treatment options can be considered.

Table 3

The Edmonton Staging Criteria[10]

Stage 0	No apparent risk factors e.g. blood pressure, serum lipid, and fasting glucose levels within normal range, no physical symptoms, no psychopathology, no functional limitations, and/or impairment of well-being related to obesity
Stage 1	Presence of obesity-related subclinical risk factors [e.g. borderline hypertension, impaired fasting glucose levels, elevated levels of liver enzymes] mild physical symptoms [e.g. dyspnea on moderate exertion, occasional aches and pains, fatigue] mild psychopathology, mild functional limitations, and/or mild impairment of well-being
Stage 2	Presence of established obesity-related chronic disease [e.g. hypertension, type 2 diabetes, sleep apnoea, osteoarthritis], moderate limitations in activities of daily living and/or well being
Stage 3	Established end-organ damage such as myocardial infarction, heart failure, stroke, significant psychopathology, significant functional limitations, and/or impairment of well-being
Stage 4	Severe[potentially end stage] disabilities from obesity related chronic diseases, severe disabling psychopathology, severe functional limitations and/or severe impairment of well-being

Behavioural lifestyle assessment

It has been suggested that a behavioural assessment of lifestyle is best undertaken by a practitioner with specialist skills[82,83] and such an evaluation usually requires an hour of professional time[69]. This is reflected in some dietetic practice across the UK where the initial appointment is devoted solely to assessment and allows 45-60minutes for this to take place. As illustrated by the breadth of the issues described below assessment can be a particularly challenging aspect of management and is unlikely to be completed quickly, particularly in those patients with complicated or long-standing histories. This calls into question the traditional dietetic practice of allowing 30 minutes for an initial consultation during which assessment must be completed and treatment advice provided. A comprehensive behavioural lifestyle assessment undertaken by a skilled practitioner must be one of the key selling points in explaining what dietitians may offer beyond the type of first line, often brief, interventions available in primary care and community settings.

The areas listed below are only suggested topics to explore and should not be considered obligatory in all patients.

Suggested Areas to Cover in Behavioural Lifestyle Assessment:

- The story so far, what led up to the referral – opportunity for the patient to tell their story and to feel heard and understood
- Understanding patients thoughts on referral
- Expectations of treatment
- Motivation to change lifestyle
- Weight history
- Dieting history
- Patient understanding of obesity
- Potential barriers to change
- Eating patterns
- Current lifestyle: dietary intake and physical activity
- Support networks
- Reward systems/strategies used to reinforce new behaviours

Although the main assessment tends to take place at the initial appointment it is possible to stage the process across visits and this may be necessary in those individuals with a complicated history. Ongoing evaluation will occur at subsequent appointments as part of the review process.

Understanding the Patient's Thoughts on the Referral

It is commonly assumed that if a patient attends an appointment they must want to be seen by the practitioner, are enthusiastic about managing their obesity, and implementing the recommended treatment programme. However the reality may be very different and it is worth spending a few minutes at the start of the consultation establishing what prompted the request for help, or led up to the referral, and whether or how, they envisage the dietitian supporting them. These first few minutes of an interview are a critical time for building a bond with the patient. Taking the time to understand the events that have brought them to the appointment and what they hope to gain from the practitioner can make an important contribution to this process. Clarifying that the dietitian's role is not to tell them what to do, but rather to explore with them the elements involved in the development of their obesity and possible treatment options, can be an invaluable start to a consultation[84].

If during the discussion it becomes apparent the patient is not interested or is unable to manage their weight at this time it has been recommended that the option of returning when their circumstances or feelings have changed is provided[1]. It is also recommended that information on the health benefits of modest weight loss should be offered to ensure they have sufficient knowledge on which to decide no action is the right option with the suggested goal of weight stability to prevent further escalation of risk[1]. However it is important to ensure this process is truly collaborative rather than the practitioner measuring readiness for change and deciding on behalf of the patient whether they are ready or not to make changes to their lifestyle.

Expectations of Treatment

Although successful weight loss is defined by practitioners and policy makers as a sustained loss of 5-10% over 6-12 months, for many patients this would be deemed a disappointing outcome. A number of studies have highlighted the much higher weight loss targets often set by people trying to manage their weight. Participants in a recent study described weight loss goals of 19.8% ±7.9% of their body weight with over 90% selecting a goal ≥10%[85]. Earlier research in women with a median BMI of 40kg/m^2 reported weight loss targets of 42%[86]. Although those with a BMI ≥35kg/m^2 are likely to need to lose 15-20% of their starting weight in order to achieve improvements in associated co-morbidities[2] this is only achieved by a very small percentage of those in behavioural weight management programmes, hence the need for more intensive treatments in those with severe and complex obesity. Traditionally behavioural programmes have suggested unrealistic weight loss targets are detrimental leading to patient disappointment, dissatisfaction and early relapse with a focus on supporting patients to reposition their expectations towards more realistic outcomes. However, a number of recent studies have challenged this assumption and suggested there is limited evidence to support this practice. A meta-analysis found there was no empirical evidence that setting realistic goals led to greater weight loss or conversely unrealistic goals had a negative effect on weight loss outcomes[87]. Indeed some research has suggested higher targets may be motivational producing more intensive effort and an improved outcome[88,89]. Further evidence is needed to clarify the complex relationship between patient's expectations of treatment, their goals, target weight losses and how these impact on treatment outcomes and programme attrition. In the meantime it seems reasonable for practitioners to provide accurate information on the usual outcomes achieved with a treatment programme/approach as well as helping patients explore what they hope weight loss will achieve. It is not uncommon for people to believe weight loss will automatically improve self-esteem, personality, body image, close relationships or various other psycho-social outcomes. Although these may be positively affected they are generally influenced by many factors other than weight[90] and in evaluating previous weight loss attempts patients may acknowledge these alterations did not occur. This highlights the importance of motivations and treatment outcomes being centred on improvements to physical health and a person's functional capacity [energy levels, ability to climb stairs or play with children][91]. If improvements in psycho-social areas are the patient's primary goals it may be appropriate to consider other or adjunct treatments delivered by mental health professionals such as cognitive behavioural therapy to improve body image[69].

Motivation to Change Lifestyle

Understanding a patient's motivation for treatment is an important aspect of assessment and influences the decision to commence or defer treatment. In many instances assessing motivation is not a simple process that can be determined by asking one or two questions alone and will be testing to the interpersonal skills of the practitioner.

Motivation or 'willpower' is commonly assumed to be something you either have or you don't. However in reality it is a far more complex phenomenon, often changing over time and being influenced by numerous factors. Indeed motivation levels seem to be task specific so it is perfectly possible for the same individual to have high motivation to change one behaviour but low motivation to change another. It is also important to recognise motivation is needed throughout the change process not just at the start of treatment and usually fluctuates depending on the patients circumstances

The variation in motivation seems to relate to two key components

- The importance the patient ascribes to the specific change [willingness to change]
- The confidence they have in their ability to undertake that change [ability to change]

It is possible to use scoring systems to evaluate the importance and confidence a patient may ascribe to changing a behavior [on a scale of 0-10, where 0 is not important/not confident at all and 10 is extremely important/confident, where would you place yourself?[92]].

However care is needed in the use of these motivation scoring systems and should ideally be used by practitioners who have had sufficient training on the underpinning theory and associated skills[93].

Assessing importance and confidence in this way alludes to the patient's willingness and perceived ability to change but it is important to recognise these are complex interacting phenomena and do not give a simple indication of readiness. In general though it is possible to evaluate whether the patient needs to focus on increasing importance, or improving confidence, or both.

For a more detailed description of how to practically evaluate readiness or motivation to change refer to the Changing Health Behaviour chapter in the Manual of Dietetic Practice[94].

It has been suggested if a therapeutic relationship can be developed in which the patient feels supported and understood by the practitioner this can be vital in sustaining the motivation necessary for the long term and challenging task of managing obesity[95,96].

Weight History

There are two areas to explore in this category that may give an indication [but not a diagnosis] of the patient's genetic predisposition to obesity and may be relevant to discussions on the factors contributing to their difficulties controlling weight and may provide an opportunity to convey understanding and hope to the client.

Age of onset of obesity – early onset childhood obesity may indicate a stronger role of biological factors[97]

Family history of obesity – obesity is known to run in families and this is due in part to shared genes[98] with maternal obesity appearing to have a stronger predisposing effect than paternal obesity[99]

Research has clearly demonstrated that some people have a greater genetic tendency to obesity than others. Indeed in experimental overfeeding it has been shown that wide variation exists in the amount of weight gained despite an equivalent feeding of excess calories[100] As our understanding of how specific genes influence body weight has improved over recent years so variability in predisposition to overweight has become clearer highlighting the unfairness and inaccuracy of judging the obese as simply those individuals with no self-control or a tendency to laziness.

Although there is much that remains to be understood about body weight control it is evident that there are some individuals who have the odds stacked against them in terms of spontaneous control of body weight.

Discussing these issues with patients can be an opportunity to convey understanding and optimism in relation to the management of their obesity. The information that some people are more predisposed to struggle with weight than others can be very important for those patients who find it difficult to understand, and accept, why they find it harder to control their weight than friends and peers. It may help allay some of their feelings of self-blame, guilt and shame[69] and is likely to contribute to the sense of support and understanding they feel the practitioner has provided.

However as well as acknowledging differences in biological risk it is also very important to discuss weight loss is possible even in those with strong biological predisposition. Getting the balance of this message right is not a simple task, and will draw heavily on the practitioner's interpersonal skills, but essentially focuses on recognising weight management will be more difficult for some people than for others, but is nevertheless still possible.

I am often struck by how frustrated people who struggle with their weight can become and this is frequently compounded in those with additional medical problems and/or by a lack of understanding shown by some health professionals. Strong genetic predisposition towards obesity needs to be acknowledged in an empathetic manner and taken into account when discussing realistic weight loss expectations. For many patients the relief of having their concerns acknowledged can free them up to consider possible management options in a constructive way. Dismissing patient's genuine concerns simply leads to increased resistance to change. The role of genetic predisposition is frequently glossed over by health professionals for fear that such acknowledgement will let the patient off the hook and discourage them from taking responsibility for change. However, this is an opportunity for the dietitian to convey her understanding of how challenging weight management can be for those with a strong family history as well as highlighting that change is still possible despite such predisposition. This creates a mutual respect that facilitates the helping relationship where changes to diet and activity can be explored in a supportive manner

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Concerns have been expressed about discussing the issue of genetic predisposition with patients and the fear it may lead to fatalism and reduced motivation to change eating and activity habits. However, studies that have explored the response to conveying genetic information about the FTO gene to individuals suggest a number of positive benefits[101,102]. In those with higher risk variants for the FTO gene, people expressed relief at having this confirmed and importantly were not fatalistic about their capacity to manage weight in the future, indeed they reported increased motivation[101,102]. Early research suggests knowledge of enhanced risk may lead to improved weight loss outcomes although more research is needed to confirm this finding [103]. In those with lower risk variants for the FTO gene no complacency was reported when the results of the testing were explained rather they recognised the multifactorial causes of obesity [101,102].

It is also useful to discuss the history of weight change in relation to significant life events such as starting university, getting married or having children. It can be helpful to discuss with patients whether some significant life events have been linked to positive or negative changes in weight[104] and then precisely how these events may have led to changes in lifestyle. For example a rapid weight gain linked to a new job may lead to further discussions on how the long hours at work were linked to a heavy reliance on take away foods, or the use of foods as a coping technique in times of stress and/or difficulty in finding time to exercise. Again this is a technique that needs to be used sensitively and by practitioners with considerable interpersonal skills.

Dieting History

Listening to the details of the many previous weight loss attempts that the patient will often have made is an important aspect of acknowledging and respecting the time, effort and frustration experienced by many patients[69]. Furthermore it can provide insight into the factors that may be helpful or unhelpful to future obesity management attempts and can provide information as to the expectations of treatments and their beliefs about the extent of control over their weight. Discussing what prompted previous attempts, how much weight

was lost over what period of time, the advantages and disadvantages of each programme, and what may have been triggered weight regain can be particularly enlightening particularly if recurring themes emerge.

Patient Understanding of obesity

It is not unusual particularly in those with longstanding obesity who may have made many previous 'dieting' attempts to lose confidence and belief in their ability to control their weight. It is understandable some people believe their obesity is the direct result of a slow metabolism or some other medical problem totally beyond their control and question whether changes to eating and activity behaviour are beneficial. Identifying and exploring these issues can be helpful as long as this is done tentatively by a skilled and non-judgemental practitioner. Acknowledging the complexity of obesity and the challenge some people face in managing their weight can be helpful and may encourage patients to reveal more about their difficulties in altering eating and activity behaviour. Openly doubting the patient who says they are eating next to nothing and yet still gaining weight is unlikely to be helpful and will most likely increase resistance on the part of the patient[105]. Building trust and rapport in this situation is the strategy most likely to be helpful and in time the patient may begin to internally question their beliefs about the factors influencing their weight. [further discussion can be found in chapter 12, Weight Management: A Practitioners Guide][105]

Potential difficulties or barriers to change

Discussing and identifying potential barriers and difficulties in changing eating and activity behaviour is an important aspect of the assessment process and forms the basis from which strategies to address some of these issues can be developed. A useful starting question might be "What might make changing your eating difficult for you?" Simply acknowledging the difficulties the patient has previously experienced can make a large contribution to their feelings of a practitioner trying to understand their specific situation.

Commonly patients feel strongly about wanting to lose weight but may feel they are unable to put changes into practice – the "I want to but I can't" scenario. This often reflects ambivalence towards changing behaviours and should be considered a normal part of the process of change. It has been suggested exploring ambivalence through discussing or writing down the pros and cons of changing or of remaining in status quo can help the patient better understand their feelings about changing food or activity habits. Helping patients become more aware of the difference between where they are now [current behaviours] and where they want to be [intended behaviours] can prove a very motivating strategy[93]. However the use of this type of motivational approach requires practitioners with strong interpersonal skills and specific training in this technique[105]

Eating and drinking patterns

Establishing the frequency of eating and the number of meals and snacks consumed during the day is an important issue during the assessment as one of the initial treatment goals for patients with chaotic eating patterns may be to develop a structured meal pattern.

Skipping meals is a common strategy used by people with overweight or obesity, often as a misguided method of managing weight, or as a by-product of years of inappropriate dieting[106]. It has been suggested this practice may disrupt appetite regulation with links to increased hunger and disinhibition[107] whereas in observational studies regular eating has been associated with improved dietary profile and weight control[108-110]. It has been suggested that regular eating may be protective against opportunistic or emotion driven

lapses in dietary control[111] and regular breakfast eating is an important behavior of participants in the US National Weight Control Registry who have successfully maintained long term weight change[106]. However, in the limited number of randomized controlled trials which have explored the impact of eating breakfast on weight, none have found greater weight loss in those consuming breakfast[112-114] and a higher frequency of eating does not appear to lead to greater weight loss[115]. Given the uncertainty in the obesity literature about the optimal frequency of eating it seems important to retain a degree of flexibility in discussing this issue with patients and to tailor advice according to the individual's current circumstances and previous experiences of altering meal frequency.

As binge eating disorder [BED] is fairly common in those seeking weight loss treatment [5-30%][116,117] it is important to be aware of the possible presenting characteristics of this disorder as specific psychological treatment is necessary and binge eating behaviour needs to have ceased before weight management can be considered[118].

Binge eating disorder was coded as a distinct entity in the DSM-5 manual in 2013[119].

Criteria for Binge Eating Disorder[119]

A. A recurrent episode of binge eating.

An episode of binge eating is characterised by both of the following:

1. Eating, in a discrete period of time (e.g. within any 2 h period), an amount of food that is definitely larger than most people would eat in a similar period of time under similar circumstances
2. A sense of lack of control over eating during the episodes (e.g. a feeling that one cannot stop eating or control what or how much one is eating)

B. The binge-eating episodes are associated with three (or more) of the following:

1. Eating much more rapidly than usual
2. Eating until feeling uncomfortably full
3. Eating large amounts of food when not feeling physically hungry
4. Eating alone because of being embarrassed by how much one is eating
5. Feeling disgusted with oneself, depressed, or very guilty after overeating

C. Marked distress regarding binge eating is present

D. The binge eating occurs, on average, at least once a week for 3 months

E. The binge eating is not associated with recurrent use of inappropriate compensatory behaviours such as bulimia nervosa and does not occur exclusively during the course of bulimia nervosa or anorexia nervosa

Specify if:

In partial remission: After full criteria for binge-eating disorder were previously met, binge eating occurs at an average frequency of less than one episode per week for a sustained period of time.

In full remission: After full criteria for binge-eating disorder were previously met, none of the criteria have been met for a sustained period of time.

Specify current severity: The minimum level of severity is based on the frequency of episodes of binge eating (see below). The level of severity may be increased to reflect other symptoms and the degree of functional disability.

Mild: 1–3 binge-eating episodes per week.

Moderate: 4–7 binge-eating episodes per week.

Severe: 8–13 binge-eating episodes per week.

Extreme: 14 or more binge-eating episodes per week.

Although dietitians are not qualified to diagnose patients with BED we can note symptoms and liaise with medical and psychiatric colleagues to support diagnoses for the patient where appropriate. In some situations the dietitian may be the health professional most likely to pick up on some of the symptoms outlined in the diagnostic criteria given the time spent with patients discussing food intake and eating behaviours.

Identifying BED in patients seeking obesity treatment is important as different treatment approaches are needed to facilitate the primary treatment goal of binge cessation. The recent NICE guidance on eating disorders management outlines a stepped approach to treatment with self-help CBT programmes offered in the first instance. If this self-help approach is not acceptable or is ineffective after four weeks, referral to group or individual CBT programme should be considered[120].

Current lifestyle: Dietary Intake

Establishing a picture of the dietary intake of the patient is clearly a central aspect of the dietetic obesity intervention however it must be recognised the methods currently available will only allow an overall impression of energy and nutrient composition as they rely on self-report. Indeed striving for a more accurate evaluation through the use of more and more questioning will most likely not only be futile but has the potential to adversely influence the patient practitioner relationship through increased resistance on the part of the patient and increased frustration on the part of the practitioner.

People with overweight and obesity are known to under-report their energy intake by approximately 30-50% compared to 20% in the non-obese[121]. Although numerous theories have been explored to explain this under-reporting, such as the process of portion assessment or cognitive burnout in completing diaries, only relatively recently has attention turned to some of the psychological explanations associated with under-reporting[122]. One qualitative piece of research that explored participant's decisions about what to report in

food diaries found one of the major influencing factors was the perceived social acceptability of what they reported. Participants stated they were concerned researchers would judge their normal dietary patterns as "bad" and as a consequence considered altering their recorded food intake[123].

For many years in dietetic practice a diet history or a 24-hour recall has been used to evaluate dietary intake in overweight or obese clients. Traditionally these methods focused on the use of numerous closed questions to gather information with the premise that the more questions asked and the more intensive the probing the greater the level of detail achieved. This tends to result in premature focus on the detail of what is eaten rather than gaining an initial overall picture. As no research has explored the patient's experience of this approach it is unclear whether such direct questioning may influence the willingness of patients to reveal their dietary intake and contribute to the extent of under-reporting commonly observed in obesity consultations.

However as the influence of the behavioural approach has expanded so recognition has increased of the style of the consultation, the way in which questions are asked, the interpersonal skills of the practitioner and the influence all of this may have on the quality of information gathered and patient practitioner relationship. This has led to the development of the typical day approach using various core communication skills such as reflection, paraphrasing, open questions and summarisation as strategies for eliciting dietary intake information while minimising any associated shame or embarrassment[104]

There are also a number of questionnaire based tools developed to facilitate dietary assessment and counseling. These approaches are subject to the same challenges of other self-report methods, including under-reporting of energy intake, recall issues, social acceptability of reported intake and difficulty of describing portion sizes. It is also important to consider the time taken to complete questionnaires and the associated burden for the patient and the health professional in scoring and interpreting the contents. The patient's experience of questionnaires will also be influenced by the timing of its completion, whether they have established a trusting relationship with their practitioner and understand the relevance of the questionnaires results. A summary of brief dietary assessment tools suitable for use in clinical practice, with simple scoring systems, and which include the relevant dietary areas for assessment in obesity management have been explored in a systematic review [124]. REAP is a brief, self-administered dietary assessment tool developed in the US for use in primary care settings primarily by doctors or nursing staff[125] and although it may be useful in some dietetic settings the level of detail it provides is fairly limited.

It is important not to overlook the intake of alcohol during the assessment process and if excessive drinking is reported further exploration via the AUDIT questionnaire [Alcohol Use Disorders Identification Test] may be helpful. This is a 10 item screening tool developed by the World Health Organisation to assess alcohol consumption, drinking behaviours and alcohol related problems[126].

A number of innovations in dietary assessment have occurred over recent years as new technologies have facilitated the use of mobile phones for self-monitoring of food intake. Mobile devices allow the easy use of food photographs to guide portion size estimation and provide instantaneous feedback on nutritional composition of foods and meals as they are entered. Electronic dietary assessment can also be utilized and accessed by practitioners via email or web portals and can provide opportunities to enhance communication with patients. Research which has compared traditional paper recording with website and mobile electronic assessment has found improved acceptability, user satisfaction and improved adherence to self-monitoring using the electronic approaches[127-129]. This is important given behavioural self-monitoring is a key predictor

of successful behavior change[130].

However self-monitoring, whether paper based or electronic, must be used sensitively and given the propensity for some patients to feel uncomfortable about revealing their dietary intake it seems prudent to reserve the use of this strategy until after the initial appointment when rapport and trust has been established, the rationale outlined, and ground rules associated with the use of the food monitoring discussed and agreed.

Diary keeping is a time intensive task and in order to make this less onerous it can be helpful to guide the patient in focusing on recording a specific targeted behaviour while highlighting the importance of practising this self-monitoring skill over time. Food diaries are powerful tools but depending on how they are promoted by the practitioner they have the potential to be associated with positive or negative patient experiences and outcomes of treatment. If used appropriately food diaries can be an excellent collaborative tool through which the patient and practitioner can work to identify links between eating habits and weight change leading to the development of a range of possible solutions. However, if used inappropriately they can become the medium through which the patient anticipates, or actually experiences, judgmental comments about their food intake. It is essential we carefully consider and reflect on our attitudes and practices in the use of food diaries and call for more research to enhance our understanding of how the various dietary assessment methods are experienced by patients.

As a way of setting a framework for change it can be helpful to consider estimating the energy intake for weight loss for the client using predictive equations. This can help by giving guidance on the energy intake goal necessary [see appendix 10, Weight Management: A Practitioners Guide[105]] and through discussion can help the patient understand more about the concept of energy balance and how it relates to their individual weight change. This may not be warranted in all cases but for some patients where there seems to be difficulty around portion sizes it may be a helpful strategy[104].

Current Lifestyle: Physical Activity

There are three main assessment methods that can be used to give an overall impression of the physical activity patterns of a patient

- Open ended questions
- Activity diaries
- Pedometers/activity monitors

Some examples of useful open ended questions are given below[104]. A significant degree of clinical judgment will be required on when, and if, to ask some of these questions and again is dependent on the strength of the practitioner's interpersonal skills.

- What is the most active thing you do in a typical day?
- What types of activities do you enjoy and how often do you engage in them?
- Do you enjoy activities alone or with others?
- How many hours a day do you spend in front of the TV or computer?
- What types of activities have you done in the past that you don't do currently?

- What types of exercises would you like to learn how to do?
- When in your day do you have time to add in exercise?

Activity diaries are based on the same principles as those for monitoring food intake and can help detect specific activity patterns and behaviours. They involve the client closely observing their own activity behaviour and in so doing begin to identify some of the barriers associated with becoming more active. It is usually most helpful for clients to record the type of activity and the time spent doing the activity or the distance walked, cycled or run if relevant.

Pedometers/activity monitors are a means of objectively measuring baseline day to day walking and other ambulatory activity that often represents a large proportion of daily activity. Although the accuracy of these devices may vary they can provide a useful measure of baseline activity and a visible means of monitoring changes in activity behavior. The activity monitor is worn on the patient's wrist or waist, depending on the device, and measures the number of steps taken in the day. This can subsequently be related to levels of activity as suggested in the table below

Number of Steps and the Associated Activity Categories[131]

No. Steps/Day	Activity Category
Less than 5,000	Sedentary
5,000 to 7,499	Low activity
7,500 to 9,999	Somewhat active
10,000 or more	Active
More than 12,500	Highly active

There are various activity questionnaires available to evaluate activity levels although some are best reserved for use in research studies where the facilities and time is available to score and interpret appropriately. The General Practice Physical Activity Questionnaire [GPPAQ] is a reliable validated tool for use in primary care for the assessment of physical activity levels in adults and uses only 7 questions[132]. It takes one minute to complete and allows adults to be classified according to their physical activity index [PAI] which correlate to cardiovascular risk; active, moderately active, moderately inactive or inactive. It is recommended that anyone falling below the 'active' category should be guided towards increasing activity levels [133].

Assessing barriers to activity is an important aspect of the physical activity assessment with suggestions that a useful opening question may be "What gets in the way or interferes with you being more active?[104]. Some of the common barriers patients experience include limited time, lack of support, poor confidence in their ability to be active, negative experiences of sport in school or limited enjoyment of exercise. Discussing the patient's specific individual difficulties provides a baseline from which potential solutions may be developed and evaluated.

Dietitians may be concerned about the safety of recommending increased activity as part of a weight management programme although reassurance has been provided that moderate-intensity physical activity is safe for most overweight and obese clients[104]. However there are high-risk individuals in whom a formal assessment by their GP and subsequent approval would be wise before considering any specific physical activity recommendations. The table below gives some key pointers as to which individuals might pose a greater risk. If there is any doubt about whether a patient needs to check with their doctor before beginning an activity programme the PAR-Q quick questionnaire provides appropriate guidance [available from www.csep.ca/forms.asp].

Table 4 How to Judge Risk in Relation to Physical Activity[104]

Low risk patients	Men below 45 yr Women <55yr with no signs/symptoms CVD & no more than 1 CV risk factor*
Moderate risk patients	Men >45yr & women >55yr & more than 1 CV risk factor*
High risk patients	Men or women with current CV, pulmonary or metabolic disease

*family history of coronary artery disease, cigarette smoking, hypertension, hypercholesterolemia, impaired fasting glucose, and sedentary lifestyle

Agreeing a way forward

Once the initial assessment process has been completed it is important to consider and discuss with the patient the treatment options available and together agree a management programme that includes a weight loss and a weight maintenance phase. It may be helpful to focus on the patient's preferred choices initially and discuss the feasibility of implementing such changes in practice, although part of our professional responsibility is to sensitively guide towards those changes which will have the greatest impact on individual health outcomes[84].

This forms the basis of negotiating goals and developing a change plan with the client. This must be undertaken in a collaborative way to ensure the practitioner is not setting goals on behalf of the patient and they are actively involved in defining what is realistically possible. Goal setting is often linked with SMART criteria – specific, measurable, achievable, realistic and time specific although this is a theoretical concept and in practice goal setting is about the what, when and how of change. Clarifying the details of what has been agreed between the patient and the practitioner by writing down the goal and how it is going to be achieved can be helpful in strengthening commitment and understanding.

Specifically working with patients on two or three goals at a time, waiting until these have been achieved before renegotiating on the next stages can be important to gradually building up the client's confidence in their ability to achieve small behavioural goals[84,105].

Summary

Skilled practitioners, who work through the assessment process in a non-judgemental manner, build rapport and trust with patients and establish the details of factors contributing to obesity and the current scenario will have created an excellent foundation of shared understanding from which the next steps in the management process can be developed.

Evaluating Weight Management Interventions

Evaluating whether and to what extent the interventions we deliver make a difference is an important and increasingly expected aspect of practice which is essential in the delivery of high quality obesity management responsive to patient's needs. As such scrutinizing the quality of the interventions delivered in terms of their effectiveness, patient experience and safety is essential. This requires systems to be put in place which facilitate data collection and monitoring and which naturally link with the initial assessment phase as well as ongoing monitoring. Evaluation in obesity management is a work in progress with a need for greater understanding of which outcome measures best reflect the impact of lifestyle modification in this condition. In particular, validated tools which are quick and feasible to use in clinical practice and which measure dietary intake and physical activity effectively are particularly relevant.

The National Obesity Observatory has produced a step by step guide on how to plan, design and conduct evaluations in weight management interventions

- Introductory guide to the evaluation of weight management, physical activity and dietary interventions, NOO 2015 accessed from www.noo.org.uk

This is essential reading for anyone new to evaluation and/or those intending to use the standard evaluation frameworks which provide detailed information on the data that needs to be collected. All evaluation frameworks are available from www.noo.org.uk

- Standard Evaluation framework for weight management interventions, NOO 2009
- Standard Evaluation Framework for Dietary Interventions, NOO 2011
- Measuring Diet and Physical Activity in Weight Management Interventions, NOO 2011 [copies of questionnaires also available for download.

Clinical outcome measures are commonly considered when evaluations are planned but of equal importance are those measures which explore patient reported experience [PREM's] and patient reported outcome measures [PROMS]. Further information on how to practically evaluate individual weight management interventions can be found in chapter 11 of Weight Management: A Practitioners Guide[105].

Treatment Options – Evidence of What Works

Evidence supports the improved efficacy of obesity management programmes that combine diet and physical activity treatments together with behaviour modification hence the recommendation for multicomponent interventions[1,4,134]. The process described below of first establishing stability in eating patterns and improving the quality of the diet are important elements and may be helpful before considering other dietary strategies [135]

Dietary treatments

Stabilisation of eating

If an erratic eating pattern has been identified during the assessment process the first stage in management may be to help the patient develop a regular structured eating pattern[135,136]. Erratic eating may range from skipped meals and long periods of fasting, grazing, frequent snacking or binge eating. Indeed in some individuals establishing a regular meal pattern may be sufficient to induce some weight loss and will provide an improved basis from which energy deficit approaches can be considered. Guidance on meal planning, shopping, food labelling and portion sizes can be an important aspect of this process.

For those with serious disordered eating please refer to the assessment section on binge eating disorder, consider the use of a self-help manual[137] or refer to mental health professionals where appropriate.

Improving the Quality of the Diet

Helping patients begin to move towards the general recommendations for a healthier diet, even if weight change is limited, is important in establishing eating habits known to be associated with many health benefits[1].

A number of studies have demonstrated the benefits associated with food nutrients on health parameters. The Dietary Approaches to Stop Hypertension [DASH] clinical study showed a healthy eating plan that emphasises fruits, vegetables and low fat dairy foods can both reduce the risk of developing high blood pressure and lower elevated blood pressure[138,139]. The Portfolio Diet found combining foods [e.g. plant sterols, soluble fibre, soya protein and nuts] can have an additive effect and assist with lowering total cholesterol and LDL-Cholesterol[140].While the Mediterranean-style diet identified in the Lyon Diet Heart Study [e.g. increasing fruits, vegetables, whole grains, beans, pulses, fish, nuts, seeds, monounsaturated fats and reducing animal protein and saturated fat] is widely referred to as an example of a dietary pattern offering primary and secondary health benefits for cardiovascular intervention[141,142]. The UK dietary policy on the prevention of cardiovascular disease highlights recent evidence supporting the importance of limiting free sugars [≤5%E][143] given their contribution to energy intake [144] and increasing total dietary fibre [30g/day], particularly cereal fibre and wholegrains, as they are strongly associated with reduced cardio-metabolic health outcomes[143,144].

Low Fat Diets

The definition of a low fat diet, in terms of its contribution to energy intake, is not clearly defined and although often considered as ~30% energy from fat a number of intervention studies have used low fat diets at much lower levels of 15-20%[145,146].

Historically high fat diets have been associated with weight gain with a number of possible mechanisms involved;

1. Fat is the most energy dense macronutrient and this high energy density has been linked with passive overconsumption when compared to lower energy dense diets[147].
2. The mouth feel of high fat foods has also been recognized as being important in over consumption[148].
3. The role of dietary fat in preferential storage is also a potential mechanism through which high fat intakes may be associated with weight gain[149].

Feeding studies in which the fat content of the diet has been manipulated have observed weight loss with low fat diets and weight gain with high fat intakes supporting the role of dietary fat in weight regulation[150-152]. A very large randomized controlled trial in women in which participants followed either a control diet or the low fat intervention diet [20%E], with recommendations to also increase fruits, vegetables and wholegrains and replace fat with carbohydrate found a 1.3kg statistically significant greater weight loss in the intervention group which was sustained during the maintenance phase[145].

There have been a number of reviews of randomised controlled trials and cohort studies that have explored the impact of lowering dietary fat on weight. A large systematic review of 33 RCT and 10 cohort studies which compared lower with usual fat intake concluded low fat diets led to a small [-1.6kg] but statistically significant reductions in body weight[146]. Likewise a more recent systematic review of randomized controlled trials and cohort studies in adults and children following low fat diets, but not with the intention of lowering weight, showed a consistent but small effect of reduced total fat intake on weight change [~1.5kg][153]. It is also worth noting that participants in the intervention group of the Look Ahead trial, who achieved mean weight losses of 4.7% at year 8[154], had been advised on <30% energy from fat & <10% energy from saturated fat[155], similar to the diet advised in the Diabetes Prevention trial[20]. Other large multi-centre randomized studies such as the Premier study, the Diabetes Prevention Trial and the Finnish Diabetes Prevention study, have found greater weight loss in groups advised on a low fat diet versus standard dietary treatment[156]. However, the interventions in these trials were multicomponent programmes with many other elements aside from a low fat diet.

Most research exploring the relationship between dietary fat and weight regulation has treated the different types of fat as equivalent in terms of their effects on energy regulation. However there is a small body of research which suggests there may be differences in how saturated, unsaturated and trans fats effect fatty acid oxidation rates, adipose tissue deposition and other mechanisms involved in weight regulation. Several studies have suggested unsaturated fats increase post-prandial fat oxidation and may stimulate dietary thermogenesis although more research is needed to understand this issue in more detail[157-159].

Although research suggests low fat diets lead to modest reductions in weight the question often asked is whether a low fat diet is the best dietary treatment for managing obesity. The Tobias systematic review in 2015 which included randomised controlled trials comparing low fat diets with low carbohydrate diets found greater weight loss [1.2kg] in the low carbohydrate group[160]. Although some of the rudimentary media interpretations of this were 'low fat diets don't work' it is important to recognize this review also showed those adopting low fat diets compared to their usual eating habits lost 5.4kg. Care is also needed in interpreting this review given the heterogeneous nature of the sample populations, the wide variation in the intervention and control diets and the way they were delivered and monitored.

There is increasing recognition of the variety of evidence based dietary treatments suitable for managing obesity with no one dietary treatment being superior and suitable for all individuals trying to manage their obesity. There are moves away from focusing solely on one macronutrient as the only element of the diet which needs to be addressed and particularly given research suggesting fat, sugar and salt combinations may be critical to palatability and may be driving overconsumption. The Pounds lost trial suggests lowering total energy intake is more important than manipulation of one particular macronutrient[161] thereby adding support to the notion there are a number of different dietary approaches suitable for helping people manage their obesity[162] and the skill of the dietitian is in working with the client to match the most suitable evidenced base dietary treatment to meet the needs of that individual.

Indeed while debate and research continue on the optimal quantity and type of dietary fat for managing obesity it is important to highlight the shift in focus of dietary management in obesity over recent years with a move away from strategies which focus on changing isolated nutrients towards the overall dietary pattern

and the need to consider broader elements of an individual's eating habits. There is a danger in over simplifying dietary messages and not considering the way in which these are interpreted by individuals and most particularly how the rest of the diet changes when one macronutrient is manipulated. The low fat message may have led some to replace fat in the diet with refined carbohydrates and added sugars thereby adversely influencing weight and risk of CVD.

The effect of altering dietary fats on obesity relates also to its impact on risk reduction, particularly of cardiovascular disease. Although there has been debate and controversy over the effects of dietary saturated fat and its replacement on cardiovascular disease a recent review of evidence concluded randomized controlled trials that lowered dietary saturated fat and replaced with polyunsaturated fats reduced cardiovascular disease by ~30%, comparable to that achieved with statins[163]. However, replacing saturated fats with refined carbohydrate was not associated with a reduction in CVD in clinical trials. Having looked at the totality of the evidence this review concluded there was good evidence for advising a reduction of saturated fats and replacement with polyunsaturated fats as part of an overall healthy pattern of eating which considers other aspects of the diet relevant to health[163].

The 600kcal deficit approach

Traditionally dietary advice has been formulated followed a diet history when the practitioner would aim to work with the patient to identify areas amenable to change. However this approach proved challenging in situations of severe energy intake under-reporting when practitioners would struggle to navigate how best to support patients. This led to the recommendation to base advised dietary change on an estimate of the patient's energy requirements for weight loss and the eventual development of what is now commonly referred to as the 600kcal deficit diet.

Research suggested adherence to dietary treatments may be influenced by the magnitude of the advised energy deficit [164] with modest energy intake restrictions linked with improved outcomes, although more research is needed to clarify this issue. The 600kcal deficit approach has been demonstrated to be an effective strategy for some individuals with a review of 13 randomised controlled trials showing a weight loss of -5.32kg compared with usual care at 12 months[165]. These diets are in line with the dietary recommendations for good health[166]

Defined energy deficit diets can be used to guide individuals towards an improved understanding of their likely energy needs and what this means in terms of food choices and portion sizes. They are not, as is sometimes suggested, a precise individual prescription for weight loss due to the limitations in predicting resting metabolism and physical activity energy expenditure in clinical settings.

Prescribed Energy Calculations

To calculate a patient's energy requirements for weight loss resting metabolism is first estimated using predictive equations and the result then multiplied by a factor that accounts for physical activity. This gives an estimate of total daily energy expenditure from which an energy deficit, usually 600-1000kcal which equates to a theoretical weekly weight losses of 0.5-1kg, is subtracted. Practical worked examples are given in appendix 2

Supporting literature, including a food group portion control chart, for using this approach is provided through the NDR website and 'Weight Loss You Can See' resource pack[www.ndr-uk.org].

Which is the Best Prediction Equation?

Given resting metabolic rate commonly accounts for ~70% of daily energy expenditure[167] in sedentary individuals, it could potentially introduce large errors into the calculation of energy needs for weight loss. A number of prediction equations have been developed from different reference populations and practitioners are known to vary in their choice of equation in clinical practice[168]. When used in people with obesity compared to those without, prediction equations are generally less accurate[169]and there is a need to consider which is the most suitable for this population.

A systematic review by the Academy of Nutrition & Dietetics concluded the Mifflin St Joer equation[170]was the most accurate in determining RMR in Americans with obesity compared to other common equations [Harris Benedict, Owen and Schofield][171-173] and the Mifflin St Joer equations are included in the US Nutrition Care Manual. More recently a British systematic review also recommended the Mifflin equations for predicting resting metabolic rate but highlighted errors above acceptable levels in approximately 25% of predictions[174]. This underlines the importance of recognizing calculations for RMR and ultimately calories needed for weight loss are only estimates and should not be treated as precise calculations. RMR predictions are a starting point for discussions about energy needs for managing weight and changes to food intake and portion sizes, but monitoring and adjustments will be important depending on the patient's response to treatment. It is also worth recollecting the range and complexity of factors that influence a person's ability to change their eating habits of which knowledge and understanding of energy requirements for weight loss and associated food changes is only one aspect.

Table 5 Mifflin St Joer Equations

Men:	RMR=[9.99xweight]+[6.25xheight]-[4.92xage]+5
Women:	RMR=[9.99xweight]+[6.25xheight]-[4.92xage]-161
Equations use weight in kg, height in cm	

Which PAL value to Choose?

Predicting energy expended through physical activity is particularly important when considering the accuracy of energy needs for weight loss as physical activity level is the most variable component of total energy expenditure and the one most likely to introduce substantial error.

Table 6 Distribution of Physical Activity Level[175]

Typical activity [median] =1.63
Less active[25th centile]=1.49
More active [75th centile]=1.78

Physical Activity Level or PAL values ascribe numerical value to activity and represent multiples of BMR such that PAL=TEE/RMR. These values have been developed from studies where measures of resting

metabolism using indirect calorimetry are combined with total energy expenditure data from doubly labeled water. The current PAL values[175] are given in table 6. The range of PAL values for the general population are from 1.38 in the most sedentary [immobile] to 2.5 in very active groups. Evidence form a contemporary US population which included 605 of people with overweight or obesity found a median PAL value of 1.63 and probably represents a light activity population. The group with below average activity had a PAL value of 1.49 and those with above average activity a PAL of 1.78[175-177].

It is important to remember these are population derived PAL values and although they represent the best current estimate when used with individuals they will inevitably introduce errors of unknown magnitude.

The Difference between Predicted and Actual Weight Loss

In theory the 600kcal deficit diet should produce a 0.5kg weight loss/week which if sustained would lead to losses of 10-12kg at 6 months. However in reality the outcomes seen in practice are well below these predicted values with people generally losing modest, albeit clinically important, amounts of weight[178]. Indeed losses at 1 year are rarely beyond 5-10kg[179,180]. The reasons for this discrepancy are important and should be considered in the ongoing adjustment of eating plans and highlight the complexity of factors that influence weight change. The physiological mechanisms linked to energy restriction are well known with compensatory energy conservation negatively affecting outcomes. These mechanisms include fall in RMR, decline in the cost of activity as the size of the body decreases and elevations in appetite. Although the 600kcal deficit approach may facilitate ongoing weight loss for a number of weeks in time a new equilibrium will be reached as energy expenditure falls in response to dieting and a readjustment to the energy prescription may be needed. Indeed after weight losses of ~5kg it may be necessary to further reduce the energy prescription by 300kcal if weight loss has slowed or plateaued and additional weight loss is desired. Energy prescription should not be taken below 1200kcal/day[181].

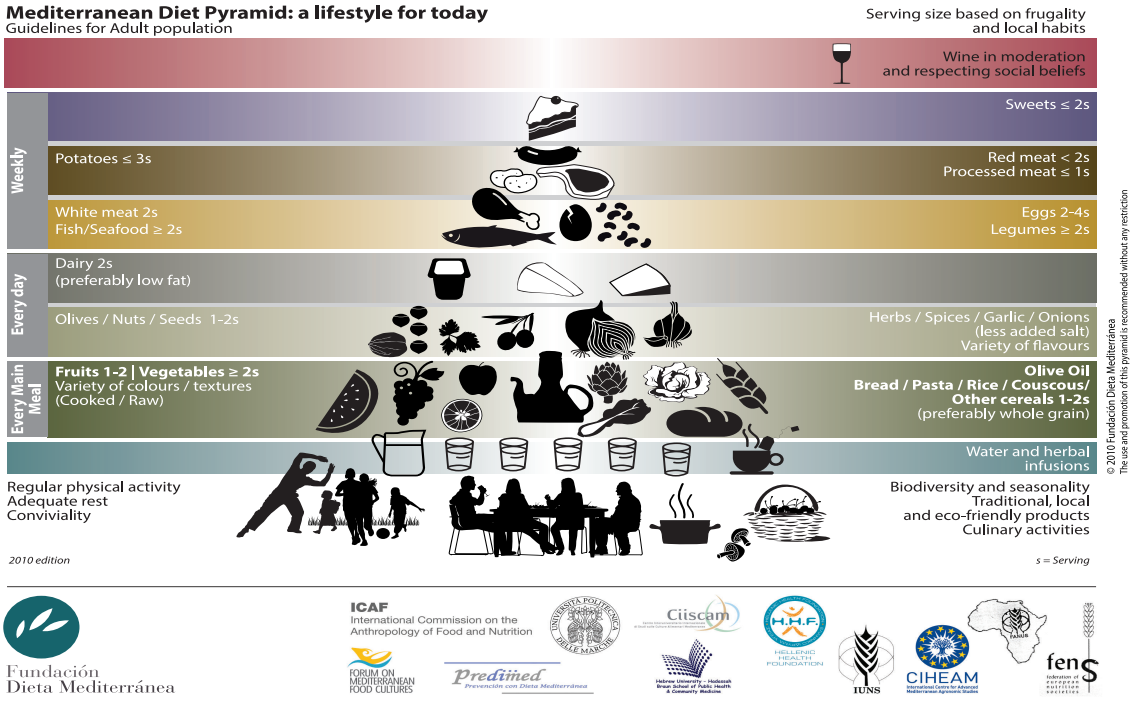
This approach may suit some individuals, particularly those looking for more specific guidance on recommended portions. Despite its structured format it can be used as part of a behavioural approach, indeed evidence supports improved programme outcomes with increasing structure [182]. However the 600kcal deficit diet will not suit every patient and there may be some who find a system that counts food portions unacceptable. This supports the increasing recognition that no one dietary treatment will suit all individuals who are overweight or obese. The skill of the dietitian is in tailoring the estimated energy requirement to the needs of the individual and may require the use of a variety of strategies including meal plans, menu ideas, calorie or portion counting.

The Mediterranean Diet

The term 'Mediterranean Diet' was first devised in the 1960's by Ancel Keys during the writing of his book 'How to Eat Well and Stay Well the Mediterranean Way'[183]. During his dietary research he described the eating habits of those living in countries such as Crete, Greece and Southern Italy and through subsequent research these dietary patterns were associated with longevity and lower rates of cancer and coronary heart disease morbidity and mortality[184,185].

As the Mediterranean diet is a description of dietary patterns across a variety of geographical locations the diet is not homogeneous as each country brings its own culture and traditions to food and eating. However there are common features namely high intake of fruits and vegetables, legumes, nuts and seeds, olive oil as the main fat source, moderate consumption of wine with meals and low intakes of red and processed meats and refined sugars. Nutritionally this translates into increased consumption of fibre and wholegrains, oleic acid, N3 fatty acids and anti-oxidants.

The Updated MD Food Pyramid



This pyramid has evolved from the original version and is based on international consensus on the decades of nutrition and health research on the Mediterranean diet. Further description of the pyramid and a downloadable format can be found at www.mediterradiet.org

The pyramid describes the frequency and proportion of various food groups together with other lifestyle elements such as conviviality, rest and physical activity. As such it tries to convey the message that in order to derive the documented benefits of the Mediterranean diet key elements beyond the amounts and types of foods will need to be incorporated.

How to Assess Adherence to the Mediterranean diet in Clinical Practice

A number of food scoring systems have been developed to allow adherence to this pattern of eating in various epidemiological and clinical trials to be assessed. Some of these tools, such as the PREDIMED screener[186] are so quick and easy to use they may be helpful in clinical practice and could facilitate feedback to patients on specific aspects of the dietary pattern.

Impact of the Mediterranean Diet on CV risk factors

The PREDIMED study was a seminal piece of research that explored the impact of the Mediterranean diet on the primary prevention of cardiovascular disease. Over 7000 people with an elevated risk of cardiovascular disease were randomised to a Mediterranean diet supplemented with olive oil, a Mediterranean diet supplemented with nuts or a low fat diet and participants were followed for a mean 4.8yr. Both Mediterranean diets were comparable in their effects with a 30% risk reduction in the primary endpoints of myocardial infarction, stroke or death[187,188]. Indeed it is now well accepted that the Mediterranean diet has strong cardio-protective effects with a meta-analysis of cohort studies suggesting this is the most likely dietary pattern to protect against cardio-vascular disease[189].

A review of six randomized controlled trials which directly compared low fat diets with the Mediterranean approach in individuals with mean BMI 29-35kg/m^2 found the latter produced more favourable effects on CV risk factors and vascular inflammatory markers[190]. After 2 years of follow up those treated with the Mediterranean diet had a mean difference in weight of -2.2kg and a mean difference in waist circumference of -0.9cm.

In those with metabolic syndrome several systematic reviews have concluded the Mediterranean diet has a positive impact with reduced risk of developing the syndrome, and a protective effect on elements such as waist circumference, triglycerides, LDL, blood pressure and glucose[191,192].

Likewise a review which explored the Mediterranean diet compared to low fat, low carbohydrate and the ADA diet found improvements in glycaemic control comparable across all diets however the Mediterranean diet led to greater improvements in HbA1c and fasting glucose levels in people with type 2 diabetes[193] and triglycerides reduced more significantly in those following the Mediterranean diet [193]

Impact of the Mediterranean Diet on Weight

Given the Mediterranean diet originates from a variety of different countries its total fat content ranges across a spectrum of <25% to >35%[194] although in practice many Mediterranean diets used in clinical trials are ~40% energy from fat[195]. This elevated total fat content [albeit low in saturates and high in unsaturates] has led to some question over whether this would lead to weight gain and thus limit its role in obesity management.

The findings on the relationship between the Mediterranean diet and weight are somewhat mixed and there is a need for longer term intervention studies which focus specifically on its use in people with obesity who are managing their weight and associated co-morbidities. Several reviews of the existing research have been published although the variation in the studies included may account for some of the differences in the conclusions drawn.

A systematic review of epidemiological data, cohort and intervention studies which explored the effect of the Mediterranean diet on weight found mixed results although it did conclude there may be a possible role for this dietary pattern in the prevention of obesity. They highlighted challenges in drawing conclusions given the complexity of obesity, methodological variation in study designs and suggested a need for increased clarity on the definition of the Mediterranean diet[196].

However, a recent systematic review has specifically examined the impact of the Mediterranean diet on weight losses beyond 12 months. It only included randomized trials with participants who were overweight or obese [mean BMI 29-34] who were actively trying to manage their weight and with elevated cardiovascular disease risk[193]. It identified five randomized controlled trials which compared the Mediterranean diet to a comparator diet, either low fat, low carbohydrate or the American Diabetes Association Diet. The Mediterranean diet led to modest changes in weight [mean changes ranged from -3.8kg to -10.1kg] and in 3 of the trials produced greater weight loss that the low fat diet beyond 12 months[197-199]. However, the changes seen with other comparator diets were similar to the Mediterranean diet[197,200]. The authors concluded the Mediterranean diet was an effective intervention producing modest weight change beyond 12 months but could not be considered superior to other dietary approaches for managing weight and suggested this added to the growing body of evidence that no one dietary treatment is optimal.

Other reviews of the literature which have looked at the impact of the Mediterranean diet on weight have drawn different conclusions suggesting this was the superior approach and should be recommended as the choice of dietary treatment in overweight and obesity[201,202]. However several methodological issues with these reviews have been highlighted including the use of studies despite heterogeneity in their design, variation in comparator diets and follow up duration across studies which may compromise some of the conclusions drawn[193].

Given the potential of the Mediterranean diet to reduce the elevated cardiovascular and other health risks associated with obesity it is an important dietary approach to consider however further clarity on its relationship with weight would be helpful and most particularly whether in clinical practice it is beneficial to advise on an energy restricted Mediterranean diet or if an ad libitum approach is more appropriate. This is the remit of the PREDIMED-Plus study [www.predimedplus.com] the results of which are due to be published in 2020.

Low glycaemic index diets

Glycaemic index [GI] is a physiological way of ranking carbohydrate foods and was originally developed as a method for exploring the role of carbohydrates in the management of diabetes[203]. Technically it is defined as the area under the 2 hour postprandial glucose concentration curve per 50g of available carbohydrate from a test food compared to a reference food which is often white bread[204]. Glycaemic load [GL] accounts not only for the GI of a food but also the carbohydrate in the *portion* of food in question with some suggesting that this is a better reflection of the glycaemic response to mixed meals[205-207].

Whether low GI or GL diets are an effective strategy for managing obesity remains controversial [208-210] although there is a small but growing body of evidence suggesting its role may be limited. Advocates of the low GI approach argue high carbohydrate low fat diets may increase postprandial hyperglycaemia and hyperinsulinaemia making weight loss more challenging as carbohydrate oxidation occurs at the expense of fat oxidation possibly leading to increased fat storage[208]. They argue low GI diets influence weight loss through their effect on increasing satiety and minimizing postprandial hyperinsulinaemia[211]. There is some interesting animal experimentation that supports this theory[212] however research in humans has produced mixed results[213]. Although animal research suggests high GI diets lead to increased weight, adiposity and have negative effects on glucose homeostatis there have been suggestions this may not be a direct effect of the glycaemic index per se but rather other factors inherent in this type of diet, such as dietary fibre, which may be exerting its effects independent of the glycemic index[214].

In 2007 a Cochrane review explored low GI and low GL diets and their role in weight management and found an improved weight loss outcome [~ 1kg greater] in those on low GI compared to control diets[215]. However, the dietary interventions were relatively short term ranging from 5 weeks to 6 months with follow up varying from zero to 6 months and only 2 of the 6 randomised controlled trials included overweight and obese

participants. A more recent systematic review explored the effect of low GI/GL versus isocaloric control diets in studies that focused on people with overweight and obesity and found no difference in weight reduction between the two approaches[216].

The impact of low GI/GL approaches on reduction in cardiovascular risk in those with overweight or obesity has also been thrown into doubt following a recent Cochrane review. This examined 21 randomised controlled trials comparing low GI with high GI diets [otherwise comparable composition] to determine their effects on cardiovascular events, blood cholesterol and blood pressure. It concluded there was "insufficient evidence from randomized controlled trials to recommend consumption of low GI diets for the purpose of improving blood lipids or blood pressure"[217].

Given the poorly controlled studies currently available it has been suggested there are difficulties separating out the effect of GI on satiety from, for example, the influence of palatability, volume and fibre in mixed meals. As such future research should explore individual food factors such as the effect of wholegrains, fibre, energy density and preparation methods[213]. There is certainly a need for long term studies with sufficient numbers of participants and using well controlled diets where the only varying factor is GI in order to truly understand the impact of this approach in weight management. Furthermore there are a number of issues in relation to the translation of a low GI diet into practical foods choices that can be easily understood by patients. At present there is no comprehensive GI labeling and considerable variation exists between brands of the same product in terms of their GI effect.

As such it seems premature to routinely recommend this strategy as an evidence based obesity management approach until further findings from large scale, high quality, long term randomized controlled trials are available.

Low Carbohydrate diets

This review of low carbohydrate diets is taken from the BDA obesity group's policy statement prepared by Dr P Dyson, accessed via www.bda.uk.com

Low carbohydrate diets have become popular for weight loss, with one recent review suggesting low carbohydrate diets are more effective than low-fat diets for general weight loss[218] and another promoting this approach as the default diet for the prevention and treatment of type 2 diabetes[219]. Currently, there is no agreement about the definition of 'low carbohydrate', although a recommendation has been made that any diet providing <130g carbohydrate/day should be regarded as low carbohydrate, and diets providing <50g carbohydrate/day and which induce ketosis should be termed very low carbohydrate ketogenic diets (VLCKD)[219].

Over the past five years, eight meta-analyses and systematic reviews investigating the role of low carbohydrate diets in adults have been published[160,218,220-225], with three additional reviews specifically in adults with type 2 diabetes[226-228]. This policy statement is based upon a synthesis of the evidence from these reviews, although conclusions are limited by the heterogeneity of the studies included in terms of the amount of carbohydrate in the intervention diet, the diet used for comparison, length of follow-up (6-24months), data quality and data reporting.

General weight loss

Reported mean weight loss in adults was approximately 6.0kg in the groups allocated low or restricted carbohydrate diets. However, in the majority of studies, the control group received dietary advice aiming for

weight loss and they also lost a significant amount of weight. Five of the eight meta-analyses[160,218,220,223,224] reported statistically significantly more weight loss in the low carbohydrate group compared to the control group, although as these differences ranged from 0.1 – 2.2kg, the clinical significance is questionable.

Cardiovascular risk

Concern is often expressed about increased cardiovascular risk associated with low carbohydrate diets, as they are assumed to be higher in saturated fat. Many studies did not report dietary intake, but those that did failed to show significant increases in absolute total or saturated fat intake[226], although the proportion of energy derived from macronutrients did change significantly. However, low carbohydrate diets are higher in total and saturated fat than comparator low-fat diets, and one meta-analysis reported that lower intakes of dietary saturated fat were associated with lower total and LDL concentrations[229].

Weight loss is generally associated with improvements in lipid concentrations, but not all meta-analyses reported lipids, and of those that did there were contradictory findings about the effect of low carbohydrate diets on lipid concentrations. A meta- analysis of randomised controlled trials suggested that triglyceride and HDL concentrations changed more favorably in those allocated low-carbohydrate diets, but changes in total and LDL concentrations were unfavorable[230].

Total cholesterol

Four of the eight meta-analyses reported changes in total cholesterol concentrations[221,222,224,225]. In the majority of studies, total cholesterol concentrations decreased with weight loss regardless of dietary allocation. One meta-analysis reported a small but statistically significant greater decrease in total cholesterol in those allocated control (higher carbohydrate) diets[225], and the remainder reported that the weighted mean difference was small and suggested little or no difference between diets[221,222,224].

HDL

Five meta-analyses reported HDL concentrations[221-225]. Three meta-analyses reported that HDL concentrations increased to a significantly greater extent in those allocated low carbohydrate diets[221,223,225], and two stated that there was little or no difference between diets[222,224].

LDL

Five meta-analyses reported LDL concentrations[221-225]. Three reported that those allocated low carbohydrate diets showed significantly increased LDL concentrations compared to low fat diets[221,222,225], and two reported that there was little or no difference between dietary interventions[222,224].

Triglycerides

Four meta-analyses reported triglyceride concentrations [221-223,225]. Weight loss was associated with decreased triglyceride concentrations, and three meta-analyses reported greater reductions in those allocated to a low carbohydrate diet[222,223,225].

Type 2 diabetes

Two recent systematic reviews and one meta-analysis have reported on the effects of low carbohydrate diets on weight loss, glycaemic control and cardiovascular risk factors in people with type 2 diabetes[226-228]. There were no differences in weight loss between low carbohydrate diets and other dietary interventions, and only the meta-analysis reported significantly greater improvement in glycaemic control in those assigned low

carbohydrate diets[228]. In this analysis, the weighted mean difference (WMD) in HbA1c was reported as 0.14% (2mmol/mol), which was statistically significant (p=0.04), but the clinical significance is questionable. Few studies have reported changes in lipid concentrations in people with type 2 diabetes, and the results are contradictory, with the meta-analysis reporting significant improvements in HDL with low carbohydrate diets[228], and the two systematic reviews failing to find significant differences in lipid concentrations[226,227].

Adverse effects

The proposed adverse effects of low carbohydrate diets include a lack of essential micronutrients and dietary fibre, the influence on renal function and calcium metabolism and increased CVD risk[231]. There is little evidence for increased CVD risk, see section above, but it has been reported that low carbohydrate diets are associated with a significantly higher risk of all-cause mortality, although this conclusion is derived from heterogeneous observational studies, and residual confounding bias cannot be excluded[232].

Dietary adequacy

Few studies have addressed dietary adequacy in individuals adopting low carbohydrate diets, but a recent cross-sectional study from Iceland reported significantly lower intakes of bread, wholegrain cereal and fruit leading to low intakes of dietary fibre, and that the intake of red meat and meat products was double that of the general population[233]. However, intakes of vitamins and minerals were higher than estimated average requirements. An analysis of those taking part in the UK National Diet and Nutrition Survey reported that those with lower carbohydrate intakes had higher intakes of red meat[234]. Processed meat products have been linked with increased risk of cancer, and red meat has been classified as a possible cause of cancer by the World Health Organisation[235].

Renal function

Concerns have been expressed about the effects of the higher protein intake associated with low carbohydrate diets on renal function. Weight loss generally is associated with improvements in renal function[236], and a recent meta-analysis reported that eGFR improved in both low carbohydrate and control diet groups, and although the increase in eGFR was greater in the low carbohydrate group, this was probably not clinically significant[237]. Randomised controlled trials have shown that low carbohydrate diets have no harmful effects on GFR, albuminuria, fluid or electrolyte balance when compared with low fat diets[238,239].

Calcium metabolism

It has been postulated that very low carbohydrate diets induce ketosis and acidosis, which promote urinary calcium loss, leading to low bone mineral density and increased risk of osteoporosis[240]. There is little research in this field; two small studies reported no change in either bone mineral density[241] or bone turnover[242]in individuals consuming a low carbohydrate diet. Conversely, other studies suggested that low carbohydrate diets increased urinary calcium loss[238] and decreased markers for bone formation[240]. The long-term effects of low carbohydrate diets on calcium metabolism and bone health are unknown.

Summary

Low carbohydrate diets have recently been promoted as a popular approach for weight loss and for the prevention and treatment of type 2 diabetes. Evidence indicates that low carbohydrate diets are effective for general weight loss and for improving glycaemic control in people with type 2 diabetes in the short-term (3-6 months), but they do not demonstrate clear superiority over other dietary weight loss interventions. There is currently limited evidence for the adverse effects of low carbohydrate diets, and no data for long-term outcomes. The position of the British Dietetic Association is that all weight loss treatment choices should take

into account an individual's personal preference and needs and their cultural and social circumstances. For this reason, individuals who choose to adopt a low carbohydrate diet should be supported in their decision, but there is no compelling evidence to recommend low carbohydrate diets as first line therapy for all.

Recommendations

- Individuals seeking dietary advice for weight loss should be offered evidence- based, personalised, specific, age and culturally appropriate advice
- Low carbohydrate diets should not be promoted as the primary strategy for long-term weight loss and for the prevention and management of type 2 diabetes, as there is no evidence for efficacy and safety over the long-term
- Some individuals may choose to adopt a low carbohydrate diet over the short-term, and these individuals should be supported in their choice and offered monitoring to ensure nutritional adequacy

Formula Diets

Partial Meal Replacements

Partial diet/meal replacements are portion controlled products, often bars or powders that can be made into shakes, are vitamin and mineral fortified and replace one or two meals in the day allowing one healthy meal using standard foods [and snack/s][243]. A meal replacement approach will usually provide in the region of 1200-1600kcal per day and should not be confused with very low-calorie diets that provide less than 800kcal/day.

Portion size is known to correlate with energy intake[244] and meal replacements are one of few evidence based portion control tools available. They may also offer a convenient alternative for those patients with limited time, skill or the inclination to prepare meals and snacks.

Interest in the use of partial meal replacements was stimulated following the first systematic evaluation of randomized controlled trials in 2003. The meta-analysis looked at trials which had compared meal replacement treatments of at least 3 month duration with standard dietary intervention in people who were overweight or obese. It found a 2.54kg greater weight loss at 3 months and 2.43kg greater reduction at one year in the partial meal replacement group compared to standard dietary treatment[243]. Interestingly attrition was comparable at 3 months between the two groups but was lower in the meal replacement group at 1 year[243].

Following this review partial meal replacements were included in the Look Ahead study; a trial which explored weight loss outcomes and the resulting effects on cardiovascular morbidity and mortality in overweight or obese people with type 2 diabetes who were randomized to either an intensive lifestyle intervention [ILI] or standard diabetes support and education [DSE]. In the ILI group meal replacements were encouraged from week 3-19 as part of a comprehensive programme which also promoted frequent support, behavioural strategies and increased physical activity. In addition, meal replacements were used as a weight maintenance tool. At year 1 the ILI group had achieved 8.6% weight loss versus 0.7% in the DES group[245]. Importantly a 5% weight loss was sustained at year 4 and 6% at the end of the trial in the ILI group[246]. Subsequent analysis showed regular use of meal replacements was correlated to improved weight loss with participants in the highest quartile of meal replacement use having four times greater odds of achieving the

7% weight loss target[245]. In type 2 diabetes meal replacements have also been shown to produce greater reductions in HbA1c, fasting glucose and fasting insulin than standard dietary treatment although a recent systematic review highlighted the need for more higher quality research in this area to improve confidence in the conclusions drawn[247].

No specific guidance on meal replacements was provided in the latest NICE obesity document although it is unclear why this was not considered[4]. However the Dietitians Association of Australia undertook a systematic review of evidence in 2012 and concluded "achieving a reduction in energy intake by incorporating meal replacements, monitored by health professionals, provides greater weight loss in overweight and obese adults than general dietary advice for periods of 1-12 months"[248]. However meal replacements incorporated into low energy diets were found to be no more effective than low energy diets without the inclusion of meal replacements[248].

In the 2012 systematic review of evidence for obesity management the National Heart Lung and Blood Institute concluded "in overweight and obese women the use of liquid or bar meal replacements is associated with increased weight loss up to 6 months in comparison to a balanced deficit diet utilizing only conventional foods. Longer term evidence of continued weight loss advantage is lacking"[249]. The American Dietetic Association suggests meal replacements may help increase structure, improve adherence via portion control and convenience. In their position paper on obesity management they concluded "for weight loss and weight maintenance the dietitian should recommend portion control and meal replacements or structured meal plans as part of a comprehensive weight management programme"[16]

However, not all reviews have been able to draw clear conclusions on the role of partial meal replacements in obesity management given the quality of available studies. A recent Spanish systematic review which explored the effectiveness of meal replacements on long term weight loss identified 7 randomised controlled trials with interventions beyond 12 months. Four of the 7 studies showed meal replacements led to greater weight loss compared to standard dietary treatment but findings in the remainder were mixed and the studies of questionable quality. The authors concluded the effectiveness of meal replacements remained unclear and there was a need for further research with longer treatment interventions and more follow up time incorporated [250].

Although there is some uncertainty about the precise role of partial meal replacements in obesity management the majority do seem to guide towards this approach being either as effective, or more so, than other dietary approaches. Most studies have used meal replacements as part of a comprehensive management programme with support and education from health professionals and less is known about the value of off shelf usage. Indeed contact with health professionals, structured education and support and close monitoring of progress have been highlighted as core elements in studies which have incorporated partial meal replacement approaches[251]. It is also worth considering the impact of free provision of meal replacements which occurs in most clinical trials and would not be directly transferable to the clinical setting.

Clear calls have been made for higher quality research in this area with longer intervention and follow up. Greater understanding is also needed on which patients do best with this dietary treatment and how to integrate partial meal replacements within the management of overweight and obesity in the UK health care and community settings

Total Meal/Diet Replacements

This approach replaces all conventional foods in the diet with nutritionally complete liquid formulas and depending on the number of replacement products used the energy level can be varied. Traditionally, this approach has been used to provide very low energy diets [VLED] with intakes of ≤800kcal/day. However, more recently research using total diet replacements to provide low energy diets [LED] of 800-1000kcal/day

has produced some very promising outcomes in managing obesity and type 2 diabetes with the added advantage of fewer side effects and associated risks.

Interest in total diet replacements has increased in recent years due in part to the recognition that most standard dietary treatments, which elicit modest energy deficits, are unlikely to achieve weight losses of more than 10%. Although the modest weight loss [5-10%] achievable with conventional dietary approaches is known to have important health benefits, such as preventing progression to type 2 diabetes and improving metabolic health,[154] it is unlikely to reverse disease once it is present. As such those with severe and complex obesity will often need to lose 15-20% [always >10kg] of their weight in order to experience improvement in co-morbid disease[181]. This magnitude of weight change requires more intensive management, hence the interest in total diet replacement. Furthermore, although it is commonly believed that the slow steady weight loss associated with modest energy deficits leads to improved weight maintenance there is increasing evidence to suggest rapid early weight loss, as seen with total diet replacement, may improve weight maintenance[252,253]. Evidence certainly seems to negate the notion that rapid weight loss is associated with rapid weight regain[254].

Very Low Energy Diet

Very low energy diets [VLED] have traditionally been defined as total diet replacements of 450-800kcal/day[4,255,256] although the minimum daily recommended energy intake has recently been raised to 600kcal [257]. They are perhaps the most controversial dietary treatment due mainly to questions over their long term efficacy and some historical concerns over their safety. Inadequacies in the formulation of original VLED, namely low biological value protein and insufficient electrolytes and micronutrients, were believed to be implicated in the arrhythmias and resulting fatalities that occurred in early use of VLED. Subsequent reformulation and tight control of optimal composition over the last four decades has eliminated these previously observed arrhythmias[258]. Given the severe energy restriction inherent in this approach a number of common side effects have been reported namely diarrhea, constipation, headaches, nausea and vomiting, dizziness, dry mouth, poor cold tolerance, dry skin and thinning hair[259]. Such side effects tend to be transient, may be alleviated by adequate hydration but may also lead to early discontinuation. More serious but less common side effects include acute gout and gallstones[260,261]. Clinical supervision and medical monitoring for those using VLED is important particularly for those with obesity related co-morbidities where adjustment to medications is likely to be necessary as requirements change in response to severe energy restriction, accompanying metabolic changes and rapid weight loss.

There is no doubt that in the short term [up to 6 months] VLED are effective in terms of weight loss [~1.4-2.5kg/week] and associated improvements in obesity related co-morbidities are impressive[262-264].Indeed a meta-analysis of six randomised controlled trials showed that over the short term VLED led to weight losses of 16.1%[265]. Clearly with this magnitude of change VLED have important potential value as a treatment option if patients need to lose weight quickly to facilitate an operation or other medical treatment[4,266]. However what remains controversial is the long term outcomes associated with VLED use. Findings from the Tsai and Wadden meta-analysis suggest comparable effectiveness of VLED and LED in the long term [1.9yr] with greater weight regain seen in the VLED treatment[265]. However, it is important to recognize many of the early VLED studies gave minimal attention to weight maintenance strategies which are critical if weight regain is to be attenuated. Subsequent research has suggested a number of factors which can improve weight maintenance following VLED programmes including behavior modification, ongoing use of meal replacements, medication and a longer food reintroduction phase[264,267,268].

However, given research has now illustrated comparable weight loss outcomes achieved using higher energy prescriptions for formula diets of above 800kcal which are also associated with fewer side effects, reduced loss of lean tissue and less attrition than using traditional VLED the formula LED would seem the preferable choice in obesity management[263].

VLED in Type 2 Diabetes

Interest in the use of VLED in type 2 diabetes was reignited in 2011 following the publication of a study which had specifically looked at whether the reversal of beta cell failure and insulin resistance, the underlying cause of disease progression, could occur through intensive dietary treatment. After the first week of the VLED fasting glucose and hepatic insulin sensitivity had normalized and by week 8 beta cell function had increased towards normal levels and pancreatic fat content had fallen[269]. This, together with subsequent research, strongly suggested the underlying aetiology of type 2 diabetes related to excess fat accumulation in the pancreas and acute energy restriction may be central to its management [269,270]. A further study in people with long standing type 2 diabetes showed comparable normoglycaemia in around 50% of participants[271]. As important as this research was at shedding light on mechanisms underlying disease progression and potential strategies for its reversal it was not designed to test the outcome of using total diet replacements in clinical populations.

Several small studies which have used VLED in those with type 2 diabetes treated with oral hypoglycemia agents or insulin have shown positive effects on weight, glycaemic control and cardiovascular risk[272-274] however shortfalls in study design have precluded firm conclusions.

The Preview trial [PREVention of diabetes through lifestyle intervention] is an ongoing international study which aims to identify the most effective lifestyle pattern/s to prevent type 2 diabetes in people with pre diabetes who are overweight or obese. In phase 1 of the study an 800kcal formula diet is used to elicit rapid weight loss followed by randomization into one of the four maintenance arms that vary in their glycaemic index, protein content and activity intensity. Findings from this trial are due to report in the near future and will further clarify the role of formula diets in the management of obesity and prevention of diabetes as well as guidance on the most effective lifestyle approaches for weight maintenance[275].

Low Energy Diet

Low energy diets are generally between 800-1200kcal/day although in practice many of the recent studies which have used LED liquid formulas have provided 800-1000kcal/day.

Results from the recent DIRECT clinical trial have shed light on the use of formula LED in the management of type 2 diabetes and more specifically the feasibility of inducing diabetes remission in those recently diagnosed with the condition. The forerunner to this trial, the Counterweight-Plus feasibility study explored the outcome of a 12 week total diet replacement in 91 obese participants [mean BMI 48] treated in primary care and found a mean weight change of -12.4kg at 12 months in those completing the study, with 33% of study participants maintaining more than 15kg[276].

The DIRECT study, a randomised trial undertaken in 49 primary care practices, included individuals with BMI's between 27-45kg/m^2 and a diagnosis of type 2 diabetes within the previous 6 years[277]. The intervention group followed the formula LED [Counterweight Pro 800] for 3-5 months followed by a stepped

food reintroduction over 2-8 weeks and structured support for long term maintenance whereas the control group followed best practice care. At 12 months 24% of those in the intervention group had lost ≥15kg compared to none in the control group. Diabetes remission, defined as HbA1c <6.5% [48mmol/mol] after at least 2 months off all antidiabetic medication from baseline to month 12, had occurred in nearly half of those [46%] in the intervention group compared to 4% in the control group[278]. Mean body weight fell by 10kg in the intervention group and 1kg in the control group [intention to treat analysis]. In the intervention group, weight nadir was occurred at the end of the total diet replacement phase with weight reduction of 14.5kg. Although some weight regain was observed during the food reintroduction [1kg] and maintenance phases [1.9kg] this was not the rapid regain sometimes associated with such intensive approaches[278]. This study clearly demonstrated the capacity of a primary care delivered intensive weight management programme, which used a formula LED, to produce diabetes remission in almost half of the participants with a corresponding cessation in diabetes medication and with the majority also stopping anti-hypertensive medication. The long term follow up of this cohort is awaited with interest and seems likely to provide further guidance on how best to optimize weight maintenance.

There are a number of ongoing studies exploring the outcomes achieved with formula diets and how best to use these in clinical practice. One such study is the Beyond trial which has been established to explore the effectiveness of two maintenance interventions [intermittent use of a formula diet strategy versus usual care] in those participants who have lost ≥8kg. Results are due to be reported shortly and further background information can be found on the clinical trials website www.clinicaltrials.gov

Use in Clinical Practice

The NICE obesity guidance suggested low calorie diets could be considered in the management of obesity but highlighted the possible nutritional inadequacy of food-based approaches. Total diet replacements using formula products in the low calorie diet category overcome this concern due to the nutritional completeness of the products and their associated legislation. This together with the mounting evidence for their efficacy, particularly in those with newly diagnosed type 2 diabetes, highlights the importance of considering this as a possible treatment option.

NICE recommendations on very low energy formula diets stated they should not be used as a routine treatment but reserved for use in those with a clinical need to rapidly lose weight[4]. They highlighted the importance of using VLED as part of a multicomponent programme, for no longer than 12 weeks, either continuously or intermittently, and highlighted the need for comprehensive assessment including screening for disordered eating, and the requirement to counsel patients on the risks and benefits particularly likelihood of weight regain[4].

The BDA obesity specialist group is currently writing a policy statement on VLED and LED formula diets and is awaiting the publication of a number of key studies before recommendations are finalized. In the interim it is important to recognize the increasing support for LED formula diets and the need to embed the intervention within a comprehensive treatment programme which focuses on evidenced based maintenance strategies and comprehensive support for the patient[279].

Intermittent Energy Restriction/Intermittent Fasting

This summary of evidence is taken from the BDA obesity groups policy statement on intermittent energy restriction/intermittent fasting prepared by Dr Michelle Harvey. The full version is available via www.bda.uk.com

Weight control is traditionally achieved with continuous energy restriction (CER). More recently interest has focused on intermittent energy restriction (IER), also commonly termed as intermittent fasting [IF], defined as periods of marked energy restriction (ER) interspersed with normal energy intake.

A 'normal' energy intake is generally defined as an unrestricted or minimal restriction/minimal dietary intervention in the literature investigating the comparative effects. IER is of potential interest to manage obesity and its metabolic effects, and also for normal weight subjects hoping to optimise their health or prevent weight gain. There are two main reasons for this. Firstly, IER only requires the individual to focus on ER for defined days during the week which is potentially more achievable than the standard approach of CER which is associated with poor compliance[280]. Secondly, many beneficial metabolic effects achieved with weight loss and ER are related to the ER per se and are enhanced when the individual is in negative energy balance[281]. Thus it may be potentially advantageous to use repeated periods of ER during the weight maintenance phase.

There are a number of different approaches to intermittent dietary energy restriction which can be grouped as follows:

1. IER; typically short spells of 60 – 85% energy restriction or a total fast during the week interspersed with days of normal healthy eating. This most commonly involves either one day, two consecutive or non-consecutive days or alternate days of ER.

2. Time restricted feeding (TRF); restriction for a few hours within the day, e.g. the 16:8 diets which advocate 16 hours of a total fast and ad lib feeding within an 8 hour period each day.

3. Periodic energy restriction (PER) regimens with extended restricted periods of ER and normal eating, e.g. 1–5 week time periods.

This statement reviews the evidence for IER diets and time restricted feeding only.

Intermittent energy restriction

Three recent systematic reviews which included the three paradigms of intermittent dietary energy restriction described above have concluded that IER achieves comparable weight loss and improvements in metabolic health to CER and can be an effective alternative strategy for weight loss but that the number of long-term studies conducted is limited, participant numbers are small and thus larger trials of ≥12 months duration are required[282-284]. A recent systematic review[285] summarised the findings from five randomised controlled trials which have specifically compared IER to CER amongst individuals who were overweight or obese where the IER was for short periods (≤7days).

Weight loss:

To date clinical trials indicate IER is equal to CER for weight loss outcomes. However, the trials were relatively small with between 32 and 115 subjects randomised and between 25 and 88 completers and therefore were not powered to detect differences in body weight. One study of a low carbohydrate, high

protein IER reported greater reductions in body fat than CER, and a trend for greater weight loss[286]. These studies are all short term, with the exception of one study reporting outcomes at 12 months[287]. Significant decreases in waist and hip circumference were comparable across the two approaches.

Metabolic effects of IER and CER:

Two studies have enrolled patients with type 2 diabetes and have reported that IER is feasible with adjustments of medication, and can achieve comparable reductions in weight, lipids and glycaemic control to CER[288-290]. A further four studies report comparable changes in total cholesterol, LDL-cholesterol, triglycerides, LDL particle size and/or blood pressure in people with overweight or obesity but not diabetes. Two studies amongst healthy overweight or obese populations report greater reductions in HOMA insulin resistance in response to IER than CER[286,291]. There is no evidence that IER is superior to CER for limiting loss of fat free mass (FFM) and reductions of metabolic rate which accompany and inevitably slow down weight loss[285].

Is IER safe amongst individuals who are overweight or obese?

The limited data on IER does not suggest IER promotes erratic eating patterns, eating disorders or low mood. There is a concern that IER will lead to compensatory hyperphagia on the 'normal' eating days. This does not appear to be the case, and some trials have instead reported an important 'carry over effect' of a 20% reduced energy intake on non-restricted days[286,291]. Likewise there is no evidence that IER perturbs the hypothalamic-pituitary-gonadal axis in women, or limits the ability to exercise. However the long term safety of IER diets amongst individuals who are overweight or obese and amongst normal weight individuals is not known.

Time restricted feeding (TRF)

A number of rodent studies have reported that TRF (typically feeding for 8 hours/day and fasting for 16 hours) protects mice from diet induced obesity and metabolic disease. These benefits are attributed to restoration of natural feeding rhythms and synchrony with circadian oscillations[292]. There are however minimal data to support the benefits of these diets in humans. Limiting access to food to 8 hours in the day is likely to limit overall intake, however this benefit could be achieved with any strategy for reducing overall energy intake. Controlled studies where dieters have consumed isoenergetic diets with TRF, i.e. one meal / day or a number of meals spread throughout the day do not suggest specific metabolic benefits with TRF. Firstly, studies of TRF vs multiple meals / day have either shown comparable loss of weight as FFM between the two approaches[293] or greater loss of weight as FFM with TRF[294]. Other studies have reported adverse changes in parameters of metabolic health, i.e. glucose tolerance, lipids, total and LDL cholesterol when an isoenergetic diet was fed in a four hour window vs. three meals spread throughout the day[295,296]. However this later study involved a four hour feeding window at night rather than in the morning. An increasing body of evidence suggests that consuming calories earlier in the day may be better for metabolic health than later in the day[297].

Future directions and recommendations for research

This summary highlights the limited data available to compare IER and CER, particularly long term outcomes. A number of ongoing studies are examining the effects of the most popular 5:2 diet of two non-consecutive days per week, but currently there is only one published paper on this approach[288]. There is a need for long term studies of IER vs. CER to assess long term efficacy and safety amongst individuals who are overweight or obese. Also any benefits or harms for maintaining weight and metabolic health amongst those who are a normal weight. The diets should be tested across different populations and disease settings,

i.e. men and women, and patients with diabetes and pre-diabetes. A range of IER regimens have been tested[298] but what is the ideal IER approach for health? How low in energy does it need to be, how long, and how often?

Conclusions:

The main conclusions on the role of IER for weight management are:

- A limited number of randomised trials have shown IER can be as effective as standard daily CER for weight loss in adult patients with and without type 2 diabetes
- There is limited long term data to inform whether IER can successfully achieve long term weight loss maintenance
- Available evidence suggests that IER is associated with incomplete energy intake compensation rather than leading to hyperphagia on non-restricted days if healthy eating is advised on non-diet days
- IER leads to improvements in metabolic health, e.g. improved insulin sensitivity, reduced lipids and improved blood pressure which are broadly comparable to CER for a given weight loss.
- There is a lack of evidence of benefits or harms of IER amongst normal weight adults
- There is a lack of evidence of benefits or harms of time restricted feeding (TRF) for weight loss or improving metabolic health.

Recommendations for practice

- IER can be offered as an alternative method for weight loss for adult weight management. Very low energy liquid based diets, or meal replacements, may be used to support the 50-75% ER.
- Contraindications for IER include; pregnancy, currently breast feeding, current eating disorder, depression or alcoholism
- IER diets have been used amongst small numbers of patients with type 2 diabetes who are likely to require adjustment of medications such as insulin or sulphonyureas[299]
- IER diets should provide dietary guidance on the types and amounts of food to consume on restricted days. It is prudent that restricted days include a minimum of 50g protein and 50g carbs as per the guidance for very low energy diets 32[300]. IER diets should also advise healthy eating on non-restricted days, e.g. the Mediterranean diet[286,291] American Heart Association diet[289] or the Eatwell Guide as described in published studies.

Fad Diets

Unfortunately there are numerous fad weight loss diets [e.g. detox, food combining, blood group diet etc.] available which make enticing promises about the speed and ease of weight loss and often advocate dietary and lifestyle approaches out of line with current scientific thinking. Their efficacy and safety are not supported by scientific evidence[301] and they often detract from evidence based approaches to managing obesity and confuse people on what are helpful approaches. It can be useful to guide patients to recognise fad diets and resist their quick fix solutions where possible. The American Heart Association [www.americanheart.org] suggests the following points may guide people in being able to identify fad diets

- **Magic or miracle foods** that burn fat.
- **Bizarre quantities** of only one food or type of food, such as eating only tomatoes or beef one day or unlimited bowls of cabbage soup or grapefruit.

- **Rigid menus**. Many diets set out a very limited selection of foods to be eaten at a specific time and day, exactly as written.
- **Specific food combinations**. There is no scientific evidence that eating foods in certain sequences or combinations has any medical benefit.
- **Rapid weight loss** of more than two pounds a week.
- **No warning** given to people with diabetes or high blood pressure to seek advice from their physician or healthcare provider.
- **No increased physical activity**. Simple physical activities, like walking or riding a bike, are one of the most important ways to lose weight and maintain weight loss. Yet many "fad" diets don't emphasize these easy changes.

Physical Activity Treatments

Physical activity treatment should be given equal billing to diet and behaviour modification in the multi-component management of obesity particularly in relation to weight maintenance. However, in reality activity treatment is often given inadequate attention with most focus being on dietary treatment[302]. As the following sections outline, the importance of activity in obesity management is not really about how many calories can be utilised but rather the critical role it can play in lowering obesity related risks, improving associated co-morbidities independent of any change in weight and supporting weight maintenance.

Physical Activity Recommendations

Current physical activity recommendations suggest people work towards a minimum weekly total of 150 minutes of moderate intensity activity, which can be done in longer sessions or broken down into bouts of 10 minutes or more[303]. Similar benefits can be achieved through 75 minutes of vigorous intensity activity spread throughout the week, or a combination of moderate and vigorous activity. Two sessions of muscle strengthening activities each week are also recommended together with a reduction in time spent in sedentary activities[303]. Although latest figures of self-reported adherence in the general population suggest 66% of men and 56% of women are meeting these targets[304] in reality physical activity may be much lower given the tendency for over-reporting[305].

Although these UK physical activity targets are well publicised it is important to recognise they relate to general health promotion and reduction in risk of various chronic diseases and are not specific to obesity management. Research has highlighted that in order to prevent overweight and obesity in the general population 45-60 minutes of activity per day may be necessary [if no reductions are made to energy intake] and in those who have lost weight 60-90 minutes may be required to maintain the loss and prevent weight regain[306].

Clearly these activity targets are well above the levels that many overweight, obese and indeed healthy weight adults undertake[307,308] and therefore it is important to convey such information carefully, at an appropriate time, and to emphasis the targets are to be worked towards rather than instantly adopted. It is also important to highlight any increases in activity will have substantial benefits for health, body composition and quality of life independent of any weight change. This is crucial when we consider the primary purpose of obesity management is to reduce associated risk factors and co-morbidities, and improve quality of life.

Role of Physical Activity in Weight Management

Physical activity as a sole intervention to manage obesity is associated with disappointing outcomes[134,309,310] and diet is recognised as a more potent weight loss treatment[311]. This probably relates to the limited ability of

physical activity to quickly induce large energy deficits unless activity can be undertaken for long periods and/or at intensities that are usually beyond the physical ability of most overweight and obese clients. This is one of the reasons why physical activity interventions are recommended as part of multi-component programmes[312].

Despite its limited impact on weight loss when used as an isolated treatment physical activity has numerous key roles to play in obesity management:

- prevention of weight gain and regain[313-315]
- promotion of numerous health benefits [e.g. improved blood lipids and blood pressure] even if no weight loss occurs[316,317].
- Possible reversal of early insulin resistance reducing the risks of developing type 2 diabetes[318] or improving the management of blood glucose in those with diabetes[319]
- Improved weight loss outcomes when combined with dietary treatments[134].
- Reduction in visceral fat, subcutaneous fat and increase in lean body mass[320,321]
- Positive impact on self-esteem, physical self-worth, body image and mood[322] which may influence the individuals capacity to cope with dietary change[323]. Indeed the beneficial impact on self-esteem seems to be greater in those with low baseline self-esteem[324]

It is important to discuss the benefits of activity with patients as they often extend beyond what many people recognise as the possible advantages of including more activity in their daily lives.

Consider sharing this information with clients

Regular activity can help:

1] Improve weight loss when used alongside dietary treatment[312]

2] Reduce weight regain during the weight maintenance period

3] Reduce stress levels, anxiety and depression leading to improved general wellbeing and improved sleep patterns[325]

4] Improve risk factors for various chronic diseases [eg. HDL cholesterol, blood pressure]

5] May have a beneficial effects on body composition by limiting the loss of muscle tissue that occurs during weight loss[326]

6] Through increased fitness and muscle strength may lead to improved functional capacity, mobility and quality of life[327]

Emphasizing the importance that physical activity plays in weight maintenance can be illustrated through highlighting the findings from the US National Weight Control Registry in which people who have lost large amounts of weight [mean weight loss 30kg] and successfully maintained this long term [mean weight maintenance duration 5.5yr] have regularly undertaken high levels of activity [60-90 minutes/day][328].

Intensity and Type of Activity

For many years the primary physical activity treatment in obesity management has been moderate intensity continuous activity [MICA] and indeed for many patients this will continue to be the most appropriate intervention. However, there is continued interest in the potential for vigorous high intensity activity and strength training, either as complementary or stand-alone options. Although consensus has yet to be reached on the efficacy of these approaches and their precise role in obesity management it is also important to balance research findings with considerations of the barriers and facilitators to physical activity, particularly for those with severe and complex obesity. Those with severe limitations to physical functioning may only be able to focus on limiting time spent in sedentary behaviours and modest increases in everyday activity. However, for others particularly those who may already be moderately active, time efficient approaches like vigorous high intensity activity may offer an alternative approach that may appeal to some individuals.

Vigorous High Intensity Activity

High intensity interval training [HIIT] involves repeatedly exercising at a high intensity for 30 seconds to several minutes interspersed with several minutes of recovery time of either no or low intensity activity. Disagreement continues over the precise definition of HIIT, evidenced by the range of different programmes available, and calls have been made for standardisation and a consistent prescribing approach[329].

There are some who suggest vigorous high intensity activity is as effective, if not more so, for managing body composition, weight and metabolism as MICA. However, as the research illustrates the situation in obesity management is not entirely clear-cut. There does however seem to be a growing consensus on the value of HIIT for improving cardiovascular fitness.

Some studies show HIIT produces greater reduction in body fat, especially abdominal fat[330], BMI[331,332], physical fitness[333] and insulin sensitivity[334,335] compared to MICA while others find greater weight loss and improved body composition with MICA[320,321]. It has been speculated that some of these discrepancies may relate to differences in the length of the intervention and/or the heterogeneous characteristics of study samples and there is a need for larger, longer-term studies to clarify the precise role of HIIT.

In terms of cardiovascular fitness a recent systematic review and meta-analysis of high versus moderate intensity activity in those with lifestyle induced cardio-metabolic disease found the HIIT approach was almost twice as effective at improving cardiorespiratory fitness as MICA[336] and this was achieved in a much shorter training time. However, no differences in body composition changes were found between the two approaches in a systematic review of HIIT versus MICA in healthy overweight and obese adults, although again HIIT involved 40% less training time[337]. Of note, no reduction in weight was observed with either MICA or HIIT despite improvements in body composition[337].

Given current research suggests both approaches are comparable in terms of their impact on body composition and weight it seems reasonable to conclude that HIIT and MICA have complementary roles in managing obesity, with patient preference and functional ability the likely determining factors. It is likely that those with severe obesity may struggle to include vigorous activity and focus would be more appropriate at lower intensities. This is in line NICE recommendations which suggest a variety of different physical activity interventions can be considered depending on the preferences of the client as well as their physical fitness and ability[1]

Although there are understandable concerns about the safety of vigorous activity it has been used in various high-risk populations with no serious adverse events[338]. Studies targeting those with cardiovascular disease have found greater reduction in blood pressure[339], lipid profile[340] and improvements in overall myocardial function[339]} with high versus moderate intensity activity. There is also evidence of safe and effective use in people with type 2 diabetes[341], stable angina[342], heart failure[343], post myocardial infarction[340] and after coronary artery grafting[344]. Although this is reassuring it is important to recognise a number of these studies were based on small sample sizes. It is also worth noting that participants taking part in research studies will have been screened for unstable cardiovascular disease and excluded if any cardiac safety concerns were noted. This is important when considering the use of HIIT approaches in clients or clinical populations that may not have undergone medical checks.

Given the higher intensity of HIIT approaches it is somewhat surprising that several studies have shown it to be the preferred option to longer duration moderate intensity interventions even in previously sedentary populations[338,345]. A lack of time is a commonly reported barrier to activity and so a time efficient approach like HIIT may appeal to some people despite its higher intensity. Debate and disagreement continues regarding the likely psychological affect [enjoyment] of high intensity activity and this is crucial in determining whether high intensity activities are more likely to be adopted and crucially sustained over the longer term[346].

In practical terms the FITT principle can be used as a guide to help the patient determine the level and type of activity that may be most effective and safe for managing their weight. For patients who are sedentary at the start of treatment the focus should initially be on establishing a regular pattern of low to moderate intensity activity before moving onto working towards increasing the duration of activity and finally if appropriate the intensity of the exercise[347].

Table 7 Recommended FITT framework for Overweight & Obesity

	Recommendations*
Frequency	> 5 days/week of aerobic exercise to maximize caloric expenditure[348]
Intensity	• Moderate to vigorous activities encouraged where appropriate • Some individuals may prefer doing vigorous exercise as its less time consuming but vigorous exercise may not be appropriate for those with severe obesity [BMI>35][2] • Individuals choosing to incorporate vigorous activity into their programme should do so gradually after an initial 4-12 week period of moderate intensity activity[2]
Time	• To prevent obesity – 45-60 min MICA/day unless kcal also reduced[1] • To treat obesity – 45-60 min MICA/day[2,306] • Obesity after weight loss to prevent weight regain– 60-90min MICA/day[1,2,306] • Obese & sedentary – build up to targets over several weeks starting with 10-20 min/day during 1-2 weeks to minimize muscle soreness & fatigue[2]
Type	• Walking is an excellent choice. For sedentary obese people brisk walking often constitutes moderate intensity activity[2] • Weight bearing activity may be difficult for the severely obese particularly those with joint problems. Instead suggest gradually increasing non-weight bearing activities [e.g. cycling, swimming, water aerobics]

Adapted from Exercise Prescription Doctors Handbook[349]

*Adjust accordingly for those with co-morbidities

Explaining what is meant by moderate and vigorous intensity exercise beyond their technical definitions can be helpful to patients.

As outlined in the Start Active, Stay Active report of 2011[303]

- Moderate intensity physical activities will cause adults to get warmer, breathe harder and their hearts to beat faster but they should still be able to carry on a conversation

- Vigorous intensity physical activities will cause adults to get warmer, breathe much harder and their hearts to beat rapidly making it more difficult to carry on a conversation

Strength Training

Twice weekly strength or resistance training [RT] is included in the UK activity recommendations[303] with the aim of reducing age-related decline in muscle strength[350].

A focus on strength training is particularly relevant to the older obese population where, decline in physical function may be further compounded by weight loss related reduction in muscle mass; this is known as sarcopenic obesity. A recent randomised controlled trial comparing MICA only, RT only or a combined resistance and MICA intervention in sedentary, obese individuals over 70 years found the greatest improvements in muscle strength and function in those using MICA with the addition of RT[351].

There is also growing interest in the possible role of RT in the treatment of cardiovascular risk factors and some suggestion that RT may have additional benefits in reducing abdominal obesity and ameliorating diet related loss of lean tissue[352]. RT has been found to improve insulin stimulated glucose uptake in those with impaired glucose tolerance[353], decrease HDL[354] and increase insulin sensitivity in older men and women with insulin resistance or type 2 diabetes[355]. However, further research is needed to fully understand whether RT offers specific advantages in addressing risk factor and co-morbidity reduction. A recent meta-analysis which explored the impact of various types of activity on glucose control and risk factors for complications in those with type 2 diabetes found combined training produced better outcomes than RT alone[356].

Although a number of studies have shown RT to be effective in reducing abdominal obesity[357,358] it remains unclear whether strength training is more effective than MICA. Randomised controlled trials comparing dietary treatment and MICA with or without the addition of resistance training have produced mixed findings. Some suggest no advantage of RT on reduction in total body fat, abdominal fat, or weight[359,360] while others suggest strength training may a useful addition to MICA in improving the loss of visceral fat, total fat and increased muscle mass[361-363].

While we await further research to clarify the specific role of RT on body composition and cardiovascular health in obesity management it seems prudent we promote this approach as complementary to MICA due to its impact on improving muscle strength.

Physical Activity Interventions

Reduction in Sedentary Behaviour

There is a growing body of evidence suggesting high levels of sedentary time [TV watching, computer based activity, travelling by car/train] increase risk of metabolic and vascular problems and this may be independent of physical activity levels[364-366]. As such reducing time spent in sedentary behaviours has been incorporated into UK activity guidelines and received more attention in relation to weight management particularly in children. There has been little research on interventions to reduce sedentary behaviours in adults so it is unclear how effective this strategy is likely to be in helping people manage their obesity[367]. However there is recognition that not every individual wants to, or is capable of, exercising at a moderate to high intensity, in a specific location [like a gym] or at a specific time. Encouraging patients to consider how long they spend in sedentary behaviours in a day and/or over a week maybe a pragmatic starting point from which to consider how best to incorporate activity back into their daily routines.

Increase Everyday Activity

There are a number of studies that have compared the effectiveness of everyday activity [e.g. active transport, gardening, heavy housework, occupational activity] to that of structured exercise. Project Active compared everyday activity to a structured gym based exercise programmes with a 6 month intensive treatment period followed by 18 months of maintenance with minimal contact. Both groups had comparable improvements in their fitness and body composition and it was concluded that both strategies were as effective in improving activity levels and fitness. The weight loss outcomes were poor in both groups which was to be expected as the main focus of the intervention was activity rather than dietary treatments[368].

In a study where they included a dietary component to the treatment programme and compared every day and structured activity in obese women over a 4 month period similar amounts of weight were lost between the two groups. However at the one year follow up significantly less weight had been regained in the everyday activity group compared to the structured group suggesting everyday activity may be as effective during the weight loss phase and possibly more so in the weight maintenance stage[369].

Walking is an activity that has been increasingly recommended as a means of increasing activity levels in people with overweight or obesity[4]. It has numerous advantages which support the potential role of this form of activity often suiting the physical capabilities of clients, involving no financial outlay, generally not associated with some negative experiences linked to sports and due to its lower intensity can be continued for longer periods compared to other forms of exercise.

Although more research is required to develop our understanding of the effectiveness of these different activity treatments it is probably safe to suggest that different approaches will suit different patients depending on their preferences, baseline activity patterns and their specific barriers and facilitators to changing activity habits.

Structured Exercise

Structured exercise is often the activity that people assume must be undertaken to lose weight and for some overweight and obese clients this type of activity may well suit their preferences and physical abilities. Structured exercise can often be undertaken in groups that for those individuals that find the support and encouragement of others during exercise helpful this can be a useful strategy to consider.

Barriers and Facilitators to Becoming More Active

Understanding why people choose to participate or not in physical activity is clearly important and yet science has a limited in depth understanding of the influencing factors. This may relate to the predominance of quantitative research methods that have used to explore this area and there is a need for more qualitative approaches particularly in those with severe and complex obesity[370]. We need to develop a more sophisticated understanding of people's experiences of physical activity and their ideas about what motivates or hinders them being active.

An interesting review of the limited qualitative studies in the UK that have explored these issues highlighted the following motivators and barriers to being active

AGE GROUP	MOTIVATIONS	BARRIERS
TEENAGERS & YOUNG WOMEN	BODY SHAPE WEIGHT MANAGEMENT NEW SOCIAL NETWORKS FAMILY SUPPORT PEER SUPPORT	NEGATIVE EXPERIENCES AT SCHOOL PEER PRESSURE IDENTITY CONFLICT PE UNIFORMS BOYS DOMINANCE IN CLASS COMPETITIVE CLASSES LACK OF TEACHER SUPPORT
ADULTS	SENSE OF ACHIEVEMENT SKILL DEVELOPMENT MEDICAL SANCTION SUPPORT NETWORKS ENJOYMENT	NEGATIVE SCHOOL EXPERIENCES ANXIETY IN UNFAMILIAR SURROUNDINGS LACK OF SOCIAL NETWORK IDENTITY CONFLICT LACK OF ROLE MODELS
OLDER ADULTS	SOCIAL SUPPORT HEALTH BENEFITS ENJOYMENT	UNCLEAR GUIDANCE LACK OF ROLE MODELS

Taken from Allender et al, 2006[370]

Those with severe obesity face additional barriers including the functional limitations of the weight itself[371,372] and the vulnerability associated with being active in public[371]. More common barriers include lack of time, competing demands on time, poor experiences of activity and not identifying as an active person[373,374].

It is helpful to have a better understanding of these motivators and barriers as it provides the practitioner with a more sophisticated understanding of some of the possible issues that may be described by individuals during their consultation. Only when we are aware of the barriers experienced by the patient can we begin to guide towards the knowledge and skills that may be helpful in addressing some of these challenges and taking advantage of opportunities available.

Behaviour Modification

An Integrated Approach

Although behaviour modification is often discussed as a separate set of strategies that are used as an adjunct to diet and activity treatments if used appropriately a behavioural approach to managing weight should extend far beyond a set of techniques and should influence the whole philosophy of the consultation and the skills and perspective of the dietitian.

An integrated approach to behaviour change focuses on a patient centred approach to care that incorporates motivational, behavioural and cognitive elements while acknowledging that the attitudes and skills of the practitioner will have a profound effect on the outcomes of treatment. This is a rather different approach to the traditional advice giving and persuasion role that dietitians have until recently assumed with suggestions that such traditional treatment may increase patient resistance by reducing their involvement and control over the process of change [93,375]. This is supported by research suggesting patients prefer dietetic consultations in which they feel listened to and understood [376].

Traditional dietetic weight management treatment tends to follow the medical model of care with the practitioner as the expert conveying information and the patient as the passive recipient. As behavioural approaches to managing weight have emerged this approach has been challenged with the importance of empowerment and patient centred care being highlighted. Empowerment views the patient as responsible for their own health care and choices and necessitates practitioners altering their attitudes to management. The patient and practitioner should be seen as equal and active partners in the consultation process with the patient as the expert in their own life and the practitioner as the expert in the chronic disease. [377] Indeed it has been suggested that in order for practitioners to work in this way they need to change their own view of their role by moving away from feeling responsible *for* patients towards being responsible *to* them [378]. Essentially the empowerment approach centres on patient choice, patient responsibility and skills development and by definition is also patient centred. Patient centred care focuses on involving clients in the decision making process and tailoring treatment interventions to meet their needs and personal preference[379]. Indeed this approach has been described as the practitioner 'actively seeking to enter into the patient's world to understand his or her unique experiences' [380{Stewart, 2014 #688]. The key principles include the modification of current behaviour patterns, new adaptive learning, problem solving and a collaborative relationship between client and therapist [381].

The interpersonal skills of the practitioner are critically important to the patients experience of the consultation and importantly to the outcomes of treatment. Indeed a number of behavioural experts have suggested that the practitioners interpersonal skills are the most potent influencer of change [82,93]. It has been suggested that health professionals will find it very challenging to truly adopt a patient centred approach without specific and comprehensive training [382]. It therefore seems prudent that we regularly review and invest in the development of these critical skills. For a comprehensive review of the specific elements of counselling skills refer to the Changing Health Behaviour chapter in the Manual of Dietetic Practice [94].

Motivational Approaches

Motivational interviewing [MI] is an important part of the integrated approach to weight management counselling, however in some instances a superficial understanding of the approach has led practitioners to misuse some of the strategies without fully understanding the underlying principles or having undergone the necessary in-depth training[93,383].

Motivational interviewing has been defined as "a collaborative conversation style for strengthening a person's own motivation and commitment to change[375]". It is also a way of *being* with people that is sometimes referred to as the spirit of MI. Dietitians practicing in this way work collaboratively alongside patients, accepting MI cannot be 'done' to someone. They respect the patient's rights and the decisions they choose to make even when they don't align with those of the practitioner. Through in depth training they have the skills to accurately empathise with their patient and acknowledge [affirm] past efforts, strengths and intensions. Expressing empathy through the process of reflective listening is critical if the client is to feel accepted and avoid feeling judged. In expressing empathy practitioners also accept ambivalence as a normal part of change and not an indicator of an uncooperative, non-compliant patient who is incapable of changing. In the spirit of MI practitioners work in a compassionate way and help the patient to recognise 'they have what it takes and together we can work through this'. Evoking the client to find within themselves their goals and values helps build intrinsic motivation. Indeed it has been said that motivational interviewing is about releasing the motivation to change that exists within each person and the skill of the practitioner is to draw out this potential to change[93].

Motivational interviewing is considered to have four key elements[375]

The four key MI Processes
Engage
Focus
Evoke
Plan

Engage: How well we engage with our patients and the quality of the helping relationship is critical to the outcome of our consultations. Central to this process is the capacity to create the core conditions of empathy, genuineness, acceptance and compassion, all of which require comprehensive patient-centred communication skills.

Focus: Truly understanding what patients want to achieve and how they believe the dietitian can provide support is central to this part of the MI process. We can guide patients to consider the broader picture, explore short and long-term goals and understand what support and services we can offer.

Evoke: This is about helping patients to generate talk about change and then reflect this change talk back to the patient so they can hear the power of their own words echoed back.

Plan: The details of exactly how change is going to take place is often skipped or given inadequate attention but it is essential to help patients develop the planning skills required to move change talk into specific action.

A number of different skills are needed for effective MI such as reflective listening [e.g. minimal encouragers, verbal following, paraphrasing, reflecting feelings, questions and summarising], affirmations and providing information in a helpful way. These challenging skills necessitate comprehensive skills training followed by practice, feedback and encouragement[93] and must go beyond what can be learnt from reading reports such as this. We have chosen therefore not to describe each skill in detail but rather to refer the interested reader to the authoritative and comprehensive guide on this style of counselling[93,375] and suggest practical skills based training via a reputable training organisation is essential.

Importance and confidence are known to be key determinants of motivation and a number of different factors can influence these constructs. A person's values and beliefs about a change can positively or negatively affect the associated importance of that change and influence motivation accordingly. If a particular change aligns with a patient's values, they believe it is important and will make a difference; motivation is likely to increase and the change more likely to occur and be sustained. Likewise, beliefs about their ability to make a change will affect confidence and in turn this will influence motivation. Whether a change is being considered at a time when sufficient priority can be given to it may also influence the motivation to change. It is also important to realise just how important our helping style can be to the outcome achieved with research showing the significant impact it can have on the levels of motivation experienced by patients[82,380].

Behavioural and Cognitive Approaches

The use of cognitive behavioural approaches in helping clients change their eating and activity behaviour is associated with improved outcomes in weight management. At the 12 month time point the use of a behavioural approach to changing eating behaviour has led to -3.1kg difference in weight compared to usual dietary care[1].

Current cognitive behavioural approaches include the use of a number of different strategies as outlined below. However, as with motivational interviewing, these are not techniques that should be undertaken by a practitioner with limited interpersonal skills or with no training in a cognitive behavioural approach.

Key Strategies

Self-Monitoring

Food diaries are one form of self-monitoring and as suggested earlier they are a key tool in the assessment of current eating behaviour. Indeed, it has been suggested that if only one skill is conveyed to patients during the whole treatment process self-monitoring should be the skill of choice [384]. Individuals who consistently self-monitor have been shown to be more successful in behavioural weight management programmes compared to those that fail to undertake this strategy [384,385{Peterson, 2014 #689]. The use of diaries is one of the behaviours employed by the successful weight loss maintainers in the National Weight Control Registry [386] has been shown to be a feature of successful maintainers in other studies[387]. A willingness to self-monitor and observe their own behaviour often indicates a willingness to come to terms with the eating and activity habits associated with weight control and to subsequently make changes [94].

As clients begin to observe their own behaviours and raise their awareness of how eating and activity behaviour is linked with their weight control this can at times be sufficient to elicit change. This can be further enhanced through working with the practitioner to identify patterns [e.g. long periods without eating, eating in response to stress] that may need to be addressed in treatment. Self-awareness and identification of patterns and behaviours are the key purpose of food and activity diaries and the known level of inaccuracy in

the quantification of nutrient intake is of limited relevance. As self-monitoring raises awareness this can be the first step in the problem solving process by identifying the 'problem' in question.

Although self-monitoring is a time intensive skill some patients may choose to use it constantly throughout treatment and maintenance. However for others this might produce diary fatigue and they may choose to use this strategy intermittently particularly at times when lapses have occurred.

Checking changes in body weight is also a form of self-monitoring with frequent weight checks seeming to be important to treatment and maintenance success [65{Butryn, 2007 #690]. This probably relates to the importance of early identification of lapses and subsequent changes to eating and activity behaviour.

Despite the supporting evidence for self-monitoring a systematic review on a variety of strategies including dietary self-monitoring, physical activity and self-weighing highlighted the limitations in the evidence base with a need for objective measures versus self-report, exploration in more diverse populations and a need for research to determine the level of self-monitoring needed for successful outcomes[388].

Stimulus control

This is a technique that involves the practitioner working with the client to identify, and then develop ways of modifying, the cues or the barriers that are linked with unhealthy eating and activity habits. Exposure to cues that are usually associated with a particularly unhelpful behaviour can be linked with relapse so modifying those cues [stimulus control] can be a helpful approach for many patients [65]. For example an unhelpful behaviour might be eating dinner in front of the TV. Eating while preoccupied with another activity often reduces the level of awareness of foods consumed or limits the associated satisfaction from the meal. Sitting in front of the TV at other times of the day may subsequently trigger cravings to eat as the client normally associates TV watching with eating. Breaking this pattern and removing the stimulus by changing the location of meals to the kitchen table with no TV watching may prove useful to improving overall eating behaviour. Some cues are external and dietitians may suggest strategies to address these e.g. don't shop when hungry. Other cues are internal and may be related to emotions and therefore it is important to ensure dietitians have the appropriate skills to help patients resolve these difficulties as well as recognising the limitations of our expertise when referral for further psychological support may be appropriate.

Goal Setting

As discussed earlier realistic goal setting is an important aspect of creating a change plan with the client and should primarily focus on behavioural goals rather than long term weight targets. Helping patients to separate longer term goals from short term ones and working with clients to recognise and reinforce when behavioural targets have been achieved and the health and wellbeing benefits associated with small changes is an important aspect of management.

Problem solving

Problem solving is at the heart of the behavioural approach to managing weight and is a critical skill for patients to acquire and part of the dietitian's role is to coach and encourage the development of this skill. It can help clients learn how best to cope with various social and emotional situations which will inevitably challenge their newly adopted behaviours or intentions at some stage in the long term management of their disease. Indeed it can be these very situations that may trigger a lapse and ultimately a relapse unless they can become skilled and confident in finding alternative ways of handling these scenarios. In some instances patients may attempt to avoid social events that involve eating but clearly in the long term this is not a feasible management solution and risks socially isolating the client. Essentially problem solving is about helping clients to initially identify the problematic social or emotional situations and then consider a range of

possible solutions. From this range of solutions the client then chooses the one they feel most likely, and able, to implement and subsequently evaluate the outcome of using that solution with the practitioner. Refinements of the solutions can then be developed or one of the original alternative solutions considered if the outcome was not desirable.

Stages of Problem Solving

- Identify problem
- Clarify goals
- Examine possible solutions
- Choose solution
- Act on solution
- Evaluate outcome

Cognitive restructuring

This is not, as is sometimes perceived, a way of encouraging patients to think positively. Rather it relates to the many inaccurate beliefs in relation to obesity and its management some of which may become apparent during the assessment or subsequent consultation with the client. Helping patients examine their thoughts and feelings in relation to managing their weight, identify negative self-defeating thoughts and help them work towards recreating more helpful ones can be important in implementing and sustaining changes to eating and activity behaviour. As with other advanced counselling techniques this is a strategy that can only effectively and safely used by those health professionals with strong interpersonal skills who have invested in training in cognitive behavioural approaches.

Social Support

It has been shown that those people with higher levels of social support tend to do better in weight management compared to those with little support [389]. Social support comes in various guises from family members, friends, peers, group programmes or other social activities. It is thought to be important due to its influence on peoples sense of motivation and self-efficacy and it may help people become more self-accepting [65]. The right type of social support can also be an invaluable source of positive reinforcement for behavioural goals achieved. However it should not be assumed that involvement of family members or friends in weight management programmes will automatically have a positive influence as it will depend on the type of support provided and whether the client finds this helpful or unhelpful. Helping the client establish and maintain a network of helpful support across the various aspects of their life will be important in the long term maintenance of weight loss and should be given due recognition during the dietetic consultations.

Self-rewards

Self-rewards or positive reinforcement after a desired behavior is a widely used psychological strategy for increasing the likelihood of a behavior being repeated. If patients can develop the skill of rewarding themselves for achieving behavioural goals they are more likely to succeed in maintaining their weight losses at 12 months compared to those that do not self-reward [390,391]. Although this sounds like a relatively straight forward task for many overweight and obese clients it can be a struggle to identify experiences or objects that they feel comfortable about and which are not food related. This is an area where support from an understanding health professional can be invaluable.

Monitoring and Review

It is important to encourage patients to review and monitor not only their food and activity behaviour but also their desired outcomes and behavioural targets rather than relying on health professionals to undertake this monitoring on their behalf.

Relapse Prevention

Lapses are often caused by people's reaction to social situations or emotional events and are an expected and therefore normal aspect of changing behaviour. As such it is important to discuss with clients the inevitability of lapses and importantly that the occurrence of a lapse does not equate to a failed weight loss attempt. Indeed lapses can prove to be important opportunities for learning which situations are potentially problematic and how different approaches to these situations may provide different outcomes. Exploring with clients their experience of lapses in previous weight loss attempts, what they have thought when they, for example, ate a piece of unplanned gateau at a party and how this influenced their subsequent behaviour can be an enlightening process for patient and practitioner. Working with clients to recognise how their thoughts and behaviours in relation to lapses may lead to subsequent overeating and working through how best to manage these future situations can be an important strategy for some clients.

Emerging Psychological Approaches

The integrated behavioural approach, described above, is the accepted gold standard in obesity management and the recommended NICE approach to evidence based treatment[1,4]. However, it is well recognised that weight regain is common over the longer term and programme attrition can at times be high suggesting some patients face challenges they may not be best equipped to address. This has sparked interest in a number of new interventions, sometimes referred to as third generation behavioural approaches, such as mindfulness or acceptance based therapies, which may have merit as standalone treatments or possibly in combination with existing behavioural approaches.

In the following section each approach is described and the associated evidence for their effectiveness presented. Given research in this field is in its infancy it is important to be aware of the available evidence to ensure enthusiasm for novel approaches is supported by scientific findings.

In general, mindfulness and acceptance based therapies aim to help people change how they respond to unwanted thoughts, feelings or bodily sensations. Rather than avoiding or trying to change these, which can have the unintended consequence of magnifying their effect, they guide towards awareness, acceptance and the development of self-regulation skills [392]. They may be particularly pertinent in those patients who present with high levels of shame, self-critical mindsets, problematic obesity related eating behaviours or in those who have not responded well to standard approaches.

Mindfulness Based Interventions

Mindfulness based interventions have become increasingly popular over recent years due in part to the expanding body of evidence supporting their efficacy in depression, anxiety and stress management [393]. Indeed mindfulness based cognitive therapy [MBCT] is particularly effective in reducing risk of further depressive episodes in those with relapsing depressive disorders [394].

Kabat Zinn defines mindfulness as "paying attention, moment by moment without judging" and this is usually encouraged through regular meditation practice. In weight management mindfulness approaches may help limit automatic, impulsive and inattentive reactions to food and through lowering emotional triggers lead to a reduction in comfort eating. By acquiring the mindfulness skills of increased awareness [e.g. of hunger and fullness sensations] and improved tolerance of distress, individuals may be better able to self-regulate eating, manage challenging food situations better and reflect less judgmentally on their choices. As such mindful eating approaches are typically targeted at those with binge eating disorder or problematic emotional overeating, although some research suggests they may have a broader application in weight management [395].

Three systematic reviews have previously explored the impact of mindfulness-based interventions on obesity related eating behaviours and weight loss outcomes. Findings from these reviews showed significant improvements in binge eating and emotional overeating, however weight loss outcomes results were mixed [396-398] This may relate to the broad range of body mass indexes included in these randomised controlled trials with healthy weight, overweight and obese participants enrolled.

However, a recent meta-analysis specifically explored the effectiveness of mindfulness-based interventions in randomised control trials and prospective cohort studies that only included overweight and obese adults [399]. At treatment completion a mean weight loss of 4.2kg was found, large improvements were reported in problematic eating behaviours and reductions in depression and anxiety symptoms were also evident. Although weight loss was sustained for up to 6 months following completion, in general the duration of studies included in this review were short and it is unknown what outcomes would be achieved over the longer term.

Nevertheless, these findings are promising and point towards the beneficial impact of mindfulness-based approaches in obesity management. Given this is a newly emerging area of research there are some shortfalls in the evidence base which need to be addressed, namely limited sample sizes, short study durations and heterogeneous study populations.

Mindfulness based interventions can, and have been delivered by non-psychologists, including dietitians. However, given the nature of this approach is very different from traditional dietetic practice it is essential that comprehensive training is undertaken to ensure high quality interventions are delivered. Further information, resources and training on mindful eating approaches can be found at

www.thecenterformindfuleating.org

Acceptance and Commitment Therapy

Acceptance and commitment therapy [ACT] combines elements of CBT with mindfulness components and works to help people adopt healthy behavioural patterns in line with their stated values while supporting commitment to these through mindfulness and acceptance skills.

One of the key differences between ACT and the standard behavioural approach is the overarching treatment goal is not weight focused, rather it relates to the patient's stated values. For example, if improved self-confidence was a desired treatment outcome, rather than waiting for this to occur as a byproduct of weight loss, the ACT approach would explore behaviours associated with increased confidence and encourage implementation of these prior to any weight change. Food cravings in ACT are viewed as inevitable and not to be avoided. Participants are encouraged to be open to experiencing the feelings associated with cravings, to notice any fears linked with these cravings and develop the capacity to continue with their value-based behaviours despite such cravings. The values work in ACT aims to help people explore the meaning behind the behaviour needed to manage their weight. When people begin to struggle with adherence rather than using problem solving skills to explore strategies such as the timing of the behaviour or what might help with implementation, ACT looks in detail at the function of *not* engaging in the planned behaviour. Might this relate to unpleasant physical sensations, fear of judgment, or comfort from unwanted feelings such as stress, boredom or fatigue? Once these have been established acceptance, mindfulness and values techniques would be used to help people relate differently to these barriers.

Although there is evidence supporting the use of ACT in other clinical conditions its use in weight management is only beginning to be explored. To date there are no randomised controlled trials comparing ACT with standard behavioural treatments although the potential value of combining ACT approaches with behavioural weight management programmes has been investigated. In a study where the LEARN programme was combined with acceptance strategies participants lost 6.6% during the treatment phase and 9.6% at 6 month follow up [400]. Other small scale studies have looked at weight loss outcomes following brief ACT interventions and in women already engaged in a weight loss programme the addition of a 2 hour ACT workshop led a 2.3kg greater weight loss in those who reported applying the principles versus those choosing not to implement the approach [401].

There is particular interest in the use of ACT during weight maintenance where approaches to preventing weight regain are currently limited. In one study participants who had lost weight were randomised to either a one-day ACT workshop or to a waiting list control group. The workshop focused on the concepts of experiential avoidance and increased psychological flexibility. At the 3 month follow up the ACT group had lost a further 1.6% body weight whereas the control group had gained 3% [402].

Although these findings are encouraging, it is too early to make any definitive statements about the effectiveness of ACT in weight management, until findings from large-scale trials are available. Further consideration also needs to be given to optimal programme content and how best to combine with standard behavioural weight loss programmes [403].

Compassion Focused Therapy

Compassion focused therapy [CFT] was initially developed to help people with disordered eating, including binge eating disorder, where high levels of shame, self-criticism and self-hostility are frequently observed [404,405]. Shame was recognised back in 1973 as being a critical component to the development and maintenance of eating disorders. Likewise self-criticism is a strong predictor of the severity of eating disorder symptoms [406]. Compassion is the antidote to shame and self-criticism and unsurprisingly in those with eating disorders self-compassion is very limited and may be accompanied by a fear of receiving compassion [407].

The development of compassion focused therapy in eating disorders [CFT-E] incorporated CFT practices into existing NICE recommended eating disorder interventions with the aim of encouraging patients to develop and experience compassion for themselves and others and to use these skills in dealing with their disordered eating and self-critical mindset [408]. Further details on this process can be found in the narrative review by Goss & Allan [409]. Preliminary evidence for the inclusion of CFT-E has been promising with significant improvements in self-reported eating disorder symptoms [409] and reductions in reported shame and self-criticism and increased self-compassion. However there are limitations to this research and further exploration on the impact of CFT-E on treatment outcomes is needed.

Many of the beliefs and behaviours evident in eating disorder patients, most notably high levels of shame, self-criticism and limited self-compassion, are shared by some of those with obesity [410]. As such the CFT-E has been adapted for this group and is currently subject to research to determine the outcomes achieved. A self-help manual has also been developed and is available for patient use [404].

There is a need for randomised controlled trials to explore the outcome of using the adapted CFT-E in the obese population as there has only been one pilot RCT study published. This was undertaken in obese individuals diagnosed with binge eating disorder in which self-help CFT was compared with a brief self-help CBT approach for managing binge eating disorder. Both interventions produced comparable reductions in binge eating episodes but the CFT approach led to greater reduction in eating and weight concerns and eating disorder pathology [411].

While we wait for the evidence exploring the efficacy of CFT in obesity management it would seem prudent that as practitioners, consider and reflect on the high levels of shame and limited self-compassion that may be evident in some of our patients. It is important that we communicate messages relating to food changes and body size in a way which does not compound their sense of shame but rather builds self-compassion and non-judgmental responses to the choices made. This is a really challenging undertaking and further underlines the importance of strong interpersonal skills and training.

Pharmacotherapy and Dietetic Obesity Management

Pharmacotherapy has an important role to play in obesity management however even when drug treatment is used lifestyle management should remain the foundation for improved health outcomes. Furthermore research has also shown combining high quality lifestyle treatment with pharmacotherapy produces considerably greater weight loss compared to drug treatment alone[412]. It is therefore critical that dietetic care is provided throughout the pharmacotherapy management process and importantly a full dietetic assessment occurs prior to commencing drug treatment.

NICE[1,4] suggests pharmacotherapy for obesity management may be considered in the following situations.

- After dietary, exercise and behavioural approaches have been started and evaluated.
- When patients have not reached a weight loss target or have reached a plateau on dietary, activity and behavioural changes alone.
- After discussing the implications of drug treatment with the patient including: mode of action, potential side effects and monitoring requirements, and possible implications on motivation.
- After additional support from health professionals on diet, physical activity and behavioural approaches has commenced and where feasible patients have been signposted to support programmes

.

Once drug treatment has been commenced the following recommendations have been made:

- Continue to provide support and guidance on dietary, physical activity and behavioural changes and monitor the effects of drug treatment
- Consider stopping drug treatment if weight loss targets are not being reached although lower targets are appropriate for those with type 2 diabetes
- Longer term use of drug treatment beyond 12 months, which is usually for the purpose of weight maintenance, should only be considered following discussion with the patient on the associated risks and benefits.
- Co-prescribing of drug treatment is not considered appropriate
- If drug treatment is being withdrawn offer guidance to help prevent weight regain or in those who may have struggled to reach their targets offer support to minimize any adverse effect on their confidence to self-manage their condition.

Orlistat

Orlistat is a gastric and pancreatic lipase inhibitor and at a dose of 120mg three times a day, approximately 30% of dietary fat will be excreted in the stool. This produces a 2.9kg greater weight loss in Orlistat versus placebo treated groups with more people achieving their 5 & 10% weight loss targets[413]. After one-year Orlistat treated groups achieve mean weight losses of 2.9-3.4%[414] and in those with type 2 diabetes a 0.4% greater improvement in HbA1c has been found[415]. Side effects are largely gastro-intestinal and due to fat malabsorption including steatorrhoea, oily spotting, flatulence with discharge and faecal incontinence. Due to the distressing nature of these side effects they can trigger early discontinuation if appropriate support and guidance in adopting a low fat diet are not provided prior to starting Orlistat treatment.

Indications for Use

Use as an adjunct to comprehensive lifestyle interventions if:

BMI≥30kg/m^2 or BMI ≥28kg/m^2 with associated risk factors

120mg t.d.s. just before, during or up to 1 hr post meal

Continue beyond 3 months only if at least 5% of initial body weight has been lost

(less strict goals may be appropriate for people with type 2 diabetes).

Contra-indications to Use

Chronic malabsorption syndrome

Cholestasis

Pregnant or breastfeeding

If there is concern about micronutrient intake, consider giving a supplement providing the reference nutrient intake for all vitamins and trace elements, particularly for vulnerable groups such as older people, who may be at risk of malnutrition[1,4].

Liraglutide

Liraglutide, a GLP-1 [glucagon like peptide] agonist, commonly known as Victoza, has been used for a number of years to treat hyperglycemia without promoting weight gain in type 2 diabetes. This observation led to clinical trials of higher doses of Liraglutide than traditionally used to treat type 2 diabetes, and ultimately led to the development of the weight management product Saxenda. This 3mg Liraglutide weight management product was given European marketing autorisation in March 2015 and was launched in the UK in January 2017.

Liraglutide is known to suppress appetite and food intake although the precise mechanism by which the GLP-1 agonist works is unclear. Saxenda is given as a once daily subcutaneous injection in the abdomen, thigh or upper arms and has a number of common side effects including nausea, vomiting, diarrhoea, constipation and indigestion. These gastro-intestinal side effects are generally mild to moderate and will usually resolve over a few days or weeks particularly if the starting dose is small and gradually escalated. There are more serious but less frequent side effects including increased incidence of symptomatic gallstones and more rarely pancreatitis.

Indications for Use

Use as an adjunct to comprehensive lifestyle interventions if: BMI ≥ 30kg/m^2 BMI ≥ 27 < 30kg/m^2 plus at least one obesity related co-morbidity such as dysglycaemia, hypertension, obstructive sleep apnoea If less the 5% target weight loss not been achieved after 12 weeks of 3mg dose then the medication should be discontinued.

The starting dose is 0.6mg per day and in order to reach the maintenance dose of 3mg, with reduced risk of side effects, a weekly increase of 0.6mg is advised. By week four the maintenance dose of 3mg should be achievable. Further details on dosing schedules, indications and contra-indications to use can be found in the summary of product characteristics https://www.medicines.org.uk/emc/medicine/32753

Evidence for Efficacy

In people without diabetes who were overweight/obese, with weight related comorbidities, treatment with a lifestyle intervention plus 3mg Liraglutide or placebo led to -8% weight change from baseline in the Liraglutide group and -2.6% in the control group[416]. On discontinuing the medication weight regain occurred in many participants. In those with diabetes weight change was -6% in the Liraglutide and -2% in the placebo treated group[417]. Use of Liraglutide in those with pre diabetes successfully lowered the incidence of diabetes compared to placebo treated groups[418] and sleep quality improved in those with obstructive sleep apnoea treated with Saxenda[419].

Cost Implications

Liraglutide (Saxenda) costs £196.20 for a 1 month supply at the maintenance dose of 3.0 mg/day (MIMS, May 2017, excluding VAT) whereas Orlistat 120 mg 3 times a day costs £18.05 for 1 month supply (Drug Tariff, May 2017, excluding VAT). This high cost seems likely to preclude widespread use of this medication in the NHS and indeed the manufacturer has reported they will only promote the use of Liraglutide (Saxenda) on private prescription.

Safety

The summary of product characteristics highlights a number of precautions and warnings associated with the use of Saxenda.

In people with diabetes there are warnings on

- Pancreatitis
- Cholelithiasis and cholecystitis
- Thyroid disease
- Dehydration
- Hypoglycaemia

To limit the risk of hypoglycaemia in those with type 2 diabetes the concomitant dose of insulin or sulfonylurea should be reduced when Saxenda is started.

Saxenda is not recommended in certain groups due to inadequate research on its efficacy or safety. These include people with:

- Severe renal impairment
- Severe hepatic impairment
- Congestive heart failure class III to IV
- Obesity secondary to endocrine or eating disorders
- Obesity caused by another medicinal treatment.
- Inflammatory bowel disease and diabetic gastroparesis
- Aged 75 years and older

For further detailed discussion see the summary of product characteristics www.medicines.org.uk/emc/medicine/32753

Obesity Surgery and Dietetic Obesity Management

Obesity surgery remains a relatively rare form of obesity treatment but as the prevalence of severe obesity increases so its use may likewise expand.

For patients with severe and complex obesity who have been appropriately selected, well informed and prepared for the procedure and are supported by trained practitioners this intervention can produce very successful outcomes. The detailed dietetic aspects required for the various types of bariatric procedure are beyond the scope of this document however outlined below are the general guidelines provided in the NICE guidance[1,4].

Patients with severe obesity may be considered for surgery if they have/are:

- BMI of 40 kg/m^2 or more, or between 35 kg/m^2 and 40 kg/m^2 and other significant disease (for example, type 2 diabetes, high blood pressure) that could be improved if they lost weight
- all appropriate non-surgical measures have been tried but clinically beneficial weight loss has not been achieved or maintained
- have already received, or will receive, specialist multi-disciplinary support in a tier 3 service
- generally fit for anaesthesia and surgery
- aware of, and committed to, the need for long-term follow-up.

In addition

- Consider surgery as the first-line option for adults with a BMI of more than 50 kg/m^2 when other interventions have not been effective
- Consider using orlistat to maintain or lower weight in those who are waiting for bariatric surgery and the length of waiting time is considered excessive.

In those with recent onset type 2 Diabetes

- Accelerate the assessment of suitability for bariatric surgery for those with recent onset type 2 diabetes* who have a BMI ≥35kg/m^2. as long as they are already receiving, or are about to receive care in a tier 3 service[4].
- In those patients with recent onset type 2 diabetes with a BMI 30-34.9kg/m2 consider assessment for surgery as long as they are receiving or will receive care in tier 3 service[4]
- Consider assessment for bariatric surgery in those with an Asian family origin who have recent onset type 2 diabetes but with lower BMI than other populations as long as they have, or will receive, care in a tier 3 service[4]

*recent onset was considered to be diagnosis within a ten year time frame

NICE recommends regular specialist dietetic monitoring is provided after the procedure and includes:

- information on the appropriate diet for the procedure
- monitoring of micronutrient status
- information on patient support groups
- individualised nutritional supplementation, support and guidance for long-term weight loss and weight maintenance.

However dietetic involvement is important across the entire patient journey and can be particularly helpful in the pre-operative stage for identifying and exploring dietary and nutritional issues, treating nutritional deficiencies, discussing treatment expectations and exchanging information on the dietary and lifestyle changes required following bariatric surgery.

A follow up package of care of 2 years within a bariatric service is recommended by NICE. This should include

1. Monitoring nutritional intake, including protein, vitamins and minerals
2. Monitoring co-morbidities and adjusting medications
3. Dietary & nutritional assessment, advice and support
4. Physical activity advice and support
5. Psychological support tailored to the individual
6. Signposting to professionally led or peer-support groups
7. Arrange shared care model of management after discharge from the bariatric centres to ensure at least annual monitoring of nutritional status and appropriate supplementation dependent on need[4].

Further details on the follow up of patients after bariatric surgery, with particular reference to nutritional management, can be found in the following documents

- Guidelines for the follow up of patients undergoing bariatric surgery[420].
- BOMSS Guidelines on the Perioperative & post-operative biochemical monitoring and micronutrient replacement for patients undergoing bariatric surgery [www.bomss.org.uk/bomss-nutritional-guidance]
- American Society for Metabolic and Bariatric Surgery Integrated Health Nutritional Guidelines for the Surgical Weight Loss Patient. 2016 Update: Micronutrients[421].

NICE recommends bariatric surgery should only be undertaken by experienced multi-disciplinary teams capable of undertaking:

- Preoperative assessments, including a risk benefit analysis that includes preventing complications of obesity, and specialist assessment of eating disorders.
- Information on the different bariatric procedures, including potential weight loss and associated risks
- Regular postoperative assessment, including specialist dietetic and surgical follow up
- Management of co-morbidities
- Psychological support before and after surgery
- Information on, and access to, plastic surgery when appropriate
- Access to the equipment needed for people having bariatric surgery and the staff trained in how to use them.

Weight Maintenance

Long-term strategies are needed to improve the sustainability of lost weight over time and our understanding expanded of how best to support patients to develop the knowledge and skills necessary to maintain lost weight.

It is well recognized that for most people weight loss peaks at 6 months and is then followed by a period of weight regain[422]. However, weight maintenance is possible for a proportion of patients and it is important to understand how those who are 'successful' in maintaining lost weight achieve this over the longer term. Research in weight maintenance compared to weight loss is limited and hampered by heterogeneous study designs and modes of delivery.

A systematic review of evidence for maintenance strategies including diet, behavioural approaches, physical activity and pharmacotherapy showed weight regain could be reduced, with a 1.56kg average difference in weight regain at 12 months, in those treated with diet and physical activity maintenance interventions and by 1.8kg in Orlistat plus lifestyle interventions versus placebo at 12 months[423].

This was supported by a further systematic review which concluded weight maintenance interventions led to less weight regain compared to control groups suggesting weight maintenance strategies are important. Indeed it estimated for every 8 patients treated for weight maintenance, 1 would sustain 5% or more of initial weight loss[424].

The National Weight Control Registry [www.nwcr.ws] is an observational study of successful losers and requires those participating to have lost at least 30lb and maintained a loss of at least 30lb for a minimum of 1 year[328]. A 10 year observational study of self-reported weight change in 2886 NWCR participants found more than 87% were still maintaining more than 10% of lost weight at the 10 year time point clearly illustrating weight maintenance is possible. At baseline mean weight loss was 31.3kg, by year 5 it was 23.8kg and at the 10 year time point 23.1kg[425]. Improved weight maintenance was associated with higher initial weight loss and longer duration of maintenance.

The NWCR database has provided valuable insight into the common characteristics of successful maintainers and their weight related behaviours.

Key behaviours and characteristics of NWCR members

Reported weight related behaviours of NWCR members

- 55.4% of participants received help from an outside source [nutritionist, doctor, commercial organisation] and 44.6% reported losing weight on their own.
- 89% used a combination of diet and activity treatments with only 10% using diet alone and 1% using exercise alone
- Dietary strategies included: restricting certain foods [87.6%], limiting portions [44%], counting calories [43%], counting fat grams [25%], using liquid formulas [20%], using exchange system diet [22%].

Six key strategies have been identified from the Registry that may be helpful for long-term maintenance

- Undertaking high levels of physical activity [approx 1 hour per day of moderate intensity exercise]
- Eating a diet low in calories and fat
- Eating breakfast
- Self-monitoring weight on a regular basis
- Maintaining a consistent eating pattern
- Catching slips before they turn into larger regains

Findings from the NWCR also suggest initiating weight loss after a medical event may be beneficial to weight loss and maintenance.

Some participants in the registry have over time gained weight and they have been compared to those members who continued to maintain their lost weight in an attempt to identify any key behavioural differences between the regainers and maintainers. The most potent predictor of weight regain was the length of time weight loss had been maintained, with participants who had sustained losses for 2 years or more being considerably more likely to maintain their weight over the following year. This suggests people who can maintain weight losses for 2 years can reduce their risk of subsequent weight regain by 50%[426]. A medical trigger or event was associated with greater initial weight loss and maintenance compared to those participants whose weight loss had been triggered by events other than medical reasons. Maintaining consistency of dieting across the entire week was also linked with reduced risk of weight regain. Participants who allowed greater freedom with their eating and food intake over weekends and holidays had a greater risk of weight regain possibly through greater exposure to high risk situations where loss of control was possible. Keeping a tight check on weight changes and preventing small weight gains from spiraling into relapses also seem to be a key strategy as once relapse had occurred few participants managed to recover[426].

Continuous Care Model of Obesity

It is now well recognised that the treatment phase of a weight management programme needs to be followed by a weight maintenance component with attendance at maintenance sessions associated with reduced weight regain[427-430] although this benefit seems to diminish once attendance ceases. In the continuous care model, obesity is considered a chronic disease that requires long term management and supportive input. This model has been associated with improved weight loss maintenance and has been achieved through the provision of continued contact by clinic visits, mail or telephone[427,431].

Further research is required to identify the optimal frequency, duration and scheduling of weight maintenance sessions to maximise management outcomes as well as considering the challenge of frequent attendance for patients and health professionals alike. Frequent contact is clearly important to management outcomes but

this continued care model of obesity management may present considerable challenges to dietetic services and may be beyond the resource and time capabilities of some in primary care, community settings and secondary care. The challenge is to develop services that begin to meet the need for regular maintenance contact and which attempt to achieve this through a multidisciplinary and multi-agency approach to obesity management.

Conclusions

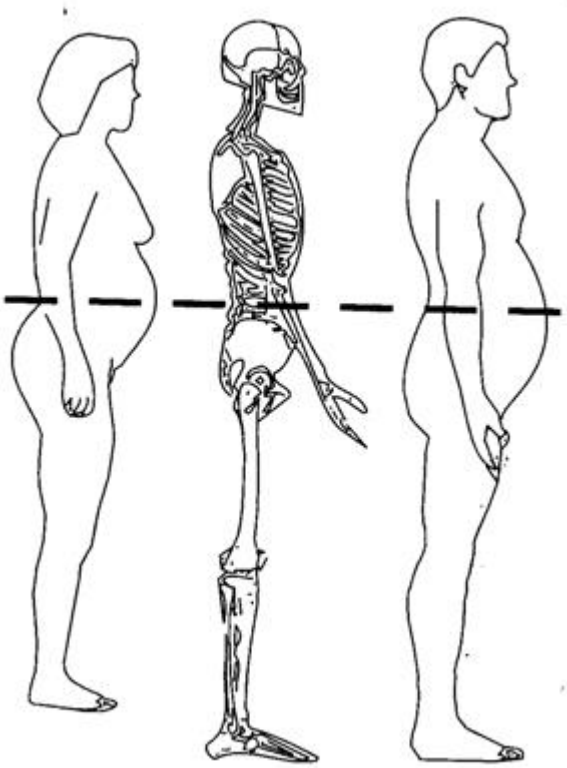
This document sets out to provide a central source of evidence in relation to the dietetic obesity management intervention and to highlight innovation from practice. It seems crucial we consider at each stage of the intervention whether our practices and systems of provision meet these recommendations and whether our skills and expertise are those required to comprehensively guide patients in managing their obesity. Investing in training at an undergraduate and postgraduate level, particularly in relation to interpersonal and advanced counselling skills, is an essential aspect of maintaining and extending the various roles of dietitians in obesity management.

Appendices

Appendix 1: How to Measure Waist Circumference in Adults

- The patient should be standing straight with arms at sides, feet together, and abdomen relaxed.
- Locate the right iliac crest using fingertips to feel for the highest point of the hip bone on the right side. This point should then be crossed with the mid-axillary line.
- Once you have located this 'cross' point, place an inelastic but flexible tape measure in a horizontal plane (parallel to the floor) around the abdomen at the level of the marked point.
- Take the reading at the end of a normal expiration.

Source: National Heart, Lung and Blood Institute, 1998



Appendix 2: How to Calculate a 600kcal Deficit Diet

How to Calculate a 600kcal Energy Deficit

Work out patient's 'Estimated Energy Requirements for Modest Weight Loss', as follows:

1.RMR: Based on patient's age, gender and current weight (in kg) as listed in the chart below, predict the patient's Resting Metabolic Rate (RMR).

Mifflin St Joer equations

Men:	RMR=[9.99xweight]+[6.25xheight]-[4.92xage]+5
Women:	RMR=[9.99xweight]+[6.25xheight]-[4.92xage]-161
Equations use weight in kg, height in cm	

2. PAL: Incorporate their Physical Activity Level (PAL) based on the activity level shown in the chart below. Do this by multiplying the patient's estimated BMR with the appropriate figure from the table below.

Distribution of Physical Activity Level

Typical activity [median] =1.63
Less active[25th centile]=1.49
More active [75th centile]=1.78

3.EER: Calculate the person's daily estimated energy requirement to maintain weight by multiplying RMR and PAL.

4. EER for weight loss: Subtract 600 calories from the above figure to estimate the person's energy requirement for modest weight loss.

Worked Example

Male aged 45, BMI=42, weight=135kg, height=1.8m
Presents with severe osteoarthritis and poor mobility

1. Predict RMR
   RMR=(1349)+(1125)-(221)+5=2258kcal/day
2. Calculate daily energy needs
   TEE=RMRxPAL
   TEE=2258x1.49=3364kcal/day
3. Minus energy deficit ~600-1000kcal/day
4. Energy prescription for weight loss ~2400kcal/day

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