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Medical Doctorate Thesis

Evaluation of massive weight loss body contouring

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20th February 2015
Supervisor: Ken Stewart
Matriculation Number 1164772

THE UNIVERSITY of EDINBURGH
For

My mother Swee Cheng and, my father Adil
Who gave me life,

My sister, Huda and brother Nawfal
Who taught me how to fight for it,

And

Simon, my husband
Who shows me how to live it a little differently
Every day
Declaration

(a) This thesis has been composed by Nada Al-Hadithy

(b) The work is the candidate's own

(c) The work has not been submitted for any other degree or professional qualification

Yours sincerely

Nada Al-Hadithy
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Publications


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Presentations

2014  A validated patient reported outcome measure for massive weight loss body contouring – introducing the British Association of plastic, reconstructive and aesthetic surgeons post bariatric outcome tool. Nada Al-Hadithy , Ken Stewart, Mark Soldin. CAR UK, Bristol

2014  Does the degree of ptosis predict the degree of psychological morbidity in bariatric patients undergoing reconstruction? Al- Hadithy N, Hosakere A, Stewart K. CAR UK, Bristol

2014  A validated patient reported outcome measure for massive weight loss body contouring – introducing the British Association of plastic, reconstructive and aesthetic surgeons post bariatric outcome tool. Nada Al-Hadithy , Ken Stewart, Mark Soldin. ESPRAS, Edinburgh


2012  Post bariatric surgery body contouring: is it worth it? Nada Al-Hadithy, Ken Stewart. EURAPS, Munich
Abstract

Introduction: There is proven therapeutic benefit in bariatric surgery for obese patients. Consequently the National Institute of Clinical Excellence UK has provided referral guidelines for bariatric surgery. Successful bariatric surgery will result in massive weight loss and ptotic skin, which can cause significant functional and psychological problems. As the number of cases of bariatric surgery increases, a corresponding number of massive weight loss patients will require plastic surgery. In this novel field of post massive weight loss surgery there is a lack of understanding of the demographics, physical symptoms and psychological health of this new group of patients. The tools to assess them are few and not validated, the patient pathway is disjointed and there is no consensus on standardised provision.

Method: A prospective multicentre, observational study of outcomes in 100 patients undergoing bariatric and post massive weight loss plastic surgery at 2 clinical sites was performed. Each patient followed a standard operating protocol. This included undergoing a semi structured interview, completing five patient-report outcome measures, having anthropometric measurements and clinical photographs taken.

Conclusion: This observational study identified key psychosocial themes prevalent in massive weight loss patients, during their weight loss journey. It identified there are no validated patient reported outcome measures available specific to this cohort of patients. This work led to the development of a new validated tool for massive weight loss body contouring.
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Chapter 1: General introduction

Obesity

A definition of ‘overweight’ is having a body mass index (BMI) greater than or equal to 25kg/m² and below 30kg/m². The definition of ‘obesity’ is having a BMI greater than or equal to 30kg/m². The World Health Organisation (WHO) has determined that being overweight can also be determined by a waist circumference. The definition of ‘abdominally overweight’ is a waist circumference of greater than 80cm for females, and 94cm for males. ‘Abdominally obese’ is a waist circumference of 88cm in females or 102cm in males¹.

The past 20 years has seen a doubling in the worldwide prevalence of severe obesity (usually defined as a body mass index BMI, >40kg/m² with comorbidities)². Scotland has one of the worst obesity records amongst developed countries³. In 2010, 65.1% of all adults in Scotland aged 16 and over were overweight or obese. Morbid obesity rates increased from 1.2% in 1995 to 2.7% in 2003, and fluctuated between 2.2% and 2.7% between 2008 and 2010.

Morbid obesity is associated with a two-fold risk of mortality compared with the general population. The National Audit Office (NAO)⁴ estimated that in 1998 over 30,000 deaths a year in England were attributable to obesity, which was approximately 6% of all deaths in that year⁵. Obesity is a risk factor for other conditions such as hypertension, type 2 diabetes, cardiovascular disease, osteoarthritis and cancer (Table 1)⁶,⁷ as well as increased rates of psychiatric illness.⁸,⁹
Table 1: Relative risk of developing selected diseases in obese people\textsuperscript{10}

<table>
<thead>
<tr>
<th>Disease</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 2 diabetes</td>
<td>5.2</td>
<td>12.7</td>
</tr>
<tr>
<td>Hypertension</td>
<td>2.6</td>
<td>4.2</td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>1.5</td>
<td>3.2</td>
</tr>
<tr>
<td>Cancer of the colon</td>
<td>3.0</td>
<td>2.7</td>
</tr>
<tr>
<td>Angina</td>
<td>1.8</td>
<td>1.8</td>
</tr>
<tr>
<td>Gall bladder diseases</td>
<td>1.8</td>
<td>1.8</td>
</tr>
<tr>
<td>Ovarian cancer</td>
<td>–</td>
<td>1.7</td>
</tr>
<tr>
<td>Osteoarthritis</td>
<td>1.9</td>
<td>1.4</td>
</tr>
<tr>
<td>Stroke</td>
<td>1.3</td>
<td>1.3</td>
</tr>
</tbody>
</table>

The estimated cost to the National Health Service (NHS) of obesity and related illnesses in 2007/8 was in excess of £175 million\textsuperscript{11} with an anticipated expenditure of £50 billion by 2050\textsuperscript{6}. Interestingly, only 2% of this total is due to treating obesity itself and the remaining 98% is spent on the treatment of obesity co-morbidities such as high blood pressure, diabetes and heart disease. All of these diseases have a proportional prescription drug cost.\textsuperscript{12} Obesity carries important cost consequences that rank second only to smoking as a cause of burden upon the NHS\textsuperscript{8}. With these economic and health costs, tackling obesity is a key priority for the public health sector in Scotland\textsuperscript{13,14,15}.

**Obesity treatment**

The three main treatment options for morbid obesity are lifestyle change, formula diets, pharmacotherapy and surgery. Lifestyle changes of calorie restriction and increased physical activity can achieve moderate weight loss in the short term. However, long-term results are poor with up to 66% of patients regaining weight within 24 months.\textsuperscript{16,17,18} Those patients on pharmacotherapy\textsuperscript{19} lose a modest amount of weight and still have significant chance of regaining the lost weight once they come off the medication. The aetiology of morbid obesity is complex, involving the interaction of psychosocial, genetic, endocrine and metabolic factors, making conservative treatment difficult and prone to failure.

Surgery is more invasive than the other options, but at present appears to be a key means of achieving considerable and sustained weight loss in people with morbid
obesity. There are several different procedures that can be used in bariatric surgery. Malabsorptive (i.e. bypass procedures) and mixed malabsorptive/restrictive procedures such as sleeve gastrectomies have been shown to be more effective in terms of weight loss maintenance and controlling diabetes than restrictive procedures.\textsuperscript{20, 21}

Intuitively, procedures such as gastric banding and gastric bypass are thought to result in weight loss by restricting the gastric volume that can accept food. Though this may be partially true, patients report decreased, rather than increased, hunger shortly following surgery, and do not eat more often to compensate for the diminished gastric reservoir. Cummings et al\textsuperscript{22} found that levels of ghrelin, a hunger-inducing hormone produced by the stomach, greatly decreased following gastric bypass but increased following diet-induced weight loss. Interestingly, glycemic control in diabetic obese subjects improves within days to weeks following both gastric banding and bypass well before weight loss occurs. At least in the case of gastric bypass, this may be due to increased secretion of GLP-1, an insulin secretagogue, by the gut; increased release of PYY following surgery may also facilitate weight loss.\textsuperscript{23}

The Swedish Obese Subjects non-randomised controlled trial compared surgical and lifestyle interventions and found a reduction in mortality rates for surgical interventions on long term follow up (after approximately 10 years), with an average weight loss of 16\% in the surgical arm compared with 1.6\% in the non-surgical arm.\textsuperscript{24,25,26} A systematic review of 22,094 bariatric patients demonstrated major reduction in the prevalence of obesity-related conditions including diabetes, hypertension, obstructive sleep apnoea and hyperlipidaemia\textsuperscript{20}. Weight loss surgery or bariatric surgery is increasingly being offered in both the NHS and in private UK medical practice. In adults with a BMI of more than 50 kg/m\textsuperscript{2} in whom surgical intervention is considered appropriate, bariatric surgery is recommended as a first-line option (instead of lifestyle interventions or drug treatment) in the NICE guidelines.\textsuperscript{27}

Previous studies have explored the mechanisms involved in successful and failed bariatric surgery\textsuperscript{28, 29}, with consequences on cost effectiveness. Successful bariatric surgery is associated with reductions in hunger and preoccupation with food, and a sense of being more in control of food intake. Conversely, unsuccessful bariatric
surgery is associated with patients who felt: unprepared for the changes required after surgery; unsupported in the time following surgery; and psychologically neglected. Saltzman et al highlighted these as key areas that need to be addressed to improve patient outcomes following surgery\textsuperscript{30}. NICE guidelines state that: ‘surgery for obesity should be undertaken only by a multi-disciplinary team that can provide psychological support before and after the surgery\textsuperscript{31}. This is currently missing in the current standard package of care in many units offering bariatric surgery\textsuperscript{37}.

**Massive weight loss body contouring**

Massive weight loss (MWL) is considered as reduction in 100 pounds (approximately 45.45 kg) of weight or more, although some authors have defined massive weight loss as 50% or greater loss of excess weight\textsuperscript{32}. For example a 1.75m man weighing 170kg is 93.5kg heavier than he should be to attain a BMI of 24.9 at the upper limit of a healthy weight (76.5kg). Therefore, he needs to lose 45.45kg or 46.75kg (50% of his excess weight) to be considered a massive weight loss patient.

As a result of this drive to tackle obesity, there are increasing numbers of patients who have achieved massive weight loss. Rapid weight loss with a massive final total weight reduction can result in disfigurement with diffuse lipodystrophy and generalized skin laxity\textsuperscript{33}. This has led to post massive weight loss deformities of loose, ptotic skin envelopes and residual adiposities with resultant contour irregularities\textsuperscript{34}. Post bariatric surgery body contouring patients comprise a substantial subset of the potential plastic surgery population. This heterogeneous group of patients often require multiple-region body-contouring procedures to address the functionally and aesthetically unsatisfactory resultant deflation and skin redundancy\textsuperscript{35}.

According to the Scottish Review of Bariatric Surgical Services in Scotland, 2004, a report by a working group of the Scottish Medical and Scientific Advisory Committee:

1. Plastic Surgery is an integral part of an overall Bariatric Surgical Service.
2. Criteria for patients undergoing plastic surgery must be clearly defined.
3. The number of patients being referred for this type of surgery is small at present but is likely to increase in the foreseeable future. This will have implications for waiting lists.
4. Female patients who have had surgery or weight management interventions for morbid obesity who achieve massive weight loss where there are functional or significant psychological problems associated with such weight loss may be eligible for breast reduction.

5. Plastic surgery should not be carried out until the target weight has been achieved and maintained for one year. This target weight could have been predefined by the patient in alliance with the massive weight loss team. In this research I have used the upper limit of a healthy BMI of 25kg/m².

Since then, Scotland has developed clear guidelines for the provision of plastic surgery following bariatric surgery.36

**Criteria for body contouring in Scotland**

Two body contouring procedures are offered if the following inclusion criteria are met:

- Severe, intractable intertrigo beneath the skin fold and massive weight loss (BMI≤27kg/m²).
- Significant weight loss following treatment for morbid obesity resulting in functional problems (BMI<27kg/m²).
- Lipodystrophy
- Adjunct to reconstructive procedures

Plastic surgery services can include abdominoplasty or apronectomy; liposuction, thighplasty or brachioplasty and will only be offered following clinical psychological assessment and demonstration of maintenance of a stable weight, BMI ≤27kg/m², for more than 1 year. However, the exclusion criteria for MWLBC surgery can include:

1) Patient has had a major life event in the previous 12 months particularly:
   - a) marital / relationship breakdown
   - b) birth of a child
   - c) death of a close family member

2) Patient currently has:
   - a) a major depressive illness
   - b) an active delusional or schizophrenic illness
   - c) an eating disorder
   - d) obsessive-compulsive disorder
e) substance abuse problem

3) Patient has had an episode of self-harm within the last two years.

4) Patient has been previously diagnosed with body dysmorphic disorder.

5) Patient clearly has a disproportionate view of problem following examination.

In England there are no standardised guidelines for provision of body contouring post massive weight loss. In a recent study of the now re-branded 147 Primary Care Trusts in England, of the 67 respondents only 54 have referral guidelines for post massive weight loss plastic surgery. Twenty three exclude all post bariatric surgery body contouring procedures\textsuperscript{37}. For example, South Staffordshire Primary Care Trust (PCT) states that “Patients must be informed that the PCT will not fund cosmetic procedures to remove any excess skin folds that may result from rapid weight loss”\textsuperscript{38}.

\textbf{Criteria for body contouring in Leeds PCT}

Leeds PCT has laid out specific criteria (Appendix 1 - Cosmetic Framework) for surgery following significant weight loss. The guidelines include funding for patients who have achieved a 25\% weight loss either following surgery or a planned weight loss programme where the BMI is 30 or less for 12 months. The criteria for treatment are as follows:

\textbf{Panniculectomy}

- the panniculus hangs below the level of the pubis; or
- the medical records document that the panniculus causes chronic intertrigo (dermatitis occurring on opposed surfaces of the skin, skin irritation, infection or chafing) that consistently recurs over 3 months while receiving appropriate medical therapy, or remains refractory to appropriate medical therapy over a period of 3 months.

\textbf{Arm and Thigh Reduction}

- the flaps cause significant documented problems with activities of daily life (e.g. ambulatory restrictions); or
- the flaps cause a chronic and persistent skin condition (e.g. intertriginous dermatitis, panniculitis, cellulitis or skin ulcerations) that is refractory to at least six months of medical treatment. In addition to good hygiene practices,
treatment should include topical antifungals, topical and/or systemic corticosteroids and/or local or systemic antibiotics; or

- the flaps cause disabling psychological distress.

Mastopexy

- the breasts cause significant documented problems with activities of daily life (e.g. ambulatory restrictions); or
- the breasts cause a chronic and persistent skin condition (e.g. intertriginous dermatitis, panniculitis, cellulitis or skin ulcerations) that is refractory to at least six months of medical treatment. In addition to good hygiene practices, treatment should include topical antifungals, topical and/or systemic corticosteroids and/or local or systemic antibiotics; or
- the breasts cause disabling psychological distress.

Leeds PCT guidance states that disabling psychological distress needs to be demonstrated and supported by documentary evidence, but referral to psychiatry is not necessary before the request is considered by the panel. Problems with activities of daily life will need to be demonstrated and supported by documentary evidence of significant morbidity which necessitates medical intervention. The request is reviewed by a Consultant in Liaison Psychiatry with an interest in body dysmorphic disorder (BDD). If psychological issues are the grounds for the request a full psychiatric assessment is carried out. Surgery is deemed to be appropriate when the psychological distress is proportionate to the problem. No self-assessment scales are used.

The investigator was advised by personal communication that Leeds PCT, in fact “rarely funds mastopexy” despite the guidelines above. In addition “we assess a number of people who have complex psycho-social problems and an equal number of people who have broken up with a partner and feel they might no longer be attractive to others. We do not regard either of these situations as appropriate use of NHS resource. However there is very little published evidence to say what the right approach is.”
According to a study carried out by Butler, 95.1% of plastic surgery units in the country offer some form of reconstructive surgery following massive weight loss, with a large variation in what is available between each unit. 4.9% of units do not offer any surgery due to lack of PCT funding. Referral via the exceptional aesthetic pathway can sometimes be seen as a caveat to these rules. However, as NHS East Lancashire PCT determines, exceptionality is essentially an equity issue that is best expressed by the question: “On what grounds can the PCT justify funding this patient when others from the same patient group are not being funded?” The burden of proof lies on the patient and his champion.

The disparity in plastic surgery service provisions for patients who have experienced massive weight loss exist both in terms of type, quality and availability. NICE guidelines state that surgery for obesity should only be undertaken by a multidisciplinary team that can provide expertise including psychological support before and after surgery and providing information on or access to plastic surgery where indicated. However, Highton et al found that only 66% of bariatric surgeons routinely counsel patients about excess skin following massive weight loss before they undergo bariatric surgery. Butler et al. found that only 24% of all plastic surgery units in the country offer psychological or psychiatric screening whereas 56% do not.

There is currently no national consensus as to whether a publicly funded health system should be providing these patients with treatment, as it regarded as aesthetic surgery. “Aesthetic surgery is not routinely offered by the NHS and can only be provided on an exceptional case basis.” However, some contend that body contouring after bariatric surgical weight loss poses a challenge of definition because it resides at the intersection between aesthetic and functional surgery.

In the document ‘Action on Plastic Surgery’ a UK government commissioned working group determined that a national, stakeholder-led ‘Successor Network’ should be created to establish strategic actions with outcome objectives and measures for procedures at a national level. Strategic action (B) is for specialists to provide appropriate, timely and informed patient care, with the patient as an active partner in their health care. Action (D) is to develop and implement clinical pathway outcome objectives and measures. Currently a cohesive patient pathway is missing in the post
bariatric body contouring service in the UK and the onus of responsibility lies on plastic surgeons to collect and present data to demonstrate the benefits of offering patients reconstructive surgery after massive weight loss. This would support the Action on Plastic Surgery Local Recommendation 2: to facilitate the roles of lead plastic surgeon, senior plastic surgery nurse and lead therapist working within plastic surgery, who would act as “Local Champions” for the delivery of plastic surgery services.

Soldin et al demonstrated significant improvements in patients’ physical and emotional well-being once they have undergone body contouring surgery following massive weight loss\textsuperscript{45}. Highton et al found that 92\% of 86 surgeon members of the British Obesity and Metabolic Surgery society felt that patients face functional problems relating to skin redundancy after massive weight loss, and a high percentage of patients complain about this problem. There is a gradual shift from deeming post bariatric surgery body contouring as an aesthetic procedure to seeing it as a necessary step in providing complete care for the bariatric patient as part of their surgical package.

Since December 2011, BAPRAS\textsuperscript{46} has been pushing for national guidelines on reconstructive surgery following bariatric weight loss procedures. National guidelines on post-bariatric body contouring surgery are needed to improve the comprehensive treatment of these patients. The clinical and cost effectiveness of bariatric surgery has been well established. However the same has not been achieved in the body contouring cohort\textsuperscript{47}. At the current time, we have not verified that surgical correction of these post-weight loss deformities can positively impact either quality of life (QoL) or psychosocial function\textsuperscript{33}. Further studies focussing on the outcome of body contouring after massive weight loss could support the development of national guidelines on post bariatric surgery body contouring, and these guidelines could become an integral part of the bariatric surgery pathway. Current research in this arena is limited and there is a dearth of evidence as to how best to achieve these goals.
Hypothesis

Due to the increase in obesity, and subsequent massive weight loss; body contouring surgery after massive weight loss is likely to be of high demand.

Body contouring post massive weight loss is likely to result in a significant functional and psychosocial improvement in the patient’s life.

Project aims

1) Identify the demand for plastic surgery in South East Scotland (chapter 3)

2) Identify seminal papers on massive weight loss and body contouring patient reported outcome measures through a literature review (chapter 4)

3) Identify the utility of patient reported outcome measures in the massive weight loss body contouring patient (chapter 5)

5) Identify the relationship between anthropometric measurements and psychological outcomes (chapter 6)

6) Develop an understanding on the relationship between post bariatric plastic surgery and psychological outcomes (chapter 7)

7) Identify the possible utility of 3D stereophotograms in objective assessment of the massive weight loss body contouring patient (chapter 8).

8) Develop a selection tool for the bariatric plastic population (chapter 10)
Project objectives

- To collate data on the need for plastic surgery in massive weight loss patients
- To carry out a literature search on topics of massive weight loss and body contouring
- To review the classification scales for the post-bariatric and MWLBC population
- To use psychometric and functional scores and patient report outcome measures (PROMS) to objectively quantify outcomes in patients during the massive weight loss journey
- To carry out semi-structured interviews to gain a deeper understanding of thematic narratives of people going through massive weight loss and body contouring
- To determine if existing patient report outcome measures reflect the narratives of this patient cohort reliably and with validity
- To determine if 3D Sterophotograms can be used to quantify change in body shape during the massive weight loss body contouring journey
- To learn the necessary techniques required in rigorous PROM development
Chapter 2: Study design

Plan
Statistical advice was sought early during planning of the pilot and main study from Dr Sarah Wild, Director of Wellcome Trust Clinical Research Facility Epidemiology and Statistics Core. An exploratory, observational study was proposed with a pragmatic sample size of 100-150 patients based on likely recruitment rates. An observational study was selected to gain a deeper understanding of the incidence, prevalence, and prognosis of this new cadre of patients. It was recognised that the power of the study would be limited but it will provide useful information that is not available at present on effect sizes which can be used to inform the development of adequately powered larger studies in the future. ‘Effect size’ is a way of quantifying the size of the difference between two groups. It is easy to calculate, readily understood and can be applied to many measured outcomes. It is particularly valuable for quantifying the effectiveness of a particular intervention, relative to some comparison. A combination of cohort and cross-sectional designs were used for the observational studies. With a sample size of 100 patients, if 50% achieve their target weight loss the 95% confidence intervals (CI) around the proportion will be 40-60% and if 25% request plastic surgery the 95% CI will be 17-35% thus providing reasonable precision of estimates.

Setting
The Bariatric Services of South East Scotland at the Royal Infirmary Edinburgh (RIE) and The Plastic and Reconstructive Surgery Services at St John’s Hospital, Livingston.

Ethical approval
Ethical approval, 10/21102/2, was obtained from NHS Lothian, South East Scotland Research Ethics Committee 02 (Appendix 2). Research and Development (R&D) approval, 10/S1102/2 was obtained from NHS Lothian (Appendix 3). The ethical principles of each participant’s rights to autonomy, beneficence and non-munificence were strictly followed. Cover letters and information leaflets (Appendices 4 & 5) were distributed to all potential participants and to their General Practitioners (Appendix 6) giving full details of the study, including benefits and risks. The leaflet also contained information concerning the patient’s right to discuss participation with their GP or a family member and the right to withdraw from the study at any time. Issues relating to
Confidentiality and privacy were guaranteed by the employment of pseudonyms and storage of data on a password-protected database (Consent form-Appendix 7). The interviewer (NAH) approached each interviewee with sensitivity and conducted the interview in a supportive manner, being sensitive to any observed distress.

**Pilot study**
A pilot study to determine recruitment feasibility was performed in November 2009. 10 patients with early weight loss following bariatric surgery were invited to join the study, of which 9 consented to participate. In pre assessment clinic 12 out of 15 patients consented. These patients were given patient information sheets, consent forms and a covering letter with information on the research project. They were given the opportunity to ask any questions and take time to consider the information before joining the research cohort. This pilot study demonstrated the feasibility of the study recruitment.

**Method**

**Sample selection and recruitment**
Patients on their weight loss journey through bariatric surgery were recruited from the Royal Infirmary Edinburgh (RIE) bariatric service with staggered entry over an eighteen month period between September 2010 and March 2012. At the routine bariatric seminar, patients were introduced to the study by an oral presentation (Appendix 8) and patient information sheets (Appendix 5). They were given 2 weeks to consider the information and discuss with their families. They were followed up with a phone call to determine if they wished to join the study. For different parts of the study, there were different numbers of patients involved, as detailed in each chapter of this thesis.

Inclusion criteria were: an age between 18-70 years and a pre bariatric surgery BMI of >35kg/m² (in keeping with the cohort of patients selected for bariatric surgery). Subjects with history of hypertension, diabetes, or lipid disturbances were included, as were subjects who had a myocardial infarction or a stroke more than 6 months before inclusion.

Exclusion criteria were patients with a previous history of gluteal or breast implants, abdominoplasty or body contouring procedures.
**Study protocol**
Five questionnaires were posted to patients. Patients were followed up in clinic and completed questionnaires with a Clinical Research Facility (CRF) accredited Clinical Research Nurse (CRN) who followed a standard operating procedure. Clinics were held at the Royal Infirmary Edinburgh and St John’s Hospital, Livingston.

**Measurement**
There is a currently a dearth of information on this unique cohort of patients and it is not yet clear which measurements best reflect functional and psychosocial outcomes. Therefore quantitative and qualitative research methods were used to measure quality of life and understand which themes are relevant.

Quantitative data collected included baseline demographic data and patient reported outcome measures. The patient report outcome measures used are well established validated tools for objectively collecting data on QoL, although are not validated for this specific cohort of patient. A wide selection of available tools were identified following a literature search and the tools most relevant to this study and this cohort of patients were selected following discussion with consultant liaison psychiatrists, clinical psychologists and consultant plastic surgeons. More details of how tools were selected are delineated in Chapter 4.

The qualitative semi structured interviews were carried out to gain a deeper understanding of themes and motifs prevalent in the patients’ experiential narrative of their weight loss journey.

In addition, anthropometric measurements and 3D stereophotograms were taken to determine if there is a correlation between objective disfigurement and functional and psychosocial outcomes.

1) Baseline data was collected with the Eating Disorder questionnaire\(^50\),\(^51\) (Appendix 9). This self-completed questionnaire collects information on: demographic variables; weight history; dieting behaviour; pathological eating behaviours such as binge and night eating patterns; weight control behaviour; exercise frequency duration and type; menstrual history; history of abuse; psychiatric history; past medical history; chemical use history; family members; family past medical history; drug history; social history; review of systems and questions designed to assess the
likelihood of the presence of sleep apnoea\textsuperscript{50}. In addition, the following information was collected:

a) Date of birth  
b) Date of bariatric surgery  
c) Bariatric surgery type received  
d) Time following bariatric procedure  
e) Complications following bariatric procedure  
f) Initial weight prior to bariatric surgery  
g) Current weight  
h) Current medical problems (for which the patient is on medication or receiving follow-up with a health care practitioner)  
i) Desire for plastic surgery  
j) Area of face/body which causes concern

2) Psychological data was collected by self-completed patient reported outcome measures (PROMS).

a) Derriford Appearance Scale (DAS-24)\textsuperscript{52} (Appendix 10).  
b) Hospital Anxiety and Depression Score\textsuperscript{53, 54, 55} (Appendix 11).  
c) Short Form-36\textsuperscript{56, 57, 58, 59, 60, 61} (Appendix 12).  
d) Bariatric Analysis and Reporting Outcome System (BAROS)\textsuperscript{62, 63, 64, 65, 66, 67, 68, 69, 70, 71} (Appendix 13).

Patients were counselled by a CRN on any difficulties encountered, to ensure all scores were completed appropriately and comprehensively.

3) Qualitative data was collected by a plastic surgery registrar (NAH) trained in interview techniques and with experience of psychotherapy. The semi-structured interview was conducted in a quiet clinic room at St John’s Hospital in Livingston or the RIE. The interviewer was blinded to the psychometric scores. (Appendix 14). More details on how the constructs were determined are outline in Chapter 7.

a) Career Progression
i) Have you noticed a change in your career either in terms of financial remuneration or career progression/ change in status/responsibilities since your procedure?

b) Relationships
   i) What are the attitudes of your family and peers to you during this weight loss process?
   ii) Do you have any sexual intimate relationships?
   iii) Are you experiencing any change in this relationship since your procedure?

c) Healthy Lifestyle Choices
   i) What is your attitude to exercise?
   ii) What is your attitude to smoking?
   iii) How do you feel about the possibility of sustaining long term weight loss?

d) Identity
   i) How do you feel about your body image?

e) Lifestyle and everyday living
   i) How has your lifestyle changed since your procedure?

f) Which factors from the psychological scores were most relevant to you?

g) Are you experiencing anything which has not been captured in the psychological scores that you think is important?

4) Anthropometric measurements were taken to objectively assess the degree of ptosis and take accurate measures of body habitus. Anthropometric measurement of BMI, arm, thigh, torso, waist and hip circumference measurements, as well as fixed point measurements of breast, pannus and buttock skin folds to track descent were taken.

Height was measured using a stadiometer with a sliding head plate, a base plate and three connecting rods marked with a metric measuring scale. Participants were asked to remove shoes. One measurement was taken with the participant stretching to the maximum height and the head positioned in the Frankfort plane. The reading was recorded to the nearest millimetre.
Weight was measured using the same scales in the outpatient department on each visit. Participants were asked to remove shoes and any bulky clothing. A single measurement was recorded to the nearest 100g. The weight loss was calculated from each patient’s own account of his/her original weight, and the weight as documented in the clinical notes. If there was a discrepancy in the two, the weight recorded in the clinical notes was used as the baseline weight.

The following surface linear anthropometric measurements were taken: arm circumferences, apex of axilla to lateral folds, suprasternal notch to left and right nipples, nipple to inferior mammary folds, suprasternal notch to umbilicus, pannus and pubic symphysis; umbilicus to pannus, and pubic symphysis, waist and hip circumferences. All measurements were rounded to the nearest centimetre taken by the same clinical practitioner (NAH) using a standard operating protocol (Appendix 15).

5) Two dimensional clinical photographs and 3D stereophotograms were taken as a visual analogue of these measurements. For the 3D stereophotogram scans, patients were photographed with Dimensional Imaging 3D technology using the same machine in the Medical Photography department at Royal Infirmary Edinburgh by trained medical photographers. (Images 1& 2)

Image 1: Di3d Stereophotogram cameras mounted on tripod
Patients were fully undressed except for their underpants. Using the technology developed by Di3D, full 3D stereophotograms were built. Photographs were taken using a standard operating protocol (Appendix 16).

**Bias**
There are four principal reasons for associations in an epidemiologic study: bias, confounding, chance, and cause. During the analysis phase care was to taken to attempt to assess, reduce and if possible prevent bias, confounding, and chance, so that a causal unbiased association between exposure and outcome is estimated.\(^{73}\)

There was no selection bias based on exposure as all patients were obese or super obese, and were on a massive weight loss journey. However, self-selection bias, where the individuals more likely to select themselves into a group, cause a biased sample with non-probability sampling was feasible. The characteristics of patients who self-selected for the study may have created abnormal or undesirable conditions in the group. Due to self-selection into a protocol which encourages reflection both with the semi structured interviews and when completing the PROMS there is a chance that the patients observed were more psychologically minded than their counterparts who did not choose to take part in study. No comparison was made between the weight loss
sample and the other bariatric weight loss patients who elected not to be part of the study.

Information bias was accounted for by blinding the principal investigator from the PROM scores when carrying out the semi structured interviews and anthropometric interviews.

**Statistical methods**

Data analysis and statistical methods used are addressed in each chapter.

Confounding factors were unknown and therefore could not be accounted for by prevention, restriction or matching in the design phase. Missing data was limited in the study design by hiring a clinical research nurse to run through all of the PROMS with the patients when they attended the research clinic.
Chapter 3: The need for plastic surgery

Introduction
Successful restrictive bariatric surgery will result in a loss of around 50% of excess body weight and up to two thirds of excess body weight in malabsorptive procedures. This massive weight loss can result in ptotic skin, causing significant functional and psychological problems. However, there are no clear predictors of which patients would desire plastic surgery following massive weight loss.

The biomedical, or seemingly intuitive belief that the worse the condition the greater the impact on the individual and the greater the resulting psychological disability, is neither demonstrated in research studies nor observed in clinical practice. In non-bariatric patients, Ong et al report a lack of relationship between the objective severity of facial disfigurement and resulting distress. Perceived severity of disfigurement provides the best predictor of distress and therefore the best predictor of post-operative satisfaction and improved QoL following aesthetic surgery. It is increasingly acknowledged that patient report outcome measures are the measure of success in plastic surgery patients. Important ameliorating factors are those individual to the patient and include perceived noticeability of disfigurement, non-avoidant coping style and social support.

Currently there is no baseline data on which groups of patients will demand plastic surgery following massive weight loss and what the demographics of that group may be, so this study set out to address these questions.
Aims
This study aims to determine:

1. The demand for plastic surgery from patients who have had bariatric surgery
2. The relationship between desire for plastic surgery and type of bariatric procedure received
3. The areas of anatomy that provoke the most concern and requests for plastic surgery
4. Whether patients approved for post-bariatric surgery body contouring in Scotland would have been approved according to guidelines used by Leeds PCT (an exemplar of a PCT following NICE guidelines).

Method
Design
A cross-sectional study of 150 consecutive patients in the Royal Infirmary of Edinburgh bariatric surgery services.

Participants
Inclusion criteria were an age between 18-70 years and a pre bariatric surgery BMI of >35kg/m² (in keeping with the cohort of patients selected for bariatric surgery). Subjects with history of hypertension, diabetes, or lipid disturbances were included, as were subjects who had a myocardial infarction or a stroke more than 6 months before inclusion.

Exclusion criteria were patients with a previous history of gluteal or breast implants, abdominoplasty or body contouring procedures.

Measures
Weight loss and 10 minute interview. Weight was measured using manual scales. Participants were asked to remove shoes and any bulky clothing. A single measurement was recorded to the nearest 100g. The weight loss was calculated from the patients’ account of their original weight and the weight as documented in the clinical notes. If there was a discrepancy in the two, the weight as per the clinical notes was used as the baseline weight. Type and date of bariatric surgery, as well as any complications were cross checked with patients’ notes.
The interview was conducted in a quiet clinic room at St John’s Hospital in Livingston, by a plastic surgery registrar trained in psychotherapy interview techniques.

**Interview Questions**
1. Date of birth
2. Bariatric surgery type received
3. Time following bariatric procedure
4. Complications following bariatric procedure
5. Initial weight prior to bariatric surgery
6. Current weight
7. Current medical problems (for which on medication or under follow up with a health care practitioner)
8. Desire for plastic surgery
9. Area of face/body which causes concern: patients were able to specify which parts of their body were most distressing to them and why. In some cases, clarification was sought to determine which pre specified category they would fall within:
   a) Face
   b) Chest
   c) Abdomen
   d) Thighs
   e) Buttocks
   f) Arms
   g) Legs

**Procedure**
Ethical approval was sought and each patient consented to take part in the study. Each patient attended a single clinic appointment at St John’s Hospital where they were weighed and interviewed for 10 minutes.

**Data analysis**
Data was analysed with IBM SPSS 20. Analysis was carried out at University College London Statistical Support Service, Centre for Paediatric Epidemiology and Biostatistics. Significance levels were deemed acceptable at 5%.
Results
One hundred and fifty patients were interviewed. Of the 150 participants, 11 were on the weight management programme and were yet to receive bariatric surgery and 139 had undergone bariatric surgery. One hundred and two (68%) wanted plastic surgery, 36 (24%) did not want plastic surgery and 12 (8%) were not sure. Of the 139 patients who had undergone bariatric surgery, 102 were positive in desiring plastic surgery, mean age 48.3 and had lost a mean of 55.12kg. 36 participants were negative for desiring plastic surgery, mean age 52 and had lost a mean of 25.12kg. There were 12 patients who were not sure yet, mean age 39 years old and had lost a mean of 16.4kg. Please see figure 3.1 and table 3.1 for further patient characteristics.

Patients of different types of bariatric surgery reported their weight loss. A Kruskal Wallis test indicated a significant effect of type of bariatric surgery on weight loss such that weight loss was higher after a laparoscopic gastric bypass surgery (Median = 57.15kg; range = 138.8) than the rest of the surgery methods (p = 0.038). (Table 3.2).
Figure 3.1: Flow diagram of study population

- **Study Population**
  - **N=150**

- **Want plastic surgery**
  - **N=102**
    - Weight management programme
      - **N=0 (0.0%)**
    - Laparoscopic gastric band
      - **N=26 (25.5%)**
    - Laparoscopic gastric sleeve
      - **N=29 (28.4%)**
    - Open gastric sleeve
      - **N=9 (8.8%)**
    - Laparoscopic gastric bypass
      - **N=55 (34.3%)**
    - Open gastric bypass
      - **N=3 (2.9%)**

- **Don’t want plastic surgery**
  - **N=56**
    - Weight management programme
      - **N=4 (11.1%)**
    - Laparoscopic gastric band
      - **N=12 (33.3%)**
    - Laparoscopic gastric sleeve
      - **N=9 (25.0%)**
    - Open gastric sleeve
      - **N=1 (2.8%)**
    - Laparoscopic gastric bypass
      - **N=6 (16.7%)**
    - Open gastric bypass
      - **N=2 (5.6%)**

- **Not sure having plastic surgery**
  - **N=12**
    - Weight management programme
      - **N=11 (91.6%)**
    - Laparoscopic gastric band
      - **N=0 (0.0%)**
    - Laparoscopic gastric sleeve
      - **N=0 (0.0%)**
    - Open gastric sleeve
      - **N=0 (0.0%)**
    - Laparoscopic gastric bypass
      - **N=1 (100.0%)**
    - Open gastric bypass
      - **N=0 (0.0%)**
### Table 3.1: Background information of study population

<table>
<thead>
<tr>
<th></th>
<th>Does want plastic surgery (n=102)</th>
<th>Does not want plastic surgery (n=36)</th>
<th>Not sure about plastic surgery (n=12)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average Age (interquartile range)</strong></td>
<td>48.3 (44-54)</td>
<td>52 (47-59)</td>
<td>39 (34-52)</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>38 (37.3%)</td>
<td>16 (44.4%)</td>
<td>3 (25.0%)</td>
</tr>
<tr>
<td>F</td>
<td>64 (62.7%)</td>
<td>20 (55.6%)</td>
<td>9 (75.0%)</td>
</tr>
<tr>
<td><strong>Type of bariatric surgery</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight management programme (none)</td>
<td>0 (0.0%)</td>
<td>4 (11.1%)</td>
<td>11 (91.6%)</td>
</tr>
<tr>
<td>Gastric band</td>
<td>26 (25.5%)</td>
<td>12 (33.3%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Sleeve gastrectomy</td>
<td>38 (37.3%)</td>
<td>10 (27.8%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Gastric bypass</td>
<td>38 (37.3%)</td>
<td>10 (27.8%)</td>
<td>1 (8.3%)</td>
</tr>
<tr>
<td><strong>Type of bariatric procedure</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open</td>
<td>12 (11.8%)</td>
<td>3 (8.3%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Closed</td>
<td>90 (88.2%)</td>
<td>29 (80.6%)</td>
<td>1 (8.3%)</td>
</tr>
<tr>
<td><strong>Mean weight loss (kg) (interquartile range (kg))</strong></td>
<td>55.1 (38.6–72.5)</td>
<td>25.1 (4.0–50.8)</td>
<td>16.4 (5.0–38.3)</td>
</tr>
<tr>
<td><strong>Number of medical problems</strong></td>
<td>2.45</td>
<td>3.86</td>
<td>4.25</td>
</tr>
</tbody>
</table>

### Table 3.2: Weight loss in kilograms for each type of bariatric surgery

<table>
<thead>
<tr>
<th>Type of bariatric surgery</th>
<th>N</th>
<th>Mean</th>
<th>Median</th>
<th>(SD)</th>
<th>Minimum</th>
<th>Maximum</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laparoscopic gastric band</td>
<td>26</td>
<td>44.68</td>
<td>39.24</td>
<td>(34.06)</td>
<td>7.40</td>
<td>151.00</td>
<td>0.038</td>
</tr>
<tr>
<td>Laparoscopic gastric sleeve</td>
<td>29</td>
<td>56.12</td>
<td>47.00</td>
<td>(26.61)</td>
<td>19.00</td>
<td>126.80</td>
<td></td>
</tr>
<tr>
<td>Open gastric sleeve</td>
<td>9</td>
<td>51.75</td>
<td>48.10</td>
<td>(16.39)</td>
<td>38.10</td>
<td>91.90</td>
<td></td>
</tr>
<tr>
<td>Laparoscopic gastric bypass</td>
<td>35</td>
<td>62.13</td>
<td>57.15</td>
<td>(27.16)</td>
<td>16.40</td>
<td>155.20</td>
<td></td>
</tr>
<tr>
<td>Open gastric bypass</td>
<td>3</td>
<td>64.03</td>
<td>46.10</td>
<td>(31.15)</td>
<td>46.00</td>
<td>100.00</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>102</td>
<td>55.11</td>
<td>50.00</td>
<td>(28.65)</td>
<td>7.40</td>
<td>155.20</td>
<td></td>
</tr>
</tbody>
</table>
Relationship between bariatric surgery type and desire for plastic surgery

Of the 139 patients of the study who had bariatric surgery, 102 desired plastic surgery whereas 36 did not. There was one post-operative patient who was not sure yet. Therefore, this patient was excluded from the analyses. Patients (n = 11) who were receiving the weight management programme were excluded from the analysis because they may undergo bariatric surgery in the near future.

Correlation analysis was carried out with a Pearson's test and it was seen that no correlation exists between sex and age for desire for plastic surgery. However, there is a positive correlation between number of medical problems, type of bariatric surgery and weight loss for desire for plastic surgery. (Table 3.3).

As can be seen in the Table 3.3, 34.3% of those who desired to have plastic surgery had laparoscopic gastric bypass whilst 2.9% had open gastric bypass, giving a total 37.3% of those who desired to have plastic surgery had gastric bypass. 37.3% had gastric sleeve whilst 25.5% had a gastric band. Patients who didn't want plastic surgery were split 31.3%, 31.3% and 37.5% for gastric bypass, sleeve and band respectively. There were no significant differences in terms of type of bariatric surgery and desire for plastic surgery (p > 0.05). Patients who had received bariatric surgery more than 6 months prior were more likely to want plastic surgery than those patient who had received bariatric surgery less than 6 month prior (p = 0.002).

Table 3.3 Association of type of bariatric surgery and desire for plastic surgery

<table>
<thead>
<tr>
<th>Type of bariatric surgery</th>
<th>Yes</th>
<th>No</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open gastric bypass</td>
<td>3</td>
<td>2</td>
<td>0.452</td>
</tr>
<tr>
<td>Laparoscopic gastric bypass</td>
<td>35</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Open gastric sleeve</td>
<td>9</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Laparoscopic gastric sleeve</td>
<td>29</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Laparoscopic gastric band</td>
<td>26</td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>
Anatomical areas that provoked the most concern
Of the 102 patients who desired plastic surgery the abdomen was the area that provoked the most concern. The chest came second, the arms third, thighs fourth and buttocks last. (Table 3.4)

Table 3.4: Body part causing concern

<table>
<thead>
<tr>
<th>Area of concern</th>
<th>Number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdomen</td>
<td>48</td>
</tr>
<tr>
<td>Chest</td>
<td>29</td>
</tr>
<tr>
<td>Arms</td>
<td>12</td>
</tr>
<tr>
<td>Thighs</td>
<td>9</td>
</tr>
<tr>
<td>Buttocks</td>
<td>4</td>
</tr>
</tbody>
</table>

Comparison between fulfilment of Leeds criteria in receiving surgery
Of the 102 patients who wanted plastic surgery, 53 had been approved for plastic surgery and were on the waiting list, 15 had been rejected for plastic surgery and 34 had not yet applied.

The 53 who had been approved for plastic surgery had a mean age of 47.4 (interquartile range 44 – 52) and had lost a mean of 65.12 kg (interquartile range 42.6-74.6kg). This amounted to between 54-100% of their excess weight.

The 15 who had been rejected for plastic surgery were a mean age of 48.9 (interquartile range 44 – 54) and had lost a mean of 42.25kg (interquartile range 33.5-49.2kg). This amounted to 28-58% of their excess weight. The reasons for rejection were the following: BMI >27 (n = 9), psychologically unsuitable (n = 2), medically unfit (n = 2), smoker (n = 2). In all cases, the patient was given the option of addressing the cause for rejection and being reviewed at a later date.

Of the 34 patients that had not yet applied for plastic surgery 13 had been told by their GPs that they would not qualify for plastic surgery on the NHS, despite losing more than 75% of their excess body weight. The other 21 patients had not yet reached their target weight.
The 53 patients who had been approved for plastic surgery were compared to the following Leeds criteria:

1. There has been at least 25% weight loss either following surgery or a planned weight loss programme where the BMI is 30 or less for 12 months and
2. Panniculus hangs below the level of the pubis
3. The medical records document that the panniculus causes chronic intertrigo (dermatitis occurring on opposed surfaces of the skin, skin irritation, infection or chafing) that consistently recur over 3 months while receiving appropriate medical therapy, or remains refractory to appropriate medical therapy over a period of 3 months.

The comparison showed that all patients who had been approved for plastic surgery in Scotland fulfilled Leeds criteria 1 and 3. However, only 33 of the patients had a panniculus below the level of the pubis.

**Discussion**

This study identified that of the patients who had bariatric surgery, 73.4% desired plastic surgery to manage their post massive weight loss skin redundancy. There is a statistically significant relationship between weight loss and type of bariatric surgery. The abdomen was the area that provoked the most concern, followed by the chest/breast, then limbs. This study demonstrates that age and gender are not determinants of desire for plastic surgery.

Our results were different to Sarwer, who recorded only one quarter of patients who have bariatric surgery request body contouring\textsuperscript{77, 80}, but very similar to Kitzinger et al who reported 75% female and 68% male patients desired body contouring surgery\textsuperscript{81}. Sarwer et al hypothesized that patients who lost the most weight would express the greatest desire for post bariatric body contouring surgery. His hypothesis was not supported by the findings from this study. In a study of 207 patients, with data for 160 participants conducted by Sarwer et al, mastopexy/male gynaecomastia mastectomy was the most frequently performed procedure and remained in demand after 9 years from the bariatric surgery. The second most contoured area was the abdomen.
Preferred procedure in Sarwer’s cohort may be different from our cohort of patients as there were more females than males in our patient group. Our study showed that patients with greater BMIs had a higher demand for post bariatric body contouring, however with time, their desire increased. Predictors of desire for post bariatric surgery body contouring remained elusive\(^2\).

This study showed there was a disparity between those patients who were approved in Scotland for post bariatric body contouring compared to those who would have fulfilled the Leeds criteria. 20 patients offered plastic surgery did not have a panniculus which hung below the umbilicus. This amounts to 37.7% of the cases carried out in Scotland being failing to meet the required threshold for surgery in Leeds. This discrepancy is another example of the postcode lottery that exists for plastic surgery services commissioning\(^44, 83, 85\).

Interestingly, of those 34 patients who had not yet applied for plastic surgical review, 13 had been informed by their GP that they would not qualify. In Scotland, there is clear guidance on the referral pathway for post bariatric body contouring,\(^25\) however, as gate keepers to commissioning health services GPs have the unenviable responsibility of keeping up to date with the changing landscape of healthcare services\(^84\). Individual GP attitudes and knowledge on local provisions can be an aide or an impediment to accessing care which may contribute to health care inequalities.\(^85\) This contradicts a recent study, which demonstrates general practices in Scotland generally recorded the highest rates for providing care that is consistent with evidence-based practice. Patients in Scotland were also the most positive about their quality of care\(^86\).

However, it is important to note, that at the time of the study Scottish health care was devolved to the Scottish Government. Devolution is the transfer of powers from a central to a regional authority and therefore healthcare policy in Leeds is under the legislation of a different government to that in Scotland and is not necessarily subject to any law of shared standards of values. The Scotland Act 1998\(^87\) (an Act of the UK Parliament) created a Scottish Parliament and passed to it the powers to make laws on a range of issues. These powers were extended by the Scotland Act 2012. Since then, the distinctive party politics and debates of each jurisdiction have created diverse
policies and trajectories. Scotland has long had high status medical leaders who are closely connected with policy, and is still home to a dense concentration of professional and academic leaders. The result is politics that values professionalism, as well as professionals. The organisational policies are relatively simple: abolition of the division between purchaser and provider in 2004 and integration of the entire system into 14 geographical health boards, creating a simple and relatively flat organisational structure.

In the English NHS, focus on markets and managerliaism has led to the increased use of targets and top down management, converting the Department of Health into a ‘department of delivery’ with the main objective of meeting targets for waiting times. This approach led to policies as diverse as independent sector treatment centres, foundation trusts, patient choice, payment by results, private polyclinics, and regulators spanning NHS and private medicine. Political sparring over top-down initiatives has led to funding multiple reorganisations in the English NHS which are expensive and exhausting; with the consequence of reduced funding for service provision. The peak of this trend has therefore probably passed as government finances and power is eroded. Scotland has chosen to prioritise the appointment of additional medical and nursing staff, as opposed to funding multiple reorganisations or meeting the cost of running an internal market system.

In a study commissioned by the Nuffield Trust, despite all of the divergent policies when comparing health care outcomes in England and Scotland, there is no evidence linking these policy differences to a matching performance divergence. Clearly there are many influences aside from devolution which can affect the overall performance of the UK’s health services.

We stand on the verge of potentially fundamental constitutional changes in the UK, with the Referendum on Independence for Scotland in September 2014. The UK political system allows and encourages policy divergence, without much attention to its sustainability or consequences for standards, labour markets, or equity. Against this backdrop, there is great interest in understanding how performance on quality in terms of patient reported outcomes, and value for money compares across the UK.
The psychological implications of redundant skin are believed to play a central role in the decision to seek body contouring surgery. A recent study in a non-bariatric patient population suggested that abdominoplasty could have a positive impact on sexuality, however there is a dearth of evidence for psychological and functional outcomes in the bariatric population. At present, it is unknown whether persons who have undergone bariatric surgery and who elect to undergo subsequent body contouring surgery experience the anticipated physical and psychosocial benefits with the associated value for money for a socially funded healthcare system. There is clearly a need for further studies to identify the psychological and functional consequences of bariatric surgery. There are no validated patient report outcome measures for this cohort of patients and the use of valid and reliable measures of physical and psychosocial status should provide important information on the experiences of this growing population of patients.

Further studies focusing on the outcome of body contouring after massive weight loss could support the development of national guidelines on post bariatric surgery body contouring. Our health care system demands evidence to perpetuate treatment availability and guide clinical decision making. The demand for body contouring post massive weight loss is on the rise and currently there is no evidence to demonstrate if patients who remove the redundant skin gain physical and psychological benefits. Plastic surgeons should champion the needs of the post bariatric patient requiring body contouring procedures, by collecting further data to identify outcomes in this patient group, improve equality in the NHS and in so doing provide best practice.

**Conclusion**
73.4% of patients who have undergone bariatric surgery desired plastic surgery to manage their post massive weight loss skin redundancy. The abdomen was the area that provoked the most concern, followed by the chest/breast, then limbs. Age and gender are not determinants of desire for plastic surgery. A national discrepancy exists for plastic surgery services commissioning, where 37.7% of the massive weight loss body contouring cases carried out in Scotland would have failed to have met the required threshold for surgery in Leeds. GPs need to be well informed of existing guidelines for health care commissioning.
Chapter 4: Literature review on patient reported outcome measures in massive weight loss body contouring patients

Introduction: The use of “Patient Reported Outcome Measures” in plastic surgery
In 1966, Donabedian\textsuperscript{96} described quality of care as being made up of 3 tangible parts: structure, process, and outcome. ‘Structure’ is concerned mostly with health care infrastructure. ‘Process’ of care focuses on the actual details of care provided to a patient during their health care journey. ‘Outcome’ looks at the final result of health care, traditionally in terms of morbidity, mortality, and restoration of function. Outcomes are a well-established feature of the quality of health care. Outcomes can often be viewed as the overall effect of care on a patient. Health care systems are, therefore, often judged and ranked solely on their outcome statistics, with an implied association with quality of care.

Morbidity and mortality statistics, while undoubtedly useful, tend to overlook the patient’s perspective of health care. Although bariatric surgery leads to a decrease in morbidity and mortality\textsuperscript{20}, ptotic redundant skin folds\textsuperscript{97} result in intertriginous rash, hygiene issues and functional and psychological impairment\textsuperscript{98}. Traditional outcome measures which focus on operative clinical outcomes, such as mortality and postoperative infection rates do not recognise these secondary concerns which are important to patients, and whose views should be central to all that we do as health care professionals. In plastic surgery outcomes are often difficult to define and notoriously challenging to measure\textsuperscript{99, 100}.

When outcome measurements of interventions to treat these chronic conditions are carried out, measuring the improvement in symptoms, psychology and function is critical, as opposed to a simply measuring a decrease in mortality\textsuperscript{101}. Body image is a psychological construct which refers to self-concept including self-image and how an individual perceives or feels about his or her body.

Such subjective information cannot be collected without direct feedback from the patient. Patient reported outcome measures (PROMs) capture this information on the patient’s perspective of health status directly from the patient\textsuperscript{102}. Similarly, with the
advent of many new interventions and therapies, increased attention must be placed on iatrogenic effects on a patient’s feelings of wellbeing.\textsuperscript{103}

PROMS can be varied from single item to multi-item multi-dimensional tools to understand the patient’s experience of her symptoms, clinical journey, functional status, well-being, or health-related Quality of Life (HRQL) and satisfaction with treatment outcomes.\textsuperscript{104} They can often include rating scales. The term 'rating scale' was originally used to define a series of items which quantified or placed in rank order\textsuperscript{105} the manifestations of a single variable, e.g. sadness. For most purposes, especially clinical, the term is often used to describe a set of scales which have some intrinsic relationship to each other. The individual scales are then referred to as items of the total scale. Rating scales can be classified as user rated or observer rated. Classification can be according to the form of the items: ‘graded items’ which record degrees of severity or relevance; in ‘checklists’ where the items are scored as present or absent; or ‘forced-choice items’ in which the rater has to choose which of two alternatives is most applicable\textsuperscript{106}. Scales can also be considered in relation to their content, e.g. symptoms, behaviour, social adjustment, family relations, functional capacity. Finally, scales can be classified according to their function. There are four of these: (1) intensity scales which measure severity of illness and also response to treatment; (2) prognostic scales which can be used to predict response to treatment; (3) scales for selection of treatment by means of differential indicators; (4) scales for diagnosis and classification.

PROMs are being used in varying roles including: referral tools; screening tools and aids to clinician decision making\textsuperscript{107}; and as aids to improve patient provider communication\textsuperscript{108} and shared decision making\textsuperscript{109}. The aim of PROMs is to assess the patient’s perspective of health, illness, and the effects of health care interventions in a reliable, valid, acceptable, and feasible way\textsuperscript{103}. Darzi’s NHS Next Stage Review\textsuperscript{110} indicates that PROMs will be increasingly used in the evaluation and policy making\textsuperscript{111} of healthcare technologies and services. The drive to improve quality of care has led to the realisation of the importance of patient perspective and the development of robust PROMs.\textsuperscript{112}
However, it is essential to realise that the quality of data provided by scales will depend on the basis of their construction, dissemination and intelligibility. Inadequate, misleading or incorrect information is not improved by recording it on a rating scale. For clinical purposes, the best way of describing the psychology of a patient is by a complete psychiatric case history. Users of rating scales must be aware that information can get lost, misconstrued or misguided. If the wrong tool is selected, for example, the rating of a bariatric patient with eating disorder on a scale for anorexics would certainly produce a set of scores and it is conceivable that they might have some sort of meaning, but they do not give an adequate description of the patient's condition. The presence of a large number of irrelevant items in a scale encourages raters to attempt to fill in at least some.

Although the information provided by a rating scale is limited, it is valuable because it is uniform for all patients and all occasions, and it is standard in its significance because the items, their grades and manner of use have been previously defined. Rating scales therefore permit comparison between different patients and between different occasions for the same patients. Well-designed and rigorously tested scales demonstrate adequate reliability and validity, which is more than can be said for 'free' case histories and diagnostic labels. Currently in most plastic surgery units, patients applying for reconstructive surgery following bariatric surgery are reviewed on a case-by-case basis. A full clinical assessment by the general practitioner, the plastic surgeon and the clinical psychologist is performed in order to assess whether there is significant social, psychological and physical benefit to be gained from post massive weight loss body contouring. There are clear benefits to psychology assessment before bariatric and plastic surgery, however there are no validated tools for screening the massive weight loss body contouring cohort. Because psychosocial functional outcomes are subjective and difficult to quantify, we may need instruments that are specific to both the patient population and the procedure or intervention.

As the prevalence of body contouring practice expands rapidly, there is a need for documentation of psychological, social, and functional features of body contouring.
The tangible changes in appearance from these procedures have been documented by various surgeons. However, QoL and psychological function of post-bariatric weight loss patients remain largely unexplored. These topics necessitate inquiry, so that we may properly document relief of prior dysfunction with surgical treatment. At the current time, we have not verified that surgical correction of these post-weight loss deformities can positively impact either QoL or psychosocial function. Body contouring after surgical weight loss is a relatively new subspecialty within plastic surgery, and lacks both standardized methods of assessment and knowledge of expected clinical outcomes. We need to perform careful and sophisticated outcome studies that can offer proof of the value of our service to this particular population and as there is growing emphasis on cost effectiveness in the health care industry there is a greater demand for comprehensive outcomes research. To accurately demonstrate improved QoL and functional status in our patients, plastic surgeons should perform outcomes-based studies. The instruments or tools used are a very important way of promoting a study’s aims or objectives, and of ensuring the reliability and validity of its findings.

Aim
- To find what patient reported outcome measures are available for the massive weight loss body contouring patient.
- To assess above PROMS against gold standards
- To correlate our findings with that of other systematic reviews of the literature

Objectives
- To carry out a literature search on patient reported outcome measure for massive weight loss patients.

Method
A literature search was carried out following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement for systematic reviews to identify PROMs designed to measure patient satisfaction, body image, and/or QOL concerns in patients who have undergone body contouring surgery. Articles from bibliographic database search conducted in MEDLINE, EMBASE, PsychINFO, Ebase, CINAHL, HAPI, Science Citation Index/ Social Sciences Citation Index, and Ovid Evidence-Based Medicine were included from their inception through August 2013.
Published articles were included if they provided evidence of measurement and/or practical properties for multi-item instruments assessing aspects of health status or QoL in patients undergoing cosmetic surgical procedures.

**Inclusion criteria:**
1) Study population related to the massive weight loss patients;
2) A clearly defined method of measuring QoL
3) The tool is patient reported
4) There is published evidence of measurement reliability, validity or responsiveness following completion in the specified patient population.
5) The instrument has been recommended for use with patients undergoing cosmetic surgical procedures.
6) English language publication

**Exclusion criteria:**
1) Lack of description or full names of PROM
2) Ad hoc or generic questionnaires not specific to the massive weight loss body contouring patient.
3) Clinician-assessed instruments,
4) Very narrowly focused or single-item instruments
5) Instruments only measuring symptoms
6) Instruments without empirical evidence of measurement properties

**Data extraction**
Data extraction followed pre-defined criteria and included both study-specific issues, such as study design and respondent characteristics, and instrument specific issues, for example, type and description of instrument, including the domains of health status covered, length, and evidence of measurement and practical utility\textsuperscript{120, 121}.

Specific search terms used with the Boolean operation AND to combine terms are listed below:

Search 1: Patient reported outcome measures AND body contouring
Search 2: Patient reported outcome measures AND massive weight loss

Search 3: Patient reported outcome measures AND abdominoplasty

One reviewer (NAH) then examined the abstracts of all identified articles and the full text of potentially relevant papers. References for included articles were examined to identify additional articles and measures. Identified PROMS were researched to obtain information on the development and validation process. PROMS were appraised for adherence to the Scientific Advisory Committee of the Medical Outcomes Trust.

**Results**

<table>
<thead>
<tr>
<th>Search Number</th>
<th>PubMed Results</th>
<th>Relevant Articles</th>
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<tbody>
<tr>
<td>1</td>
<td>18</td>
<td>4</td>
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<tr>
<td>2</td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>24</td>
<td>1</td>
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**Search 1**


**Search 2**


Search 3


The three searches rendered 10 relevant papers. Following removal of any duplicated articles this left a total of 6 relevant papers for further review.

Supplementary searches included scanning the reference lists of review articles, checking instrument websites where found, and drawing on other bibliographic resources. There were 146 related citations of which 18 were relevant. Six were excluded by the agreed criteria – leaving 12 articles.


14) Koller M, Schubhart S, Hintringer T. QoL and body image after circumferential body
15) Gusenoff JA, Messing S, O'Malley W, Langstein HN. Temporal and demographic
factors influencing the desire for plastic surgery after gastric bypass surgery. Plast
16) Pecori L, Serra Cervetti GG, Marinari GM, Migliori F, Adami GF. Attitudes of
morbidly obese patients to weight loss and body image following bariatric surgery
17) Lazar CC, Clerc I, Deneuve S, Auquit-Auckbur I, and Milliez PY. Abdominoplasty
after major weight loss: improvement of QoL and psychological status. Obesity
18) Song AY, Rubin JP, Thomas V, Dudas JR, Marra KG, and Fernstrom MH. Body image
and QoL in post massive weight loss body contouring patients. Obesity. 2006;14(9):
1626-1636.
Ferreira. QoL after abdominoplasty in women after bariatric surgery. Obesity
20) K. Stuerz, H. Piza, K. Niermann, and J. F. Kinzl, “Psychosocial impact of
21) E. S. J. Van Der Beek, W. Te Riele, T. F. Specken, D. Boerma, and B. Van Ramshorst.
The impact of reconstructive procedures following bariatric surgery on patient
22) van Hout GCM, Fortuin FAM, van Heck GL. Psychosocial Functioning, Personality
January; 18(1): 115-120
<table>
<thead>
<tr>
<th>Study</th>
<th>Questionnaire Employed</th>
<th>Psychometrically Validated</th>
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<tbody>
<tr>
<td>1</td>
<td>Jabir S Review</td>
<td></td>
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<tr>
<td>3</td>
<td>Reavey et al Review</td>
<td></td>
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<tr>
<td>4</td>
<td>Coriddi et al</td>
<td>The survey was nonvalidated, but was adapted from other validated surveys such as the Barthel Activities of Daily Living Index and the Functional Rating Index</td>
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<tr>
<td>6</td>
<td>Staalesen et al (7)</td>
<td>Review article of outcomes with abdominoplasty</td>
</tr>
<tr>
<td>7</td>
<td>Wagenblast et al</td>
<td>Unable to obtain English translation of score</td>
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<tr>
<td></td>
<td>Study</td>
<td>Description</td>
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<tr>
<td></td>
<td>Gusenoff et al</td>
<td>Unnamed survey. 13 point questionnaire focusing on financial burden of massive weight loss body contouring</td>
</tr>
<tr>
<td>13</td>
<td>Lazar et al</td>
<td>Three-item subjective questionnaire</td>
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<tr>
<td></td>
<td></td>
<td>Nine-item psychological status questionnaire designed by trained psychologist</td>
</tr>
<tr>
<td>14</td>
<td>Song et al</td>
<td>PBIA, BISA, CBIA, HR-QoL, PBSQol, Becks Inventory</td>
</tr>
<tr>
<td>15</td>
<td>Cintra et al</td>
<td>Adaptive Operationalized Diagnostic Scale (AODS): A 31-item instrument consisting of 4 domains: affectivity/personal relations, productivity, social/ cultural performance, and organic/somatic health. Together they evaluate physical and</td>
</tr>
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</table>
mental health, social adjustment, body image, self-concept, self-esteem, and mood and feelings. Results are summarized in five levels of adaptation from good (level 1) to very severe maladaptation (level 5) for each domain and as a final score for a complete test.

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<tr>
<td></td>
<td>Stuerz et al</td>
<td>Strauss and Appelt’s Questionnaire for assessing one’s own body: This questionnaire consists of 52 items which are answered with “true” or “not true” and consists of four subscales: attractiveness/self-confidence; accentuation of external appearance; worry about possible physical defects; problems regarding sexuality. Subscale “Emphasis on attractiveness” of the Body Perception Questionnaire by Paulus: This is a 22-item scale which assesses the extent to which appearance is adjusted to meet social norms. The Life Satisfaction Questionnaire: Covers ten areas of life, is, an index of general life satisfaction, and includes, healthiness, work life, financial status, leisure, partnership, relationship to own children, own person, sexuality, friends/relatives, and residence. The Hospital Anxiety and Depression Scale: A self-rating scale which consists of two separate subscales for anxiety and depression (each with 7 items) and is used to detect states of depression and anxiety. Author’s general questionnaire: Developed by the authors of the study and inquires about factors such as financing, expectations, reasons, desire for any other plastic surgery, dealing with the scar, satisfaction, effects on leisure activities, sexuality, inhibitions, and preoperative surgical information.</td>
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<tr>
<td>16</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Van der Beek et al</td>
<td>Obesity Psychosocial State Questionnaire (OPSQ) measures seven domains with items in each domain having a five-point rating from 1 (almost never) to 5 (almost always). Physical function To kneel or duck easily. Mental well-being To feel depressed (reversed score). Physical appearance To feel fat when someone takes a picture (reverse score). Social acceptance To be discriminated because of my weight. (reverse score). Self-efficacy To feel helpless toward my eating. behaviour (reversed score) Intimacy To have sexual problems because of my weight (reversed score).</td>
</tr>
<tr>
<td>18</td>
<td>van Hout et al</td>
<td>Symptom Checklist-90: a multidimensional psychopathology indicator with eight subscales and one summarized score (psychoneuroticism); its psychometric qualities are satisfactory to good. Dutch Personality Questionnaire (NVP): The NPV measures six personality characteristics; its psychometric qualities are also satisfactory to good. Body Attitude Test: measures subjective body experience and the attitude towards one’s own body; it has three subscales and one summarized total score, is commonly used in Europe, and is a reliable and valid questionnaire.</td>
</tr>
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</table>
Discussion
This literature search identified 25 tools of which one was validated and specific to massive weight loss body contouring patients. Studies that are relevant and applicable to this specific patient population are still limited.

The Sahlgrenska Excess Skin Questionnaire (SESQ) was developed in Sweden between 2009 and 2010 and contains 29 questions\(^1\). It is the only validated tool specific to the massive weight loss patient found in this literature search. Seven questions related to general demographics, smoking habits, height and current and maximum weight, and time since bariatric surgery. Ten statements relate to activity and daily life, where subjects give a rating on a five-grade scale from “all the time” to “never”. Examples of statements are: “the excess skin makes it difficult for me to participate in sports”, and “my body is unattractive because of the excess skin”. Nine combined questions are about the experience of excess skin in specific body parts where patients grade the amount of excess skin for each body part on a five-grade scale from “no” to “very much”. One question is about excess skin for the body as a whole. Two questions considering plastic surgery and the body part(s) on which they would like to have reconstructive surgery.

Post Bariatric Satisfaction Questionnaire (PBASQ)\(^2\) is a 34-item self-report instrument, which can be completed in approximately 15 min. Survey questions focused on cosmetic and body contouring concerns that arise following gastric bypass surgery, and patients responded to the items using a five-point Likert scale ranging from “very good” to “unsatisfied” and a three-point Likert scale ranging from “never” to “recurring”. The data analyses on males and females were conducted separately because weight loss on body areas is thought to differ between the sexes. This measure has not been validated following bariatric contouring procedures.

The Obesity Psychosocial State Questionnaire – OPSQ\(^3\), is a Dutch tool developed by Larsen & Geenen 2003\(^4\), which has been previously validated in the bariatric population. It has seven scales /domains which have a close link to physical and psychosocial concerns. It has not been validated in English. Its seven domains are: physical functioning, mental health and well-being, body image/appearance, social
acceptance, self-efficacy towards eating, intimacy and sexuality and social network. A number of statements ranging from: to walk long distances; to feel desperate; to be discriminated because of your weight; to walk up a staircase or steps easily; to struggle with undertaking your work; to feel fat if you wear tight clothes; to believe that your weight could shorten your life; to have pain in your back; to have intimate contact with someone is asked for each domain, in relation to pre- and post-surgery perceptions. The participant is asked the extent to which they agree or not, on a 5 point Likert-type rating scale (1 = almost never, to 5 = almost always). According to Van der Beek et al. (2010. p. 37), all the domains have ‘a moderate to high reliability’. This score has not been validated in the post MWL body contouring population.

The Body Attitude Test (BAT)\textsuperscript{126} is a self-report questionnaire already adopted in previous studies evaluating body image perception in bariatric patients\textsuperscript{127,128}. The BAT consists of 20 items, scored on a six-point scale (0-5), with a stable 3 factor structure: negative appreciation of body size; lack of familiarity with one’s own body; general body dissatisfaction. The maximum total score is 100, with higher scores for greater deviation in the body experience. The critical score that determines the boundary between patients and a normal population is established at 36 using Shrout and Fleiss’ model\textsuperscript{129}. This score has not been validated in the post MWL body contouring population.

Additional measures include: the Body image satisfaction assessment (BISA) questionnaire\textsuperscript{130}, Current Body Image Assessment (CBIA), a silhouette on which patients can highlight the areas of their body which causes greatest distress,\textsuperscript{131,132} Post Bariatric Surgery QoL (PBSQOL) - is currently undergoing validation, Adaptive Operationalised Diagnostic Scale (AODS) – semi structured interview format, and the Body Q – undergoing validation.

The lack of validated PROMS specific to massive weight loss body contouring patient was further confirmed by a systematic review of PROMS by Reavey et al\textsuperscript{133}. In this systematic review, Reavey and Pusic identified five PRO measures that have been developed to measure patient satisfaction and QoL concerns among body contouring surgery patients. Their literature review resulted in 1504 articles found on a
bibliographic database search conducted in MEDLINE, EMBASE, PsychINFO, Ebase, CINAHL, HAPI, Science Citation Index/ Social Sciences Citation Index, and Ovid Evidence-Based Medicine—from their inception through August 2010. Search terms were grouped into three general categories—terms pertaining to obesity or overall body image; plastic surgery in general or specific body contouring surgical procedures, and QoL outcomes in general or questionnaires. Fifty four relevant PROMs were identified of which, five were developed to measure procedure-specific outcomes: one liposuction (the Freiburg Questionnaire on Aesthetic Dermatology and Cosmetic Surgery [FQAD]), one general plastic surgery (the 59-item Derriford Appearance Scale [DAS-59]), and three breast reduction measures (the Breast Reduction Assessed Severity Scale Questionnaire [BRASSQ], Breast Related Symptoms questionnaire [BRS], and the BREAST-Q reduction module).

Freiburg Questionnaire on Aesthetic Dermatology and Cosmetic Surgery - FQAD\textsuperscript{134} is a 64-item multiscale questionnaire developed for liposuction patients. Questionnaire items were generated from open surveys of patients who underwent liposuction of the arms, abdomen, waist, legs, chin, and/ or neck. No information about the psychometric properties of the instrument is available in the literature. Following its initial development, application of this questionnaire has been limited to a study measuring patient satisfaction with facial appearance following botulinum toxin treatment\textsuperscript{135}.

Breast Related Symptoms Questionnaire - BRS\textsuperscript{136} is a 13-item scale developed to measure physical symptoms related to breast hypertrophy. Items for this measure were generated from focus groups with patients and input from an expert panel. The focus of the scale is on physical symptoms and/ or physical limitations related to breast hypertrophy. Other broader QoL issues are not covered, nor are patient satisfaction with breast appearance following surgery. The BRS is reported to have good test retest reliability and face validity.

Breast Reduction Assessed Severity Scale Questionnaire - BRASSQ\textsuperscript{137} is a 39-item questionnaire composed of five subscales. Items for this questionnaire were
developed through focus groups with breast reduction patients and input from expert panels. This questionnaire’s validation and evaluation process are documented in the literature\textsuperscript{138} and it has good reliability. However, the items included in the BRASSQ are limited to physical symptoms and psychological issues related to breast hypertrophy. There are no items or scales that measure postoperative issues (eg, scarring, pain, and recovery process); therefore, it may not be appropriate for comparing different operative techniques for breast reduction.

The BREAST-Q has a procedure-specific modular structure. The Reduction Module\textsuperscript{139} is composed of 91 items that measure aspects of patient satisfaction/QOL across multiple domains. Items were generated from interviews with breast reduction patients, input from expert panels, and a systematic review of other relevant breast surgery measures. The BREAST-Q covers a range of content domains important to the breast reduction patient across seven subscales. Validation studies have confirmed validity, reliability, and responsiveness.\textsuperscript{140} Reavey et al concluded that while the BREAST-Q and BRASSQ could be used with breast reduction patients, there is clearly a lack of adequately-developed PRO measures for other body contouring procedures. Importantly, no measure has been designed for the post bariatric surgery population.

Jabir’s\textsuperscript{141} review of psychosocial outcomes following massive weight loss body contouring identified 89 studies of which 9 met his inclusion criteria. These studies examined outcomes using 21 scores. Of these 11 were validated and none were specific to the massive weight loss patient.

The 2013 structured review of patient reported outcome measures used in cosmetic surgical procedures from University of Oxford identified 35 PROMS previously used in the assessment of cosmetic surgical procedures, of which none were for the massive weight loss body contouring patient.

The three literature reviews above confirm the findings in my literature review that although generic PROMS are available for cosmetic surgery and general body image assessment, there is a dearth of validated scores specific to the massive weight loss
body contouring group. Given the preoperative physical and psychological differences that exist between post bariatric patients and the cosmetic body contouring population it is likely that specific concerns and QoL issues will differ. There appears to be growing interest in PRO measures among plastic surgeons, which is likely due in part to increasing numbers of body contouring procedures being performed but also to the recognition that patient satisfaction and QoL are central to the success or failure of these operations. As new PRO measures are developed to measure outcomes following other body contouring procedures, separate instruments for the cosmetic and post bariatric populations may be needed. Our current healthcare environment demands high-quality data to guide surgical decision making, patient education, and negotiations with funding agencies; given this, the use of ad hoc questionnaires is simply no longer acceptable. Therefore, research is needed to develop reliable PRO measures for the full variety of body contouring procedures. Once developed, these measures should be evaluated and appropriately utilized in subsequent clinical studies. It is our hope that the incorporation of reliable patient-reported outcomes data with traditional complications data will guide an informed outcomes discussion and, in so doing, help to advance surgical techniques, evidence-based practice, and patient education.

**Conclusion**

Although 25 generic PROMS are available for cosmetic surgery and general body image assessment, only one is validated for the massive weight loss patient and how the excess skin effects quality of life, but it is not responsive to plastic surgery interventions. A validated robust PROM for the massive weight loss body contouring patient is needed.
Chapter 5: Understanding which patient reported outcome measures are most relevant to the massive weight loss body contouring patient

Introduction

Rapid weight loss with a massive final total weight reduction can result in disfigurement with diffuse lipodystrophy and generalized skin laxity; necessitating excisional contouring. Post bariatric surgery body contouring patients comprise a substantial subset of the potential plastic surgery population. This heterogeneous group of patients often require multiple-region body-contouring procedures to address the functionally and aesthetically unsatisfactory resultant deflation and skin redundancy. Complications rates correlate with the number of procedures performed. Despite losing 50% of their body weight (and more) in some cases, these patients often still do fall within the morbidly obese range, with a BMI of greater than 40kg/m², and have associated medical issues.

The combination of raised BMI and prolonged surgical time render this group of patients at particularly high risk of intraoperative complications such as haemorrhage and post-operative complications such as delayed wound healing, infection, seromas and venous thromboembolism. Mild to moderate hypertension is seen in 50–60% of obese patients and severe hypertension in 5–10%, with a 3–4 mmHg increase in systolic and a 2 mmHg increase in diastolic arterial pressure for every 10 kg of weight gained. An expansion of the extracellular volume, resulting in hypervolaemia, and an increase in cardiac output are characteristic of obesity-induced hypertension. The morbidly obese patient is likely to have significant cardiovascular impairment and to tolerate fluid loading poorly. Increased risk of bleeding relates to impaired endothelial function, with dilated vessels which have a reduced inability to vasoconstriction, larger surface areas of subcutaneous fat exposed and greater venous and arterial bleeding points, altered cardiorespiratory physiology in the obese patient with increased ventilation pressures required to overcome lower pulmonary compliance in the obese patient resulting in higher venous pressures and greater losses through venous oozing. Some studies report a greater than 30% increase in peri-operative blood loss in obese patients. Surgical goals must balance safety and aesthetics whilst establishing realistic outcomes with the patients. These risks
continue even after the massive weight loss patient has reached his/her target weight. In many cases, MWLBC occurs in patients who are still obese when they require interim procedures to enable them to continue to lose weight.

National guidelines on post-bariatric body contouring surgery are needed to improve patient safety, equitable health care provision and comprehensive understanding and treatment of these patients. However, there is a dearth of evidence when observing outcomes in MWL patients.

The relationship between the severity of visible difference from social ‘norms’ and resulting psychological distress is of interest for two reasons:

1. Enables the focus scarce resources on the groups most in need of them
2. The basis for reconstructive surgery is predicated on a positive relationship between severity of a condition and psychological distress, or the belief that improved appearance will lead to improved psychological functioning and a better QoL.

Understanding the complex psychological and medical needs of the post bariatric body contouring patient is key. There is a gradual shift from deeming post bariatric surgery body contouring as an aesthetic procedure to seeing it as a necessary step in providing complete care for the bariatric patient as part of their surgical package. The appreciation of the higher complication risk necessitates the importance of careful patient selection and meticulous operative planning. Ascertaining whether MWL body contouring leads to functional or psychological improvement is critical when developing standardised guidelines for funding. This is especially pertinent in socially funded health care systems, where limited funds need to be allocated on the best possible evidence.

The literature search in chapter 4 identified that there are currently no appropriate validated tools for this group of patients.

**Overall aim**

- Identify which components of the selected scores are most sensitive to MWL body contouring patients
• Extract key themes and questions which can be used to devise a more specific tool for the MWLBC cohort.

Two studies were conducted to evaluate the efficacy of the selected psychometric scores, and determine if those data triangulated with findings from semi-structured qualitative interviews.

**Method**

**Design**
Please see each sub section as below.

**Participants**
As in chapter 2

**Measure**
In view of the lack of validated scores for the massive weight loss body contouring cohort, expert opinion was sought from Dr Aditya Hosakere, Prof Jim Mitchell and Dr Jon Fear.

The following validated scores were selected for their breadth of evaluation in health and QoL metrics.

The Hospital Anxiety and Depression Scale (HADS) scale\(^5\) is a 14 item screening tool for anxiety and depression, standardised to both general and hospital populations that generates ordinal data. Seven of the items relate to anxiety and seven relate to depression. Cut off scores were used to define mild (8-10), moderate (11-15) and severe (>16) levels for each condition. Zigmond and Snaith created this outcome measure specifically to avoid reliance on aspects of these conditions that are also common somatic symptoms of illness, for example fatigue and insomnia or hypersomnia. The higher the score, the greater the likelihood of anxiety and/or depression depending on the arm of the test.

The Derriford Appearance Scale (DAS24) is a 24 item factorial scale measuring appearance related distress, social anxiety and avoidance, standardised on both general and hospital populations. The DAS 24 generates six measures of psychological
distress and dysfunction (a full scale score and five factor scores) as well as a measure of physical distress and dysfunction. Factors are labelled ‘general self-consciousness of appearance’, ‘social self-consciousness of appearance’, ‘self-consciousness of appearance’, ‘self-consciousness of sexual and bodily appearance’, ‘negative self-concept’, and ‘self-consciousness of facial appearance’. Normative values are provided for different samples with conditions affecting different parts of the body. The higher the score, the greater the “caseness” of appearance related distress. Song et al preferred the DAS-56, but felt it too lengthy in view of the multiple body areas of concern in the MWL body contouring cohort.

Short Form-36 is a measure of health status commonly used in health economics as a variable in the quality-adjusted life year calculation to determine the cost-effectiveness of a health treatment. If the quality-of-life changes are very specific, the ceiling and floor effects of the SF-36 make measuring improvement beyond particular points of an instrument difficult.

Bariatric Analysis and Reporting Outcome System (BAROS) is a tool validated for the bariatric cohort and allocates points for percentage weight loss, change in medical conditions, and a Likert scale is included for QoL changes: self-esteem; physical well-being; social well-being; labour (ability to work); and sexual intimacy. Complications and the need for reoperation are taken into consideration for the final score.

In addition, permission was given to use the Eating Disorder Questionnaire developed for the Longitudinal Assessment of Bariatric Surgery (LABS). A validated baseline questionnaire including self-reported information on: demographics; weight history; weight control behaviour; exercise, history of abuse; psychiatric history; past medical history; chemical use history; social history; and other factors.
Study 1: A cross sectional study examining functional and psychosocial improvement following body contouring procedures in bariatric patients

**Aims**
This study aims to investigate functional and psychosocial outcomes before and after body contouring in bariatric surgery patients.

**Methods**
Regional Ethical Committee approval was obtained for the study protocol. Written informed consent was obtained from all subjects.

**Participants**
One hundred patients over the age of 18, who had undergone or were undergoing bariatric surgery, were recruited from the regional bariatric service, with staggered entry between 2010 and 2012. Patients with a previous history of gluteal or breast implants, abdominoplasty or body contouring procedures were excluded.

**Measurement & study protocol**
A per chapter 2: patients were followed up in clinic and completed questionnaires with a Wellcome Trust Clinical Research Facility (CRF) accredited Clinical Research Nurse (CRN) who followed a standard operating procedure. A plastic surgery registrar (NAH) trained in psychological interview techniques carried out a qualitative interview. She was blinded to the psychometric scores.

Qualitative interviews were carried out as per chapter 2.
Results
Statistical analysis was carried out using GraphPad Prism 6.02 by GraphPad Software. One hundred patients were recruited. Seventeen were lost to follow up (Figure 5.1). Eighty three patients were reviewed in clinic and underwent the above protocol.

Figure 5.1 Flowchart of recruitment outcomes

Twenty five were male and fifty eight were female. The patients were divided up into four groups dependent on whether they were pre bariatric, post bariatric, pre MWLBC or post MWLBC surgery (this was also known as ‘surgical status’) (Figure 5.2).

Figure 5.2: Flowchart of patient cohorts
Table 5.1 tabulates the results. Pre bariatric surgery patients consisted of 15 patients. Two were male and 13 were female. They were under review by the bariatric services and were attending seminars for a pre surgical weight management programme. Post bariatric patients had completed bariatric surgery. This group consisted of 29 patients, 10 males and 19 females, with a mean age of 51.24 (range 38-67). Time post bariatric surgery was a mean of 19.2 month (min =1, max = 53 months). Pre MWLBC patients had been reviewed by plastic surgeons; approved for surgery and were currently on the waiting list. This group consisted of 19 patients, 7 males and 12 females, with a mean age of 46.16 (range 28-62). Time post bariatric surgery was a mean of 21.11 months (min = 7 months, max = 54 months). Expected surgery included abdominoplasty, lower body lift, total body lift (upper and lower body lift), mastopexy and brachioplasty. Post plastic surgery patients had completed body contouring following massive weight loss. This group consisted of 20 patients, 7 males and 13 females, with a mean age of 47.90 (range 24-68). The most commonly performed procedure was an abdominoplasty. (Table 5.2). Time post bariatric surgery was a mean of 38.15 months (min = 12 months, max = 93 months). There were no statistically significant differences between group means as determined by one way ANOVA (F(3,79)=2.74, p=0.25 for age, patients’ starting weight, ideal weight and type of bariatric surgery. Table 5.1.
### Table 5.1: Means of demographic and QoL data and ANOVA

<table>
<thead>
<tr>
<th>Surgical Status</th>
<th>Pre bariatric surgery</th>
<th>Post bariatric surgery</th>
<th>Pre plastics surgery</th>
<th>Post plastic surgery</th>
<th>One Way ANOVA</th>
<th>Brown Forsythe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>15</td>
<td>29</td>
<td>19</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean Age (min-max)</td>
<td>47.40 (39-58)</td>
<td>51.24 (38-67)</td>
<td>46.16 (28-62)</td>
<td>47.90 (24-68)</td>
<td>F=2.74(3.79)</td>
<td>p=0.25</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>2.73</td>
</tr>
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<td></td>
<td>p=0.049</td>
</tr>
<tr>
<td>Mean starting Weight (kg)</td>
<td>157.08(114-31190.51)</td>
<td>164.34(127-233.2)</td>
<td>154.62 (128.1-233.2)</td>
<td>172.44(114-3261.86)</td>
<td>F=2.02(3.79)</td>
<td>p=0.116</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>4.21</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>p=0.0074</td>
</tr>
<tr>
<td>Ideal Weight (kg)</td>
<td>68.48 (57.76-81)</td>
<td>70.25(60-83.72)</td>
<td>69.83(47.61-85.56)</td>
<td>70.52(56.25-83.72)</td>
<td>F=6.27(3.79)</td>
<td>p=0.049</td>
</tr>
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<td>4.01</td>
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<td></td>
<td>p=0.001</td>
</tr>
<tr>
<td>Current Weight (kg)</td>
<td>145.99(107.95-171)</td>
<td>113.29(74.4-133.36)</td>
<td>86.20(59.9-133.36)</td>
<td>89.59(56.7-142.15)</td>
<td>F=2.17(3.79)</td>
<td>p=0.0001</td>
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<tr>
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<td>3.70</td>
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<td>p=0.015</td>
</tr>
<tr>
<td>% of extra weight loss</td>
<td>13.18(0-29.9)</td>
<td>53.82(8.6-98)</td>
<td>77.95(24.8-100)</td>
<td>83.29(36-100)</td>
<td>F=44.15(3.79)</td>
<td>p=0.0001</td>
</tr>
<tr>
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<td></td>
<td>p=0.015</td>
</tr>
<tr>
<td>BMI</td>
<td>53.69(37.37-69.57)</td>
<td>40.36(27.25-54.57)</td>
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<td>31.00(20.44-49.7)</td>
<td>F=29.32(3.79)</td>
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</tr>
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<td>Type of Bariatric Surgery</td>
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<td>F=1.031(2.8)</td>
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<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>OGS</td>
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<td>1</td>
<td>0</td>
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</tr>
<tr>
<td></td>
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<td>9</td>
<td>11</td>
<td>8</td>
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<tr>
<td></td>
<td>OGB</td>
<td>N/A</td>
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<td>1</td>
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<tr>
<td>Time After Bariatric Surgery (months)</td>
<td>N/A</td>
<td>19.17(1-53)</td>
<td>21.11(7-54)</td>
<td>38.15(12-93)</td>
<td>F=10.06(2.65)</td>
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<td>Area of Concern 1</td>
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<td>Abdomen</td>
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</tr>
<tr>
<td>Pain from feature</td>
<td>Almost always</td>
<td>Sometimes</td>
<td>Almost never</td>
<td>Never/Almost never</td>
<td>F=8.65(3.79)</td>
<td>p=0.0001</td>
</tr>
<tr>
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<td></td>
<td>p=0.3561</td>
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<tr>
<td>Limitation due to feature</td>
<td>Almost always</td>
<td>Almost always</td>
<td>Sometimes</td>
<td>Never/Almost never</td>
<td>F=6.611(3.79)</td>
<td>p=0.0005</td>
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<td>Exercise Status</td>
<td>4.27 (0-12)</td>
<td>5.55 (0-20)</td>
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<td>12.55(0-24)</td>
<td>F=8.35</td>
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<td>Smoking Status</td>
<td>30.93 (0-80)</td>
<td>20.41 (0-80)</td>
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<td>9.1(0-60)</td>
<td>F=3.793</td>
<td>p=0.013</td>
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<td>p=0.0095</td>
</tr>
<tr>
<td>Career Progression</td>
<td>0(0-0)</td>
<td>0.103(0-2)</td>
<td>0.63(0-2)</td>
<td>0.85(0-2)</td>
<td>F=8.319</td>
<td>p=0.0001</td>
</tr>
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<td>p=0.0012</td>
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</table>

Key for Table 5.1
LGB: Laparoscopic gastric band
LGS: Laparoscopic gastric sleeve
OGS: Open gastric sleeve
LGB: Laparoscopic gastric bypass
OGB: Open gastric bypass
Table 5.2: Plastic surgery procedures carried out

<table>
<thead>
<tr>
<th>No. of pts</th>
<th>No. of ops</th>
<th>No. of procedures per op</th>
<th>Surgical procedures carried out</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>3</td>
<td>1</td>
<td>Abdominoplasty, breast augmentation, and breast mastopexy</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Fleur de lys abdominoplasty, neck reduction and mastopexy</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>Mastopexy and abdominoplasty; brachioplasty and thigh lift</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Fleur de lys abdominoplasty and neck reduction, brachioplasty and mammoplasty</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>1</td>
<td>Brachioplasty, followed by a revision</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Abdominoplasty followed by brachioplasty</td>
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<td></td>
<td></td>
<td>Abdominoplasty followed by a mastopexy</td>
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<td>Abdominoplasty followed by a mastopexy</td>
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<tr>
<td>2</td>
<td>1</td>
<td>2</td>
<td>Liposuction and mastopexy</td>
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<td></td>
<td>Fleur de lys abdominoplasty and neck reduction</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>1</td>
<td>Abdominoplasty</td>
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<td></td>
<td>Interim abdominoplasty</td>
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<td>Fleur de lys abdominoplasty</td>
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<td></td>
<td>Fleur de lys abdominoplasty</td>
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<td></td>
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<td></td>
<td>Total body lift</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Neck reduction</td>
</tr>
</tbody>
</table>

**Complications**

Nine patients experienced the following 18 complications following plastic surgery. Post-operative complications were categorized according to the modified Clavien classification\(^\text{163}\). Grade I is where there is any deviation from the normal post-operative course without the need for pharmacological treatment or any intervention. Grade II complications require pharmacological treatment with drugs other than such allowed for grade I complications. Blood transfusions and total parenteral nutrition are also included. Grade III require surgical, endoscopic or radiological intervention with a sub classification of ‘IIIa’ as not under anaesthesia and ‘IIIb’ as under anaesthesia. Grade IV is a life threatening complication, IVa with a single organ dysfunction, and IVb with multi organ dysfunction. Grade V is death of a patient. Of those patients three were active smokers, two were recent ex-smokers and four had never smoked. Mean age=51 (range 38-68). Mean weight loss 100.1kg (range 51.2kg – 199.58kg). Table 5.3
Table 5.3. Complications

<table>
<thead>
<tr>
<th>Complication</th>
<th>Number</th>
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</thead>
<tbody>
<tr>
<td>Haematoma requiring evacuation in theatre:</td>
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<tr>
<td>Seroma requiring aspiration:</td>
<td>4</td>
</tr>
<tr>
<td>Infection requiring IV antibiotics:</td>
<td>6</td>
</tr>
<tr>
<td>Infection requiring surgical debridement:</td>
<td>2</td>
</tr>
<tr>
<td>Abdominal wound dehiscence:</td>
<td>3</td>
</tr>
<tr>
<td>Abdominal wound dehiscence:</td>
<td></td>
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<tr>
<td>(1 requiring long term VAC dressing, 1 requiring 2 weeks packs)</td>
<td></td>
</tr>
<tr>
<td>Dissatisfaction with scar = muffin top:</td>
<td>1</td>
</tr>
</tbody>
</table>

General analysis

**Weight Change**

Patients had a greater percentage weight loss in each successive group along their MWLBC journey. These differences were statistically significant as determined by one way ANOVA $F(3,79)=44.15$, $p<0.0001$. Table 5.1. Post hoc testing using Tukey’s multiple comparisons compared all possible pairs of means for each variable. This test demonstrated statistically significant differences between all the groups except when comparing the pre plastic surgery and post plastic surgery groups which had a mean difference of -5.337. Table 5.4. This reflects that the post plastic surgery group had gained weight relative to the pre plastic surgery group, although this was difference was not statistically significant.

Table 5.4 Tukey’s Multiple Comparisons Test: 95% Confidence Interval

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<tr>
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<th>HADS A</th>
<th>HADS D</th>
<th>PF</th>
<th>RP</th>
<th>BP</th>
<th>GH</th>
<th>VT</th>
<th>SF</th>
<th>RE</th>
<th>MH</th>
<th>PCS</th>
<th>MCS</th>
<th>DAS 24</th>
<th>BAROS</th>
<th>% vs w loss</th>
<th>Limitation</th>
<th>Pain</th>
<th>Exercise</th>
<th>Smoking</th>
<th>Career</th>
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</thead>
<tbody>
<tr>
<td>Pre bariatric vs</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
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<tr>
<td>Pre bariatric vs</td>
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<td>post bariatric</td>
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<td>post plastic</td>
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</table>
Key for Tables 5.4 & 5.5

(PF) Physical functioning: correlates highly with physical component
(RP) Role physical: correlates highly with physical component
(BP) Bodily pain: correlates highly with physical component
(GH) General health: contributes to both physical component and mental component
(VT) Vitality: contributes to both physical component and mental component
(SF) Social functioning: correlates highly with mental component
(RE) Role emotional: correlates highly with mental component
(MH) Mental health: correlates highly with mental component
(PCS) Physical health component summary
(MCS) Mental health component summary

Area of concern
There was some change in the area of concern between each group, with weight being the priority in the pre bariatric surgery group, the surplus skin on the abdomen in the post bariatric and pre plastic surgery groups and the arms in the post plastic surgery group. These differences were statistically significant as determined by ANOVA testing. Table 5.1.

Limitation and pain from feature
There were statistically significant differences between group means as determined by one way ANOVA for pain from feature and limitation of activity from feature. (F(3,79)=8.63, p<0.0001 and F(3,79)=6.611, p<0.0005 respectively. Table 5.1.

Exercise
Patient’s scores from the Eating Disorder Questionnaire on the frequency and duration of exercise were scored to give each patient an exercise status score. Pre bariatric patients struggled with exercise and did the least both in terms of duration and frequency. Post bariatric surgery patients who had not yet plateaued in their weight loss exercised several times per month for 15-30 minutes each time. Post bariatric surgery patients who had plateaued in their weight loss ('pre plastic' surgery) exercised once per week for 15-30 minutes each time. Post MWL plastic surgery patients ('post plastic' surgery) exercised several times per week for 31-60 minutes. Each progressive group had higher means than the last, with the post plastic surgery group exercising
the most. Figure 5.3. ANOVA testing revealed these differences between the 4 groups, $F(3,79) = 8.35, p < 0.0001$ as statistically significant.

Figure 5.3 Histogram of exercise activity in minutes per month

![Histogram of exercise activity in minutes per month](image)

**Smoking**

Patients smoking frequency and number of cigarettes scores from the EDQ gave pack year history. Figure 5.4. There was a statistically significant difference between the means of the four groups as determined by one way ANOVA $F(3,79) = 3.793, p = 0.013$ underlined in Table 5.1. Further post hoc tests with Tukey’s highlighted that the most statistically significant difference was between the pre bariatric surgery and pre plastic surgery group with a mean difference of 25.25. Table 5.4. However, it was seen that the post plastic surgery group smoked more than the pre plastic surgery group (Table 5.1) with a mean difference of -3.416, although this was not statistically significant. Table 5.4.
Career Progression
Patients were asked if they had experienced a change in their career, which made them feel more fulfilled or lead to an improvement in their financial remuneration (above the level of inflation) or responsibility. They were given a score of 1 if they had achieved one item and 2 if they had achieved both. Figure 5.5. There was a statistically significant difference between the means of the four groups as determined by one way ANOVA $F(3,79)=8.319$, $p<0.0001$. Table 5.1. There was a statistically significant difference between the pre bariatric surgery and the pre plastic and post plastic surgery groups with a mean difference of -0.63 and -0.85 respectively. There were also statistically significant differences between the post bariatric surgery groups and pre plastic and post plastic surgery groups with mean differences of -0.528 and -0.747 respectively. However, it was seen that there was no statistically significant differences between the pre bariatric and post bariatric surgery and pre plastic and post plastic surgery groups. Table 5.4.
Figure 5.5. Histogram of career progression

![Histogram of career progression](image-url)
**Psychometric results**

Table 5.5 shows the mean score results for HADS, Derriford, SF-36 and BAROS for the 4 groups. There were statistically significant differences between the means of the four groups as determined by one way ANOVA for HADS Anxiety, SF-36 physical functioning (PF) & general health (GH) and BAROS (underlined).

Table 5.5: Means of PROMS and ANOVA

<table>
<thead>
<tr>
<th>Surgical Status</th>
<th>Pre Bariatric Surgery Mean (±SD)</th>
<th>Post Bariatric Surgery Mean (±SD)</th>
<th>Pre Plastic Surgery Mean (±SD)</th>
<th>Post Plastic Surgery Mean (±SD)</th>
<th>ANOVA (3,79)</th>
<th>Brown Forsythe Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>HADS</td>
<td></td>
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<tr>
<td>Anxiety</td>
<td>13.93 (2.46)</td>
<td>7.93 (±5.36)</td>
<td>7.84 (±5.23)</td>
<td>7.25 (±4.45)</td>
<td>F=7.29</td>
<td>P=0.0002</td>
</tr>
<tr>
<td>Depression</td>
<td>14.33 (3.77)</td>
<td>6.86 (±5.40)</td>
<td>5.47 (±5.05)</td>
<td>5.8 (±5.15)</td>
<td>F=11.52</td>
<td>P&lt;0.0001</td>
</tr>
<tr>
<td>SF-36</td>
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</tr>
<tr>
<td>SF-36(PF)</td>
<td>19 (±26.13)</td>
<td>48.10 (±36.87)</td>
<td>68.95 (±27.27)</td>
<td>77 (±25.77)</td>
<td>F=10.92</td>
<td>P&lt;0.0001</td>
</tr>
<tr>
<td>SF-36(RP)</td>
<td>20 (±31.62)</td>
<td>53 (±43.51)</td>
<td>76.32 (±28.14)</td>
<td>70 (±44.13)</td>
<td>F=6.386</td>
<td>P=0.0006</td>
</tr>
<tr>
<td>SF-36(BP)</td>
<td>23.27 (±19.11)</td>
<td>41.14 (±26.09)</td>
<td>63.89 (±30.33)</td>
<td>64.75 (±31.37)</td>
<td>F=9.013</td>
<td>P&lt;0.0001</td>
</tr>
<tr>
<td>SF-36(GH)</td>
<td>22.47 (±8.57)</td>
<td>51.52 (±25.24)</td>
<td>60.74 (±24.55)</td>
<td>71.65 (±22.77)</td>
<td>F=14.64</td>
<td>P=0.0001</td>
</tr>
<tr>
<td>SF-36(VT)</td>
<td>24.33 (±16.35)</td>
<td>46.64 (±23.51)</td>
<td>52.89 (±24.96)</td>
<td>62.5 (±28.24)</td>
<td>F=9.151</td>
<td>P&lt;0.0001</td>
</tr>
<tr>
<td>SF-36(SF)</td>
<td>30 (±22.56)</td>
<td>59.63 (±27.91)</td>
<td>68.42 (±29.38)</td>
<td>69.38 (±28.24)</td>
<td>F=7.393</td>
<td>P=0.0002</td>
</tr>
<tr>
<td>SF-36(RE)</td>
<td>48.89 (±46.91)</td>
<td>62.85 (±43.97)</td>
<td>77.19 (±30.52)</td>
<td>73.33 (±39.89)</td>
<td>F=1.567</td>
<td>P=0.2038</td>
</tr>
<tr>
<td>SF-36(MH)</td>
<td>41.87 (±15.56)</td>
<td>64.5 (±17.16)</td>
<td>62.95 (±21.18)</td>
<td>68 (±19.34)</td>
<td>F=6.732</td>
<td>P=0.0004</td>
</tr>
<tr>
<td>SF-36(PCS)</td>
<td>24.41 (±10.76)</td>
<td>35.40 (±13.99)</td>
<td>45.25 (±10.48)</td>
<td>47.29 (±12.45)</td>
<td>F=11.50</td>
<td>P&lt;0.0001</td>
</tr>
<tr>
<td>SF-36(MCS)</td>
<td>37.36 (±10.01)</td>
<td>46.74 (±11.96)</td>
<td>45.82 (±10.37)</td>
<td>47.17 (±12.98)</td>
<td>F=2.616</td>
<td>P=0.0569</td>
</tr>
<tr>
<td>Derriford</td>
<td>73.87 (±10.08)</td>
<td>57.45 (±16.72)</td>
<td>57.90 (±18.44)</td>
<td>47.55 (±17.07)</td>
<td>F=7.601</td>
<td>P&lt;0.0002</td>
</tr>
<tr>
<td>BAROS</td>
<td>-2.48 (0.96)</td>
<td>2.31 (±2.83)</td>
<td>3.71 (±2.22)</td>
<td>5.29 (±2.35)</td>
<td>F=33.55</td>
<td>P&lt;0.0001</td>
</tr>
</tbody>
</table>
Further analysis was carried out with Spearman’s rank correlation to determine the strength of association between the two ranked variables. Surgical status, age, time after bariatric surgery, various anthropometric measurements, exercise status and history of abuse were compared to PROM outcomes. Table 5.6. There were statistically significant correlations between surgical status, time after surgery, anthropometric measurements, and exercise status and the SF36, BAROS and DAS24 (underlined). The correlations were either positive or negative depending on how the score was ranked. Taking into consideration the greater reliability of the HADS A, BAROS and physical functioning and general health components of the SF36 in these patients, closer attention was paid to these (shaded grey). It can be seen that the surgical status, anthropometric measurements from xiphisternum to umbilicus, pannus and pubic symphysis, arm, waist and hip circumferences and exercise status had statistically significant positive correlations to HADS A, BAROS and SF36. Time after bariatric surgery had a positive correlation to all scores except SF 36 PCS.
Table 5.6: Spearman’s Rank correlation for PROMs

<table>
<thead>
<tr>
<th>Spearman Rank</th>
<th>Derriford</th>
<th>HADS A</th>
<th>HADS D</th>
<th>BAROS</th>
<th>SF 36 PCS</th>
<th>SF36 MCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgical Status</td>
<td>p(81)=-0.4172 P&lt;0.0001</td>
<td>p(81)=-0.3483 P=0.0013</td>
<td>p(81)=0.4137 P&lt;0.0001</td>
<td>p(81)=0.6810 P&lt;0.0001</td>
<td>p(81)=0.5385 P&lt;0.0001</td>
<td>p(81)=0.2305 P=0.0372</td>
</tr>
<tr>
<td>Age</td>
<td>p(81)=-0.1901 P=0.085</td>
<td>p(81)=-0.04029 P=0.716</td>
<td>p(81)=0.04478 P=0.6877</td>
<td>p(81)=0.01464 P=0.8955</td>
<td>p(81)=0.03706 P=0.0006</td>
<td>p(81)=0.1571 P=0.1586</td>
</tr>
<tr>
<td>Time after bariatric surgery (months)</td>
<td>p(81)=0.3251 P=0.0027</td>
<td>p(81)=0.2601 P=0.0176</td>
<td>p(81)=0.3023 P=0.0055</td>
<td>p(81)=0.2922 P=0.0074</td>
<td>p(81)=0.1531 P=0.1670</td>
<td>p(81)=0.2611 P=0.0178</td>
</tr>
<tr>
<td>Xiphisternum to umbilicus</td>
<td>p(81)=0.2242 P=0.0416</td>
<td>p(81)=0.2518 P=0.0216</td>
<td>p(81)=0.2561 P=0.0194</td>
<td>p(81)=0.4901 P&lt;0.0001</td>
<td>p(81)=0.1709 P&lt;0.0001</td>
<td>p(81)=0.1709 P=0.1247</td>
</tr>
<tr>
<td>Xiphisternum to pannus</td>
<td>p(80)=0.3136 P=0.013</td>
<td>p(80)=0.3475 P=0.0057</td>
<td>p(80)=0.2425 P=0.0575</td>
<td>p(80)=0.4729 P=0.0001</td>
<td>p(80)=0.5129 P&lt;0.0001</td>
<td>p(80)=0.1173 P=0.3679</td>
</tr>
<tr>
<td>Xiphisternum to pubic symphysis</td>
<td>P(80)=0.3511 P=0.001</td>
<td>P(80)=0.3642 P=0.0007</td>
<td>P(80)=0.3220 P=0.0030</td>
<td>P(80)=0.6207 P&lt;0.0001</td>
<td>P(80)=0.5706 P&lt;0.0001</td>
<td>P(80)=0.1447 P=0.1946</td>
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<tr>
<td>Arm Circumference</td>
<td>P(81)=0.4121 p=0.0001</td>
<td>P(81)=0.44028 p=0.0002</td>
<td>P(81)=0.3470 p=0.0013</td>
<td>P(81)=0.4625 P&lt;0.0001</td>
<td>P(81)=0.3867 P&lt;0.0003</td>
<td>P(81)=0.2616 p=0.0176</td>
</tr>
<tr>
<td>Waist Circumference</td>
<td>P(81)=0.3061 p=0.0049</td>
<td>P(81)=0.3116 P=0.0041</td>
<td>P(81)=0.3703 p=0.0006</td>
<td>P(81)=0.6181 P&lt;0.0001</td>
<td>P(81)=0.6585 P&lt;0.0001</td>
<td>P(81)=0.1387 p=0.2141</td>
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<tr>
<td>Hip Circumference</td>
<td>P(81)=0.3693 p=0.0006</td>
<td>P(81)=0.3550 p=0.001</td>
<td>P(81)=0.3675 p=0.0006</td>
<td>P(81)=0.6694 P&lt;0.0001</td>
<td>P(81)=0.5908 P&lt;0.0001</td>
<td>P(81)=0.1981 p=0.074</td>
</tr>
<tr>
<td>Exercise Status</td>
<td>p(81)=-0.2698 p=0.0136</td>
<td>p(81)=-0.3596 p=0.0008</td>
<td>p(81)=-0.3054 P=0.0050</td>
<td>p(81)=0.4863 P&lt;0.0001</td>
<td>p(81)=0.5167 P&lt;0.0001</td>
<td>p(81)=0.1984 P=0.0740</td>
</tr>
<tr>
<td>History of abuse</td>
<td>0.3671 P=0.0006</td>
<td>0.1608 p=0.1465</td>
<td>0.07912 p=0.4771</td>
<td>-0.1258 p=0.2572</td>
<td>-0.04540 p=0.6836</td>
<td>-0.07869 p=0.4822</td>
</tr>
</tbody>
</table>
Further analysis was carried out to determine whether it was the time, percentage weight loss or surgical status which had the strongest correlation to healthy lifestyle choices. Spearman’s rank correlation was carried out comparing these three variables to area of concern, percentage of excess weight loss, BMI, exercise status, smoking, career status and anthropometric measurements. Table 5.7.

Table 5.7 Spearman’s rank correlation for demographic data and anthropometric measurements

<table>
<thead>
<tr>
<th></th>
<th>Area of Concern</th>
<th>% of xs wt loss</th>
<th>BMI</th>
<th>Exercise status</th>
<th>Smokind</th>
<th>Career Status</th>
<th>Arm Circ</th>
<th>Xiph-PS</th>
<th>Hip Circ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time after bariatric surgery months</td>
<td>-0.01217 p=0.913 1</td>
<td>-0.2615 p=0.017</td>
<td>0.208 p=0.058</td>
<td>0.00338 p=0.975 8</td>
<td>0.1277 p=0.250 1</td>
<td>-0.05415 p=0.626 8</td>
<td>0.2070 p=0.060 4</td>
<td>0.02148 p=0.847 2</td>
<td>0.1289 p=0.245 5</td>
</tr>
<tr>
<td>% excess wt loss</td>
<td>0.2508 p=0.022</td>
<td>-0.9501 p&lt;0.000 1</td>
<td>0.4813 p&lt;0.000 1</td>
<td>-0.1824 p&lt;0.000 9</td>
<td>0.3005 p&lt;0.000 8</td>
<td>-0.5793 p&lt;0.000 1</td>
<td>-0.6673 p&lt;0.000 1</td>
<td>-0.8114 p&lt;0.000 1</td>
<td></td>
</tr>
<tr>
<td>Surgical Status</td>
<td>-0.1840 p=0.095 8</td>
<td>0.7295 p&lt;0.000 1</td>
<td>-0.6685 p&lt;0.000 1</td>
<td>0.04714 p&lt;0.000 1</td>
<td>-0.3069 p&lt;0.000 8</td>
<td>0.5281 &lt;0.0001</td>
<td>-0.4875 p&lt;0.000 1</td>
<td>-0.7343 p&lt;0.000 1</td>
<td>-0.5818 p&lt;0.000 1</td>
</tr>
</tbody>
</table>

Analysis between post bariatric surgery patients and post plastic surgery patients
To look at the two post-surgical groups and make direct comparisons further analysis was carried out. The post bariatric group was compared to the post plastic surgery group with student t-tests and sorted by Levene’s tests to assess the equality of variances. Analysis revealed statistically significant differences in the percentage of excess weight loss (p = 0.000), BMI (p=0.000) and current weight (p= 0.002). There were no differences between the two groups for sex; age; height; ideal weight; previous weight; history of depression or history of abuse. Table 5.1. Comparison of patient report outcome measures between the two groups found statistically significant differences in SF36 PCS (p=0.0078), Derriford 24 (p=0.003) and BAROS (p= 0.000). There was no significant difference in the HADS score for both anxiety and depression between the two groups. The SF-36 demonstrated statistically significant changes between the two groups for physical function (PF); bodily pain (BP); general health (GH); vitality (VT) and overall physical health (PCS). There was no statistically
significant difference for the role-physical (RP); social functioning (SF); role emotional (RE) and mental health metrics (MCS).

Analysis of the Derriford score demonstrated changes which crossed the norm values for patients who have had body contouring procedures compared to the post bariatric group who had not (as indicated by the horizontal lines). Figure 5.6. There were statistically significant differences in patients who identified their area of concern as “abdomen”, “chest” and “limbs”

Figure 5.6: Bar chart of Derriford 24 scores post bariatric surgery and post plastic surgery

The Derriford score included two questions which did not contribute to the final score and these were reviewed separately. “My feature causes me physical pain/discomfort” was found to be statistically significantly different between the post bariatric and the post bariplastics group. An independent samples test, with t test for equality of means demonstrated $p=0.024$. In the last question of “My feature limits my physical ability to
do the things I want to do” there was a difference between the two groups with a p value of 0.050.

The BAROS also showed a statistically significant difference between patient groups, with the post bariatric patient population scoring a mean of 2.3 (range 0.5-4) and the post bariplastic surgery group scoring a mean of 5.28 (range 0.5-8.5). 2 tailed t test demonstrated a p value of 0.000. (Figure 5.7).

Figure 5.7: Psychometric outcomes for bariatric surgery patients
Discussion

Interpretation of results

Demographic data

The groups have the same baseline information, with no statistically significant differences. So although this was not a cohort study, we were able to identify that they were similar in starting weight, age, type of bariatric surgery.

There was a statistically significant difference in mean pack year history of smoking between pre bariatric surgery and pre plastic surgery patients, as seen in Table 5.1 with a reduction from a 30.93 pack year history to a 5.68 year pack year history F=3.793, p=0.013. Prior to plastic surgery patients are advised by their surgeons to quit smoking completely to minimise peri and post-operative complications in order to qualify for any procedures. This could be a key driver in encouraging patients to quit smoking and make health lifestyle choices. Unfortunately it was seen that the post plastic surgery patients had an increased smoking history, although this difference was not statistically significant.

Patients reported better career progression following bariatric surgery, with statistically significant incremental improvements in self-reported career scores when comparing patients from the pre bariatric and pre plastic surgery; pre bariatric and post plastic, post bariatric and pre plastic and post bariatric and post plastic groups. (Table 5.1) Interestingly there was no statistically significant difference between the pre bariatric and post bariatric surgery groups, which may indicate that bariatric surgery alone is not enough to lead to an improvement in career. The data suggests it is not time alone that leads to this change in career status, but the percentage weight loss and, even more positively, the surgical status. Patients in the pre plastic surgery group had been approved for plastic surgery and therefore, already knew that they would soon have their deformities corrected within a given time in the future. Further studies are required to identify if there is an improvement in QoL by knowing that surgery is imminent, and the effect of waiting list times. There were no statistically significant differences between the pre plastic surgery and post plastic surgery group.
Complications following plastic surgery

Nine patients experienced 18 complications. This constituted a 10.8% complication rate. Post-operative complications were categorized according to the modified Clavien classification\textsuperscript{164}. All cases were analysed for risk factors. Two patients had grade 3 Clavien complications: large haematomas following abdominoplasty that required surgical evacuation; one of these suffered a subsequent wound dehiscence. Both had been on warfarin and had lost over 100kg. The BMI at time of operation was 32 and 35. In the patients with wound dehiscence alone following panniculectomy: 1 required packing for 2 weeks, was a non-smoker and had lost 101.64kg. 1 patient required long term VAC dressings; had been on aspirin and clopidogrel; was still a diabetic and had lost 120kg, his BMI was 37. Despite the complications he was happy with the final result. Of the 8 patients with infection 4 were diabetic and 2 also had concomitant seroma formation. All patients were satisfied with the final results except the patient with dissatisfaction of her scar. She was due to have further review. All of these patients still had improvement in exercise, career progression and relationship status, as well as statistically significant improvements in their SF36, Derriford 24 and BAROS despite their complications.

There is a known increased risk of complications such as infection, wound dehiscence, thromboembolism and bleeding following body contouring procedures for massive weight loss\textsuperscript{165} and when performing concomitant procedures\textsuperscript{166}. However, appropriate patient selection with: a stable weight\textsuperscript{167}; BMI of 32 or less regardless of starting BMI\textsuperscript{157, 146} and comprehensive perioperative approach can help reduce morbidity and lead to improved satisfaction. Patients with a BMI greater than 35 should be limited to panniculectomy as there is a dramatic increase in complications in this population\textsuperscript{168}. Additional reasons cited for the rate of complications include nutritional deficiencies of post bariatric surgery patients\textsuperscript{169,145,170} and enlarged vessels subsequent to chronic increased adiposity\textsuperscript{171,172}.

Psychometric Scores

When comparing all four groups, the levels of anxiety (HADS A) improved between the pre bariatric and post bariatric, pre plastic and post plastic surgery groups. However, there was further improvement in physical functioning and general health (SF-36) and BAROS between the post bariatric and post plastic surgery groups. This may indicate
that there are additional physical benefits from the plastic surgery. These findings correlated with the anthropometric measurements and exercise status.

When comparing the post bariatric surgery and post plastic surgery patients there was no statistically significant difference in HADS scores for either the anxiety or depression arms of the score. Previous studies have shown that following bariatric surgery, patients’ mood and attitudes improve, despite no tangible weight loss\(^{173}\). However, the Swedish Obese Subjects study reported a decrease in depressive symptoms after weight loss of more than 25% of initial weight\(^{174}\) as did Dixon et al\(^{175}\). A further study demonstrated no changes in anxiety scores in patients after bariatric surgery, and it was felt that there was low anxiety level in their sample\(^{176}\).

This study shows that the SF-36 parameters for physical function, bodily pain, general health, vitality and overall physical health are significantly better in the plastic surgery patients than in those patients who only had bariatric surgery. Previous studies have shown that physical dimensions of the SF-36 improve after bariatric surgery\(^{54}\) and other studies have demonstrated that body image and QoL improves following abdominoplasty in non-bariatric\(^{177}\) and bariatric patients\(^{98}\). However, our results demonstrate a greater change in physical health and functional outcome over psychological outcome for the patients who had received body contouring post bariatric surgery. This study gives preliminary data to show that there is a functional improvement following plastic surgery in the bariatric population which subsequently leads to more active lifestyles, and improved self-confidence and career progression.

The statistically significant difference in Derriford scores between the post-bariatric surgery patients and the post MWLBC patient group demonstrates that patients who experience rapid weight loss with bariatric surgery do suffer psychological sequelae from their body image. The significant improvement in Derriford scores following reconstructive procedures highlights the potential value of plastic surgery for these patients.

The statistically significant difference in BAROS scores between the post bariatric surgery and post MWLBC surgery group demonstrate that patients who have had bariatric surgery continue to gain benefit with plastic surgery, using a score that is validated for bariatric patients. Previous studies using the BAROS have shown that the
majority of morbidly obese patients show psychological and interpersonal improvement after surgical weight loss\textsuperscript{178}. This study shows that this improvement is augmented following plastic reconstruction.

**Fulfilment of Scottish Adult Exceptional Aesthetic Referral Criteria for plastic surgery**

All except 7 of the patients fulfilled the Scottish Adult Exceptional Aesthetic Referral Protocol (AEARP)\textsuperscript{36}. Of the 7 patients, 3 of had BMIs over 27 and were approved for interim panniculectomies to enable mobility. 4 patients had more than 2 procedures.

**Strength and weakness**

Limitations of the study include the fact that nonspecific prosms were used\textsuperscript{126} and that patients were not followed up in cohort. Recruitment of patients to the study was subject to self-selection bias. Patients were recruited from the bariatric surgery seminars following a presentation where they informed of what the study was for and what would be involved. Those patients who came forward may have already been interested in massive weight loss body contouring, although no promise of plastic surgery treatment was made. Self-reported data is not always accurate. E.g. physical activity (PA) behaviour is often over-reported – The Health Survey for England (2008/9) found that self-reported PA was over estimated when compared to accelerometer assessed PA in the same sample.

In addition, 16 patients were lost to follow up. If all of them had been unhappy with the results, this may have made the results less significant. This study is a cross sectional study, and although the patients were all recruited from the same pre bariatric surgery support group in the same service area in Scotland, and followed up prospectively, they were reviewed at different times of their weight loss journey. It would be interesting to see how these results would compare with a prospective cohort study. Initial analysis was carried out to show that they shared similar demographic baseline information, however they were still not the same people before and after their procedures which would make direct comparison difficult.

Patients who seek plastic surgery following massive weight loss self-select and therefore would not necessarily represent all of the massive weight loss patients. A previous study of patients in the same geographical region has shown that 73\% of patients seek body contouring following bariatric surgery\textsuperscript{179}.
Conclusion
This study shows that following massive weight loss, body contouring procedures are associated with functional improvement, and improvement in career progression, exercise activity and smoking cessation. We believe these early findings indicate an emerging trend that reconstructive surgery following massive weight loss could be seen more as a functional procedure than an aesthetic one. A large prospective cohort study is warranted.
**Study 2: Longitudinal cohort study of psychological outcomes following massive weight loss body contouring procedures**

**Aims**
This exploratory study was carried out to investigate if anthropometric measurements and psychological scores could shed any light on the complex process of MWL body contouring patient selection.

**Methods**
We performed a prospective cohort observational study of outcomes in patients undergoing bariatric and plastic surgery procedures at 2 clinical sites in Scotland, UK. Regional Ethical Committee approval was obtained for the study protocol. Written informed consent was obtained from all subjects.

**Participants**
Twenty-five post bariatric surgery patients over the age of 18 who were due to have body contouring procedures were recruited from the bariatric services in Edinburgh. There was staggered entry between 2010 and 2012. Patients with a previous history of gluteal implants, abdominoplasty and body contouring procedures were excluded.

**Study protocol**
As per chapter 2

Patients were followed up in clinic and completed questionnaires with a CRF accredited Clinical Research Nurse (CRN) who followed a standard operating procedure. Height was measured using a stadiometer with a sliding head plate. Participants were asked to remove shoes. One measurement was taken to the nearest millimetre, with the participant stretching to the maximum height and the head positioned in the Frankfort plane. Weight was measured using the same scales in the outpatient department on each visit. The same clinical practitioner took surface linear anthropometric measurements including arm circumferences; apex of axilla to lateral folds; suprasternal notch to left and right nipples; nipple to inferior mammary folds, suprasternal notch to umbilicus, pannus and pubic symphysis; umbilicus to pannus and pubic symphysis and waist and hip circumferences.

Qualitative interviews were carried out by the same plastic surgery registrar who has experience of psychotherapy and effective interview techniques (Appendix 14).
Transcripts were analysed by the same researcher, with an emergent methodology approach to data analysis and points given for outcomes on each health, social and QoL metric.

**Results**

4 patients were lost to follow up. A cohort of 21 patients was followed from pre plastic surgery through to following their plastic surgery procedure. M=8, F = 13. Age 50.9 (38-67). They were followed up at a mean of 17.8months (6-33) post bariatric surgery and 6.9 months post plastic surgery. The most common operation carried out was the interim abdominoplasty (6/21), to remove a prohibitively large pannus. Following this fleur de lyse abdominoplasty and liposuction to flanks (5/21), then lower body lift (4/21), reduction mastopexy (3/21), neck reduction and brachioplasty (2/12) and finally fleur de lys abdominoplasty with no liposuction (1/21). Most of the patients had undergone a laparoscopic gastric band or bypass. Figure 5.8.

Figure 5.8: Bar chart of bariatric surgery procedures carried out

All patients lost weight from the start of their weight loss journey. The mean original weight was 180kg (123-2-261.86) with a BMI 61.1 kg/m². This was reflected in their body mass indices. Table 5.8. 14 patients continued to lose weight, mean 19.4 (1.9-81kg). This resulted in a mean of 73.66 (33.4-97.6) percentage of total excess weight lost.
Patients were asked the frequency and duration of exercise. Each item was given a score and marked appropriately. Table 5.8. Post bariatric surgery patients carried scored a mean of 4.43 (0-12), whereas after plastic surgery the same patients scored a mean of 8.9 (0-20) for frequency and duration of exercise. Patients who had plastic surgery following bariatric surgery did double the amount of exercise in terms of duration and frequency, than patients who had lost weight post bariatric surgery alone. Outcomes were analysed with a student’s T test and were found to be statistically significant. Data was collected on consumption of caffeinated drinks and smoking. Patients reported a decrease in both following reconstructive surgery. Prior to plastic surgery, patients were drinking a mean of 4.24 cups of caffeinated drinks a day, which dropped to 2.79 following plastic surgery. Smoking decreased from a mean of 6.7 cigarettes per day to 0.95. Both results were statistically significant on analysis with student’s t test.
### Table 5.8

<table>
<thead>
<tr>
<th>N=21</th>
<th>Post bariatric surgery</th>
<th>Post plastic surgery</th>
<th>2 Tailed T Test</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Weight (kg)</td>
<td>110.7 (43-156)</td>
<td>101.1 (73-140.6)</td>
<td>0.037</td>
<td></td>
</tr>
<tr>
<td>Mean BMI (kg/m²)</td>
<td>37.7 (17.2-62.0)</td>
<td>34.4 (25.9-53.1)</td>
<td>0.072</td>
<td></td>
</tr>
<tr>
<td>Weight loss (kg)</td>
<td>69.23 (12.8-160.36)</td>
<td>78.94 (34-158.76)</td>
<td>0.051</td>
<td></td>
</tr>
<tr>
<td>% of excess weight loss</td>
<td>63.08 (12.57-92.16)</td>
<td>73.66 (33.4-97.59)</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td>Exercise Status</td>
<td>4.43 (0-12)</td>
<td>8.9 (0-20)</td>
<td>0.000099</td>
<td></td>
</tr>
<tr>
<td>Mean number of cigarettes per day (range)</td>
<td>6.71 (0-20)</td>
<td>0.95 (0-10)</td>
<td>0.0028</td>
<td></td>
</tr>
<tr>
<td>Mean caffeinated drinks (range)</td>
<td>4.24 (0-11)</td>
<td>2.79 (0-6)</td>
<td>0.0122</td>
<td></td>
</tr>
<tr>
<td>Self-reported career progression in last 12 months</td>
<td>2</td>
<td>18</td>
<td>0.00083</td>
<td></td>
</tr>
<tr>
<td>HADS A</td>
<td>10.36 (3-18)</td>
<td>5.14 (2-12)</td>
<td>0.000283</td>
<td></td>
</tr>
<tr>
<td>HADS D</td>
<td>8.05 (2-17)</td>
<td>5.5 (0-16)</td>
<td>0.085222</td>
<td></td>
</tr>
<tr>
<td>BAROS</td>
<td>1.78 (-2.5-7.3)</td>
<td>4.23 (-0.5-9)</td>
<td>0.006003</td>
<td></td>
</tr>
<tr>
<td>SF 36 PCS</td>
<td>40.81 (21.4-56)</td>
<td>49.48 (33.5-78.9)</td>
<td>0.016779</td>
<td></td>
</tr>
<tr>
<td>SF 36 MCS</td>
<td>46.53 (28.6-57.9)</td>
<td>49.33 (20.3-62.1)</td>
<td>0.445205</td>
<td></td>
</tr>
<tr>
<td>Derriford 24</td>
<td>68.1 (50-80)</td>
<td>47.32 (21-75)</td>
<td>0.0000006</td>
<td></td>
</tr>
<tr>
<td>DAS 24 Physical Pain from feature</td>
<td>2.727273</td>
<td>1.545455</td>
<td>0.000572</td>
<td></td>
</tr>
<tr>
<td>DAS 24 Feature Limited physical ability</td>
<td>2.5</td>
<td>2.090909</td>
<td>0.185789</td>
<td></td>
</tr>
</tbody>
</table>

Patients were asked whether they had experienced any career progression in terms of financial remuneration (above the level of inflation) or responsibility. They were given a score of 1 if they had achieved one item and 2 if they had achieved both. Following plastic surgery, 12 patients reported career progression, with a total score of 18. This included 2 patients reporting an improvement in responsibility and 2 patients setting up their own companies (florist and childcare).
On the EDQ, respondents were asked to choose the 2 areas they would like addressed most. Of the respondents who had plastic surgery went on to focus on another part of their body following their body contouring procedures, with only 2 patients feeling that they were satisfied with their body image. Initial areas of concern prior to plastic surgery, then changed when patients were asked after their body contouring procedure. Figure 5.9.

Figure 5.9: Histogram of areas of concern in MWL patients

<table>
<thead>
<tr>
<th>Area 1</th>
<th>Area 2</th>
<th>Area 1</th>
<th>Area 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre plastic surgery:</td>
<td>Post plastic surgery:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abdomen</td>
<td>Arms</td>
<td>Breasts</td>
<td>Buttocks</td>
</tr>
<tr>
<td>8</td>
<td>6</td>
<td>5</td>
<td>4</td>
</tr>
</tbody>
</table>

Psychometric scores were evaluated. As part of the Derriford, patients were asked whether their physical feature causes pain and limits their ability to do the things they want to do. There was a statistically significant (p = 0.00057) improvement in pain following plastic surgery but no improvement in physical ability. Table 5.8. Of the responses, the BAROS, Derriford, HADS A and HADS D crossed normal value thresholds (horizontal lines). Figure 5.10 and 5.11. The changes were statistically significant for BAROS, SF-36 –PCS (overall physical health), Derriford, HADS A and HADS D. There was no statistically significantly difference for the mental health outcomes (MCS). Table 5.8.
Following plastic surgery 7 patients gained weight, (Table 5.9) with a mean of 9.82kg weight gain (1.25-41kg). These patients were reviewed more closely and it was found that their exercise status, cigarette smoking and consumption of caffeinated drinks did
not improve by a statistically significant amount. It was also seen that their HADS A, HADS S, BAROS and SF-36 PCS deteriorated, and this was found to be statistically significant. As expected there was no improvement in anthropometric measurements.

4 patients experienced 7 complications following plastic surgery: localised infection (1) wound dehiscence (2), seroma formation (4). Of those patients 1 was an active smoker, 3 were recent ex-smokers.

Table 5.9. Table of complications

<table>
<thead>
<tr>
<th>N=7</th>
<th>Pre plastic surgery</th>
<th>Post plastic surgery</th>
<th>2 tailed T test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Weight (kg)</td>
<td>95.29(43-123.8)</td>
<td>105.11(83.8-130)</td>
<td>0.028</td>
</tr>
<tr>
<td>Mean BMI (kg/m²)</td>
<td>31.89 (17-39.52)</td>
<td>35.53(30.45-41.50)</td>
<td>0.034</td>
</tr>
<tr>
<td>Weight gain (kg)</td>
<td>9.82 (1.25-41)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of excess weight lost</td>
<td>81.61(63.84 - 128.05)</td>
<td>69.13 (58.91-89.12)</td>
<td>0.049</td>
</tr>
<tr>
<td>Exercise Status</td>
<td>3.71 (0-10)</td>
<td>4.88(0-12)</td>
<td>0.24</td>
</tr>
<tr>
<td>Cigarettes per day</td>
<td>2.86(0-10)</td>
<td>1.43(0-10)</td>
<td>0.17</td>
</tr>
<tr>
<td>Caffeinated drinks</td>
<td>2.57(0-6)</td>
<td>2.29(0-6)</td>
<td>0.73</td>
</tr>
<tr>
<td>HADS A</td>
<td>4.14(2-6)</td>
<td>8.86(4-12)</td>
<td>0.003</td>
</tr>
<tr>
<td>HADS D</td>
<td>3.14(1-5)</td>
<td>9.86 (5-16)</td>
<td>0.0059</td>
</tr>
<tr>
<td>BAROS</td>
<td>2.76 (1-8)</td>
<td>0.64 (-0.5-5)</td>
<td>0.0018</td>
</tr>
<tr>
<td>SF36-PCS</td>
<td>50.59(47.5-56)</td>
<td>40.2(33.5-49.2)</td>
<td>0.000128</td>
</tr>
<tr>
<td>SF36-MCS</td>
<td>48.16(44.2-57.9)</td>
<td>45.36(31.7-56.3)</td>
<td>0.46</td>
</tr>
<tr>
<td>Derriford 24</td>
<td>44.14(29-56)</td>
<td>49.86(21-75)</td>
<td>0.26</td>
</tr>
<tr>
<td>SN - Umbo</td>
<td>48.86(42-58)</td>
<td>51.71(35-60)</td>
<td>0.57</td>
</tr>
<tr>
<td>SN-PS</td>
<td>71.57 (57-83)</td>
<td>70(52-86)</td>
<td>0.51</td>
</tr>
<tr>
<td>SN-Pannus</td>
<td>61.57(54-67)</td>
<td>59.83(42-72)</td>
<td>0.77</td>
</tr>
<tr>
<td>Waist Circumference</td>
<td>114.14(107-129)</td>
<td>116.14(110-126)</td>
<td>0.64</td>
</tr>
<tr>
<td>Hip Circumference</td>
<td>126.29(115-142)</td>
<td>127.57(110-150)</td>
<td>0.60</td>
</tr>
</tbody>
</table>
Discussion
The demographics of this cohort are consistent with patient groups studied elsewhere\(^\text{180}\). However, in this study, validated psychometric scores were used in addition to constructed interviews which enabled triangulation of qualitative and quantitative data. Similar to Klassen\(^\text{181}\), our study also demonstrated that patients described a range of important health, function and QoL benefits from body contouring procedures. The removal of excess skin led to improvements in a patient’s appearance and enhanced physical, psychological and social health and well-being.

However, we found that following interim procedures 7 patients gained mean weight 9.82kg (1.25-41kg) relative to their pre plastic surgery weight. One patient of this group had had a breast reduction and gained 1.6kg. 6 of these patients had undergone an interim abdominoplasty and were still suffering from psychological morbidity due to their weight and appearance. These patients were still obese (BMI 35.53kg/m\(^2\)). Their mean weight gain was 11.19kg (1.25-41kg). These patients had plateaued in their weight loss due to prohibitively large abdominal aprons that has left them unable to walk comfortably. Following their plastic surgery procedures they were exercising marginally more (score 3.71-4.88) but this was not found to be significant, and they were still yielding to unhealthy lifestyle choices such as smoking. Residual psychological morbidity is understandable and perhaps they should be reviewed again after body contouring following achieving their target weight.

However, for the patients who had reached their target weight and undergone plastic surgery, there was an improvement in exercise quality and frequency, smoking cessation and career progression following their plastic surgery procedure. Given improved exercise\(^\text{182}\), and smoking cessation is cost effective\(^\text{183,184,185,186}\) this could be early evidence by proxy that post MWL body contouring could be cost effective in a socially funded health care, where limited funds need to be allocated on the best possible evidence. In Scotland two body contouring procedures are offered if the following inclusion criteria are met\(^\text{36}\):

- Severe, intractable intertrigo beneath the skin fold and massive weight loss (BMIs\(\leq\)27).
• Significant weight loss following treatment for morbid obesity resulting in functional problems (BMI<27).
• Lipodystrophy
• Adjunct to reconstructive procedures

Therefore, patients were asked to highlight the two that they would most want addressed. Initial areas of concern mainly focused on the abdomen and general contour, however following simple abdominoplasty, contouring prevailed as the area of most concern, followed by breast and buttocks and hips. Previous studies have highlighted the complex reconstruction and aesthetic needs of MWL patients. Lipodystrophy provides a reconstructive option for the MWL patients, but alone, does not manage the aesthetic or contour needs. Post bariatric contouring is not a single procedure carried out in isolation; the patient’s contours and specific needs should be addressed as part of their operative plan.

Following MWL reconstructive surgery there was in improvement in physical pain from their “feature” following their procedure, and statistically significantly better outcomes in psychometric scores: HADS Anxiety and Depression, BAROS, SF-36 (overall physical health) and Derriford.

There was a statistically significant difference in HADS scores for the anxiety and depression arms of the score after the patients has lost weight through bariatric surgery alone and following their MWLBC procedure. Previous studies have shown that following bariatric surgery, patients’ mood and attitudes improve, despite no tangible weight loss. This could account for the general improvement in HADS score despite one third of the patients gaining weight following their plastic surgery. However, the Swedish Obese Subjects study reported a decrease in depressive symptoms after weight loss of more than 25% of initial weight. A further study demonstrated no changes in anxiety scores in patients after bariatric surgery, and it was felt that there was low anxiety level in their sample. Our previous study demonstrated no improvement in the anxiety or depression arm of the HADS scale, in a larger population. The HADs score is a reliable instrument for detecting states of depression and anxiety in the setting of a hospital medical outpatient clinic, but is not a validated tool in the bariatric population.
The statistically significant BAROS scores between the post bariatric surgery and post MWLBC surgery group demonstrate that patients who have had bariatric surgery continue to gain benefit with plastic surgery, using a score that is validated for bariatric patients. Previous studies on QoL in morbidly obese patients after surgical weight loss have demonstrated that using the BAROS, a majority of morbidly obese patients show psychological and interpersonal improvement after surgical weight loss\(^{178}\). Construct validity between the BAROS and the SF-36 were demonstrated to correlate significantly for seven of the eight SF-36 scales. The ‘physical functioning’ concept was the only scale of the SF-36 that failed to correlate significantly.\(^ {28}\) The construct validity between BAROS and SF-36 was confirmed in our study which demonstrated significant improvements in both SF-36 and BAROS between the post bariatric surgery and post plastic surgery populations.

This cohort study further corroborates our initial paper on a cross sectional population demonstrating that the SF-36 parameters for physical function, bodily pain, general health, vitality and overall physical health are significantly better in the MWLBC patients than in those patients who only had bariatric surgery. Previous studies have shown that physical dimensions of the SF-36 improve after bariatric surgery\(^ {49}\) and other studies have demonstrated that body image and QoL improves following abdominoplasty in non-bariatric\(^{177}\) and bariatric patients\(^ {98}\). However, our results demonstrate a greater change in physical health and functional outcome over psychological outcome in the SF-36 for the patients who had received body contouring post bariatric surgery. This study, gives further data to show that there is a functional improvement following plastic surgery in the bariatric population.

The statistically significantly different Derriford scores between the post bariatric surgery patients and the post MWLBC patient group demonstrate that patients who experience rapid weight loss with bariatric surgery do suffer psychological sequelae from their body image. These elements compound the inherent psychosocial issues related to MWL and this can be addressed by reconstructive surgery. The significant improvement in Derriford scores following reconstructive procedures highlights the potential value of plastic surgery for these patients. Therefore the needs of the bariatric patient should be considered in the context of full functional, clinical and
psychological assessment. It is therefore essential to develop a system in which patients are assessed for suitability of reconstructive and body contouring surgery.

4 patients experienced 7 complications following plastic surgery: localised infection (1), wound dehiscence (2), seroma formation (4). Of those patients 1 was an active smoker, 3 were recent ex-smokers. Studies have been carried out to demonstrate that there is an increased risk of complications such as infection, wound dehiscence, thromboembolism and bleeding following body contouring procedures for MWL. Other studies have shown that the longer operation times are associated with increased rates of surgical complications with concomitant procedures. However, appropriate patient selection with someone of a stable weight, BMI of 32 or less regardless of starting BMI and comprehensive perioperative approach can help reduce morbidity and lead to improved satisfaction. Patients with a BMI greater than 35 should be limited to panniculectomy as there is a dramatic increase in complications in this population. Additional reasons cited for the rate of complications include nutritional deficiencies of post bariatric surgery patients and enlarged vessels subsequent to chronic increased adiposity.

This study has provided early evidence to demonstrate that MWL body contouring is associated with physical, functional and psychosocial benefits and is not only of aesthetic value. Given the complications patients can experience following body contouring procedures, and the possible need for multiple procedures, consideration of staging and consent, and careful patient selection is vital to ensure the best clinical outcomes.

We had previously shown that in a cross sectional group of post bariatric surgery patients, there an improvement in psychological and functional outcomes following body contouring. This study confirms this outcome in a single cohort of patients observed over a 2 year period during their weight loss programme.
Limitations
This cohort was made up of 21 patients, with an original enrolment of 25 patients. Missing information from those 4 patients lost to follow up could have resulted in data that was not as statistically significant. The follow up period was only 6.9 months following plastic surgery, which does not give information on long term QoL improvements following body contouring surgery. Other authors, however, have demonstrated that 7 years after MWL body contouring, the improvement seen in their Obesity Psychosocial State Questionnaire was sustained, if, albeit with a small deterioration in comparison to their 4 years post review. Except for the BAROS, the psychometric scores used were not specific to the bariatric population. Further work is warranted, with the development of a psychometrically sound patient reported outcome instrument for the massive weight loss body contouring patient.

Self-reported career progression is not entirely reliable. Most patients will always achieve some degree of career progression and/or financial reward over time with inflation. As the numbers were small, this study did not control for confounding variables or inflation. Further work is warranted with control for the typical progression over the same period of time.

Conclusion
Massive weight loss body contouring is not only of aesthetic value but leads to real benefits in health and mental wellbeing. Patient who had MWLBC were more likely to maintain weight loss with the associated health benefits, stop smoking and increase exercise. They also had an improvement in both in their family and professional lives. Given the complications patients can experience following body contouring procedures, and the possible need for multiple procedures, consideration of staging and consent, and careful patient selection is vital to ensure the best clinical outcomes.
Chapter 6: Does the degree of ptosis predict the degree of psychological morbidity in bariatric patients undergoing reconstruction?

**Introduction**
There is proven therapeutic benefit in bariatric surgery for obese patients\(^{190}\). Consequently the National Institute of Clinical Excellence, UK\(^{191}\) determined patients with a body mass index (BMI) of over 40kg/m\(^2\), or of over 35kg/m\(^2\) with associated health conditions should be referred for bariatric surgery. This massive weight loss can result in ptotic skin, causing significant functional and psychological problems\(^{34,192}\). As bariatric surgery increases so will the demand for plastic surgery\(^{193}\). Currently there is no evidence based indication for massive weight loss body contouring and therefore there is no standardized provision\(^{37}\): Some surgeons carry out interim panniculectomy after massive weight loss to enable exercise and aid progression of weight loss\(^{41}\) and others receive no funding or support for completion of treatment in these patients. However, restriction on the availability of surgery to rectify excess skin is an impediment to weight loss\(^{41}\).

Studies have shown that there is improvement in mental health and psychological functioning following bariatric surgery\(^{194}\), and our recent research has demonstrated that this improvement is further augmented following body contouring to rectify deformity from ptosis\(^4\). What is not known is whether the degree of ptosis can be determined by the type of bariatric surgery and if the extent of disfigurement has an impact on psychological morbidity.

**Aims**
Identify if there is a correlation between type of bariatric surgery, anthropometric measurements and psychological morbidity in patients who have undergone bariatric surgery.

**Methods**
We performed a prospective cross sectional multicentre, observational study of outcomes in patients undergoing bariatric and plastic surgery procedures at 2 clinical sites in Scotland, UK. Regional Ethical Committee approval was obtained for the study protocol. Written informed consent was obtained from all subjects. Seventy five
patients over the age of 18, who had undergone or were undergoing bariatric surgery, were recruited from the regional bariatric service, with staggered entry between 2010 and 2012. Patients with a previous history of gluteal implants, abdominoplasty and body contouring procedures were excluded.

The following patient report outcome measures (PROMs) were used:

1. Eating Disorders Questionnaire (EDQ)\textsuperscript{50,195}
2. Derriford Appearance Scale (DAS-24)\textsuperscript{52}
3. Hospital Anxiety and Depression Score\textsuperscript{53,54,55}
4. Short Form-36\textsuperscript{56,57,58,59,61,61}
5. Bariatric Analysis and Reporting Outcome System (BAROS)\textsuperscript{62,63,64,65,66}

Patients were followed up in clinic and completed questionnaires with a Wellcome Trust Clinical Research Facility (CRF) accredited Clinical Research Nurse (CRN) who followed a standard operating procedure. Height and weight was measured. The same clinical practitioner took surface linear anthropometric measurements including arm circumferences; apex of axilla to lateral folds; suprasternal notch to left and right nipples; nipple to inferior mammary folds, suprasternal notch to umbilicus, pannus to pubic symphysis; umbilicus to pannus and pubic symphysis and waist and hip circumferences. A standard operational protocol was followed in taking anthropometric measurements to ensure inter-subject consistency. (Appendix 15).

**Results**

Data was analyzed with IBM SPSS V.19 statistical package, at Dundee University. 75 patients were recruited. 7 were lost to follow up. 68 patients were reviewed in clinic and underwent the above protocol. 24 were male and 44 were female.

The patients were divided up into 2 groups: bariatric surgery alone or bariatric surgery and reconstructive surgery and were a mean of 19.64 and 38.71 months post bariatric surgery, respectively. Mean time post plastic surgery was 14.3 months (range 3-45) (table 6.1). Two sample t-Test demonstrated no statistically significant differences in patients’ height, current weight, weight loss or percentage weight loss (table 6.1).
Table 6.1: Demographics

<table>
<thead>
<tr>
<th></th>
<th>Post Bariatric Surgery</th>
<th>Post Plastic Surgery</th>
<th>Two sample t-Test assuming unequal variances</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>48</td>
<td>20</td>
<td>-</td>
</tr>
<tr>
<td>Sex</td>
<td>M = 17 F = 31</td>
<td>M= 7, F=13</td>
<td>-</td>
</tr>
<tr>
<td>Mean time post bariatric surgery (months)</td>
<td>19.64 (range 1-54)</td>
<td>38.71 (range 12-93)</td>
<td>-</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>W= 45 I=3</td>
<td>W=20</td>
<td>-</td>
</tr>
<tr>
<td>Mean Age</td>
<td>49.39 (range 28-67)</td>
<td>48.02 (24-68)</td>
<td>0.64</td>
</tr>
<tr>
<td>Mean height (cm)</td>
<td>167.77 (138-185)</td>
<td>169.165 (150.0-183.49)</td>
<td>0.04</td>
</tr>
<tr>
<td>Mean current weight (kg)</td>
<td>102.75 (59.9-159)</td>
<td>90.54 (56.67-142)</td>
<td>0.07</td>
</tr>
<tr>
<td>Mean BMI (kg/m2)</td>
<td>36.7 (22.55-54.57)</td>
<td>31.4 (20.44-49.7)</td>
<td>0.01</td>
</tr>
<tr>
<td>Mean previous weight (kg)</td>
<td>161.10 (87.1-233.2)</td>
<td>171.78 (114.3-261.86)</td>
<td>0.27</td>
</tr>
<tr>
<td>Mean weight lost (kg)</td>
<td>58.34 (7.4-155.2)</td>
<td>81.19 (37.85-160.36)</td>
<td>0.004</td>
</tr>
<tr>
<td>Mean ideal weight (kg)</td>
<td>70.20 (47.619-85.56)</td>
<td>70.52 (56.25-83.72)</td>
<td>0.836</td>
</tr>
<tr>
<td>Mean percentage of excess weight lost</td>
<td>63.6 (8.6-100)</td>
<td>82.06(36-100)</td>
<td>0.0005</td>
</tr>
<tr>
<td>Mean cigarettes per day</td>
<td>7.5 (0-40)</td>
<td>3.79 (0-30)</td>
<td>0.25</td>
</tr>
<tr>
<td>Mean pack year history</td>
<td>17.731(0-60)</td>
<td>17.59 (0-80)</td>
<td>0.81</td>
</tr>
<tr>
<td>Mean Exercise Score</td>
<td>6.77</td>
<td>12.33</td>
<td>-</td>
</tr>
<tr>
<td>Career progression</td>
<td>0.32</td>
<td>0.88</td>
<td>-</td>
</tr>
<tr>
<td>Physical pain from feature</td>
<td>1.35</td>
<td>0.80</td>
<td>0.049</td>
</tr>
<tr>
<td>Feature limits physical ability</td>
<td>1.667</td>
<td>1.05</td>
<td>0.038</td>
</tr>
</tbody>
</table>

There was variation between the two groups in the patients’ age, previous weight, ideal weight and smoking history. The plastic surgery procedures carried out included abdominoplasty, interim abdominoplasty, fleur de lys abdominoplasty, lower body lift, thigh lift, mastopexy, mammoplasty, brachioplasty and neck reduction. Figure 6.1.
Demographic data was collected from the Eating Disorder questionnaires and further triangulated by face to face interviews. Information on exercise frequency and data were collected and allocated scores. Age, height, weight, BMI, weight lost, percentage of excess weight lost, complications, pain and limitation in function due to their feature (as defined in by the Derriford 24 score), smoking, exercise and career history were documented. Nine patients experienced complications. Mean age=51 (range 38-68). Mean weight loss 100.1kg (range 51.2kg – 199.58kg). There was statistically significant reduction in pain from the physical feature patients sought plastic surgery for; from 1.35 to 0.8 (p value 0.049). Following plastic surgery patients were also less likely to report a limitation in their physical ability to their feature (p value 0.038) (table 6.1).

Post plastic surgery patients smoked less by 50.5%, were 1.82 times more active and 2.75 times more likely to have reported career progression from either a professional or financial vantage point when compared to the control group of those who had reached their target weight but had not had reconstructive surgery.

They were further divided into two groups on whether they had undergone restrictive or malabsorptive bariatric surgery (table 6.2). Following bariatric surgery patients lost 60.7% (restrictive) and 66.5% (malabsorptive) of their excess weight. This increased to 88.22% (restrictive) and 75.89% (malabsorptive) following plastic surgery.
The restrictive group consisted of 26 patients who had undergone laparoscopic gastric band (14), or laparoscopic (10) or open gastric sleeves (2). The malabsorptive group was made up of 22 patients. All had a laparoscopic gastric bypass, except 2 who underwent an on-table conversion to open. The post plastic surgery group was subdivided in restrictive (12) and malabsorptive (8). Table 6.2. Lifestyle choices such as smoking, exercise and career as well as psychological outcomes can be seen in table 6.3 with keys in tables 6.4&6.5. There was a statistically significant improvement in psychological outcomes as reported through Derriford 24, BAROS, and HADS. This was not reflected in the SF-36. The best results were seen in the patients who had undergone body contouring procedures following restrictive bariatric surgery. This was consistent across all psychometric scores.

<table>
<thead>
<tr>
<th></th>
<th>Post Bariatric Surgery</th>
<th>Post plastic Surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Restrictive</td>
<td>Malabsorptive</td>
</tr>
<tr>
<td>n</td>
<td>26</td>
<td>22</td>
</tr>
<tr>
<td>Sex</td>
<td>M = 5, F = 21</td>
<td>M = 12, F = 10</td>
</tr>
<tr>
<td>Mean time post bariatric surgery (months)</td>
<td>21 (range 1-36)</td>
<td>18.27 (range 2-54)</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>W = 24, I = 2</td>
<td>W = 21, I = 1</td>
</tr>
<tr>
<td>Mean Age</td>
<td>49 (range 28 – 63)</td>
<td>49.77 (Range 29-67)</td>
</tr>
<tr>
<td>Mean height (cm)</td>
<td>166.1 (154.94-182.88)</td>
<td>169.44 (138-185)</td>
</tr>
<tr>
<td>Mean current weight (kg)</td>
<td>100.6 (59.9-145)</td>
<td>104.9 (61.2-159)</td>
</tr>
<tr>
<td>Mean BMI (kg/m²)</td>
<td>37.0 (22.55-54.57)</td>
<td>36.4 (23.43-54.36)</td>
</tr>
<tr>
<td>Mean previous weight (kg)</td>
<td>153.92 (87.1-204.1)</td>
<td>168.27 (110-233.2)</td>
</tr>
<tr>
<td>Mean weight lost (kg)</td>
<td>53.32 (7.4-126.8)</td>
<td>63.36 (28.7-155.2)</td>
</tr>
<tr>
<td>Mean ideal weight (kg)</td>
<td>68.83 (59.9-78.32)</td>
<td>71.56 (47.61-85.56)</td>
</tr>
<tr>
<td>Mean % of excess weight lost</td>
<td>60.7 (8.6-100)</td>
<td>66.5 (42-100)</td>
</tr>
</tbody>
</table>
Table 6.3: Healthy lifestyle choices and PROMS of subgroups

<table>
<thead>
<tr>
<th></th>
<th>Post Bariatric Surgery</th>
<th>Post Plastic Surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Restrictive</td>
<td>Malabsorptive</td>
</tr>
<tr>
<td>Mean cigarettes per day</td>
<td>8 (0-40)</td>
<td>7 (0-40)</td>
</tr>
<tr>
<td>Mean pack year history</td>
<td>17.31 (0-60)</td>
<td>18.15 (0-80)</td>
</tr>
<tr>
<td>Mean Exercise Score</td>
<td>6.72</td>
<td>6.82</td>
</tr>
<tr>
<td>Career progression</td>
<td>0.19</td>
<td>0.45</td>
</tr>
<tr>
<td>Derriford</td>
<td>58.76 (21-90),</td>
<td>56.27 (17-79)</td>
</tr>
<tr>
<td>BAROS</td>
<td>3.28 (-3.5-8),</td>
<td>2.65 (-1.5-8)</td>
</tr>
<tr>
<td>SF36 PCS</td>
<td>42.87 (19.2-59.6)</td>
<td>35.07 (12.2-59.8)</td>
</tr>
<tr>
<td>SF 36 MCS</td>
<td>45.72 (24.3-62.1)</td>
<td>47.10 (22.4-67.4)</td>
</tr>
<tr>
<td>HADS A</td>
<td>7.77 (1-18),</td>
<td>8.046 (1-17)</td>
</tr>
<tr>
<td>HADS D</td>
<td>5.5 (0-10),</td>
<td>7.27 (1-21)</td>
</tr>
</tbody>
</table>

Table 6.4: Key for BAROS, HADS and SF36

<table>
<thead>
<tr>
<th>BAROS</th>
<th>Failure</th>
<th>&lt;1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fair</td>
<td>1-3</td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>3-5</td>
</tr>
<tr>
<td></td>
<td>Very Good</td>
<td>5-7</td>
</tr>
<tr>
<td></td>
<td>Excellent</td>
<td>&gt;7</td>
</tr>
<tr>
<td>HADS</td>
<td>Normal</td>
<td>0 to 7</td>
</tr>
<tr>
<td></td>
<td>Suggestive</td>
<td>8 to 10</td>
</tr>
<tr>
<td></td>
<td>Caseness</td>
<td>11 or higher</td>
</tr>
<tr>
<td>SF36</td>
<td>Best possible result</td>
<td>PCS 57.9</td>
</tr>
<tr>
<td></td>
<td>MCS</td>
<td>62.1</td>
</tr>
<tr>
<td></td>
<td>Worst possible result</td>
<td>PCS 20.1</td>
</tr>
<tr>
<td></td>
<td>MCS</td>
<td>17.3</td>
</tr>
</tbody>
</table>
Table 6.5: Derriford values for abdomen. Highest scores reflect highest distress

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min</td>
<td>23</td>
<td>20</td>
</tr>
<tr>
<td>Q1</td>
<td>43</td>
<td>48</td>
</tr>
<tr>
<td>Median</td>
<td>57</td>
<td>60</td>
</tr>
<tr>
<td>Q3</td>
<td>68</td>
<td>72</td>
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<tr>
<td>Max</td>
<td>80</td>
<td>92</td>
</tr>
<tr>
<td>Mean</td>
<td>54.67</td>
<td>59.68</td>
</tr>
<tr>
<td>SD</td>
<td>15.95</td>
<td>16.37</td>
</tr>
</tbody>
</table>

Psychological outcomes can be seen in figures 6.2 and 6.3. A high score in SF36 and BAROS represents a good outcome, whereas high scores in Derriford 24 and HADS suggest “caseness” of depression or anxiety. There was a statistically significant improvement in psychological outcomes as reported through Derriford 24, BAROS, and HADS. This was not reflected in the SF-36. The best results were seen in the patients who had undergone body contouring procedures following restrictive bariatric surgery. This was consistent across all psychometric scores.

Figure 6.2 Histogram of Derriford 24 and SF36 PCS & MCS post bariatric and post plastic surgery in restrictive and malabsorptive sub groups
Figure 6.3 Histogram of HADS and BAROS post bariatric and post plastic surgery in restrictive and malabsorptive sub groups

This same group of patients (plastic surgery following restrictive bariatric surgery) demonstrated best outcomes in anthropometric measurements (table 6.6). This occurred despite this particular group of patients having lost the greatest amount of weight.

Table 6.6: Anthropometric measurements of subgroups

<table>
<thead>
<tr>
<th>Measure</th>
<th>Post Bariatric Surgery</th>
<th>Post plastic Surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Restrictive</td>
<td>Malabsorptive</td>
</tr>
<tr>
<td>Xiphisternum (xiph) – umbilicus (umbo) (cm)</td>
<td>45.35 (12-60)</td>
<td>50.95 (40-60)</td>
</tr>
<tr>
<td>Xiphisternum – pannus (cm)</td>
<td>63.6 (33-84)</td>
<td>66.00 (51-84)</td>
</tr>
<tr>
<td>Xiphisternum – pubic symphysis (PS) (cm)</td>
<td>75.58 (27-102)</td>
<td>80.36 (57-105)</td>
</tr>
<tr>
<td>Umbilicis to pubic symphysis (cm)</td>
<td>30.30769 (15-56)</td>
<td>29.5 (12-45)</td>
</tr>
<tr>
<td>Umbilicis to pannus (cm)</td>
<td>16.69231 (9-28)</td>
<td>15.23 (7-24)</td>
</tr>
<tr>
<td>Pannus to Pubic Symphisis (cm)</td>
<td>14 (4-48)</td>
<td>14.36 (4-34)</td>
</tr>
<tr>
<td>Waist Circumference (Circ) (cm)</td>
<td>111.04 (29-143)</td>
<td>116.05 (84-140)</td>
</tr>
<tr>
<td>Hip Circumference (Circ) (cm)</td>
<td>126.42 (95-164)</td>
<td>119.73 (11-155)</td>
</tr>
</tbody>
</table>
A spearman’s rank correlation coefficient was calculated comparing the PROMs to anthropometric measurements (table 6.7). Of all of them, the xiphisternum to pubic symphysis, umbilicus to pubic symphysis and hip circumference measurements were most closely correlated to psychometric outcomes, as highlighted in table 6.7.

Table 6.7: Spearman’s Rank Correlation of psychometric scores against anthropometric measurements

<table>
<thead>
<tr>
<th></th>
<th>Xiphi-Umbo</th>
<th>Xiphi-PS</th>
<th>Umbo-PS</th>
<th>Pannus-PS</th>
<th>Waist Circ</th>
<th>Hip Circ</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Derriford</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correlation Coefficient</td>
<td>.224**</td>
<td>.351**</td>
<td>.437**</td>
<td>.374**</td>
<td>.306</td>
<td>.369**</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.042</td>
<td>.001</td>
<td>.000</td>
<td>.001</td>
<td>.005</td>
<td>.001</td>
</tr>
<tr>
<td><strong>Baros</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correlation Coefficient</td>
<td>-.490**</td>
<td>-.621**</td>
<td>-.608**</td>
<td>-.520**</td>
<td>-.618**</td>
<td>-.669**</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td><strong>SF 36</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correlation Coefficient</td>
<td>-.219**</td>
<td>-.279**</td>
<td>-.316**</td>
<td>-.291**</td>
<td>-.249*</td>
<td>-.280**</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.047</td>
<td>.011</td>
<td>.004</td>
<td>.008</td>
<td>.023</td>
<td>.010</td>
</tr>
<tr>
<td><strong>HADS A</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correlation Coefficient</td>
<td>.252**</td>
<td>.364**</td>
<td>.413**</td>
<td>.311**</td>
<td>.312</td>
<td>.355**</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.022</td>
<td>.001</td>
<td>.000</td>
<td>.004</td>
<td>.004</td>
<td>.001</td>
</tr>
<tr>
<td><strong>HADS D</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correlation Coefficient</td>
<td>.256**</td>
<td>.322**</td>
<td>.326**</td>
<td>.290**</td>
<td>.370</td>
<td>.367**</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.019</td>
<td>.003</td>
<td>.003</td>
<td>.008</td>
<td>.001</td>
<td>.001</td>
</tr>
</tbody>
</table>

Of all of them, the xiphisternum to pubic symphysis, umbilicus to pubic symphysis and hip circumference measurements were most closely correlated to psychometric outcomes. An analysis of variance between the groups was carried out with the Derriford 24 as the dependent (table 6.8). Both the spearman’s rank correlation coefficient and the ANOVA demonstrated a statistically significant relationship between PROM and anthropometric measurement.
Table 6.8: Univariate Analysis of Variance of Derriford against anthropometric measurements

<table>
<thead>
<tr>
<th>Source</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hip Circumference</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Model</td>
<td>5.509</td>
<td>.002</td>
</tr>
<tr>
<td>Intercept</td>
<td>1003.815</td>
<td>.000</td>
</tr>
<tr>
<td>Quartile</td>
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<td>.002</td>
</tr>
<tr>
<td><strong>Waist Circumference</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Model</td>
<td>2.650</td>
<td>.055</td>
</tr>
<tr>
<td>Intercept</td>
<td>914.827</td>
<td>.000</td>
</tr>
<tr>
<td>Quartile</td>
<td>2.650</td>
<td>.055</td>
</tr>
<tr>
<td><strong>Umbo-Pannus</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Model</td>
<td>2.469</td>
<td>.071</td>
</tr>
<tr>
<td>Intercept</td>
<td>866.410</td>
<td>.000</td>
</tr>
<tr>
<td>Quartile</td>
<td>2.469</td>
<td>.071</td>
</tr>
<tr>
<td><strong>Umbo-PS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Model</td>
<td>7.013</td>
<td>.000</td>
</tr>
<tr>
<td>Intercept</td>
<td>1038.062</td>
<td>.000</td>
</tr>
<tr>
<td>Quartile</td>
<td>7.013</td>
<td>.000</td>
</tr>
<tr>
<td><strong>Xiphi-PS</strong></td>
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<td></td>
</tr>
<tr>
<td>Corrected Model</td>
<td>5.208</td>
<td>.002</td>
</tr>
<tr>
<td>Intercept</td>
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<td>.000</td>
</tr>
<tr>
<td>Quartile</td>
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<td>.002</td>
</tr>
<tr>
<td><strong>Xiphi-Pannus</strong></td>
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<td></td>
</tr>
<tr>
<td>Corrected Model</td>
<td>2.720</td>
<td>.053</td>
</tr>
<tr>
<td>Intercept</td>
<td>855.456</td>
<td>.000</td>
</tr>
<tr>
<td>Quartile</td>
<td>2.720</td>
<td>.053</td>
</tr>
<tr>
<td><strong>Xiphi-Umbo</strong></td>
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<td></td>
</tr>
<tr>
<td>Corrected Model</td>
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<td>.241</td>
</tr>
<tr>
<td>Intercept</td>
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<td>.000</td>
</tr>
<tr>
<td>Quartile</td>
<td>1.427</td>
<td>.241</td>
</tr>
</tbody>
</table>

Anthropometric measurements were divided into four percentile groups (quartiles) and plotted against, BAROS and Derriford and 8 variables (figures 6.4 & 6.5). To fit these variables in the same plot, Z scores (SDs from the mean) were calculated for each and used as the x-axis. The horizontal red lines reflect the normal values, and it can be seen that in the fourth quartile these psychological outcomes cross thresholds, from successful to unsuccessful outcomes. This indicates that in the fourth quartile, those patients with the largest anthropometric measurements had statistically significantly pathological psychometric outcomes.
Figure 6.4 Box and whisker plots of BAROS vs anthropometric measures
Figure 6.5 Box and whisker plots of Derriford 24 vs anthropometric measures
As the xiphisternum to pubic symphysis, umbilicus to pubic symphysis and hip circumference measurements were most closely correlated to psychometric outcomes, anthropometric were reviewed in closer details. The anthropometric measurements were grouped into quartiles and box and whisker plots were drawn against Derriford 24, BAROS, SF-36 and HADS (figure 6.6-6.10). This closer analysis revealed that the top 25% (xiphisternum to pubic symphysis (≥91cm), umbilicus to pubic symphysis (≥38cm) and hip circumference (≥143cm)), had worse outcome scores on the Derriford 24, BAROS and HADS. However, this change was not detected with the SF-36. Note, that this was the case for all three measurements however only a sample of the figures were included to minimise replication.

Figure 6.6 Box and whisker plots of Derriford vs percentile group for umbilicus to pubic symphysis
Figure 6.7 Box and whisker plots of BAROS vs percentile group for xiphisternum to pubic symphysis

Figure 6.8 Box and whisker plots of SF36 PCS vs percentile groups for hip circumference
Figure 6.9 Box and whisker plots of SF36 MCS vs percentile groups for hip circumference
Figure 6.10 8 Box and whisker plots of HADS vs percentile groups for umbilicus to pubic symphysis
Discussion
Studies have shown that following massive weight loss body contouring procedures patient expectations are for three main outcomes: improvement of appearance, self-confidence and QoL, in that order. Our previous study demonstrated that patients sought massive weight loss body contouring for concerns about the appearance of different parts of their body and the consequences this has on their psychosocial well-being and physical ability to carry out the activities of daily living.

This study shows that post massive weight loss body contouring patients had a decrease in distress and dysfunction about appearance concerns (Derrifod 24), an improvement in mood, QoL and function. In addition, patients had improved outcomes in health metrics such as smoking cessation and exercise.

This was the case despite the complications. Two patients had grade 3 Clavien complications: large haematomas following abdominoplasty that required surgical evacuation; one of these suffered a subsequent wound dehiscence. Both had been on warfarin and had lost over 100kg. The BMI at time of operation was 32 and 35. In the patients with wound dehiscence alone following panniculectomy: 1 required packing for 2 weeks, was a non-smoker and had lost 101.64kg. 1 patient required long term VAC dressings, had been on aspirin and clopidogrel, was still a diabetic and had lost 120kg, his BMI was 37. Despite the complications he was happy with the final result. Of the 8 patients with infection 4 were diabetic and 2 also had concomitant seroma formation. All patients were satisfied with the final results except the patient with dissatisfaction of her scar. She was due to have further review. All of these patients still had improvement in exercise, career progression and relationship status, as well as statistically significant improvements in their SF36, Derriford 24 and BAROS despite their complications.

The patients who underwent body contouring following malabsorptive bariatric surgery, were reviewed after the longest post-operative period (41.5 months post their initial surgery), yet still had worse anthropometric and psychological outcomes. Furthermore, these patients had lost more weight initially, but subsequently, following plastic surgery; the restrictive patients had the best outcome both in terms of weight loss, contour and the psychometric scores: Derriford 24, BAROS and HADs. This is in
keeping with previous papers\textsuperscript{176} that found that 1 year after restrictive bariatric surgery weight loss correlated with decrease in depressive symptoms, and as weight loss plateaued so did the improvement in mood. The lack of improvement in SF-36 has also been previously documented\textsuperscript{196,197,198}. Therefore, it could be said that key outcomes measured in the Derriford 24, BAROS and HADS are more reflective of the bariatric population. However, our previous paper and work by Dymek\textsuperscript{199} suggests that some improvements in some subscales of the SF-36 can be seen (physical functioning, general health, vitality and mental health).

The patients who had malabsorptive procedures reported worse psychometric outcomes, and this is in keeping with previous work by Zwaan et al\textsuperscript{200} who reported worse scores for bodily pain and overall physical composite scores. This study demonstrates malabsorptive bariatric surgery led to greater disfigurement with diffuse lipodystrophy and generalized skin laxity. Typically patients who undergo malabsorptive bariatric surgery lose weight more rapidly than patients who have restrictive bariatric surgery\textsuperscript{201}. We believe that the increased rate of weight loss contributes to the degree of skin ptosis. We also found that increased ptosis leads to increased psychological morbidity, even after reconstruction with plastic surgery. It may be possible that the variations in physical appearance as a result of the varying rates of weight loss may contribute to worse psychometric outcomes. Further studies are warranted.

The modern concept of the aesthetic abdomen as described by Lockwood\textsuperscript{202} will not be achieved through simple abdominoplasties in massive weight loss patients. Since it was developed in the 1960s, the abdominoplasty has undergone innovative modifications to obtain ever superior aesthetic outcomes\textsuperscript{203, 204, 205, 206}. For the bariatric patient, innovative excisional contouring pioneered by Pitangy and Lockwood\textsuperscript{33} is necessary. However, in this cohort of patients, the reconstruction surgery offered was dominated by abdominoplasty, brachioplasty and mastopexy. It has been seen that although abdominoplasty results in a functional improvement, it does not address all the aesthetic needs of this complex group of patients. This could account for the lesser degree of satisfaction in the malabsorptive patients, who had lost more weight and suffered a greater degree of ptosis. Given the complex nature of these patients, there is an increasing belief that massive weight loss body contouring
should be undertaken in a unit with a multi-disciplinary team and the appropriate expertise to offer appropriate contouring procedures safely.

Limitations
Seven patients were lost to follow up and this lost data could account for different results. Patients in the post plastic surgery cohort were younger than the post bariatric surgery alone cohort with a mean age difference of 1.33 years. The authors believe that this age difference is unlikely to cause change in dermal laxity to account for difference in ptosis. The age difference could be accounted for by the fact that the post plastic surgery patients were the very first patients to have bariatric surgery in the South East of Scotland and therefore, were selected for lower risk factors associated with lower ages. However, as the operative experience has increased, a more diverse group of patients have been operated on.

This study was an exploratory study and further larger studies would need to be carried out to validate the results. As the patients were only followed up at two time points, the rate of weight loss was difficult to track. Ideally the patients’ weight would have been tracked during the entirety of their weight loss programme as this would have provided very useful information in identifying whether plateaus in weight loss correlated with plateaus in psychological morbidity, or, if it is the rate of weight loss and not the final weight lost that leads to psychological outcomes. Further studies are warranted.
**Conclusion**

Massive weight loss body contouring (MWLBC) is not purely aesthetic surgery but leads to functional and psychosocial benefits. This study has given preliminary data on which anthropometric measurements and their thresholds are associated with the greatest benefit from MWLBC. From this study, the fourth quartiles of the following anthropometric measurements: xiphisternum to pubic symphysis (≥91cm), umbilicus to pubic symphysis (≥38cm) and hip circumference (≥143cm) were statistically significant in crossing the psychometric tolerances from within the normal range to pathological psychology. Currently there is no evidence based guidance for provision of post bariatric surgery body contouring\(^7\). Therefore, these measurements could provide guidance when allocating limited resources in socially funded health systems.

Following massive weight loss body contouring the somatic health of patients dramatically improves with a reduction in smoking and increase in exercise, whilst the psychological health can in some cases, deteriorate. This paper has demonstrated in a limited number of patients that the rate of weight loss associated with malabsorbative bariatric surgery, the subsequent degree of ptosis and extent of disfigurement is associated with levels of psychological morbidity. The plastic surgeon has long appreciated how good pre-operative counselling is imperative to optimise patients and manage expectations. This early data may guide surgeons carrying out massive weight loss body contouring procedures and highlight the importance of carrying out the correct procedure in the correct setting with the support of a multi-disciplinary team that can address the complex needs of these patients.
Chapter 7: A semi-structured interview to explore emergent themes

Introduction
Obese people are seen as unattractive, aesthetically displeasing, morally and emotionally impaired, alienated from their sexuality, and discontented with themselves. Their doctors describe them as weak willed and their peers rate them as unlikeable. Employers are unwilling to hire fat people and even when employed, they are less likely to be promoted and report significant discrimination. Fat people are less likely to attend college, perhaps because their parents are less willing to pay for their expenses. These difficulties with advancement in the job force and higher education may account for the fact that fat people tend to more downwardly economically mobile from their parents and are associated with lower socioeconomic status. Obese people are discredited and distinguished from cultural norms. Stigma is a deeply entrenched sociocultural phenomenon, and lies at the root of many human rights violations, resulting in entire population groups being disadvantaged. It is so ingrained that marked cases of human rights violations are perceived as acceptable. Stigmatisation leads to discrimination, psychological distress and low self-esteem. The obese person perceives this disapproval and consequently adopts protective or avoidance behaviours. This may spoil his/her “normal identity” as the stigmatised individual starts behaving in a way that their stigmatizers expect of them. In contemporary society, there is only limited suppression of fat prejudices and indeed, obesity discrimination is overt, pervasive and often unrelenting.

Goffman, one of the most influential sociologists of the twentieth century, defined stigma as:

*The phenomenon whereby an individual with an attribute which is deeply discredited by his/her society is rejected as a result of the attribute. Stigma is a process by which the reaction of others spoils normal identity.*

The complex psychosocial adjustment to obesity and massive weight loss does not occur in a vacuum. Fat people perceive societal dissonance, either as a result of overt abuse or indirectly. Therefore understanding anti fat attitudes can contextualise the
experience of being fat and help predict success in weight loss maintenance and adjustment.

Two variables lead to anti-fat attitudes. The first is a personal or cultural preference for thinness. The second is the belief that weight is volitionally controlled. To generate dislike of fat people, one must think fat undesirable and simultaneously blame the person for his or her situation. If one believes that fatness is fat peoples’ fault, then one will denigrate and stigmatise them. The argument is attributional: if ideology leads to controllable attributions to targets, one will blame fat people for their weight. Attributions and values are conceptually linked, in that both reflect characteristic ways of giving meaning to the social world. Thus, beliefs, values and ideologies should be closely linked with individual differences in the tendency to make internal, controllable attributions.

In response to stigmatisation there is a dissonance between ones actual identity and the virtual identity. This leads the stigmatised to safety seeking behaviour, avoidance behaviours and verification and checking. Identifying these safety seeking and avoidance behaviours in the massive weight loss cohort, will enable the researcher to track change in persona and recovery from the spoiled identity when avoidance behaviours are discontinued. However, it is also important to note that many people with stigmatized attributes have high self-esteem, perform at high levels, are happy and appear to be resilient to their negative experiences.
Concept generation

Most people are aware of societal standards regarding fatness and thinness. Individual differences in the extent to which these sociocultural attitudes are adopted as personal values and beliefs can have important implications for individuals’ personal relationship with body weight and size.²²⁶ Body image therefore, is a cognitive affective self-schema that organises experiences and behaviour, shaping attitude, values and self-determination.

Quantitative data collection methods have been used in this research to collect patient reported outcome measures, anthropometric measurements and 2D and 3D clinical images. However, given the emotive and personal experiences of each of these patients, it is important to carry out qualitative research to contextualise this objective data. Using Goffman’s framework of stigma and the multi-level framework of obesity, data from previous chapters in this thesis (especially chapters 4 and 5) I carried out structured interviews to identify themes prevalent in this unique cohort of patients. In particular, I was keen to identify if there were any positive predictors for patients protected from stigma who had a sense of validation and contribution to society despite their discredited condition.
Aims

1. To interview massive weight loss patients during their weight loss journey to gain a richness of narrative and deeper understanding with contextual descriptions of how these patients experience their weight loss journey
2. Identify prevalent themes
3. Generate a multilevel framework for the massive weight loss patient and subsequent weight loss and body contouring.
Methods

The history of the interview and its benefits and limitations

A semi-structured interview is a qualitative research methodology\(^\text{227}\). The aim of this approach is to ensure that each interviewee is presented with exactly the same questions in order to standardise the responses but the interviewer has the flexibility of changing the order of the questions (accordingly with the flow of the interview) and prompting for additional info. A ‘standardised structured interview’ suggests an interview which is not flexible in this way. The semi structured interview ensures answers can be reliably aggregated and that comparisons can be made with confidence between sample subgroups or between different survey periods whilst retaining flexibility.\(^\text{228}\) An interview schedule listing the wording and sequencing of questions was developed. (Appendix 14). The interview schedule increased reliability and credibility of research data but still enabled administration of open-ended questions.\(^\text{229}\) Open-ended questions have the ability to evoke responses that are meaningful and culturally salient to the participant, unanticipated by the researcher and rich and explanatory in nature. It also allows the researcher flexibility to probe initial participant responses.

Advantages of the semi-structured interview include the flexibility to prompt for additional info and react to the responses of the patients, so the order of questions can be changed as you go in order to focus on what the participants perceives to be important. In addition, maintaining which questions are asked of survey respondents helps provide context. This minimises the impact of context effects, where the answers given to a survey question can depend on the nature of preceding questions. Though context effects can never be avoided, it is often desirable to hold them constant across all respondents. The exploratory nature of this qualitative research methodology, the flexibility as an instrument and its observatory elements enable description of variation, relationships, experiences and some normal values in a developing clinical population.
Design
The qualitative methodology was carried out in alliance with the Qualitative research review guidelines RATS\textsuperscript{230, 231}.

Relevance of the study question
Post massive weight loss patients are increasing and this new cohort of patients need a validated tool to ensure evidence based medicine is practised. From the literature search, lack of relevant patient report outcome measures are a problem and deeper understanding of their journey, needs and unique psychological morbidity are more relevant than ever.

Appropriateness of qualitative method
Qualitative methods seek to explore phenomena and use more flexible instruments, with an iterative style of eliciting and categorizing responses to questions. The strength of qualitative research is its ability to provide complex textual descriptions of how people experience a given research issue. It provides information about the “human” side of an issue – that is, the often contradictory behaviours, beliefs, opinions, emotions, and relationships of individuals. Qualitative methods are also effective in identifying intangible factors, such as social norms, socioeconomic status, gender roles, ethnicity, and religion, whose role in the research issue may not be readily apparent. Qualitative methods are used to describe variation, relationships, individual experiences and group norms.

When used along with quantitative methods, qualitative research can help us to interpret and better understand the complex reality of a given situation and the implications of quantitative data.

The four most common qualitative methods are participant observation, in-depth interviews, focus groups and ethnography. Participant observation is appropriate for collecting data on naturally occurring behaviours in their usual contexts. In-depth interviews are optimal for collecting data on individuals’ personal histories, perspectives, and experiences, particularly when sensitive topics are being explored. Focus groups are effective in eliciting data on the cultural norms of a group and in generating broad overviews of issues of concerns to the culture groups or subgroups.
represented. Ethnography is the study of social interactions, behaviours, and perceptions that occur within groups, teams, organisations, and communities.

Semi structured interviews were chosen as this exploratory research method enables participants to respond in their own words, rather than forcing them to choose from fixed responses. This can potentiate meaningful and culturally salient responses, that are unanticipated by the researcher and rich in explanatory nature.

Transparency of procedures

Sampling
The main technique of sampling was purposive sampling, with some additional snowballing or chain referral sampling. Purposive sampling is a strategy based on the preselected criteria relevant to the research question and is the most commonly used form of non-probabilistic sampling. I specifically targeted the patients at the massive weight loss seminar groups run out of the Royal Infirmary Edinburgh. This way, I knew the participants selected were relevant to the study. Patients also referred their friends, and other social contacts to the research study for potential participation – this is also known as snowball sampling (or chain referral sampling) Snowball sampling is a type of purposive sampling and is often used to find and recruit ‘hidden populations,’ that is groups, not accessible to the researchers through the sampling strategy. Participants or informants with whom contact has already been made use their social networks to refer the researcher to other people who may participate in or contribute to the study.

Guidelines for determining non-probabilistic sample sizes are virtually non-existent. Purposive sample size typically relies on the concept of “saturation,” or the point at which no new information or themes are observed in the data. Although the idea of saturation is helpful at the conceptual level, it provides little practical guidance for estimating sample sizes, prior to data collection, necessary for conducting quality research. Previous studies have determined that operationalized saturation occurs at 12 in depth interviews, although basic elements for meta-themes were present as early as six interviews. Variability within the data followed similar patterns. However, a further study demonstrated that in a prospective study of Paget’s disease of the bone, study wise data saturation was achieved at interview 17.
Given the aims and objectives for the rest of the MD, the sample size was kept consistent between the quantitative and qualitative component of the research. More details on recruitment below.

**Participants**
The criteria for selecting the study sample and recruitment methods are explained in chapter two. Data collection was aimed at a pragmatic recruitment of 100 volunteers. In the context of this study, at the time of recruitment, the researcher did not occupy dual roles as clinician and researcher. Ethical approval and research and development approval had been provided in chapter two.

**Measure**
Face-to-face in-depth interviews were conducted and transcribed verbatim. The data were analysed using thematic analysis.

**Procedure**
Qualitative data was collected by a plastic surgery registrar (NAH) with some experience of psychotherapy interview techniques. The semi-structured interview was conducted in a quiet clinic room at St John’s Hospital in Livingston or the RIE. The interviewer was blinded to the psychometric scores.

**Interview protocol**
The patients were interviewed following the semi-structured interview as per Appendix 14.

**Analysis**
**Soundness of interpretive approach**
The analysis chosen is thematic. This is an exploratory, descriptive, hypothesis generating means of data analysis. The first step is data preparation. Data was obtained in the form of notes and transcriptions of the interviews that took place. During this stage of the analysis, the whole data set was read, so that a full picture of the studied phenomenon was obtained. During this initial reading, insights and understandings emerged and were collated.

Themes were derived from the data by inductive reasoning, as it is more open-ended and exploratory.
This narrative data was reviewed with patients divided into their 4 groups: pre bariatric surgery, post bariatric surgery, pre plastic surgery or post plastic surgery. Information was indexed according to the questions and under each question, themes were identified and organised.

**What counts as a theme?**
A theme captures something important about the data in relation to the research question, and represents some level of patterned response or meaning within the data set. This is no prescriptive indication on the prevalence of the theme to gain statistical significance. The key is whether it captures something important in relation to the overall research question.

**Semantic or latent themes?**
A thematic analysis typically focuses exclusively or primarily on one level. With a semantic approach, the themes are identified at the explicit level and the analyst is not looking for anything beyond what a participant has said or what has been written. With a thematic approach the themes are identified and analysis goes beyond the spoken word. Here the analyst examines the underlying ideas, assumptions, conceptualisations and ideologies – that are theorised as shaping or informing the semantic content of the data. Ideally, the analytic process involves a progression from description, where the data has been organised to show patterns in semantic content, and summarised, to interpretation, where there is an attempt to theorise the significance of the patterns and their broader meanings and implications, often in relation to previous literature.

In view of the need to generate a conceptual framework and understand obesity as a social construct the analysis selected was semantic.

**Thematic maps**
It is important to develop a system to review themes so that there is internal homogeneity and external heterogeneity. Data within themes should cohere together meaningfully, while there should be clear and identifiable distinctions between themes. Further refinement of themes could lead to the development of thematic maps. Once the thematic map is created, themes are clearly defined and named.
Results
100 patients were recruited. 16 were lost to follow up. 84 patients were reviewed in clinic and underwent the above protocol. 26 were male and 58 were female. To identify patient narratives in the context of societal stigma, patients were divided up into 4 groups dependent on whether they were pre bariatric, post bariatric, pre MWLBC or post MWLBC surgery. Pre bariatric patients were morbidly obese and subject to the most overt stigma. Post bariatric patients, were still feeling the health problems related to their weight and were still overweight. Pre plastic surgery patients, had reached their target weight and were no longer overweight, however had significant problems with hanging redundant skin. Post plastic surgery patients, had undergone body contouring to reconstruct any defects from excess skin and ptosis.

Pre bariatric surgery (PreB) patients consisted of 15 patients. 2 were male and 13 were female. They were under review by the bariatric services and following the pre bariatric surgery protocol. Post bariatric (PosB) patients had completed bariatric surgery. This group consisted of 29 patients, 10 males and 19 females, with a mean age of 51.24 (range 38-67). Time post bariatric surgery was a mean of 19.2 month (min =1, max = 53 months). Pre MWLBC (Pre MWLBC) patients had been reviewed by plastic surgeons, approved for surgery and were currently on the waiting list. This group consisted of 19 patients, 7 males and 12 females, with a mean age of 46.87 (range 28-62). Time post bariatric surgery was a mean of 22.1 months (min = 8 months, max = 54 months). Expected surgery included abdominoplasty, lower body lift, total body lift, mastopexy and brachioplasty. Post plastic (PosP) surgery patients had completed body contouring following massive weight loss. This group consisted of 21 patients, 7 males and 14 females, with a mean age of 46.16 (range 28-62). Time post bariatric surgery was a mean of 38.2 months (min = 12 months, max = 93 months). Table 7.1. There were no statistically significant differences in the age, sex, patient’s original weight, weight loss or complications between groups.
Table 7.1: Bariatric surgery procedures and time post procedure

<table>
<thead>
<tr>
<th>Patient Cohort</th>
<th>Mean age (range)</th>
<th>Sex</th>
<th>Laparoscopic gastric band</th>
<th>Laparoscopic gastric sleeve</th>
<th>Open gastric sleeve</th>
<th>Laparoscopic gastric bypass</th>
<th>Open gastric bypass</th>
<th>Time post bariatric surgery (minimum, maximum months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre bariatric surgery (n=15)</td>
<td>51.5 (39-66)</td>
<td>2M 13F</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>19.2 (1, 53)</td>
</tr>
<tr>
<td>Post bariatric surgery (n = 29)</td>
<td>51.2 (38-67)</td>
<td>10M 19F</td>
<td>9</td>
<td>8</td>
<td>1</td>
<td>9</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Pre MWLBC (n = 19)</td>
<td>46.8 (28-62)</td>
<td>7M 12F</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>11</td>
<td>0</td>
<td>22.1 (8, 54)</td>
</tr>
<tr>
<td>Post MWLBC (n = 21)</td>
<td>46.1 (28-62)</td>
<td>7M 14M</td>
<td>11</td>
<td>1</td>
<td>0</td>
<td>8</td>
<td>1</td>
<td>38.2 (12, 93)</td>
</tr>
</tbody>
</table>

Analysis of qualitative data included review of interview transcripts for patient quotations.

**Preset categories included:**

**Career progression**

Have you noticed a change in your career either in terms of financial remuneration or career progression/ change in status/responsibilities since your procedure? The following are a selection of comments made by the pre and post bariatric surgery patients and the pre and post plastic surgery patients.

**PreB**: *No – I’m not able to work because of my health. I get short of breath after walking a few minutes.*

**PosB**: *I am more physically able at work ... but this has not affected my pay.*
**PreP:** I am changing my attitude to work now, as I think that soon enough I won’t have the restriction of my apron. I definitely have more energy than I used to – but still feel limited in the amount I can do. At the moment, I still get rashes and have to take time off to go to the GP for antibiotics and pain relief, but I am optimistic that this going to improve after my surgery.

**PosP:** I have finally realised my dream and set up my own business. It’s been an amazing exciting experience.

In the pre bariatric surgery group, there was little change in careers. Motivation was poor and morale was low. In the post bariatric surgery group, patients has not yet plateaued in their weight loss but were beginning to adjust to no longer being the big person in the office. It meant that they could interact with people on another basis, except through the eyes of a fat person. This seemed to give them new perspective. Conversely, some found their loss of anonymity difficult to cope with, people were commenting on new haircuts or clothes, which had not happened before.

Pre plastic surgery patients had reached their weight loss goal and were due to have plastic surgery. For the most part, these patients were moving forward in their career. They were aspiring to achieve promotions, take on more responsibilities and were thinking of change. Post plastic surgery patients seemed to have the motivation to take on their dream job, start their own business and take on new responsibilities, with, in some cases, an improvement in financial remuneration.

However, patients on long term benefits reported no or very little change, irrespective of whether they had received post bariatric plastic surgery or not.

**Relationships**
1) What are the attitudes of your family and peers to you?

**PreB:** I’ve spoken to my friends and family about joining the seminars for having bariatric surgery. Some people are really judgmental and think that I shouldn’t be wasting NHS money and should just lose weight on my own – but they don’t know how hard I’ve tried.
**PosB:** I’ve definitely lost some friends, you know selfish jealous people that can’t be happy for others, when they have done well. I know that we were friends before because we were similar size, but now that I have taken steps to improve myself, they no longer want to be friends.

**PreP:** Knowing that I am going to have plastic surgery soon to remove all this excess skin, is really helping my self-confidence and in turn, is making me a happier person. My husband has noticed this and he’s really proud of me

**PosP:** My direct family are super proud of me – I know my kids are like – wow – look at Mummy – she can play with us in the park and looks great in her new clothes.

2) Do you have any sexual intimate relationships?

**PreB:** No – I haven’t for years, my husband and I can’t physically have sex because of our size.

**PosB:** No – I can’t bear how my body looks and haven’t had a partner for years.

**PreP:** Yes – but it’s really difficult with the skin folds and sores, we are trying to remain close – but I’m really struggling letting my partner close.

**PosP:** Not right now, but who knows, I’ve started dating for the first time in 10 years and it’s really exciting.

3) Are you experiencing any change in this relationship since your procedure/joining the programme?

**PreB:** Since joining the programme, I have met more people who are like me, but nothing that would lead to any romance!

**PosB:** My relationship and sex life with my husband has improved, but 1 year later I notice my saggy arms and thighs and am really embarrassed about the apron of skin hanging down from my stomach... this is damaging our relationship.

**PreP:** We are still getting intimate in the dark and I never want him to see my undressed, the only difference is now, when we are in bed, the skin folds get caught and it can be really sore. I’m really hoping that removing them will help improve our sex life.
**PosP:** I’m much more open with being naked in front of wife, I didn’t realise how much it was affecting me, especially since we had been married for 23 years. Now I just feel so much happier and satisfied in our relationship.

Most patients found their partners and families supportive of their weight loss regime. However some reported that they had not told anyone that they were having plastic surgery on the NHS as they felt that they were undeserving of it. Some had negative interactions with people who judged them for using public resources to fix a problem they had been perceived to cause. In those patients it became apparent that they also avoided exercise in communal/public places or outside. This was especially acute in environments were minimal clothes are worn, such as swimming pools, on holiday by the beach and at the gym.

Previous social networks broke down. Fat friends who were previously stigmatised became the stigmatisers when patients lost weight. Consequently patients became socially isolated from their old support networks.

These avoidance behaviours could be seen both in massive weight loss patients and massive weight loss body contoured patients. Massive weight loss patients were ashamed of their body habitus and too embarrassed to take part in communal social activities where their unsightly, smelly and deformed bodies could be seen. Unexpectantly, patients who had undergone massive weight loss body contouring reported feeling judged by their loved ones for having massive weight loss body contouring.

Nearly all patients seemed to have problems with physical intimacy and exposure in full light. The pre bariatric surgery patients were embarrassed of their size, the post bariatric surgery patients were becoming aware of their redundant skin and the pre plastic surgery patients seemed to suffer with sores and intertrigo as well as extremely large aprons. The post plastic surgery patients seemed to be more able to have intimate relationships years after the procedures, when the scars had matured. However they too often, were still shy of their body.
On healthy lifestyle choices

1) What is your attitude to exercise?

**PreB:** I remember when I was little I used to really love swimming – but I can’t go now, because I hate how people look at me. It’s too embarrassing.

**PosB:** My energy levels are massively improved, with an overall improvement in physical ability. This especially shows on the dance floor... where my ballroom dance partner really notices a difference.

**PreP:** I’m exercising by walking lots but would really love to get back to swimming. I can’t find a swimsuit that fits all the rolls of skin in and still tight enough to keep my boobs in place.

**PosP:** I just feel that life has completely changed... I’ve joined a gym and am exercising regularly... for the first time in 30 years I have climbed up Corstophine Hill!

2) (In smokers/ ex-smokers) What is your attitude to smoking?

**PreB:** I’m trying to give up one thing at a time – at the moment its food and it’s just too hard to try and quit smoking too.

**PosB:** I hadn’t quit smoking initially but after all the complications with my stomach opening up and not healing, I have finally found the strength to quit completely. I’ve not had a fag for 4 months now and think that I will definitely keep it up.

**PreP:** I know I need to quit smoking in order to have my plastic surgery procedure, so that is a real incentive for me.

**PosP:** I’ve not smoked cigarettes for 10 years now, but still smoke cigars and a pipe. I think I am going to continue smoking a pipe but plan to quit cigars.

3) How do you feel about the possibility of sustaining long term weight loss?

**PreB:** It’s never worked before, and I’ve tried every diet under the sun. So this has to work, because if it doesn’t I’m going to die soon.

**PosB:** It’s been a massive struggle but the seminar prior to the surgery really prepared me for how hard the diet restriction and food intolerance is going to be. Now I just have first-hand experience of it, so I’m optimistic that I am going to keep it up.
**PreP:** My weight is still fluctuating a little bit – around 1-2kg a week. But I notice it now and try to take steps to ensure it doesn’t go up too much. I want to be as slim as possible for my surgery though it is really hard.

**PosP:** I’m sure I’m going to stay this size, I am never going back to the way I was.

There was an increased exercise proclivity in the post bariatric surgery group, with an even greater increase in activity in the post plastic surgery group. This was triangulated with data from the Eating Disorders Questionnaire (EDQ). There was a greatly increased determination to be exercising outside and in natural environments following massive weight loss and particularly following body contouring. Patients reported feeling more physically able to tackle local “munros” that they had never been able to climb and were no longer inhibited from being seen in public by stigma and therefore could enjoy the natural beauty outside.

There was a statistically significant decrease in smoking cessation per plastic surgery. This was reported as a bargaining tool, where patients who wanted to have plastic surgery knew they had to quit completely before being operated on.

**Restricted lifestyle and everyday living**

1) How has your life changed since your procedure/attending the seminars?

**PreB:** Being on the fasting diet is really hard and I’m struggling. But the support from the team here at the RIE is making it possible. I never imagined I would be having this surgery. Increased discipline and taking the time and making the structure for the programme is putting me first, which I haven’t done for so long.

**PosB:** I’m getting used to not eating certain things, but as I get used to it I am finding that I am spending less time thinking about food, which is liberating.

**PreP:** I am thinking about my life in an entirely different way. I am happy and active and able to move and pick up my kids.

**PosP:** I’m a different person to who I was. Talking to you and thinking about the change in my life, and all its permutations. I fly for virgin as a pilot and have had a promotion, am in a relationship and feel empowered in my life now.. for the first time in decades.
Emergent themes:

Fragile relationships
As patients went through their weight loss regimen they evolved beyond the bounds of some relationships that may have been damaging or unhealthy. Examples included obese friends and feeder partners who no longer accepted them as a thinner person.

“I’m not as available as I used to be - I’m not stuck in the house comfort eating. I’m spending more time at the gym and with people that go to the gym.”

Others found that they were the ones moving on from their long term partners, because they found the confidence to look for something more in life and were able to feel that they would be worthy of something better.

Bereavement
Patients who had previously used food to cope with underlying psychological problems reported struggling with the limited food consumption.

“I used to eat when I felt sad or lonely – which was quite a lot of the time, and the food was my friend and my comfort. Now that is taken away from me, and I need to try and find some other way of finding happiness.”

Other patients talked about feeling that they had lost some part of themselves.

“I don’t recognise myself anymore. I don’t think I know who I am. I was also the “fat person” in the office and now – that’s changing and I don’t know who I am. I would like to say that losing this weight has given me a new lease of life – but the way I feel about myself now with all this loose skin, disgusts me. I am no longer a fat person, but I am not a thin person. I don’t know what I am.”

In some cases, being a larger person was a method of preventing sexual advances following horrific sexual assault in childhood, which had left patients very fearful of any further sexual encounters.
“I began to eat when I was a child, after my uncle had abused me sexually. He used to tell me how pretty I was, and how lovely my skin was, and that what we were doing was natural. I was terrified at night, when the door handle turned, and thought of everything to stop him from touching me. One way was to hide, so I hide in my body. I ate and ate until I entered oblivion. Somewhere free from pain, and free from fear. It was mindless eating, but that was the point. I didn’t want to think and didn’t want to see myself as he did…I now realise that this was not the solution. But now that I am losing weight, and even though he is dead, I am scared of sexual advances and sexual attention.”

Another person lamented the loss of her anonymity that her former size enabled. She had to start dealing with people commenting on her new haircut and her new clothes, which seemed like too much attention. She felt that people were staring at her.

“I don’t understand why people are looking at me so much now, I wear long baggy clothes to cover my loose skin. People keep on smiling and congratulating me on my weight loss. Some people that I happened to bump into in the street said they didn’t recognise me and that I look great. I don’t like this feeling of being watched and scrutinised.”

Reconciliation of new body with identity
How do you feel about your body image?

PreB: Horrible

PosB: The pre bariatric surgery seminars and meetings with the clinical psychologists and presentations from you were all aimed at showing me how my body will be after the weight loss but it didn’t seem to go through. I just kept on thinking- yeah – I know I’ll have loose skin – but I’ll be so much thinner that it won’t bother me. But it really does, I feel even worse now, then when I was fat. My body disgusts me.

PreP: My body is so ugly, people in the street notice I’m thinner and congratulate me on the weight loss, but they can’t see what’s under the clothes. I still walk into shops
and ask for a size 24. I can’t get my head round the fact that I am a size 12. I’m so happy to be having a tummy tuck. I will be a totally different person after this surgery.

**PosP:** I’ve still got a slight muffin top, and the scars are pretty massive. I thought I would be tighter everywhere, but I still have loose skin at the tops of my thighs and around my breasts, which are really bothering me still.

Which factors from the psychological scores were most relevant to you?

The scores were reviewed with the patients and they selected the questions which felt most relevant to them. All of the questions that were selected were marked and a percentage allocated for relevance. The questions which scored above 10% are represented in figure 7.2.
Figure 7.2. Bar chart of relevance of factors from existing psychological scores

Does your health now limit you in activities you might do in a typical day?

Does your health now limit you in activities you might do in a typical day?
Are you experiencing anything which has not been captured in the psychological scores that you think is important?

The following additional themes were identified: difficulty finding clothes that fit; distress at seeing pictures of myself; difficulty doing exercise because of poor fitting clothes, especially swimming costumes; physical difficulty having sex because of skin overhanging and getting caught or getting in the way.
Discussion
Fat people are denigrated by thin people\textsuperscript{241}, health care workers, employers, peers, potential romantic partners, their parents and even themselves\textsuperscript{242}. Some have developed negative implicit attitudes towards fatness, but only some people have internalised these standards and developed negative explicit attitudes toward fatness that they endorse as personal beliefs\textsuperscript{243}. To the extent one endorses the virtue of hard work and self-determination, one will tend to celebrate the victories of heroes and conversely blame victims for their fates. For example, the politically conservative are more likely to make ‘person attributions’ in explaining poverty, whereas the politically liberal are more likely to make ‘situation attributions’\textsuperscript{244}. This is where the person is thought to cause the attribution they are more likely to be stigmatised.

The qualitative interview questions identified changes in 3 main areas in the post bariatric and post plastic surgery populations: career progression, relationships and attitudes to exercise. These findings were triangulated by the EDQ which covered similar topics in written form and with scale ratings.

Career
In the EDQ patients documented their occupation and qualifications. The interviews enabled a richer understanding of how they grew into new roles or took greater risks by applying for promotions which they had avoided previously, as they did not want the additional scrutiny.

There is clear evidence of stigmatisation of obese people in the work place. Obese individuals are less likely to be hired, than thin people, even with identical qualifications.\textsuperscript{245} Negative perceptions of obese persons exist in employment settings where obese employees are viewed as less competent, lazy and lacking self-discipline.\textsuperscript{246, 247} These attitudes have a negative impact on wages,\textsuperscript{248} promotions\textsuperscript{249} and decisions about employment status.\textsuperscript{250}

Patients who had lost weight, achieved sustained weight loss and went on to have body contouring showed the greatest career progression and satisfaction in the work life.
**Relationships and fragile relationships**

Relationships were complex to stratify: Patients reported being in supportive relationships, often losing weight with partners and friends. Some patients were rejected by partners once they lost weight, others rejected their partners once they achieved their weight related goals. Some patients felt ostracised by peers; whereas others reported feeling they no longer had anything in common with their previous social networks and moved on. Some patients felt ostracised by family and were not able to tell them that they had massive weight loss body contouring surgery on the NHS, as this was socially funded and they were undeserving of this expense, since their obesity was their fault.

Several studies suggest that fat people have difficulties with self-regard\(^{251, 252, 253}\). As patients went through their weight loss regimen they evolved beyond the bounds of some relationships that may have been damaging or unhealthy. Some reported friends and family trying to sabotage their weight loss regimen, and ask them to stop dieting when they had lost “too much weight” even if they had not yet achieved their target weight. This is in keeping with work by Thomas et al.\(^ {254}\) Other examples included obese friends, who were felt to be judgemental of their weight loss and new weight loss regime and feeder partners who no longer accepted them as a thinner person. These patients were being supported by the team at the RIE and were very committed to losing weight. The diet group was seen a safe sphere, where they had a sense of belonging and some social contact with others who understood their journey. There was a feeling of solidarity and acceptance within this group. Therefore, it was seen from the interviews that any impediment to life-saving weight loss, may be jettisoned. This is in keeping with previous papers, which find that sustained weight loss is more achievable when there is a feeling of acceptance and support from partners, friends, family and support networks.\(^ {255}\)

However, it has also been seen that when friends attempt to lose weight together, and when one succeeds and the other fails – the person who fails to lose weight can lead to comparisons and feelings of self-loathing and failure.\(^ {255}\) Therefore, it could have been the fat friends who no longer wanted this new thin person within their social circle as a reminder of their failed weight loss attempts. Both a sense of self and self-
esteem depends to a large extent on group membership.\textsuperscript{256} Thus it is in one’s self interest to evaluate one’s own group positively. However, in a study by Candrall, there was no evidence of self-interested in-group bias in obese people\textsuperscript{291, 257}. One primary reason for identifying with a group is that association with other members in the group can enhance self-esteem,\textsuperscript{258} however obese people may not show in-group bias as identification with other obese people does not improve their self-image. In addition, fat people may see themselves as capable of leaving the group through dieting and exercise, further inhibiting group identification. This was demonstrated in this work, where patients no longer associated with previous social groups, which they no longer wanted to be identified with.

Research has shown that adolescent victimization of obese girls is a real problem in society and may put obese girls at particular risk for experiencing psychological and social difficulties.\textsuperscript{259} Relationships are central to the formation of the personal and group identity of girls, even more than they are for boys.\textsuperscript{260} Therefore, as these obese girls turn into obese women, they often have difficulty finding partners and fulfilling relationships. Crocker, Cornwell, and Major found that when obese women attributed a lack of interest of a dating partner to their weight, they suffered from anxiety and depression.\textsuperscript{261} This can lead to acceptance of damaging relationships which they think they are deserving of, even if abusive or violent. Some patients reported that once they had lost the weight and found strength and self-determination in their new identity, they were able to move on from long term partners. They found the confidence to look for something more in life and were able to feel that they would be worthy of something or someone better. Ultimately there needed to be acceptance of the weight loss; the new habitus and identification as a thinner person by friends, family and partners. The patient also needed to accept their social network once they had become thinner. If this did not occur relationships became problematic.

**Healthy life style choices**

**Exercise**
The frequency and duration of exercise increased on the EDQ in each successive patient cohort and this triangulated with the semi structured interviews where patient
enjoyed more exercise outside. It appears, that losing weight and subsequently losing the contour irregularities associated with the stigmatised obese person through plastic surgery, enables patients to overcome stigma and benefit from exercise. If weight stigma motivates people to avoid exercising then the individuals might suffer doubly. They are less likely to experience the general health benefits of physical fitness and they are less likely to experience the benefits of losing weight. Weight stigma was seen to influence exercise motivation and behaviour through embarrassment and shame. Patients reported feeling too embarrassed to wear swimming costumes or exercise out of the sphere of safety. This work, confirms the work by Ball, which states obese individuals are too embarrassed to exercise. In addition, patients reported feelings of shame, which was characterised by a wish to hide, withdraw and avoid thinking about shameful aspects of the self (in this case their weight). However, these behaviours were seen less in the pre plastic surgery and post plastic surgery groups. The research confirms the findings of Vartanian et al, which found, as stigma decreased, the need for exercise avoidance behaviours also decreased.

**Smoking**

All patients knew there are health benefits from smoking cessation and that they ought to quit. However, the majority of the pre bariatric patients could not consider quitting as they were concentrating on losing weight and felt that they could not cope without the cigarettes. The post bariatric patients were more likely to quit smoking if they had experienced complications of their bariatric surgery and were actively losing weight. Using the EDQ to triangulate results, there was a statistically significant higher rate of smoking in pre bariatric and post bariatric patients. These groups were already under great stress to tackle their food addiction.

Patients who are applying for massive weight loss body contouring are usually advised that the surgery will not be safe unless they have stopped smoking. Therefore, since smoking cessation is seen as a bargaining tool for body contouring surgery, there was an increased rate of smoking cessation in the pre plastic surgery cohort. These patients reported feeling able to quit smoking in the context of knowing that they would be able to have their surgery to remove excess skin and had already overcome the psychological problems of eating less food.
There was an increased smoking rate in the post plastic surgery group. This may be because, those who had quit, had only done so in order to achieve funding for their massive weight loss body contouring procedures. However, overall those who were still smoking in this group, were smoking less that the pre bariatric and post bariatric groups and reported smoking less than they ever had before. Further work here is needed.

Severely obese patients are more likely to have psychological disturbance.\(^{265}\) There is a well-known association between childhood abuse and increased prevalence of smoking (2-4x) as well as obesity (1.4-1.6).\(^{266}\) Food is often used a coping mechanism.\(^{267}\) Therefore, when the patients are in the process of losing weight, they have lost some of the coping mechanisms for often, unrecognised, psychological morbidity. Removing food, in the wrong patients, can lead to decompensated psychological conditions as they have inefficient stress coping mechanisms that lie at the core of infant, child and adult stress disorders.\(^{268}\) In the context of morbidly obese patients, it was often felt that giving up food and cigarettes at the same time would be too much. It is well known that even perceived stigma in obesity can lead to health care avoidance.\(^{269}\) It is also well established that smoking stigma leads to limited access to healthcare resources,\(^{270}\) where smokers feel devalued\(^{271}\) by their health care practitioner. In the context of the potential underlying psychological morbidity a patient care pathway which sensitively tackles smoking cessation in the context of massive weight loss should be established to minimise any negative impact on weight loss and commitment to uptake of health lifestyle choices.

**Long term weight loss, identity & restricted lifestyle and everyday living**

Personal identity refers to “a sense of self built up over time as the person embarks on and pursues projects or goals...”\(^{272}\). Individuals’ self-perceptions are thought to encompass social, role and personal identities, representing the groups and roles they feel tied to and their personal traits. A personal identity is based on a set of attributes that individuals believe differentiate them from other individuals, and thus reflects their “true self”\(^{273}\). Our personal identity is based on a set of dispositional traits or behavioural tendencies that are considered “core” to ourselves.\(^{274}\) The designation or attribution of these personal attributes to the self, which we refer to as internalization,
is often embedded in a particular social context and asserted during the course of social interaction. In this way, personal identity is a set of labels that individuals come to internalize but need broader social acceptance in the context of society. Thus, while personal identity is a cognitive representation of oneself, the process by which any particular personal identity is internalized is decidedly social.

It is well known that there is a reduction in self-acceptance in obese people. Reflected appraisal processes may be operating; very obese persons may hold critical self-views because they perceive that others view them negatively due to their weight. In essence, they are unable to internalise their views on their personal identity, as it conflicts with their spoilt identity created by felt and actual stigma from society. In 1963 Goffman identified the “master status.” It has been suggested that with a very high weight (i.e. BMI over 35), obesity may become this master status - a characteristic that overrides all other features of a person’s identity.

In the interview process I saw that realisation of long term weight loss and acceptance of self-determined identity was very closely linked. Those patients who had achieved long term weight loss and were working towards it in a constructive and positive manner were able to accept their new identity. This included leading a less restricted lifestyle and making life choices free from the constraints of their physical size and their perceived stigmatised status and previous spoilt identity. Psychological recovery has been coined as “the establishment of a fulfilling, meaningful life and a positive sense of identity founded on hopefulness and self-determination.”

Andersen et al thematically analysed a large number of personal accounts of recovery, to identify four key component processes of recovery:

1. Finding and maintaining hope;
2. The reestablishment of a positive identity;
3. Finding meaning in life;
4. Taking responsibility for one’s life.

Other studies have found the following key.
5. Moratorium: A time of withdrawal characterised by profound sense of loss and hopefulness
6. Awareness: Realization that all is not lost and that a fulfilling life is possible.
7. Preparation: Taking stock of strength and weaknesses regarding recovery, and starting to work on developing recovery skills.
8. Rebuilding: Actively working towards a positive identity, setting meaningful goals and taking control of one’s life.
9. Growth: Living a full and meaningful life, characterized by self-management of the illness, resilience and a positive sense of self.

There was a definite incremental step in “recovery” in terms of attitude to controlling eating behaviours and weight in each distinct group of patients. The patients in the pre bariatric group were actively attending the weekly weight management seminars with dietician, nurse specialist and psychological support. They were in the awareness, preparation and rebuilding phases – where they had realised that all was not lost and a fulfilling life was possible, and were actively taking stock of their strengths and weaknesses to set goals. They still saw themselves as fat people. Those patients in the post bariatric group generally were actively working to losing weight and setting meaningful goals to achieve for their weight loss target. The pre plastic surgery patients were still identifying themselves as “fat” people and reported feeling shocked when in shop and assistants suggested size 10 and 12 clothes – when they had asked for a size 22. The post plastic surgery patients, saw their obese selves as something in their past. They had a new sense of self-worth and were living a full and meaningful life, characterized by self-management, resilience and a positive sense of self. This self-determination led to a change in levels of activity which lead to an improvement in family life, in particular with children, where patients reported feelings of being “a better parent as I am able to run and play with my children.”

The Prochaska and DiClemente’s Transtheoretical Model (TTM) uses the Stages of Change and is an integrative, biopsychosocial model to conceptualize the process of intentional behaviour change.\textsuperscript{279} TTM identifies that change as a process unfolds over time and involves progress through a series of stages: precontemplation, contemplation, preparation, action and maintenance.\textsuperscript{280, 281} While progression through the Stages of Change can occur in a linear fashion, a nonlinear progression is common.
Often, individuals recycle through the stages or regress to earlier stages from later ones.

Psychology led rehabilitation could address these critical elements of the Stages of Change; identify how to support patients through their weight loss and body contouring journey and prevent relapse to the earlier stages of change. This is in line with recommendation by Ogden et al. He focuses on implementing change and improvement in weight loss through psychological interventions. A health psychologist uses both didactic methods such as information giving and non-didactic methods such as active listening, asking open questions and encouraging reflection. The sessions are fully structured but are flexible to work with the individual patient. In particular the service addresses 5 key factors as follows: i) knowledge (ie information about dietary change); ii) beliefs (concerning the causes and solutions to obesity); iii) behaviours (with a focus on diet and physical activity); iv) coping strategies (i.e. managing emotions without using food; identifying alternative and healthy methods of coping; managing other addictions); v) adjustment (i.e. exploring ways to work with the restriction imposed by the operation). Body contouring has been seen to be critical to coping with ptotic redundant skin and the unpleasant side effects of rash, infections and limitation of function and activity. All of these elements lead to an impact on psychological well-being. After reconstruction the removal of excess skin can improve adjustment, self-acceptance and improved resilience to psychological regression and weight-gain.

According to traditional psychoanalytic thought, overeating (and subsequent obesity) is the product of a deep sense of dependency that arises in the oral stage of development when the infant’s basic needs are not adequately satisfied. Independent self-determination makes feeling accepted more realisable and allows recovery. However, it has been suggested that perceived discriminatory or stigmatising behaviour from others impacts feelings of acceptance and is enough to make obese people regress through their pathway of recovery. It has also been seen that perceived stigma from health care workers can lead to obese people avoiding necessary health care activities and interventions. Thus, it is feasible, that the patients in the pre plastic surgery and post plastic surgery cohort, as accepted for and
awaiting plastic surgery or already treated for their ptotic skin redundancies, have a reduction in perceived stigma and increased feeling of value; further fuelling their weight loss and health lifestyle choices. This was triangulated with the objective data from the EDQ on weight reduction and exercise.

Other factors not picked up in the other PROMS

**Bereavement**
Patients who had previously used food to cope with underlying psychological problems reported struggling with the limited food consumption. One patient reverted back to recreational drug use, which she had not done for 10 years when her coping mechanism of excessive eating was removed. Other patients talked about feeling that they had lost some part of themselves. In some cases, being a larger person was a method of preventing sexual advances following horrific sexual assault in childhood, which had left patients very fearful of any further sexual encounters. Another person lamented the loss of her anonymity that her former size enabled. She had to start dealing with people commenting on her new haircut and her new clothes, which seemed like too much attention. She felt that people were staring at her. This tied in a sense of loss of their identity and with this a very tangible shift in relationships - often deterioration. Patients who had been stigmatised previously had developed engrained avoidance behaviours and were startled by the increased social interactions, inclusion and acceptance.

In an influential essay on how the stigmatized protect their self-esteem, Crocker and Major described several self-protective strategies that buffer the negative feedback stigmatized people receive, for example, attributing negative feedback to prejudice toward the group and engaging in social comparison only with in-group members. However, the strategies they reviewed are group oriented; for them to work, a sense of identification with the group is essential. Because fat people do not show in-group bias, it may be that there is little group feeling among fat people. If fat people feel individuated, these self-protective strategies would be unavailable to them. This was found in the patients who were not able to accept their new identities and felt isolated from their previous social circles and as a result very bereft.
Reconciliation of new body with identity

Another theme that emerged was related to how subjects coped with their new body habitus. Body image is generally more favourable in healthy and vigorous patients, and post-bariatric surgery weight loss patients may gain additional satisfaction from their recent victory over severe obesity and the ensuing healthier lifestyle. Clearly, positive changes in physical appearance and physical effectiveness should influence self-image.

Some were able to embrace their new bodies and new identities, whereas others, even after plastic surgery still could not conceive that they were now thin people. A common comment was that when they went shopping they were still asking for sizes 28+ when they were now a size 10-12. Clothing selected would often be tight leggings and a loose top to cover their perceived size. It seemed that those patients who were not able to identify as a thin person were also less likely to make time for exercise or move forward in their career. There were only 10 patients like this and therefore, too few to view this as a definite relationship. However, it seemed a plausible link for further investigation. These patients still held their old world view – as the stigmatised obese person despite losing weight. From this work, when a patient is unable to embrace their new identity, despite the weight loss, they retain the characteristics of this master status.

We have identified a plastic surgery population whose body image and quality-of-life changes have scarcely been investigated. Previous studies indicate that internalization of societal emphasis on physical appearance is a stronger predictor of body dysmorphia than the mere self-image or awareness of public standards. Viewing of ideal body images in the media has not only changed ideal body image but has directly increased approval of plastic surgery for image enhancement.

In our clinics, the majority of our patients at initial consultation expressed general satisfaction with their appearance except for their loose-hanging skin, especially in the abdomen. However, on correction of those specific deformities, more areas of dissatisfaction would often surface. Obese individuals suffer from disturbed body image and decreased psychosocial function in relation to excess adiposity, and how much these parameters shift during the course of weight loss and body contouring is,
as yet, unclear. One hypothesis is that as this patient population approaches normalcy in appearance, they become increasingly susceptible to the thinness ideals of the prevailing sociocultural milieu.

Summary of themes
Hence a combination of scores validated for capturing information on mood, relationships, eating habits, body image and QoL were used in alliance with structured interviews. In the structured interviews additional items were detected, such as problems finding clothes that fit; problems pursuing leisure activities; distress at seeing pictures of themself; difficulty doing exercise because of poor fitting clothes, especially swimming costumes; physical difficulty having sex because of overhanging skin getting caught or in the way; problems with body confidence, social embarrassment, difficulty fitting in public transport, and reluctance for intimate relationships. These factors, touted as top priorities are not measured in most quality-of-life scales.

A recent critical review of published research literature on the impact of body contouring surgery following weight loss on patient QoL identified seven studies that directly reported on QoL changes. This work confirmed our work as above. A number of areas of QoL were identified:

- Physical functioning and feelings of healthiness.
- Freedom from dependency or disability, improvements in psychological and mental health well-being and stability in mood.
- Improved self-efficacy towards eating.
- Resumption of or improvement in sexual intimacy.
- Body image satisfaction, feelings of attractiveness and reduced feelings of body uneasiness.
- Enhanced self-image and self-esteem, including confidence and positive thinking.
- Improved social acceptance and greater involvement in the social and cultural performance domain.
- Cosmetic and body contouring concerns that arise following gastric bypass surgery.
Additional themes specific to recovery following massive weight body contouring identified here include:

- Career progression
- Impact on relationships and fragile relationships
- Exercise
- Smoking cessation
- Long term weight loss
- Identity and reconciliation of new body with identity
- Restrictions on lifestyle
- Bereavement
- Clothing
- Difficulty of exercise

These prevailing themes are relevant to the massive weight loss body contouring population and as yet, are not all present in any one specific validated tool.
Strengths and weaknesses

Strengths
Qualitative methods generates data which can often be extended to people with characteristics similar to those in the study population, gaining a rich and complex understanding of a specific social context or phenomenon. Semi-structured interviews require a thorough understanding of the important questions to ask, the best way to ask them, and the range of possible responses. In this work, interviews were informed by evidence, pilot work, and/or understanding the theory to coping with stigma and the psychosocial factor in obesity and massive weight loss. This led to a deeper understanding of which questions to ask.

Questions asked were open ended, and because the interviews were semi structured and qualitative methodology was used, I was able to code emergent themes (e.g. framework analysis) and add to the evidence base when interview responses do not fit pre-specified categories that came from the literature.

Using this qualitative data alongside quantitative data in the right way allows the researcher to gain a deeper understanding of the phenomenon of stigma in obesity and following massive weight loss and body contouring. There was clear triangulation of qualitative and quantitative findings.

In society there is little pressure to suppress anti fat sentiment. When using self-report methods to measure anti fat attitudes, social norms about public behaviour, egalitarian values and social desirability concerns to do not contaminate the process.

Social desirability is the tendency of some respondents to report an answer in a way they deem to be more socially acceptable than would be their "true" answer. They do this to project a favourable image of themselves and to avoid receiving negative evaluations. The outcome of the strategy is over reporting of socially desirable behaviours or attitudes and underreporting of socially undesirable behaviours or attitudes. Social desirability is classified as one of the respondent-related sources of error (bias). Social desirability bias intervenes in the last stage of the response process when the response is communicated to the researcher. In this step, a more or less deliberate editing of the response shifts the answer in the direction the respondent feels is more socially acceptable.
Weiese et al carried out an experiment to attempt to reduce medical students’ endorsement of the obese stereotype. They used broad band manipulation based on the elaboration likelihood model that increased sympathy for obese people. They managed to reduce endorsement of the stereotype, but they did not succeed in reducing the stigma of obesity. Although they increased empathy with the obese and changed their subject’s stereotypes, they did not change attributions. Therefore, attributions, rather than stereotypes lead to stigma and rejection of fat people.

**Weaknesses**
Qualitative research generates data which usually cannot be generalized to other geographical areas or populations. During analysis I had to be very careful to stay open to identifying themes and not just falling into the pitfall of using of the data collection questions (such as from an interview schedule) as themes. In such a case, no analytic work has been done to identify themes across the entire data set, or make sense of the patterning of responses.

Thematic analysis requires active identification, analysing and reporting of patterns within the data set. This, by definition, requires an active researcher who identifies patterns/themes, selects which are of interest and reports them to readers. The researcher needs to acknowledge her own theoretical positions and values in relation to qualitative research. As Fine argues, even a ‘giving voice’ approach “involves carving out unacknowledged pieces of narrative evidence that we select, edit, and deploy to border our arguments.”

One of the main downfalls of my technique was that I did not formally assess the reliability of the thematic analysis. I could have, for example, had a second person code 20% of the transcript to compare results statistically with kappa coefficient for inter rater agreement.

**Conclusion**
When a person is thought to be responsible for their problems there is cause for antipathy, and as obesity is stigmatised, there is denigration. This argument is true at both the social/cultural as well as the personal level. In line with the research on stigma, it may be that fat people are punished, isolated or taken advantage of by their peers for deviating from the cultural body image ideal. Anti-fat attitudes are
pervasive, have an internal logic, and result in discrimination. Even if there is no overt
discrimination, the perception of the stigmatised state by the obese person is enough
to lead to avoidance behaviours which can lead to, difficulty finding meaningful
relationships; inhibition of exercise and healthy lifestyle choices; limited access to
healthcare and limited career progression. In contrast to racism and sexism, the overt
expression of antipathy toward fat people is currently affected only modestly by
normative pressure and concerns about social desirability.

There is clear evidence of stigmatisation of obese people in multiple domains. Other
important domains to capture could have included health care, education and the age at which the negative attitudes become evident.
Summarising so far

Results from the two studies in chapter 5 and the analysis of semi structured interviews in chapter 7 demonstrate that more work is required on patient reported outcomes for the massive weight loss body contouring patients\textsuperscript{303}.

Despite these methodological difficulties, subjective self-evaluation should be systematically incorporated into the care of the post-bariatric weight loss patients. By identifying the struggles regarding body image and recognizing the hurdles to achieving their optimal QoL, we can more appropriately assist these patients. Our challenge lies in developing the optimal methods of assessment that elucidate and demystify the clinical evolution of this rapidly expanding population.

Further key considerations include:

1. The measures should be amenable to pre- and post-operative administration.
2. In the MWL cohort, contouring procedures rarely result in a “normal” outcome because of residual deformities.
3. The heterogeneity of procedures, time frames of relevance will be highly varied.
4. QoL factors were identified in the semi structured interviews that are not covered in the existing PROMS. These included the inability to play with children, go shopping and find clothes that fit, manage rubbing of flesh and excoriations as well as the clinic appointments subsequent to dermatological complications are not covered in other PROMS.
Chapter 8: Examining the use of 3d stereophotograms in massive weight loss patients

Introduction
Our previous study demonstrated that 73% of patients who underwent bariatric surgery desired plastic surgery to manage their post massive weight loss skin redundancy. However, there was no obvious effect of age, gender, or type of bariatric surgery on the desire for body contouring procedures. The abdomen was the area that provoked the most concern, followed by the chest/breast, then limbs. Previously it was thought that it was predominantly the psychological implications of redundant skin, which was instrumental in the decision to seek body contouring surgery. However, it has also been found that abdominoplasty could have a positive impact on sexuality, functional morbidity, career progression, smoking cessation and psychosocial function. However, there is still no objective means of assessing deformity and no validated patient report outcome measure (PROM) for post massive weight loss body contouring patients.

Traditionally clinical assessments of body areas requiring reconstruction, such as the breast and body contouring, are conducted by subjective methods which lack accuracy and reproducibility. New qualitative methods for assessing post bariatric surgery ptosis are under development. These include user rated scaled such as the Bozola, Iglesias, Gurunluoglu and Pittsburgh classification systems. Each system has its benefits and drawbacks. Bozola et al. emphasise focussing on more specific descriptions and measurable characteristics (e.g., fat deposit, musculo-aponeurotic layer and amount of skin) to make the grading less dependent on the observers’ interpretation. Iglesias et al. designed a classification system using fixed anatomic references and objective anthropometric measurements, which are subject with inter observer variation and knowledge of anatomy (the system measures the redundant pannus in relation to the inguinal ligament and the total length of the thigh, for example). The separate classification of 10 regions makes the Pittsburgh Rating Scale extensive but time consuming.
As yet, no objective method based on 3d stereophotograms has been developed to overcome the problems of yielding various different intersubject and interobserver results in the massive weight loss population.

Various objective methods have been used for the assessment of the shape and size of anatomical areas. In the past laser scanning and magnetic resonance imaging were used. Laser scanners produce light from a collimated source aperture that scans the object. Disadvantages of this method include slowness, difficulties to capture soft tissue surface texture and therefore difficulties in locating landmarks. MRI makes use of nuclear magnetic fields which resonate around the structure to produce images of the soft tissues of the human body. Disadvantages of this method are the high cost, production of texture less images, difficulties with positioning and discomfort for the patient. In the past decade, advances in optical-based three-dimensional imaging technologies, such as structured light and stereophotogrammetry, have gained popularity worldwide and offer multiple medical applications.

Structured light technology was initiated by the machine-vision industry for fast full-field measurements and was commercialized in 1995. It analyzes the surface of an object by sequentially capturing calibrated patterns of light projected onto the object’s surface. Distortions in the patterns are processed to register the shape data as colour-texture information, creating a three-dimensional model. This system was enhanced by Siemens and introduced into the medical field by Axis Three Ltd. (Belfast, United Kingdom) in 2006. This system was originally designed for use in engineering, where accuracy and speed of measurement has high priority so data acquisition is approximately two seconds.

In 1944 stereophotogrammetry was introduced as the principle of taking two pictures of the same object from two different viewpoints to create a stereo pair, recording depth to generate a composite three-dimensional model. It has the ability to capture three-dimensional data acquisition between 1 and 8 msec. The three main systems available are Dimensional Imaging was launched in 2002, 3dMD in 2002 and Canfield Scientific in 2005. Stereophotogrammetry has been validated for use in the face, breast and thorax.
Stereophotogrammetry has three strategies: active, passive, and hybrid. Active stereophotogrammetry (Canfield CR 3D) projects a pattern onto the surface of the target object. Combining this projected and the visible natural (e.g., pores, freckles, and scars) patterns of the object's surface allows dense measurements of the reconstructed three-dimensional geometry. No additional lighting is needed for this strategy, which resists the effects of ambient lighting. In contrast, passive stereophotogrammetry (Canfield and Di3D) does not need projection of any patterns; it generates three-dimensional geometry on the basis of natural visible patterns. Because strong directional ambient light may cause glare and diminish the superficial details, passive stereophotogrammetry depends on the integrity of the pixels and requires carefully controlled lighting conditions for the three-dimensional reconstruction. Hybrid stereophotogrammetry (3dMD) combines active and passive stereophotogrammetry triangulation strategies into one system, fusing both technologies.

Once the image is captured, a life like 3D image is built. Determining the volume is dependent on creating a mathematical calculation for the chest wall by a software algorithm. The advantages of this method are the fast capture speed, the ability to capture the true soft tissue surface texture, the ability to locate landmarks and to measure and objectively analyze the 3D images. Disadvantages include the fact that stereophotograms are not validated for the whole body as yet.

In Scotland, there is clear guidance on the exceptional aesthetic referral pathway for post bariatric body contouring but there is not a clear system in place to streamline the process. For example, in the exceptional aesthetic pathway for breast augmentation, patients’ psychological screening and clinical image of their torso is reviewed in a multi-disciplinary team meeting before they are seen in clinic. If there is no infra-mammary fold, they are one step closer to meeting the criteria for socially funded augmentation and receive an outpatient appointment, if they do not meet the criteria; they are advised of this in a letter. Currently, the massive weight loss patients still need to attend plastic surgery outpatient clinics to determine if they meet the criteria. As bariatric surgery is increasingly being offered in the UK, and with the obesity epidemic growing, massive weight loss body contouring is currently the largest growth area in plastic surgery in the UK and the USA. Therefore, a means of
assessing patients and streamlining the referral process to improve the patient journey will strengthen the health system efficiency, reduce consultant clinic time wastage and improve first outpatient clinic referral efficiency.

BAPRAS has developed national guidelines on reconstructive surgery following bariatric weight loss procedures. If we are to have clear referral guidelines for massive weight loss body contouring, as a speciality we should have the means to receive and triage the referrals in an equitable, consistent and systematic manner. This study was designed to clarify whether 3D stereophotograms are reliable in correlating to clinical anthropometric measurements and therefore, be useful as an objective assessment tool for preoperative screening.

**Aim**

To compare 3d surface measurements and actual anthropometric measurements to determine accuracy of di3d surface measurement tool for objective assessment of massive weight loss body contouring patient.

**Methods**

We performed a prospective, observational study of outcomes in patients undergoing bariatric and plastic surgery procedures at 2 clinical sites in Scotland, UK. Regional Ethical Committee approval was obtained for the study protocol. Written informed consent was obtained from all subjects. Seventy patients over the age of 18, who were under follow up by the bariatric or plastic surgery services for massive weight loss, were recruited from the regional bariatric and plastic surgery units, with staggered entry between 2010 and 2012. Patients with a previous history of gluteal implants, abdominoplasty and body contouring procedures were excluded.

Patients were followed up in clinic and had weight and height measured by a CRF accredited Clinical Research Nurse (CRN) who followed a standard operating procedure. Height: Height was measured using a stadiometer with a sliding head plate, a base plate and three connecting rods marked with a metric measuring scale. Participants were asked to remove shoes. One measurement was taken, with the participant stretching to the maximum height and the head positioned in the Frankfort plane. The reading was recorded to the nearest millimetre. Weight was measured using the same scales in the outpatient department on each visit.
A plastic surgery registrar took surface linear anthropometric measurements including of the xiphisternum to umbilicus and pannus and waist and hip circumferences. A standard operational protocol was followed in taking anthropometric measurements to ensure inter subject consistency. (Appendix 16).

The patients were reviewed in the clinical photography department and had 2D clinical images and 3D stereophotograms taken, following a standard operating procedure. The subjects were photographed at a set distance from the camera, wearing no clothes, except their underpants (Appendix 15). Each subject was imaged using the Dimensional Imaging 3D system. The 3D stereophotogrammetry system integrates two pods, each with two cameras; on either side, two monochrome cameras are synchronised to capture images illuminated by integral projectors. This camera system required calibration each day prior to capturing the data.
Results
Images were captured with the Di3D system.

Image 3: 3D stereophotogram of post bariatric surgery patient
Image 4: 3D stereophotogram of pre plastic surgery patient
Data was analyzed with IBM SPSS V.19 statistical package, at Dundee University. 65 patients were recruited. 5 were lost to follow up. 60 patients were reviewed in clinic and underwent the above protocol. 22 were male and 38 were female. Table 8.1.
Table 8.1 Spearman's rank correlation of anthropometric measures vs 3D stereophotogram

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Anthropometric Measuremet</th>
<th>3D Stereophotogram</th>
<th>Mean differences</th>
<th>Spearman Rank Correlation R value</th>
<th>Two tailed Paired T test</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Xiphisternum – umbilicus</td>
<td>45.85 (29-62)</td>
<td>42.56 (29.17-61)</td>
<td>3.18</td>
<td>0.6661 P value &lt;0.0001</td>
<td>t(59)=4.06 p=0.0001</td>
</tr>
<tr>
<td>2 Xiphisternum – pannus</td>
<td>60.63 (30-98)</td>
<td>59.91 (30-99)</td>
<td>0.72</td>
<td>0.7716 P value &lt;0.0001</td>
<td>t(59)=0.53 p=0.597</td>
</tr>
<tr>
<td>3 Waits Measurements</td>
<td>110.45 (51-150)</td>
<td>115.41 (60-180)</td>
<td>4.97</td>
<td>0.825 P value &lt;0.0001</td>
<td>t(59)=2.51 p=0.014</td>
</tr>
<tr>
<td>4 Hip Measurements</td>
<td>120.8 (50-191)</td>
<td>126 (51-200)</td>
<td>5.2</td>
<td>0.96 P value &lt;0.0001</td>
<td>t(59)=5.1 p&lt;0.0001</td>
</tr>
</tbody>
</table>

**Discussion**

There were statistically significant differences in the 3D stereophotograms and the anthropometric measurements for measurements 1, 3 and 4. However, there were found to be similarities in the xiphisternum to pannus measurement between the stereophotogram and anthropometric measurements taken.

In order to calculate the surface linear measurements between the xiphisternum and umbilicus and pannus, the 3D software provided required the user to drop pins at points along the course of the pathway and measurements could be taken between each point. It was not possible to take measurements directly and therefore a mathematical formula below was used to carry out the calculation:

$$3 \text{ Dimensional Distance Formula} = \sqrt{(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2}$$
Limitations
This was quite a simple formula to use and indeed, it may be that the results could have been more accurate had the software enable the measurements to be automatically generated. Currently the system used has the ability to calculate differences in measurements between two images superimposed and correlated by bony landmarks. The problem with doing this in the thorax is that bony landmarks are not visible.

Other limitations of the software is that the 3D stereophotograms are unable to capture images in skin folds or on the under surface of the pannus. This resulted in very limited analysis for the circumferences, and for any surface linear measurement which travelled over skin folds.

Possible shortcomings of a 3D imaging system by multiple stereophotogrammetry were the need for an experienced operator, the cost, which was about £45 000 for our prototype system then a further annual maintenance fee and the length of data processing, which took up to 2 h to capture, build the 3D model and digitize landmarks. Faster systems are now available for merging the images and building the 3D digital model of the breast; this will encourage wider clinical applications.

Conclusion
The means to receive and triage referrals for massive weight loss body contouring in an equitable, consistent and systematic manner is required.

However, although validation of 3D stereophotograms has been carried out in the face, breast and thorax in non-massive weight loss patients, currently the technology available cannot be applied to this population as their ptotic skin folds limit the ability of image capture on all the surface linear measurements. Further technological advancements are necessary before they can be used in this group of patients.
Chapter 9: Body contouring surgery in the massive weight loss patient: A BAPRAS survey of UK Plastic surgeons

Introduction
The UK currently ranks fifth in rate of obesity among developed countries. Data published by the Health and Social care Information Centre in 2013 indicates that the prevalence of obesity has nearly doubled in the last 8 years. 62% of adults (age 16 and over) are overweight or obese with 2.5% having severe obesity. This has caused a proportional increase in number of bariatric surgery procedures performed each year, with data showing a 30-fold increase in bariatric surgery procedures from just 261 in 2000/2001 to 6643 in 2010/2011 on the NHS.

Bariatric surgery leads to massive weight loss in patients in a small amount of time resulting in folds of redundant skin. This in turn has caused a rise in the demand for body contouring surgery, which is now evolving as a significant subspecialty in Plastic surgery.

With the rising incidence of obesity and the corresponding increase in bariatric surgery procedures performed, there is an increasing population of patients who are disfigured and disabled by these large folds of skin. However, management of these redundant skin folds involve variations of well-known cosmetic procedures and are often seen as aesthetic surgery, therefore their provision on the NHS has been variable. This has led to a call for national guidelines for post massive weight loss reconstructive body contouring surgery. We have carried out a survey of all UK Plastic surgeons to determine consensus on massive weight loss body contouring surgery with particular focus on funding by NHS and contents of national guidelines.
Methods
An 11-item questionnaire (Appendix.17) was sent through BAPRAS to all NHS Plastic surgery Consultants in Scotland, England, Northern Ireland and Wales. The survey focused on: the number of body contouring procedures performed by the surgeon each year; participation in Bariatric MDT; opinions on funding for body contouring; current problems faced when performing body contouring; the desirability of national MWLBC guidelines. The survey was open for 2 weeks and was accessible via the internet.

Results
There were 105 respondents, which, of the 424 BAPRAS registered plastic surgery consultants in the UK, represent a 24.76% response rate. The responses were collected from every unit in the country. 68.3% of the respondents carried out less than 5 MWL body-contouring procedures per year, 24.8% carried out 6-10, 5% carried out 11-20 and 2% carried out more than 20 in their NHS practice.

81.4% of the respondents considered massive weight loss (MWL) body contouring surgery, as a means to address both aesthetic and functional needs. 3.9% considered it just aesthetic surgery whilst 14.7% considered this as predominantly functional reconstructive surgery. (Figure 9.1).
Figure 9.1: Pie chart of response to the question: Do you consider MWL BC to be aesthetic or functional surgery?

![Pie chart](image)

The peri-operative BMI was grouped ranging from <27->40.

Only 55 respondents had patients in the <27 BMI group, most surgeons operated on patients in the 27 – 30 BMI range. 41 respondents had performed MWL body contouring in patients with a BMI of 31-39. 9 surgeons had patients with BMI >40 with 3 surgeons confirming >75% of their patients were in this group. (Figure 9.2)
Only 6.1% of the total responders were Bariatric MDT participators. However, 32.7% felt that they would like to take part (Figure 9.3).

The most common impediment to performing body-contouring procedures was cited as “lack of funding” at 68.3%. 42.6% of respondents cited the lack of bariatric MDT as a reason. Other reasons included inconsistent PCT and commissioning guidelines and
BMI restrictions (23.8%); lack of the support from the trust (13.9%); training issues (8.9%) and lack of surgeons’ interests (7.9%). 9.3% of surgeons experienced no difficulties. (Figure 9.4)

Figure 9.4. Bar chart showing response to whether surgeons experience difficulties in MWL patient

More than half (56.7%) of the surgeon cohort felt that the NHS should fund body-contouring surgery whilst 18.6% were opposed to the idea of NHS funding. 24.7% were undecided. (Figure 9.5)
In terms of procedures to be funded, abdominoplasty was the most favoured procedure with 82.8% votes, followed closely by interim apronectomy/panniculectomy with 72.4% votes, reduction mammoplasty, thigh lifts and brachioplasty were close contenders with votes ranging between 42.9-56.3%, face lift and neck lift were the least favoured with only 1-2% of the surgeons considering these should be funded by the NHS. (Figure 9.6)
Figure 9.6: Bar chart showing what MWL BC procedures should be funded in the NHS

Most surgeons agree that funding for massive weight loss patients on the NHS should be conditional on patients making healthy lifestyle choices (76.3 %).

Almost 90% of the respondents felt that clear national guidelines would be helpful in dealing with this group of patients.

Surgeons were able to select items that should be included in the guidelines. The highest ranking inclusion criteria was length of weight stability (89.8%), followed by smoking status (88.8%), BMI (87.8 %), functional morbidity (82.7%) and skin conditions after massive weight loss. 68.1% believed that current exercise status should be taken into consideration. Understandably past medical history was also seen as an important inclusion criterion at 60.6%. 40-50% of the respondents felt that body dysmorphic disorder; eating disorders; delusional or schizophrenic illness; history of self-harm; major depressive illness; substance abuse and death of a close family member in last 12 months should be taken into account. Only 31.6% believed that body contouring should be age restricted. Less than 10% felt that social issues like relationship status, birth of children and career were important. (Figure 9.7)

Figure 9.7: Bar chart showing what national guidelines should include.
Discussion
It is increasingly recognized that the psychological burden of obesity carries on long after reduction in weight because of resultant redundant skin. Studies carried out by Wolf et al. and Taylor et al confirm the stigma associated with redundant skin and the need for body contouring surgery\textsuperscript{325, 326}.

81.4% of plastic surgeons who completed the survey deemed body contouring surgery as both a functional and aesthetic procedure. Highton et al. found that 92% of his cohort of surgeons from the British Obesity and Metabolic Surgery society felt that patients face functional problems relating to skin redundancy after massive weight loss\textsuperscript{42}.

Multidisciplinary team approach
The guidelines and literature state that in view of the complexity of these patients a multidisciplinary team should only undertake surgery for obesity with access to plastic surgery\textsuperscript{327}. Despite these recommendations only 6.1% of the plastic surgeon cohort were part of a bariatric MDT, which represents less than 20% of the surgeons in the country, carrying out more than 5 MWL body-contouring procedures per year. The number of plastic surgeons willing to be part of a MDT reflects the number carrying out these procedures regularly (33.3%).

Psychological evaluation
NICE guidance clearly indicates the importance of psychological assessment in both pre and postoperative periods. There is a 25% increase in mood, and anxiety disorders in
obese populations\textsuperscript{328}. These ranges from depression, mood and anxiety disorder to substance abuse problems and personality disorders\textsuperscript{329,330}. The risk of depression in persons with a BMI $>$40 kg/m$^2$ is nearly five times higher than that of an average weight person\textsuperscript{331}. Following massive weight loss these complex issues can be further exacerbated by disfigurement with excess skin causing disengagement with society, body image dissatisfaction and self-disgust\textsuperscript{332}. These studies signify the importance of psychological counseling and support in the effective management of the obese patient which reflects our data where 40-50\% of the surgeon population approved of psychological preparation being an integral part in the post MWL patient pathway.

**Inclusion and exclusion criteria:**
National guideline inclusion and exclusion criteria selected by our cohort of plastic surgery consultant colleagues reflects current guidelines on ensuring safety by minimizing peri-operative BMI, which is associated with an increased risk of complications\textsuperscript{333}. Lengths of weight stability (89.8\%) and smoking cessation (88.8\%) are the other key factors, which predict long-term success and minimal complications in these patients. In terms of procedures favoured for funding on the NHS, abdominoplasty proved to be most favorable, it is interesting to note that this is in keeping with the preference of body contouring procedures in patients, previously depicted in a study, the most commonly requested procedure was abdominoplasty followed by breasts, thighs and arms.

**Variability in provision:**
Our results demonstrate the increased difficulty in obtaining funding in the current financial climate where nearly 70\% of the surgeons reported funding was unavailable. This is stark contrast to Butler et al.’s data in 2009 where 95.1\% of the plastic surgery units in the country were able to offer some form of body contouring procedure following massive weight loss\textsuperscript{334}.

Currently in England, there are no standard guidelines for provision of body contouring surgery. 23 trusts excluded all post Massive weight loss body contouring surgery. This is also a dramatic increase from 2009, where only 4.9\% of units were not able to offer any surgery due to lack of funding. This perhaps reflects a healthier financial climate in 2009 compared with 2013.
Wolverhampton Primary care Trust (PCT) and South Staffordshire PCT state that “Patients must be informed that the PCT will not fund cosmetic procedures to remove any excess skin folds that may result from rapid weight loss”. Such statements may represent current attitudes of affiliating these reconstructive and functional procedures with aesthetic operations, which share some of the same techniques.

The importance of tackling such inequality has received sustained policy attention for the past 15 years. Yet despite this, there has been disappointingly slow progress in reducing health inequalities. A recent King’s Fund review of the NHS identified this as the most significant health policy failure of the last decade. The following four areas of weakness have been identified: (i) lack of serious attention to social and economic inequality; (ii) failure to shift resources from secondary and tertiary services to high quality prevention, early diagnosis and treatment in primary care; (iii) lack of performance management; and (iv) persistence of a weak evidence base.

The clinical commissioning groups (CCGs) formed in April 2013 will empower local GPs to make decisions of service provision based on local contextual factors whilst mediating the effect of policy interventions. A survey carried out by BAPRAS in 2010 revealed that 45% of all GP’s are in favour of NHS funding for body contouring procedures.

Therefore in some areas, where limited budgets need to be spent on (for example) an elderly population, it will only become more apparent that less resources are allocated to post massive weight loss body contouring, whereas in other areas this group of patients will be financially supported.

As a specialty, we need to champion the needs of our patients and, as plastic surgeons we need to provide the best possible evidence base, collate and disseminate information on performance management and develop effective partnerships with CCGs to support patients in this difficult financial climate. Education of the new commissioners and understanding of the cost benefit implications must be tackled.

Limitations
A limitation of this study is that it is a subjective evaluation of consultant surgeons. In order to ensure the questionnaire was quick to complete only 11 questions were sent
out. There are 424 plastic surgeon consultants registered with BAPRAS and of these 105 responded, giving a 25% response rate. The 75% that did not respond could have altered the results significantly. However, feedback from individuals who also received the study but did not respond was that they were no longer NHS consultants and therefore did not think it appropriate to complete the survey. The study questions were designed to be unbiased, however feedback from some respondents commented on the fact that there was no option for “none” for question 8 and therefore was biased. However, the questionnaire did give the option of “other” in which comments could be added.

**Conclusion**
Post-bariatric body contouring is an integral component to the total care of the obese patient and to optimize results achieved from bariatric surgery.

Results from the survey convey a message of agreement amongst the plastic surgery fraternity in regards to the need and requirements of national guidelines. Lack of funding in some trusts across the UK, has been determined as the most commonly encountered problem for plastic surgeons.

Bariatric surgery has shown cost-benefit effects and provision of body contouring can enhance this, however robust data is required for evidence to support treatment guides. Plastic surgeons as a community should aim to gain data, supporting the needs of the obese patient. In addition to a fast developing subspecialty, learning and training opportunities should be created in preparation for the increased demands of body contouring in the near future ensuring patient centered care. National Guidelines for body contouring will ensure better quality of care by standardization of treatments throughout the country, eradication of healthcare inequalities and production of improved patient pathways. The aim of addressing obesity should not simply be to reduce the financial burden on the state through the resolution of obesity related diseases. The goal should be for the patient to return as a happy and productive member of society. Body contouring plays an important role in achieving this objective, and should always be considered part of the patient pathway when PCTs agree to fund weight loss surgery.
Chapter 10: Smoothing the patient journey through massive weight loss body contouring: A proposed PROM

Introduction
Ensuring the validity and robustness of data generated from PROMs depends on selection of the most appropriate measurement tool, reflecting the population, disease and specific domains relevant to the cohort. Although PROMs have been used widely in chronic illness and cancer, PROMs are still a relatively new concept in the field of surgery.

Although studies have shown psychological implications of redundant skin to be determinants in the decision to seek body contouring surgery, it has also been found that abdominoplasty could have a positive impact on sexuality, functional morbidity, career progression and smoking cessation in addition to psychosocial function. As body contouring practice undergoes rapid expansion, there is a need for documentation of psychological, social, and functional features of body contouring. The tangible changes in appearance from these procedures have been documented by various surgeons. However, QoL and psychological function of massive weight loss body contouring patients remain largely unexplored territories. Reflecting the need to practice evidence based medicine, these topics necessitate inquiry, so that we may properly document relief of prior dysfunction with surgical treatment. Body contouring after surgical weight loss, being a relatively new subspecialty within plastic surgery, particularly lacks both standardized methods of assessment and knowledge of expected clinical outcomes. Therefore we need to perform careful and sophisticated outcome studies that can offer proof of the value of our service to this particular population. However, a major impediment to this is that there is still no validated patient reported outcome measure for post massive weight loss body contouring patients. As there is growing emphasis on cost effectiveness in the health care industry there is a greater demand for comprehensive outcomes research using a validated tool.

The 2005 white paper Choosing health: making healthy choices easier emphasise the role of primary care in obesity management. It highlighted the need to increase
resources to facilitate referrals\textsuperscript{348}. A paper by Ogden et al identified general practitioners are sceptical of what they can offer in obesity management and felt the responsibility lies with the patients and the system is not efficacious. Primarily, managing obesity in primary care requires the development of effective patient interventions and clear patient journeys in which GPs can have faith\textsuperscript{349}.

**Aims**
This paper discuss the initial steps in devising a PROM which aims to facilitate the patient journey through the massive weight loss body contouring journey as a “referral tool” by reflecting the national commissioning guidelines from the British Association of Plastic and Reconstructive Surgeons (BAPRAS) in development, and collect key outcome measures.

**Methods**
Regional Ethical Committee approval was obtained for the study protocol. Written informed consent was obtained from all patient subjects.

The design of our PROM followed the format of that set out by the Scientific Advisory Committee of the Medical Outcomes Trust.\textsuperscript{350} Eight defined attributes have been proposed (conceptual measurement model; reliability; validity; responsiveness; interpretability; administrative burden; forms of administration; and cultural & language adaptations) as well as the criteria for reviewing instruments.
Step 1 PROM content development

Content validity is felt to be one of the most critical forms of validity to be assessed for a PROM. Robust content development will determine the extent to which the PROM represents the most relevant and important aspects of a concept in the context of a given measurement application.

A PROM should have evidence supporting its content validity, including evidence that patients and/or experts consider the content of the PROM relevant and comprehensive for the concept, population, and aim of the measurement application. This includes documentation of: 1) qualitative and/or quantitative methods used to solicit and confirm attributes (i.e., concepts measured by the items) of the PRO relevant to the measurement application; 2) the characteristics of participants included in the evaluation (e.g., race/ethnicity, culture, age, gender, socio-economic status, literacy level) with an emphasis on similarities or differences with respect to the target population; and 3) justification for the recall period for the measurement application.

Qualitative methods including literature review, semi structured patient interviews and expert opinions were used to generate important components of outcome for a preliminary PROM.

The literature review was conducted (Chapter 4).

Interviews were conducted with 84 massive weight loss patients at varying time of their weight loss journey. (Appendix 14)

Expert opinion on what should be included in the “referral tool” element of the PROM was gathered from a survey sent out to all plastic surgeons registered with the British Associations of Plastic Surgeons in the UK (Appendix 17).

The PROM was then discussed with a clinical psychiatrist specialized in appearance research regarding the content and appropriate wording before producing the preliminary version.

The tool was also reviewed by the BAPRAS body contouring commissioning guidance development group which consisted of 6 plastic surgery consultants, 1 bariatric surgery consultant, 3 plastic surgery registrars, a clinical psychologist, 2 lay observers who
were also patient representatives (Chair of the British Obesity Society and Chair of the Weight Loss Surgery Information group), a general practitioner and a health care commissioner. (Appendices 18 & 19)

This preliminary PROM was then piloted with 34 Darzi fellows via email who provided insights into the tool (Appendix 20). Darzi fellows have been rebranded as Fellows in Clinical Leadership. This innovative programme competitively selects a cohort of exceptional clinicians, usually GPs, to develop the capability necessary for their future roles as clinical leaders. Fellows play a major role in many successful transformations projects including Quality, Innovation, Prevention and Productivity initiatives, and many have generated significant financial savings for their organisation. Therefore, these fellows were seen as ideal young experts in developing efficiency at the same time as improving the quality of care.

These discussions, together with a review of previous literature, were used to generate a candidate list of communication content elements, attempting to capture those elements described as most important while avoiding duplication and unnecessary detail. The list was circulated once again among the physicians, to make sure it reflected their views, and was approved by consensus with minor revisions.

The tool was reviewed from version 1, to version 3 over the course of 6 months. (Appendices 21, 22, and 23).
Results

Literature review

A recent critical review of published research literature on the impact of body contouring surgery following weight loss on patient QoL identified seven studies that directly reported on QoL changes. A number of areas of QoL were identified: Physical functioning and feelings of healthiness, improvements in psychological and mental health well-being, freedom from dependency or disability, stability in mood, body image satisfaction, feelings of attractiveness, reduced feelings of body uneasiness, enhanced self-image and self-esteem, enhanced confidence, positive thinking, improved social acceptance, greater involvement in the social and cultural performance domain and body contouring concerns that arise following gastric bypass surgery.

However none of these studies used a validated PROM on body image satisfaction following massive weight loss body contouring. To accurately demonstrate improved QoL and functional status in our patients, plastic surgeons should perform outcomes-based studies with validated tools; which is essential to promote a study’s reliability and validity of its findings.

A further systematic review of PROMS by Reavey et al in 2011 confirmed no validated PROMs exist for the massive weight loss body contouring patient. The 2013 structured review of patient reported outcome measures used in cosmetic surgical procedures from University of Oxford identified 35 PROMS previously used in the assessment of cosmetic surgical procedures, of which none were for the massive weight loss body contouring patient.

Our literature review demonstrated no new tools since this publication.
Semi structured interview
Chapter 7 highlights how the semi structured interviews identified key themes important to massive weight loss body contouring patients. These topics covered: career progression; relationships; fragile relationships; bereavement; reconciliation of new body with identity and body image.

The semi structured interview also identified which factors from the psychological scores were most relevant to this cohort of patients and critically, any experiences or concerns that had not been captured in the psychological scores used. The following additional themes were identified: difficulty finding clothes that fit, distress at seeing pictures of myself, difficulty doing exercise because of poor fitting clothes (especially swimming costumes), physical difficulty having sex because of skin overhanging and getting caught or getting in the way.

Expert opinion
Expert opinion was sought from:

1. Consultant members of the British Association of Plastic and Reconstructive Surgery (BAPRAS) via a survey (chapter 9)
2. The BAPRAS massive weight loss body contouring commissioning group.
3. General Practitioners in Training: Darzi fellows

Review via BAPRAS survey
A standard questionnaire was electronically sent out to all consultant members of BAPRAS. 105 responses were received and analyzed. Surgeons were able to select items that should be included in the guidelines. The highest ranking inclusion criteria was length of weight stability (89.8%); followed by smoking status (88.8%); BMI (87.8%), functional morbidity (82.7%) and skin conditions after massive weight loss. Sixty eight per cent believed that current exercise status should be taken into consideration. Understandably past medical history was also seen as an important inclusion criterion at 60.6%. Forty to fifty per cent of the respondents felt that body dysmorphic disorder; eating disorders; delusional or schizophrenic illness; history of self-harm; major
depressive illness; substance abuse and death of a close family member in last 12 months should be taken into account. Only 31.6% believed that body contouring should be age restricted. Less than 10% felt that social issues like relationship status, birth of children and career were important.

**Review by BAPRAS body contouring commissioning guidance development group**
Generally it was felt that the form was good with the following sections being specifically requested by members of the group to stay in. “Overall, the tool is very comprehensive and excellent in terms of eliciting holistic information.”

1. Employment and status categories
2. QoL issues

The following items were felt to be necessary to be included additionally

1. Reorganisation of the bariatric surgery options to include: laparoscopic, laparoscopic converted to open, open.
2. NHS numbers to standardise the data collection nationally but also comparably to the bariatric data.
4. A space for “additional information” to be written freehand by the patient

Concerns were raised regarding:

1. Clarification required for term “significant functional disturbance”
2. Length of the form
3. Dissemination strategy
4. Who would complete the form
Review by Darzi fellows
Of the 34 Darzi fellows this form was sent to, 20 responded with the following comments.

Positives

1. Glad that this is being done
2. Comprehensive form which gives us an understanding of which patients should get approved.
3. Desperately need help navigating the referral pathway for patients – timely intervention
4. I am battling for one of my patients to get surgery based on her psychological morbidity but she is getting rejected and I don’t know what the next steps should be. I hope this form will clarify the referral pathway.
5. It would be helpful for both the patients and referring clinicians if this referral criterion is respected.
6. I like the Gok style images of people in size order that the patients have to line up themselves in…. good!

Concerns:

1. If all pages have to be completed by the GP, it is too long.
2. Funding applications should be done by the surgeons as they are the ones with the expertise regarding whether surgery is appropriate. GPs would apply for funding for assessment.
3. It is not clear how the detail would affect the referral – why does it require full daily diet history?
4. I see how the detail is helpful for the surgeons to make a decision but I imagine that would form part of your consultation process - is it really necessary to be in the referral form?
5. Why does it need exercise history? Will it be rejected on the grounds of what is written?
6. Under method of weight loss “Exercise” has been left out
7. Substance misuse – worth listing alcohol separately and types of drink as they have a high calorie load
8. Smoking listed in pack instead of numbers of cigarettes

9. Page 3 – the word move should be used instead of mobilise to be more patient friendly

10. The key is simplicity, weight lost and percentage excess needs to be calculated automatically and not be done by the GP.

11. What is the definition of percentage excess weight – it should not be included.

12. How do we know if funding is secured?

13. What does functional morbidity mean?

14. What does psychological morbidity mean?

The tool was corrected to reflect these queries with many minor alterations resulting in version 3. The silhouettes in the tool were derived from Stunkard silhouettes but modified to encompass much larger body shapes as per Song et al’s Pictorial Body Image Assessment (PBIA). The line diagrams of the font and back of a body, as a prompt to highlights of concern was derived from the Current Body Image Assessment (CBIA)
Discussion
In terms of achieving Donabedian’s “quality care” we have the power to address the structure of health care delivery and the process the patient goes through with this referral tool. Thereby, hopefully, achieve what all clinicians aim to do: improve outcomes in our patients.

Referrals in general are inconsistent in content, timeframe and destination\textsuperscript{363}. Unwarranted variations in service provision need to be tackled and one of the recommendations in doing so is to make referral guidelines available and easy to follow. This is reflected in the increasing drive to make effective referrals first time, as demonstrated by the “patient referral service” lead by Westminster Clinical Commission Groups (CCGs)\textsuperscript{364} where a team of doctors review referrals to ensure that patients meet criteria for referral and that the referral are appropriate to prevent wastage of first clinic appointments. Private companies are also monetising on the clear financial benefits to CCGs of appropriate first time referrals by developing platforms which provide interactive referral templates to ensure all the correct data is collected and directed to the appropriate setting\textsuperscript{365}. The financial benefits would occur not only at the primary care setting but also in the hospital which will have fewer wasted clinic appointments with inappropriate referrals.

Referrals that meet the inclusion criteria would streamline the patient journey, mitigate unnecessary stress and save resources both in time and money.

The steps taken so far have been in keeping with international published guidelines of creating content for validated PROMs.\textsuperscript{350, 366} However, even though this method was adhered to there are deeper methodological considerations including the way in which questions in the tool are asked must be considered. “Open-ended” questions enable the patient to provide their perspective without as many restrictions, whereas “closed” questions gives more quantitative evaluations, but does not provide the situation the patient is referring to and may not address areas of concern from the patient’s standpoint. In the ideal survey, both types of questions should be included to avoid underreporting of problems and also to identify areas for change.

As with any tool, there will be arguments against its use. Some are generic and include: better to rely on independently verifiable observations, too difficult to interpret and
collection is too intrusive for patients/subjects. None of these objections were held to be valid per se, although they can all become so under certain circumstances. This is particularly relevant in circumstances where PROMs are not developed in the context of a partnership process with representatives of those who ultimately stand to benefit from the research proposal. If there has not been proper patient and carer consultation in the development of PROMs then there is indeed a danger that PROMs will be seen as a burden rather than a genuinely empowering tool.

It is also likely that the collection of PROM data will require a degree of trade-off between rigour and comprehensiveness on the one hand, and willingness of patients to complete the PROM to collect the data.

These concerns are reflected in the feedback from both the panel of experts and the GPs specialising in health care commissioning and leadership (Darzi fellows). Many of the concerns were addressed with minor alterations to the form. The question of who will be completing the form and where the form should be sent will be clarified in the additional documentation providing the conceptual and measurement model. As per the Scientific Advisory Committee of the Medical Outcomes Trust guidelines “A PROM should have documentation defining and describing the concept(s) included and the intended population(s) for use.”

Other considerations include biases. Several biases based on psychosocial theories may influence satisfaction measurement. The cognitive consistency theory implies that a patient is more likely to respond positively to a satisfaction survey to justify their own time and effort spent obtaining treatment. The Hawthorne effect implies that the very action of measuring the level of satisfaction increases the apparent concern of the health care provider, thus improving satisfaction levels. Social desirability bias indicates that patients give positive responses because they feel that these are more acceptable to satisfaction researchers. Ingratiating response bias implies that patients give positive responses to try and ingratiate themselves to health care staff, especially when anonymity is suspect. Similarly, patients may be reluctant to provide negative feedback in fear of prejudice from the health care provider. Self-interest bias causes patients to provide positive responses, because they believe this will allow the health care program to continue running, which is in their best interest. Gratitude is
also a common factor, which in the United Kingdom is associated more with the elderly generation.

There is a clear need to have a measure which is psychometrically sound, derived from patient and user experiences, has face validity and is easy to administer and score. The literature reviews have consistently found that no measure exists which meets these criteria. This paper outlines the first steps taken develop a PROM which reflects our aspirations to meet this need. The next step is validation studies.
**Step 2: Validation studies**

**Introduction**
Following bariatric surgery, morbidity and mortality decreases\(^{20}\), however ptotic redundant skin folds do not contract with the volume loss\(^{97}\) resulting in intertriginous rash, hygiene issues and functional and psychological impairment\(^{98}\). Identifying outcomes in these patients requires an understanding of the complex adjustment they are making to their new body habitus, the redundant skin, removal of the coping mechanism of food, identity and the functional and psychosocial fall out. Evidence-based health policy emphasizes the importance of using scientifically rigorous patient-based outcome measures to evaluate the impact of disease and treatment.\(^{372}\)

Ensuring the validity and robustness of data generated from patient reported outcome measures (PROMs) depends on an appropriate assessment tool\(^{373}\), reflecting the population, disease and specific domains relevant to the cohort. Although PROMs have been used widely in chronic illness and cancer, PROMs are still a relatively new concept in the field of surgery\(^{342}\). Currently there is no measure for the massive weight loss body contouring patient which is psychometrically sound, derived from patient and user experiences, has face validity and is easy to administer and score.

We have developed a patient report outcome measure for massive weight loss (MWL) patients wishing to undergo body contouring called the Post Bariatric Outcome Tool (PBOT) (Appendix 23). This PROM has been designed to fit in with the national guidelines of massive weight loss body contouring published by BAPRAS in 2014.\(^{374}\)

By utilising this PROM as part of the referral pathway it will help the referrer identify if patients meet the national criteria and will heighten awareness of psychological disturbance that may warrant early psychological intervention. We anticipate users of the PBOT will come from a range a professional backgrounds including GPs, bariatric surgeons, plastic and reconstructive surgeons, clinical health psychologists and specialist nurses, as well as academics. The PBOT is five pages long. The referrer completes pages 1-2. The patient completes pages 3-5.
The length of time taken to complete the PBOT varies, but is usually between 10 and 15 minutes for pages 3-5. The completed form (pages 1-5), along with a clinical photograph of the patient is then sent to the MWLBC MDT for analysis and scoring. Figure 10.1.

Figure 10.1: Flowchart of PBOT use

In order to measure psychological and functional adjustment to MWLBC it is recommended that the patient completes pages 3-5 of the PBOT for a second time at the final plastic surgery outpatient clinic.

To develop a conceptual model and generate items for the PBOT we followed an established method of: literature review; semi structured patient interviews and expert opinions. This has been described in earlier chapters. This chapter highlights the outcomes of assessment of validity of the PBOT in a prospective study, as per the
Methods
Field test and psychometric analysis
The following 3 groups were posted and completed the PBOT and Derriford 24 (DAS24) at week one and week three.

- 10 non-obese, healthy population
- 10 patients following massive weight loss (MWL)
- 10 patients post massive weight loss and body contouring (MWLBC)

Psychometric analysis was then performed on results for conceptual and measurement model, acceptability, responsiveness, reliability and validity.

Conceptual and measurement model
“A PROM should have documentation defining and describing the concept(s) included and the intended population(s) for use.” The PROM is supported by appropriate documentation. (Appendices 24 & 25).

Administrative burden/ Acceptability
The burden of acceptability was assessed by completion percentage of the PBOT. We were willing to accept < 10% frequency of missing data from completed scores. Response distributions were examined, focusing on maximum endorsement frequencies, i.e. highest proportion of respondents who endorsed a single category for an item (should be <80%). Reading ease should be assessed. The Flesch/Flesch–Kincaid readability tests are designed to indicate comprehension difficulty when reading a passage of contemporary academic English. There are two tests, the Flesch Reading Ease, and the Flesch–Kincaid Grade Level.

Responsiveness
This is the ability of a PROM to detect change over time or following intervention/surgery. Responsiveness (also known as sensitivity or longitudinal validity) can be measured in effect sizes to characterise the magnitude of change following the intervention. Effect sizes are calculated by dividing the mean change...
score by the standard deviation of the pre-operative score. By convention an effect size of 0.2 is considered small, 0.5 moderate and 0.8 or greater is large\textsuperscript{380}.

**Reliability**

Reliability is a measure of the extent to which a PROM is free from random error. For PROMs, the two most common types of reliability that are assessed include internal consistency and test-retest reliability. Internal consistency can be measured with Cronbach’s Coefficient Alpha\textsuperscript{381} We judged $r > 0.70$ acceptable\textsuperscript{382}. Test-retest reliability is a measure of the reproducibility of the PROM to provide consistent scores over time in a stable population. Test-retest reliability was assessed by estimated Bland and Altman’s method for agreement of repeated scores, where $>95\%$ of the mean of the re-test against the difference of the re-test within 2 standard deviations of the bias was considered acceptable.

**Validity**

Construct validity is the extent to which scores on the PROM relate to other validated measures (e.g., for the BAPRAS PBOT we have compared it to another patient-reported outcome measure – the Derriford Appearance Scale 24\textsuperscript{61}) in a manner that is consistent with theoretically derived hypotheses concerning the constructs that are being measured.\textsuperscript{7,383} It is calculated using Spearman rank correlation co-efficients for mean questionnaire scores. Content validity was determined in Step One of this chapter. Content validity (also known as logical validity) refers to the extent to which a measure represents all facets of a given social construct. A test has content validity built into it by careful selection of which items to include.\textsuperscript{384} Validity hypothesis testing is the ability to measure expected differences between groups within patient population\textsuperscript{385}.
RESULTS

Demographic information

30 subjects completed the DAS24 and the BAPRAS PBOT twice, 2 weeks apart. The groups were matched for sex. (Table 10.1).

Table 10.1: Demographic data

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Relationship Status</th>
<th>Sex</th>
<th>Mean Age (Range)</th>
<th>Mean BMI (Range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non obese</td>
<td>10</td>
<td>Single = 4, Married = 5, Widowed = 1</td>
<td>M=4, F=6</td>
<td>47.9 (31-68)</td>
<td>22.59 (17.75-26)</td>
</tr>
<tr>
<td>MWL</td>
<td>10</td>
<td>Single = 2, Married = 5, Widowed = 1, Separated = 2</td>
<td>M=4, F=6</td>
<td>45.00 (31-67)</td>
<td>30.19 (22.55-41)</td>
</tr>
<tr>
<td>BC</td>
<td>10</td>
<td>Single = 5, Married = 4, Widowed = 1</td>
<td>M=4, F=6</td>
<td>48 (24-67)</td>
<td>29.07 (20.44-49.7)</td>
</tr>
</tbody>
</table>

They were seen a mean of 27.85 months following bariatric surgery (range 12-60). There were equal numbers of laparoscopic gastric bypass procedures and laparoscopic gastric bands at 7 each. 6 patients had their bands converted to open procedures intra operatively. Table 10.2.

Table 10.2: Surgical history of MWL and BC groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Type of bariatric surgery</th>
<th>Time post-surgery (months)</th>
<th>Type of plastic surgery</th>
<th>Time post plastic surgery (months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MWL &amp; body contouring</td>
<td>Lap gastric bypass</td>
<td>18</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Gastric band</td>
<td>12</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Gastric band</td>
<td>12</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Lap gastric band</td>
<td>13</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Lap gastric bypass</td>
<td>14</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Lap gastric bypass</td>
<td>21</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Lap gastric bypass</td>
<td>20</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Lap gastric band</td>
<td>24</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Lap gastric bypass</td>
<td>44</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Gastric band</td>
<td>26</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>BC</td>
<td>Gastric band</td>
<td>60</td>
<td>Procedure 1: Abdominoplasty</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Procedure 2: breast augmentation &amp; mastopexy</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Lap Gastric band</td>
<td>48</td>
<td>Procedure 1: Mastopexy &amp; abdominoplasty</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Procedure 2: brachioplasty</td>
<td>3</td>
</tr>
</tbody>
</table>
and thigh lift

<table>
<thead>
<tr>
<th></th>
<th>Procedure 1: Mastopexy</th>
<th>Procedure 2: Lower body lift</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Lap Gastric band</td>
<td>Abdominoplasty</td>
</tr>
<tr>
<td>4</td>
<td>Gastric band</td>
<td>Fleur de lys abdominoplasty, neck reduction, brachioplasty, breast reduction</td>
</tr>
<tr>
<td>5</td>
<td>Lap gastric band</td>
<td>36</td>
</tr>
<tr>
<td>6</td>
<td>Gastric band</td>
<td>36</td>
</tr>
<tr>
<td>7</td>
<td>Gastric band</td>
<td>36</td>
</tr>
<tr>
<td>8</td>
<td>Lap bypass</td>
<td>46</td>
</tr>
<tr>
<td>9</td>
<td>Interim Abdominoplasty</td>
<td>19</td>
</tr>
<tr>
<td>10</td>
<td>Fleur de lys abdominoplasty</td>
<td>&amp; liposuction to flanks on</td>
</tr>
</tbody>
</table>

Completed forms for each group were assessed using the mark scheme and aid (Appendices 24&25). The scores were reflected in two parts: one for the referral tool component (pages 1-2), and the other for the PROM component (pages 3-5). The DAS24 was scored for comparison. Table 10.3.

Table 10.3: PROM and Derriford 24 Scores for 3 Groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Ref Score Week 1</th>
<th>Week 3</th>
<th>PROM Score Week 1</th>
<th>Week 3</th>
<th>Total Score Week 1</th>
<th>Week 3</th>
<th>DAS 24 Week 1</th>
<th>Week 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non obese</td>
<td>4.30 (0-7)</td>
<td>4.3 (0-7)</td>
<td>92.28(74.5-102)</td>
<td>92.48 (75-102)</td>
<td>96.58 (74.5-109)</td>
<td>96.78 (75-109)</td>
<td>29.3 (21-41)</td>
<td>29.5 (21-39)</td>
</tr>
<tr>
<td>MNL</td>
<td>7.9 (2-11)</td>
<td>7.9 (2-11)</td>
<td>57.68 (48.75-65.00)</td>
<td>57.9 (49.00-64.00)</td>
<td>71.28 (5.75-94.00)</td>
<td>71.28 (55.75-94.00)</td>
<td>72.7 (60-84)</td>
<td>93.4 (90.0-98.0)</td>
</tr>
<tr>
<td>BC</td>
<td>4 (0-9)</td>
<td>4 (0-9)</td>
<td>85.1 (51-103)</td>
<td>85.1 (51-102)</td>
<td>89.1 (55-111)</td>
<td>89.1 (55-110)</td>
<td>44.4 (25-75)</td>
<td>44.8 (28-75)</td>
</tr>
</tbody>
</table>
Analysis
Data was analyzed with IBM SPSS V.19 statistical package. The three groups were matched for sex. There was no statistical difference in age with a coefficient of variation of 28.94%, 22.62% and 26.67% respectively. ANOVA resulted in F value of 0.81, P value 0.45 and R square of 0.05.

Administrative burden/ Acceptability;
The burden of acceptability was assessed by percentage completeness of the PBOT. The mean completion percentage was 93.82%, which met our acceptance criteria of frequency of missing data. Table 10.4.

Table 10.4: Administrative Burden: Completion rate of score in each group

<table>
<thead>
<tr>
<th></th>
<th>Non Obese Non Disease Group</th>
<th>Post MWL</th>
<th>Post BC</th>
<th>Total Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage Completions Week 1</td>
<td>94.4% (91-99%)</td>
<td>93.2%(90-98%)</td>
<td>93.5%(90-99%)</td>
<td>93.7%</td>
</tr>
<tr>
<td>Percentage Completion Week 3</td>
<td>94.3%(91-99%)</td>
<td>93.4%(90-98%)</td>
<td>94.1%(91-99%)</td>
<td>93.9%</td>
</tr>
<tr>
<td>Maximum Endorsement Week 1 &gt;80%</td>
<td>13 items &gt;80%</td>
<td>0 items &gt;80%</td>
<td>4 items &gt;80%</td>
<td>63.03%</td>
</tr>
<tr>
<td>Mean 83% (30-100%)</td>
<td>0 items &gt;80%    Mean 47.4% (30-80%)</td>
<td>3 items &gt;80%</td>
<td>Mean 58.7%(30-90%)</td>
<td></td>
</tr>
<tr>
<td>Maximum Endorsement Week 3 &gt;80%</td>
<td>12 items &lt;80%</td>
<td>0 items &gt;80%</td>
<td>3 items &gt;80%</td>
<td>62.39%</td>
</tr>
<tr>
<td>Mean 82% (30-100%)</td>
<td>0 items &gt;80%    Mean 46.9% (30-80%)</td>
<td>Mean 58.26%(30-90%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The response distributions were examined in table 10.4. In the non-obese non-disease group 12-13 items had a >80% maximum endorsement frequency of the 27 items. This represents an 11.1% to 44.4% of the range of questions. In the post body contouring group alone, 3-4 items had a >80% maximum endorsement frequency, representing an 11.1%-14.8% range of questions.

The Flesch Reading Ease score for the PBOT was 62.3, indicating a reading age of approximately 13. A key can be seen in table 10.5.

Table 10.5: Flesch Reading Ease Scores

<table>
<thead>
<tr>
<th>Score</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>90.0–100.0</td>
<td>easily understood by an average 11-year-old student</td>
</tr>
<tr>
<td>60.0–70.0</td>
<td>easily understood by 13- to 15-year-old students</td>
</tr>
<tr>
<td>0.0–30.0</td>
<td>best understood by university graduates</td>
</tr>
</tbody>
</table>
Responsiveness
This was not measured as the same group of patients did not complete the PBOT before and after surgery or an intervention.

Reliability
Internal consistency can be measured with Cronbach’s Coefficient Alpha. The data was collated in groups and time (week 1 and 3). Table 10.6.

Table 10.6: Internal Consistency: Cronbach’s Coefficient Alpha for 3 Groups’ Score

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>Mean</th>
<th>Variance</th>
<th>Std. Deviation</th>
<th>Cronbach’s Alpha</th>
<th>CA Standardised</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non Obese</td>
<td>10</td>
<td>Week 1</td>
<td>67.28</td>
<td>61.895</td>
<td>7.87</td>
<td>0.788</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Week 3</td>
<td>67.27</td>
<td>61.895</td>
<td>7.87</td>
<td>0.788</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>Average</td>
<td>67.27</td>
<td>58.64</td>
<td>7.66</td>
<td>0.788</td>
</tr>
<tr>
<td>MWL</td>
<td>10</td>
<td>Week 1</td>
<td>63.38</td>
<td>119.74</td>
<td>10.94</td>
<td>0.724</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Week 3</td>
<td>63.38</td>
<td>119.74</td>
<td>10.94</td>
<td>0.724</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>Average</td>
<td>63.38</td>
<td>113.44</td>
<td>10.65</td>
<td>0.724</td>
</tr>
<tr>
<td>MWL BC</td>
<td>10</td>
<td>Week 1</td>
<td>67.35</td>
<td>45.59</td>
<td>6.75</td>
<td>0.603</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Week 3</td>
<td>67.35</td>
<td>45.55</td>
<td>6.75</td>
<td>0.603</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>Average</td>
<td>67.35</td>
<td>43.16</td>
<td>6.57</td>
<td>0.603</td>
</tr>
<tr>
<td>All Groups</td>
<td>30</td>
<td>Week 1</td>
<td>83.00</td>
<td>281.49</td>
<td>16.78</td>
<td>0.894</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>Week 3</td>
<td>83.67</td>
<td>285.11</td>
<td>16.89</td>
<td>0.899</td>
</tr>
<tr>
<td></td>
<td>60</td>
<td>Average</td>
<td>83.67</td>
<td>280.281</td>
<td>16.74</td>
<td>0.899</td>
</tr>
</tbody>
</table>

Test-retest reliability was assessed by estimated Bland and Altman’s method for agreement for repeated scores, where >95% of the mean of the re-test against the difference of the re-test within 2 standard deviations of the bias was considered acceptable. Table 10.7 and Figure 10.2.
Table 10.7: Test-retest reliability: Bland Altman’s Method for Agreement for 3 Groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Bias</th>
<th>SD of Bias</th>
<th>95% Limits of Agreement</th>
<th>Outliers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non Obese</td>
<td>-0.20</td>
<td>0.42</td>
<td>-1.03-0.63</td>
<td>0</td>
</tr>
<tr>
<td>MWL</td>
<td>-0.23</td>
<td>1.03</td>
<td>-2.24-1.79</td>
<td>0</td>
</tr>
<tr>
<td>BC</td>
<td>0.0</td>
<td>0.82</td>
<td>-1.60-1.60</td>
<td>0</td>
</tr>
<tr>
<td>Average of the 3 groups</td>
<td>-0.14</td>
<td>0.78</td>
<td>-1.66-1.38</td>
<td>1</td>
</tr>
</tbody>
</table>

Figure 10.2: Test-retest: Bland Altman’s Method

Validity
Construct validity was calculated using Spearman’s Rank correlation coefficients for mean questionnaire scores between DAS24 and the PROM component of the PBOT.

Table 10.8: Construct validity: Spearman’s ranks correlation coefficients for mean scores between DAS24 and the PBOT

<table>
<thead>
<tr>
<th>Groups</th>
<th>Week 1</th>
<th>Week 3</th>
<th>Average of weeks 1 &amp; 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Spearman’s Rank Correlation r</td>
<td>P Value (two tailed)</td>
<td>Spearman’s Rank Correlation r</td>
</tr>
<tr>
<td>Non obese</td>
<td>-0.60</td>
<td>0.05</td>
<td>-0.61</td>
</tr>
<tr>
<td>MWL</td>
<td>-0.561</td>
<td>0.05</td>
<td>-0.627</td>
</tr>
<tr>
<td>BC</td>
<td>-0.806</td>
<td>0.001</td>
<td>-0.802</td>
</tr>
</tbody>
</table>
As n=10 for weeks 1 and 3, the p value was looked up on a table rather than determined by the statistical package. Spearman’s ranks correlation was statistically significant with a p value of <0.0001 for the three groups.

Validity hypothesis testing
Kruskall Wallis test was used to identify if there was any similarity in the referral tool scores between the three groups. Kruskal – Wallis statistic 17.66. P value 0.0001. A score above 7 prompts the next step of the referral pathway to be activated, and this was found to be the case for the MWL group, who would be eligible for surgery if they meet the rest of the inclusion criteria. The majority of the respondents in the non-obese and MWL were below the threshold and would not have screened positive for inclusion into the next step of the pathway (Appendix 24).
Discussion
The administrative burden was not too great, as the completion was 93.8%. Table 10.4. If patients do not complete a PROM or omit particular items frequently, this is a potential sign that the questions are difficult to understand, distressing or in some other way unacceptable. However, there are multiple factors which reduce acceptability beyond the nature of questions, including: length of form,\(^{386}\) time taken to complete,\(^{387}\) disease burden at time of completion,\(^{388}\) method of administration,\(^{389}\) and translation and cultural applicability.\(^{390}\)

Other studies\(^{\text{Error! Bookmark not defined.}}\) have achieved an acceptability of 95%, however in this study only 67% of the patients returned the PROM. In our study 100% of PBOTs posted were returned by patients. Furthermore, given this was a postal survey, a completion of 93.8% is good in comparison to the expected completion of 75–80% achievable according to some authors.\(^{389, 391, 392}\)

Rather than use completion percentages as a proxy for acceptability, other authors suggest direct assessment of patients’ views about a new PROM.\(^{393}\) This was carried out for the PBOT in the first stage of development. In clinical usage, depending on the dissemination strategy, it may be that forms are not completed satisfactorily and therefore assistance may be required. Further large scale studies are required for a more accurate measure of acceptability.

Maximum endorsement frequencies of >80% occurred in 12 items (at week 1) and 13 items (week 3) for the non-obese non-disease population. The questions with a >80% maximum endorsement in these two groups would not be applicable to the non-obese non-disease group. They included: weight fluctuation; satisfaction with medical care; satisfaction of most recent surgery; satisfaction with scar and contour. As the PBOT was not devised for this control group, this degree of maximum endorsement was expected.
In the MWL group there were no items with a maximum endorsement frequency of >80%. In the MWLBC group the following items had a >80% maximum endorsement frequency.

1. Have you had any weight fluctuation in the last 6 months?
2. I am satisfied with the medical care I received;
3. I find it difficult to move around;
4. I am unable to independently perform some activities of personal hygiene.

These questions were likely to have similar answers in the post MWLBC group as the inclusion criteria for surgery is stable weight. Furthermore, most patients were satisfied with their surgery and had an improvement in their quality of life. A maximum endorsement frequency of above 80% in a cohort of 10 represents only 2 patients answering differently. It would be worth reviewing the endorsement frequency with a greater number of patients and removing some questions to shorten the PBOT if possible. With a larger cohort, more detailed assessment of item distribution with Rasch analysis may be worthwhile. Some authors believe that if more than 20% of responders score at the maximum level of good or bad health, score distribution general suggests ceiling or floor effects, respectively.

The Flesch Reading Ease score indicates a reading age of approximately 13, which should be fine for the referrer, and satisfactory for the patient. Administration of the PROM may be assisted if necessary. Table 10.5.

Responsiveness was not assessed, and further work is required here.

Interpretability testing has not been carried out and further work is required here. PROMS must provide scores that are easily interpretable to different stakeholders including patients, researchers, clinicians, and policy makers. In the supporting documentation information on scoring and inclusion and exclusion criteria has been included. Appendices 24 & 25.
The reliability testing with Cronbach’s Alpha reflected acceptable internal consistency in each group with scores of 0.788, 0.724 and 0.603 for non-obese, MWL and MWLBC groups respectively. When standardised, this became 0.837, 0.763 and 0.811 respectively. Table 10.6. Cronbach’s alpha is grounded in the ‘tau equivalent model’ which assumes that each test item measures the same latent trait on the same measure. When each group was assessed independently the Cronbach’s Alpha underestimated reliability because the small size of the group violated the assumption of tau-equivalence. However, heterogeneous test items can also violate the assumptions of the true score equivalence or tau-equivalent model which may be the cause of the difference between the standardised item alpha and Cronbach’s alpha. Therefore a further Cronbach’s alpha was carried out on all groups at all time periods (n=60), resulting in a Cronbach’s alpha of 0.894. This is considered a good to excellent score.

Test-retest reliability was estimated by the Bland and Altman’s method for agreement and all the scores for all groups were found to lie within 2 standard deviations of the bias except for one outlier. In a group of 10, 1 outlier accounts for 10% of the total. Therefore, further testing on larger numbers is warranted.

The validity of the PBOT was compared to outcomes on the DAS24 with Spearman’s rank correlation co-efficients for mean scores. In all groups the p value was statistically significant for a correlation with r values of -0.60, -0.59 and -0.804 in the non-obese, MWL and MWLBC groups respectively. In the DAS24, the higher the score, the greater distress from physical appearance, whereas in the PBOT, the higher scores reflect a greater ability to cope with MWL, which accounts for the minus score on the spearman’s rank correlation. In massive weight loss patients, functional problems are also very relevant and therefore it may be useful to do further validity testing with other PROMs such as the Short Form 36. At present there are no validated PROMs specifically designed for MWLBC cohort, however in the future use of the Body Q designed by Klassen would be an interesting tool for comparison.

The PROM has good face validity, largely due to the items being emergent from patient accounts of the problems of living with massive weight loss. A study on the
face validity of the PROM did not elicit any negative comments from users in a bariatric and MWLBC plastic surgery population.

The referral tool component was able to distinguish between the three groups. Therefore it had good validity for hypothesis testing between those who would meet the inclusion criteria and those who would not. To be eligible for MWLBC a score of 8 or more needs to be achieved. In the non-obese non-disease group no candidates met the inclusion criteria for MWLBC. The mean was 4.3 and the maximum score achieved was 7.

In the MWL group a mean score of 7.9 was achieved. Four patients would have been excluded from the referral pathway with scores of 2, 6, 6 and 7. These patients had BMIs above the threshold. One had active psychiatric illness and another had a recent bereavement. Six patients would have met the threshold for progressing to the next step of the pathway. These patients had lost >50% of their excess body weight and were within the target BMI range and leading healthy lifestyles.

In the post body contouring group 1 patient reached the threshold for body contouring with a score of 9. This patient did not need any body contouring and was in excellent shape. However, the form has been devised for patients wishing to be referred for MWLBC when suffering functional and psychological problems with redundant skin. This patient would not have been referred.
Comparison to other plastic surgery PROMS
The cosmetic surgery PROMS review of 2013 has selected the Breast-Q, FACE-Q Satisfaction with Facial Appearance Scale and Skindex as PROMS which meet current recommendations for the development and validation of PROMS.

The Breast-Q is a 91 item PROM for use with patients undergoing a number of breast surgery procedures including reconstruction, augmentation, hypertrophy, mastopexy, lumpectomy and mastectomy\textsuperscript{397}. The Breast Q has been subjected to a rigorous validation process in a very large number of patients, and covering all items listed above, including a Rasch analysis. The length of 91 items however is considered too long and may warrant further development. The Breast Q has 44 items more than the PROM component of the BAPRAS PBOT, which has 47 items, of which 27 are scored.

The FACE-Q Satisfaction with facial appearance scale is a 10 item PROM for use with patients undergoing facial aesthetic surgery\textsuperscript{398}. This too has been rigorously validated in a large number of patients.

The Skindex was initially a 61 item self-administered survey with eight scales, each of which addresses a construct\textsuperscript{399}. Subsequently two shorter (29 item and 16 item) versions have been validated. The 29 item version was validated in a cross sectional study and did not review outcomes over time in individual patients\textsuperscript{400, 401}.

In comparison to these PROMS which stood out as meeting all the recommendations for the development and validation as outlined by The Patient Reported Outcome Measurement Group, in their report to Department of Health\textsuperscript{402}

Limitations
This preliminary validation study was carried out in 60 people. Further larger studies are required, ideally with multi centres. This would give a better understanding of the acceptability, maximum endorsement frequencies and reliability testing.

The authors can foresee some problems with the clinical photographs. Funding will be an issue, as will the photographs themselves. Medical photographs can make patients feel vulnerable and could prove to be a barrier to referral. However, recent studies show that patient comfort with full body photography improves quickly as they move
through the surgical process\textsuperscript{403} and the senior authors have found that these patients are very willing to have pictures taken if it improves their chances of getting funding.

The PBOT has been designed as part of the referral pathway and therefore, in the early stages patients who are keen to be approved for MWLBC may feel coerced to complete the PROM section of the form. Therefore, appropriate consent will need to be carried out before administration of the form. Other studies have examined whether their PROMs can be used to compare new techniques, surgical teams and units. Given the novel stage of surgical approaches for MWLBC; the new BAPRAS guidance on service provision and best practice guidelines from NICE, it would be worth examining whether the PBOT can achieve this.

It is recommended that comprehensive assessment of outcome should include a combination of generic and specific measures\textsuperscript{404}. One limitation of this study is that it has not been compared to other specific measures, as this is the first validated MWLBC PROM published.
Further work required:
1. Development on a clinical population
2. Development on a non-clinical population
3. Maximum endorsement frequencies in a larger group of patients
4. Responsiveness, by asking the same patient cohort to complete the PBOT before and after surgery.
5. Assessment of precision; ie the ability of the PBOT to distinguish clearly and precisely between respondents in relation to reported health or illness.
6. Assessment of item distribution with Rasch analysis.
7. Interpretability testing
8. Inter rater reliability
9. Cultural and language translations required.

Conclusion
This new PROM was seen to be reliable both in terms of the internal consistency and test-retest reliability. Comparison to the DAS24 demonstrated it to be valid; however there need to be further larger validation studies, with comparison to functional PROMS such as the SF-36 or Sloane Kettering Memorial “Body Q” currently in development.
Final Discussion

Body contouring surgery after massive weight loss is of high demand in patient groups and is associated with a significant functional and psychosocial improvement in the patient experience. Therefore this thesis proved the hypothesis true. This work has also found that massive weight loss body contouring is associated with an improvement in maintenance of weight reduction, a reduction in smoking, an improvement in exercise uptake, improved career progression and improvement in psychological outcomes. This research has also identified that no validated patient report outcome measure for the massive weight loss body contouring patient exists, and therefore one was devised, piloted and underwent the first stages of validation.

Obesity is a risk factor for a multitude of illnesses such as heart disease, diabetes and cancer. If effective; obesity surgery improves a patient's health and reduces their need for NHS care for other healthcare costs. If unsuccessful patients are then subject to all the health, functional and psychosocial sequelae of not only obesity but yet another failed attempt at weight loss and possible complications of the bariatric surgery. This has cost implications for the NHS. More focus is required to ensure that the patient journey is complete from morbidly obese, to massive weight loss to healthy active member of society. The current service for bariatric patients nationally is inconsistent. Patients may or may not see a clinical psychologist to diagnose any clinical disorders, which might require treatment. Despite significant changes in body habitus which requires adjustment, psychological support is usually very limited. A health psychologist should be offered to all massive weight loss patients, as per the NICE guidelines and would bring the bariatric service in line with other clinics such as smoking cessation and rehabilitation post myocardial infarction and stroke.

This early work has seen that specialist functional, aesthetic and psychological rehabilitation is beneficial to massive weight loss patients and can aid long term weight loss. I have also identified that the majority of patients wish to have body contouring after massive weight loss, which is in keeping with other studies. In view of the variation in services nationally the Royal College of Surgeons (RCS) and British Association of Plastic, Reconstructive and Aesthetic Surgeons (BAPRAS) have developed guidelines. (Appendix 18). (Chapter 3)
Clinicians need to champion their patients' cause and collect evidence to ensure essential services are provided. Our literature search demonstrated that there are no validated PROMS relevant to this unique cohort of patients. We need to perform careful and sophisticated outcome studies that can offer proof of the value of our service to this particular population. (Chapter 4)

The use of non-specific quality of life PROMS demonstrated that body contouring plastic surgery is associated with improved physical function; bodily pain; general health; vitality; overall physical health and psychosocial functioning in the massive weight loss patients (Chapter 5). Those patients with the grossest ptotic deformities had the most significant psychological improvement following massive weight loss body contouring (Chapter 6).

Obesity is stigmatised and as there is only limited suppression of fat prejudices, obesity discrimination can be overt. The complex psychosocial adjustment to obesity and massive weight loss does not occur in a vacuum. Fat people perceive societal dissonance, either as a result of overt abuse or indirectly. Therefore understanding anti-fat attitudes can contextualise the experience of being fat and can give a better understanding of acceptance and self-determination. Overcoming the master status of obesity and integrating into society on terms other than weight, is the first step in realising long term weight loss. Themes prevalent in this unique cohort of patients included: physical functioning and feelings of healthiness, freedom from dependency or disability, improvements in psychological and mental health well-being, improved self-efficacy towards eating, resumption of or improvement in sexual intimacy, reduced feelings of body uneasiness, enhanced self-image and self-esteem, improved social acceptance, career progression, impact on relationships and fragile relationships, effect of weight on exercise, smoking cessation, long term weight loss, identity and reconciliation of new body with identity, limitation in restrictions on lifestyle, bereavement and clothing.

The success of sustained weight loss is complex and dependent on multifaceted interplay of social, contextual, physical and psychological factors. Decisions regarding initiation of weight loss depend on favourable expectations regarding future
outcomes; decisions regarding behavioural maintenance are dependent on satisfaction with outcomes. Patients who were able to accept their new body habitus following massive weight loss were more likely to feel satisfied and maintain their weight loss and healthy lifestyle choices such as smoking cessation and exercise activity. They also had a global improvement in self-esteem, career progression and relationship status. The master status is no longer in control and previously obese people became better integrated members of society. Some patients accepted their new body habitus without plastic surgery; however these patients had minimal skin ptosis. These themes were integrated into a new PROM developed to identify success in weight loss maintenance and adjustment to new body habitus with or without body contouring. (Chapter 7).

In contrast to the subjective PROM, a further tool was assessed for viability of assessing this group of patients: 3D stereophotograms. Validation of 3D stereophotograms has been carried out in the face, breast and thorax in non-massive weight loss patients, however, currently the technology available cannot be applied to massive weight loss patients as their ptotic skin folds limit the ability of image capture on all the surface linear measurements. Further technological advancements are necessary before they can be used in this group of patients. (Chapter 8). This further demonstrated the significance of developing a PROM to capture outcomes in this group of patients.

An understandable criticism of this work is that the 3D stereophotograms are not relevant to this thesis. However, the first question asked to initiate this study at the very beginning was whether it would be possible to objectively classify massive weight loss body contouring patients. My literature search has demonstrated that this has been attempted by other authors with other means. However, as this research progressed it became apparent that any attempt to objectively assess ptotic deformities, whether by 3D stereophotograms or visual analogue scales, misses the point. It may be of use to clinicians to understand the types of deformities these patients experience in order to offer best possible means of reconstruction. However, clinical assessment of physical deformities alone will not be of value without a deeper understanding of how they affect the patient. Therefore the patient perspective must
be taken. Some patients with significant deformities were happy in themselves and resilient to the stigma of massive weight loss skin deformities, whilst others were suffering psychosocial and functional sequelae as a result of their redundant skin folds.

In addition, as an investigator, the journey I personally undertook from germinal idea, to ethics and R&D approval, to published research involved a great deal of time organising, devising protocols and examining 3D stereophotograms of these patients. Most of my study budget was spent on the licensing, equipment and clinical photographers. When comparing the results of the clinical 3D stereophotograms and whether this changed my paradigm, versus reviewing transcripts of semi structured interviews the stark contrast further demonstrated the significance of patient report outcomes in plastic surgery. All of this is an important lesson for me, and important to my development as a researcher.

The Post Bariatric Outcome Tool (PBOT) has been designed in response to a call from patients, NICE guidelines and the British Association of Plastic, Reconstructive and Aesthetic Surgeons (BAPRAS). It has been designed to fit in with the new commissioning guidelines on massive weight loss body contouring published by BAPRAS in 2014. Methodological rigour in development was demonstrated by adherence to the standards set out by the Scientific Advisory Committee of Medical Outcomes Trust. The aggregate components of each chapter of this thesis, from identification of clinical importance, literature search to quantitative outcome measures as discussed above, to canvassing expert opinion (Chapter 9) all contributed to the content validation. Qualitative methods such as semi structured patient interviews and expert opinions were used to generate important components of outcome for a preliminary PROM.

The PBOT has been developed through a very organic process. The conceptual and measurement model was developed as I progressed through the process of understanding this unique cohort patients. Field test and psychometric analysis demonstrated that in a limited number of people, it is valid for content and reliable both in terms of the internal consistency and test-retest reliability (Chapter 10). Comparison to the DAS24 demonstrated it to be valid; however there needs to be further larger validation studies, with comparison to functional PROMS such as the SF-
and specific PROMS such as the Sloane Kettering Memorial “Body Q” currently in development. I have been contacted by the lead author of the Sahlgrenska Excess Skin Questionnaire (SESQ), the only validated MWLBC tool available at present to do further collaborative work. We hope to compare our PROMS and in so doing, this will not only address the need for further validation work against a specific PROM, but will also address the need for cultural and language adaptations as the SESQ team are based in Sweden.

Responsiveness needs to be assessed. A trial of the PROM in pre and post massive weight loss body contouring surgery in a prospective cohort is required to assess responsiveness. We are currently looking at a national multicentre prospective study based in Edinburgh, Leeds, London and Exeter with social anthropologist, Professor Holliday. I am a co-principal investigator on this work. Naturally when responsiveness is carried out, we will also examine all other components required to meet the Scientific Advisor Committee standards.

Further work is required to review the PBOTs interpretability. If further work is carried out in Sweden, I will be able to see how other authors can use the PBOT and whether, they achieve the same results that I did in terms of response percentage and completion rates for respondent and administrative burden. It will also demonstrate whether their results are easy to interpret, or if it was only simple for me, because I devised the PBOT.

Universal use may improve clinician and health board decision making to reduce healthcare inequalities and demystify the patient’s journey in what is currently a very inequitable service. The referral component in the tool is designed to ameliorate the patient journey and help screen high risk patients who would benefit from psychological interventions early on in their massive weight loss journey. The score is also a means of objectively quantifying outcomes following bariatric surgery and massive weight loss body contouring and could be an aid to assessing functional and psychological outcomes.

The PBOT therefore fulfils three functions:
1. Referral tool (to aid GPs and other healthcare practitioners) to identify if their patients meet the inclusion criteria as per the national BAPRAS guidelines.

2. Screening tool (to aid bariatric and plastic surgeons) for high risk patients who have psychological morbidity and would benefit from further clinical assessment by an appropriately trained clinical psychologist with experience of bariatric and plastic surgery.

3. Patient report outcome measure to identify satisfaction with clinical care, measure clinical outcomes and patient reported outcomes of function and psychosocial change following surgery.

This could be a weakness of the PROM, which may not be everything to all people. However, the complex interplay between body habitus, psychological morbidity and satisfaction has been shown to be intimately related and therefore this was utilized in the PBOT for different stakeholders.

What started as a germinal research idea has been developed into this work presented here, mainly through communication with a multitude of stakeholders. Through understanding each party’s requirements I have come to understand the different perspectives required in caring for the massive weight loss patient. However, it was only through speaking to the patients themselves and gaining insights into their lives that I was able to pull all the various threads from all the various stakeholders together. I hope to continue my work with this unique group of patients and would like to thank the patient for giving me the opportunity to understand their lives and world.
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