

**Outcomes of a community-based weight management programme for morbidly obese populations**

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1 **Outcomes of a community based weight management programme for morbid obese**  
2 **populations**

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12 Conflict of Interest:

13 The authors declare no conflict of interest

14

15

16 Keywords: morbid obesity, community, service evaluation, weight management  
17 programme

18 **Abstract**

19 *Background:* Morbid obesity (BMI >40kg/m<sup>2</sup>) is an ongoing concern for health care  
20 providers worldwide. There is a paucity of research reporting primary care outcomes  
21 focussed on complex obesity and morbidly obese populations. National Institutes of  
22 Clinical Excellence (NICE) recommends a specialist, multidisciplinary weight management  
23 team for the successful management of such populations. This is the first service  
24 evaluation which reports primary (weight change) and secondary (BMI, waist  
25 circumference, physical activity levels, fruit and vegetable intake and Rosenberg self-  
26 esteem score) outcome measures in morbidly and complex obesity patients.

27 *Methods:* A prospective observational study of a cohort data set for patients (n= 288)  
28 attending their 3 month and 6 month (n= 115) assessment appointments at a specialist  
29 community weight management programme.

30 *Results:* Patients had a mean (SD) initial BMI of 45.5 (6.6) kg/m<sup>2</sup>; 66% were females. Over  
31 82% of patients attending the service lost some weight by 3 months. Average weight loss  
32 was 3.28 (3.82)% (4.11(4.95) kg) at 3 months and 4.90 (6.26)% (6.30(8.41) kg) at 6  
33 months providing statistically significant weight change at both time points ( $P<0.001$ ). This  
34 meets NICE best practice guidelines for commissioning of services which lead to a  
35 minimum of 3% average weight loss, with at least 30% of patients losing at  $\geq 5\%$  of their  
36 initial weight. Waist measurement and BMI reduced significantly at 3 months.  
37 Improvements were seen in physical activity levels, fruit and vegetable consumption and  
38 self-esteem levels ( $P < 0.001$ ).

39 *Conclusion:* This service was successful in aiding weight loss in the morbidly obese  
40 population. This supports the view that sensible weight loss targets of 3% are realistic for  
41 this under-researched population.

42

43

44

45 **Introduction**

46 Overweight and obesity are defined as abnormal or excessive fat accumulation that  
47 presents a risk to health (1). Morbid obesity (BMI  $\geq 40$  kg/m<sup>2</sup>) levels are rising in the UK  
48 adult population; from 0.2% of men and 1.4% of women in 1993 to 1.6% of men and 3.9%  
49 of women in 2013 (2-4). The higher the BMI, the greater the chance of developing obesity-  
50 associated conditions such as cardio-vascular disease, diabetes, osteoarthritis and some  
51 cancers (1,5,6), resulting in high total healthcare costs (7,8). Additionally, the  
52 psychological aspects of obesity have been well documented, with an established  
53 relationship between weight loss, better emotional wellbeing and health-related quality of  
54 life (9). For the purpose of this paper, 'complex obesity' is defined as a BMI  $\geq 35$  kg/m<sup>2</sup> with  
55 at least one obesity-related comorbidity.

56 There are very few published data which evaluate the current NHS service provision within  
57 the UK outside of the research context (10-12). NHS services are often set up quickly to  
58 provide evidence-based information and support for patient groups. The outcomes of  
59 these services may range significantly as statistical analysis and service evaluation  
60 outcomes are not often embedded into the service at pre-planning stages, and therefore it  
61 is difficult to collect useful statistical data. The lack of published evidence for NHS  
62 services, in comparison to commercial slimming organisations, means that it is difficult to  
63 provide substantial evidence for the commissioning and decommissioning of services and  
64 is unhelpful when bidding for investment for such services. This is particularly relevant in  
65 the current climate where widespread financial constraint sees NHS organisations  
66 competing against commercial slimming organisations for provision of public health  
67 services.

68 In 2004, the UK government white paper *Choosing health: making healthy choices easier*  
69 (13) emphasised the role of primary care in obesity management and recognised primary  
70 care as a suitable setting in which to promote weight loss. Despite clinical guidelines for  
71 obesity management (4,14-17) and related disease (18), there is little research from  
72 primary care about treating morbid or complex obesity populations and indeed, a recent  
73 systematic review found no interventions which reported data from solely morbidly obese  
74 individuals (19) and research from primary care based on individuals with morbid obesity is  
75 limited to a single study. The NHS Glasgow and Clyde Weight Management Service  
76 (GCWMS) service evaluation by Logue *et al.* was based on a large cohort of 1 838 obese  
77 patients (BMI  $\geq 30$  kg/m<sup>2</sup> with obesity-related comorbidities or BMI  $\geq 35$  kg/m<sup>2</sup>) which had a  
78 mean starting BMI of 43.3 kg/m<sup>2</sup> and reported weight change data up to 12 months (20).  
79 However, it is well recognised that lack of weight loss does not capture the protective  
80 benefits of increased fruit and vegetable intake, physical activity or self-esteem (21) all of  
81 which are important to the health of this population group. Aside from aiding weight loss  
82 maintenance, increased physical activity has been shown to benefit blood lipid profile (22),  
83 insulin sensitivity (23) and all-cause and cardiovascular disease mortality (24).

84

85 The UK National Institute for Clinical Excellence (NICE) guidelines recommend that  
86 primary care physicians and healthcare professionals identify their obese patients and  
87 offer clinical management (4,16). Previously, clinically significant weight loss has been  
88 defined as a loss of 5-10% of initial weight (4,25), whilst the Scottish Intercollegiate  
89 Guidelines Network (SIGN; 2010) recommend a 15-20% reduction for those with a BMI  
90  $\geq 35$  kg/m<sup>2</sup> (14). Evidence suggests that 5–10% of weight loss is associated with  
91 meaningful clinical improvements in health-related risk factors, such as serum lipids,  
92 glucose tolerance and blood pressure (26,27); although current NICE Public Health  
93 guidelines describe a successful weight loss intervention as one which achieves an

94 average of 3% weight loss in all patients attending one or more sessions, and at least 30%  
95 of patients having lost  $\geq 5\%$  weight loss (16).

96

97 There are many barriers to staff raising the issue of weight in primary care, including lack  
98 of evidence of efficacy, time, and training (28,29). Widely available options include  
99 commercial weight management groups, National Health Service (NHS) or public sector  
100 care programmes which vary in quality and duration. Unfortunately, very little evidence  
101 exists for the success of these types of programme for specific population subgroups  
102 including morbid and complex obesity patients. The present study aimed to investigate the  
103 physical, psychological and dietary impact of a 12 week Specialist Community Weight  
104 Management Programme (SCWMP) on morbid and complex obesity patients with  
105 assessments at 3 and 6 months.

106

## 107 **Methods**

108 This service evaluation uses routinely captured data from patients over 18 years old, in a  
109 prospective cohort study. The SCWMP was established in August 2010 in-line with NICE  
110 recommendations (4). Patients were referred to the service by GPs or health care  
111 professionals for a 12-week NHS intervention. Patients were contacted if they were eligible  
112 to attend the service and met the inclusion criteria. Patients who did not meet the inclusion  
113 criteria were referred to an appropriate alternative service. The most common reasons for  
114 exclusion were BMI less than  $35\text{kg/m}^2$  (or  $32.5\text{kg/m}^2$  for South Asians), patient presented  
115 with other comorbidities that needed to be prioritised prior to weight loss, not motivated to  
116 lose weight, or currently engaged in successful weight loss attempts elsewhere.

117 Inclusion criteria for patients eligible for the service were: Male or female, aged 15 or over;  
118 registered with an eligible GP; motivated to make changes to their diet and lifestyle; not

119 pregnant; BMI  $\geq 35$  kg/m<sup>2</sup> with a comorbidity such as type 2 diabetes, hypertension, sleep  
120 apnoea, osteoporosis, depression or BMI  $\geq 40$  kg/m<sup>2</sup> without a comorbidity ( $\geq 32.5$  kg/m<sup>2</sup>  
121 and  $\geq 37.5$  kg/m<sup>2</sup> for patients of South Asian origin) (44) and that they had tried and failed  
122 Tier 1 services previously such as commercial weight management, gym memberships,  
123 walking groups and practice nurse weight management advice.

124 Each eligible patient had a one hour initial assessment appointment with a senior member  
125 of the multidisciplinary team (i.e. dietitian, physiotherapist, psychologist) where data on the  
126 patients' medical, physical, psychological and social history was collected and a treatment  
127 plan was agreed. Treatment plans were tailored to the individuals' needs and consisted of  
128 up to 12 contacts via telephone, e-mail, in groups, or face-to-face appointments, over a 12  
129 week intervention period. The contact appointments were delivered by dietitians,  
130 physiotherapists, psychologists, cognitive-behavioural therapists, nutritionists, and/or  
131 physical activity guides. Staff were trained to embed motivational interviewing and  
132 behaviour change techniques into their consultations. Evening and weekend appointments  
133 were provided for enhanced accessibility of the service. Patients had an interim  
134 assessment at the end of the 3 month treatment period, followed by a further follow-up at 6  
135 months. This analysis includes those who attended their interim assessment  
136 appointments..

137

### 138 **Demographics and anthropometrics**

139 A detailed multi-component assessment of the patient was achieved using anthropometric  
140 measures and questionnaires which were distributed to all patients at three time points:  
141 their initial (baseline), interim (3 months) and final assessments (6 months). The primary  
142 outcome was weight change from baseline at 3 and 6 months. Secondary outcomes

143 included physical activity levels, fruit and vegetable consumption, self-esteem score and  
144 BMI.

145 Anthropometric data was collected in a pre-determined standardised sequence by a  
146 trained staff member. Patients were weighed in kilograms on calibrated scales (Tanita BC-  
147 420MA or Seca 665 high capacity). Height (in metres) was measured at the initial  
148 assessment using a Seca Leicester stadiometer. If the patient was unable to stand, ulna  
149 length was measured, and height was calculated using BAPEN charts (30). Body Mass  
150 Index (BMI) was calculated using weight (in kg) divided by height (in metres) squared.  
151 Waist circumference was measured in centimetres with a standard length, plastic coated  
152 tape measure in line with NHANES III protocol guidelines (31). For patients who were  
153 wheelchair bound or unable to stand, waist circumference was not measured. The  
154 Rosenberg self-esteem scale was used as a measure of psychological wellbeing which is  
155 validated and widely used in the obese population (32,33). It ranges from 0 to 30 with a  
156 higher score indicating greater self-esteem. Fruit and vegetable intake was assessed as  
157 an indicator of dietary quality change using self-reported fruit and vegetable consumption;  
158 options for answers were: 0, 1, 2, 3, 4 or 5+ per day. Seven-day physical activity recall  
159 was used to assess number of minutes of physical activity perceived to be at moderate-  
160 high intensity per week (adapted from the Stanford 7-day recall, (3)). Deprivation quintile  
161 proportions for the cohort was provided by the NHS data analysis team as postcode is  
162 considered identifiable data (34).

163

#### 164 **Statistical analysis**

165 Data from the patient records was analysed using SPSS (v. 18). Frequency data describes  
166 the baseline data. Means, modes, medians, standard deviations, standard error and  
167 significance of the data was analysed using appropriate methods for parametric or non-



168 parametric data as appropriate.

169 Change in parametric data were analysed using paired T-tests. Non-parametric data (fruit  
170 and vegetable portions and Rosenberg score) was analysed using Wilcoxon Signed Ranks  
171 test. Data was deemed to be significant if  $P < 0.05$ . A regression analysis of change in BMI,  
172 (both kg and percent) was completed using STATA 14. Explanatory variables were age,  
173 gender, ethnicity, physical activity, fruit/vegetable intake, self-esteem, number of session  
174 attended, and type of therapist used.

175

176 Ethical approval was not sought as the focus on service evaluation in the UK, is subject to  
177 different guidance in accordance with National Research Ethics Service (2009), thus  
178 exempting the work from the need for ethical approval (35).

## 179 Results

180 The majority of patients who attended an initial assessment were aged 35 to 65 years.  
181 Thirty-four per cent of the patients accessing and completing the service to interim were  
182 male (Table 1)

183 **Table 01: Demographic data of patients at baseline and at final assessment**

	<b>baseline</b> <b>(n= 288)</b>	<b>final</b> <b>(n= 115)</b>
<b>Gender</b>	<i>n (%)</i>	<i>n (%)</i>
Male	98 (34)	44 (38)
Female	190 (66)	71 (62)
<b>Age Range (years)</b>		
19-24	9 (3.1)	1 (0.9)
25-34	31 (10.8)	14 (12.2)
35-44	67 (23.3)	29 (25.2)
45-54	73 (25.3)	27 (23.5)
55-64	71 (24.7)	32 (27.8)
65+	37 (12.8)	12 (10.4)
<b>Ethnicity</b>		

White British & Irish	259 (89.9)	100 (87.0)
Asian	18 (6.3)	11 (9.6)
Black African/Caribbean	11 (3.8)	4 (3.5)
<b>Deprivation Quintiles</b>		
Most deprived	77 (27)	
2	75 (26)	
3	55 (19)	
4	40 (14)	
Least deprived	35 (12)	
Unknown	6 (2)	
	<i>Mean (SD)</i>	<i>Mean (SD)</i>
<b>BMI (kg/m<sup>2</sup>)</b>	45.5 (6.6)	43.5 (7.5)
<b>Weight (kg)</b>	126.9 (21.5)	120.3 (2.0)
<b>Waist circumference (cm)</b>	130.7 (14.6)	125.1 (1.4)
<b>Minutes of physical activity</b>	113.2 (233.2)	213.6 (248.1)
<b>Fruit &amp; Vegetables (portions/day)</b>	2.6 (1.5)	4 (1.2)
<b>Rosenberg self-esteem score</b>	16.8 (6.1)	20.3 (6.2)
<b>Number of different therapists seen</b>		
0	1 (0.3)	0
1	38 (13.2)	12 (10.4)
2	144 (50.0)	61 (53.0)
3 or more	105 (36.4)	42 (36.5)

184

185

186 Patients who attended seven or more of their booked appointments were considered to  
187 have engaged well with the service. The mean (SD) average number of sessions attended  
188 was 9.3 (1.75) with 95 out of 288 (33%) people completing 10 out of a maximum of 12  
189 sessions during the intervention period. There was significant loss to follow up (60%)  
190 between the 3 and 6 month appointments.

191 Deprivation data . demonstrated that the service was accessed equitably by patients  
192 from all deprivation quintiles, including the two most deprived quintiles who comprised  
193 53% of attendees.

194

## 195 **Primary outcome**

### 196 **Weight change**

197 There were statistically significant declines ( $P < 0.001$ ) in weight at 3 month and 6 month  
198 assessments.; the mean average (SD) weight loss at 3 months was 4.11 (4.95) kg, 1.24  
199 (4.11) kg between 3 and 6 months, and 6.3 (8.41) kg total weight loss at 6 months (Tables  
200 2 and 3). This equates to an average weight loss of 3.28 (3.82)% at 3 months, and  
201 average total weight loss of 4.90 (6.26)% for patients attending their 6 month assessment.  
202 Overall, 82% of patients who attended their interim appointment lost some weight at 12  
203 weeks, with 79.5% having lost some weight at their 6 month final assessment.

204

### 205 **Table 02: % of patients in the study cohort stratified by weight change at interim and** 206 **final assessments**

207

Weight change	Interim (%) n= 288	Final (%) n= 115
<b>≥10% loss</b>	5.2	17.1
<b>≥5-9.99% loss</b>	19.1	28.3
<b>≥3-4.99% loss</b>	24.3	16.2
<b>0-2.99% loss</b>	36.1	17.9
<b>Gained</b>	14.6	19.7

208

209 **Table 03: Mean (SD) weight, BMI and waist circumference changes in patients**  
 210 **between initial, interim and final assessments**

211

	Change at 3 months	<i>P</i> value	Change between 3-6 months	<i>P</i> value	Overall change at 6 months	<i>P</i> value
<i>Weight (kg)</i>	-4.11 (4.95) n= 287	<0.001	-1.24 (4.11) n= 115	0.002	-6.30 (8.41) n= 115	<0.001
<i>BMI (kg/m<sup>2</sup>)</i>	-1.46 (1.73) n=287	<0.001	-0.42 (1.41) n= 115	0.002	-2.18 (2.84) n= 115	<0.001
<i>Waist circumference (cm)</i>	-4.08 (5.12) n=282	<0.001	-0.82 (4.34) n=115	0.45	-5.64 (7.61) n= 115	<0.001

212

213 .

214 **Secondary outcomes**

215 need a sentence here about the secondary outcomes

216 **Table 04: Mean (SD) physical activity, fruit and vegetable intake and Rosenberg self-esteem score in patients between initial, interim and final assessments**  
 217

	Baseline	mean change 0-3 months	Interim (3 months)	mean change 3-6 months	Final (6 months)	overall mean change 0-6 months
<i>Physical activity (mins/week)</i>	113.2 (233.2) n= 287	<b>123.2 (363.5)</b> <i>P</i> <0.001	237.9 (362.4) n= 283	<b>-37.9 (254.0)</b> <i>P</i> = 0.146	214.1 (246.8) n= 96	<b>107.4 (209.7)</b> <i>P</i> <0.001
<i>Fruit and vegetable</i>	2.6 (1.5)	<b>1.0 (1.3)</b>	3.6 (1.3)	<b>0.3 (0.7)</b>	4.0 (1.2)	<b>1.3 (1.4)</b>

<i>intake</i> (portions/day)	n= 287	<i>P</i> <0.001	n= 283	<i>P</i> <0.001	n= 97	<i>P</i> <0.001
<i>Rosenberg</i> <i>self-esteem</i> <i>score</i>	16.8 (6.13)	<b>3.1 (5.4)</b>	19.9 (6.26)	<b>0.6 (3.5)</b>	20.3 (6.23)	<b>3.6 (5.6)</b>
	n= 286	<i>P</i> <0.001	n= 283	<i>P</i> = 0.066	n= 97	<i>P</i> <0.001

218

219 In the regression model, none of the variables were identified as being predictive of weight  
 220 loss at 3 or 6 months except change in physical activity level which was positively  
 221 associated with weight loss at 6 months (95% CI 0.170-0.001; *P*= 0.028).

222

223

224

## 225 **Discussion**

226 This paper presents data from a relatively large sample size (n= 288) of complex and  
227 morbidly obese individuals who have attended a well-designed, multi-professional  
228 specialist weight management programme. The analysis shows that for patients who  
229 attend the service, SCWMP is a successful way to aid weight management and improve  
230 their overall wellbeing. We conclude from the data presented, that for those patients who  
231 attended their planned sessions, the prevention of weight gain is likely to be achieved by  
232 over 80% of patients, regardless of their age, ethnicity or gender.

233 The current study shows that at 3 months, 24.3% of patients actively participating in the  
234 programme had lost 5% or more of their weight, and by 6 months, 45.4% of patients had  
235 lost more than 5% of their initial weight. Previous research has reported a variety of weight  
236 losses at 12 weeks (29,36-38), from 54.7% of patients (who completed at least 10  
237 sessions of a Slimming World programme) who lost over 5% of their initial weight (38), and  
238 the Lighten Up study which demonstrated 16-46% of patients lost more than 5% weight  
239 (36). The mean BMI for patients in the present study was 45.5 (6.6) kg/m<sup>2</sup> which is  
240 considerably higher than previously published data sets which ranged from 31.4 (2.6)  
241 kg/m<sup>2</sup> (39) to 39.7 (6.9) kg/m<sup>2</sup> (37). Whilst these findings from this study are lower than  
242 previously published data, the mean baseline BMI was higher in this study. This highlights  
243 caution when comparing studies as percentage weight loss can mean significantly different  
244 absolute (kg) weight losses depending on the initial average BMI of the study populations.  
245 There is a stark similarity between the weight loss results from this intervention and the  
246 NHS GCWMS service evaluated by Logue et al. (2014) on a large cohort of complex and  
247 severe obesity patients which had a mean starting BMI of 43.3 kg/m<sup>2</sup> and reported weight  
248 change data up to 12 months (20). At 3 months, 25% of all completers had lost  $\geq$  5% of  
249 their starting weight (compared to 24.3% in the present study) and at 6 months 44% of all  
250 completers had lost  $\geq$  5% (compared to 45.4% in the present study). Based upon this

251 limited available evidence on complex and morbidly obese populations, it may only be  
252 possible to achieve a 5% weight loss in fewer than 50% of patients by 6 months. Further  
253 follow-up studies on complex obesity patients are needed.

254

255 Overall, 82% of patients who attended their interim appointment lost some weight at 12  
256 weeks, with 79.5% having lost some weight at their 6 month final assessment. Prevention  
257 of weight gain was achieved by 85.4% of patients at interim, 80.3% at final. This is notably  
258 less than in the research presented by Stubbs *et al.* who found that prevention of weight  
259 gain was achieved in 92.1% (38), and 96.3% (12) of patients at 6 months. The reason for  
260 these differences is beyond the remit of the current evaluation, and could be addressed  
261 with further research.

262

263 By interim assessment, 21.5% of patients reported that they do zero minutes of moderate-  
264 high physical activity per week, which improved slightly to 19.6% of patients by their final  
265 assessment. In 2010, 20% of respondents in the Health Survey for England reported that  
266 they took walks of at least 20 minutes “less than once a year or never” (40), which is in line  
267 with the findings from this study. Patients were able to engage with increased physical  
268 activity with support, but once they had finished the intensive input stage of the  
269 programme, they did not increase activity further.

270

271 The increase in Rosenberg scores at interim and final assessment were statistically  
272 significantly improved from baseline ( $P < 0.001$ ) which is indicative of higher self-esteem.  
273 However, evidence is lacking as to whether an increased Rosenberg score impacts upon  
274 ability to lose weight although the relationship between low self-esteem and obesity is well  
275 established in children (41).

276

277 Fruit and vegetable intake increased throughout the intervention and follow-up period (see  
278 Table 04) indicating that patients may continue to make dietary changes even after the  
279 intensive intervention has finished. The most recent Health Survey for England (2012)  
280 found that adults aged 19 to 64 years on average consumed 4.2 portions of fruit and  
281 vegetables per day, with older adults consuming a mean average of 4.4 portions (40).  
282 Therefore the data presented shows that this study population group at baseline were  
283 consuming less than the mean average portions of fruit and vegetables per day. During  
284 the SCWMP, they appear to be engaging with dietary changes and increasing their fruit  
285 and vegetable consumption in line with the rest of the general population. This supports  
286 the conclusions of Carlson *et al.* (2012) who reported that increase in fruit and vegetable  
287 intake may be one of the easiest health-promoting behaviour changes to make (42). While  
288 portions of fruit and vegetables increased on average, self-reported data is subject to  
289 reporting bias. In this study the maximum number of portions of fruit and vegetables per  
290 day which could be recorded as consumed was 5. It would be reasonable to estimate that  
291 some patients will eat more than 5 portions per day and therefore the mean averages are  
292 based on a worst case scenario. This is beneficial as Wang *et al.* (2014) demonstrated a  
293 significant correlation between increased fruit and vegetable intake and reduced all-cause  
294 mortality, particularly cardiovascular mortality (43), with Tapsell *et al.* (2014) reporting that  
295 increased vegetable consumption as part of a calorie-controlled diet results in greater  
296 weight loss, which appears to be sustainable (44).

297

298 The improvement in results across all measures demonstrates the benefits of the  
299 specialist multidisciplinary team supporting a variety of patients' needs to be attended to  
300 within a single service. The SCWMP was designed in line with NICE and Grace  
301 recommendations (4,16,17) and the inclusion of a multidisciplinary team may have



302 contributed to the holistic improvement of this patient group. Unlike many of the papers  
303 which were examined in the literature review, there were no statistically significant  
304 differences in weight change or secondary outcome measures by age, ethnicity, gender,  
305 attendance, therapist seen or continuity of same therapist. This may be due to the  
306 thorough assessment of patients at their initial assessments and the flexibility of the  
307 programme which ensures that patients are seen by the most appropriate clinician or  
308 clinicians at the most appropriate time or that the changes in weight reported are seen  
309 predominantly in those with simple obesity or a BMI less than 35kg/m<sup>2</sup>. However, it is  
310 interesting to note that the patients who attended the service for the initial assessment  
311 were more likely to be over 35 years old.

312

313 Data presented in this study is intended to help generate debate over realistic target  
314 weight losses for morbidly obese patients, and emphasises the importance of longer term  
315 multi-disciplinary specialist weight management programmes to aid patients to achieve  
316 physical, social and psychological benefits; not with a pure focus on weight loss targets.  
317 Many obese individuals report long-lasting effects of obesity-related stigma due to a focus  
318 on weight, which leaves them less likely to engage in health promoting activities and  
319 health care services (45,46); and experience stigma-related mental health issues such as  
320 depression, anxiety, low self-esteem, and psychological stress (47). This leads to debate  
321 as to whether body weight is a realistic or ethical target within public health interventions  
322 (48) and whether more holistic “health promotion” services are indeed more beneficial than  
323 weight management, with the movement of the ‘Health at Every Size’ agenda  
324 (<http://www.haescommunity.org/>).

325

## 326 **Strengths and Limitations**

327 This study provides a “real-life” insight as to how weight management interventions are  
328 attended in practice in NHS settings, and highlights achievable outcomes in the morbidly  
329 and complex obese populations. Data is lacking in this area, and it is well-recognised that  
330 attrition rates are high (49), and engagement with male patients, and those of low  
331 socioeconomic status has previously been reported to be poor (50,51). However, in this  
332 study, 38% of subjects who completed the 6 month intervention were males, and  
333 engagement with patients from low socioeconomic groups was high, which supports the  
334 findings of Moroshko, Brennan and O’Brien (2011) who concluded that whilst many factors  
335 have been suggested to correlate with attrition, no individual factor had been consistently  
336 identified (49). It is hypothesised that providing a holistic, multi-disciplinary assessment at  
337 baseline encouraged otherwise poor engagers to attend the service as it was tailored to  
338 the individuals’ needs.

339 Unfortunately, these results are representative of only one city in the UK and further  
340 research is therefore required to compare similar services throughout the UK, and  
341 internationally which have a specific provision for morbidly and complex obese individuals.  
342 Larger data sets with longer-term follow up would also be beneficial, with the data sets  
343 following patients from baseline through to completion. However, attrition rates are  
344 notoriously high, and participant engagement post-intervention period is low (52). In future  
345 studies the improvement of data collection would be valuable, for example an improved  
346 fruit and vegetable scale, and the addition of blood biochemistry e.g. blood lipid profiling  
347 and anthropometry measures at each assessment period.

348

## 349 **Implications for future practice and recommendations for service improvement**

350 Due to the nature and complexity of morbidly obese patients, a holistic service evaluation

351 is necessary, and it is unhelpful to use weight change as a sole primary outcome for  
352 service evaluation. Data from this service evaluation was considered during the  
353 development of the new NICE Public Health guidelines (2014), which suggests a 3%  
354 weight loss target is beneficial for this patient group, and is a more realistic target for  
355 commissioners to be using in tenders (16). The impact of increased physical activity, self-  
356 esteem (alongside other measures of mental health status) and dietary quality should be  
357 recognised, and these attributes should be addressed within the service by specialist  
358 multi-disciplinary teams (14,16,17).

359

360 Data from this population group is lacking, and provision should be made by  
361 commissioners for data collection and thorough service evaluation, with statistical support.  
362 Data collected by each service should be standardised to aid ease of comparison, and can  
363 be collected using the NOO Standard Evaluation Framework (2009) (53). It is crucial that  
364 this data is available in the public domain to improve the understanding of factors which  
365 are pertinent to effective services and to aid service development, design and  
366 commissioning in the future.

367

## 368 **Conclusion**

369 By six months, over 60% of patients who actively engaged with the SCWMP lost 3% body  
370 weight or more. Therefore, the service appears valuable in aiding weight loss in the  
371 morbidly obese population for those patients. Results appear comparable to those  
372 provided in previously published studies although it is recognised that data based on  
373 comparable populations is lacking.

374

375 In the longer term, additional studies need to be commissioned to fill gaps in knowledge

376 surrounding the impact of current acute or community weight management services in the  
377 UK in morbidly obese populations, and provide more qualitative or mixed methods analysis  
378 to add depth to our understanding of the current issues, and design suitable programmes  
379 with which these populations will successfully engage.

380

381 **Conflict of Interest**

382 The authors declare no conflict of interest

383

384

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