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Evaluation of the first phase of a specialist weight management programme in the UK National Health Service: prospective cohort study

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Abstract

Objective: To evaluate the first phase of a specialist weight management programme provided entirely within the UK National Health Service.

Design: Prospective cohort study using multiple logistic regression analysis to report odds of ≥5 kg weight loss in all referrals and completers, and odds of completion, with 95% confidence intervals. Anxiety and depression 'caseness' were measured by the Hospital Anxiety and Depression Scale.

Setting: Glasgow and Clyde Weight Management Service (GCWMS) is a specialist multidisciplinary service, with clinical psychology support, for patients with BMI ≥35 kg/m^2 or BMI ≥30 kg/m^2 with co-morbidities.

Subjects: All patients referred to GCWMS between 2004 and 2006.

Results: Of 2976 patients referred to GCWMS, 2156 (72·4%) opted into the service and 809 completed phase 1. Among 809 completers, 35·5% (*n* 287) lost ≥5 kg. Age ≥40 years, male sex (OR = 1·39, 95% CI 1·05, 1·82), BMI ≥ 50 kg/m^2 (OR = 1·70, 95% CI 1·14, 2·54) and depression (OR = 1·81, 95% CI 1·35, 2·44) increased the likelihood of losing ≥5 kg. Diabetes mellitus (OR = 0·55, 95% CI 0·38, 0·81) and socio-economic deprivation were associated with poorer outcomes. Success in patients aged ≥40 years and with BMI ≥50 kg/m^2 was associated with higher completion rates of the programme. Patients from the most deprived areas were less likely to lose ≥5 kg because of non-completion of the programme.

Conclusions: Further improvements in overall effectiveness might be achieved through targeting improvements in appropriateness of referrals, retention and effective interventions at specific populations of patients.

Keywords
Obesity
Overweight
Secondary prevention

The prevalence of excess weight and obesity is increasing in the UK and is a major cause of morbidity and mortality from cardiovascular and respiratory diseases, non-insulin dependent diabetes, musculoskeletal disorders and many cancers[1,2]. It has been estimated that 60% of men and 50% of women could be clinically obese (BMI ≥30 kg/m^2) by 2050, costing the National Health Service £49·9 billion per year[3]. In Scotland, the prevalence of obesity has increased consistently since 1995[4–6] such that, by 2008, about 26% of men and 27·5% of women were obese[7]. Overweight in men is about 6% less prevalent in the largest regional Health Board of Scotland, Greater Glasgow and Clyde, but the prevalences of obesity in men and both overweight and obesity in women are similar to the national figures[5].

Despite the broad public health concerns about the impacts of obesity, evidence for the effectiveness of interventions based on diet and physical activity alone has been sparse and inconsistent[8]. Obesity is a complex problem that requires multi-modal approaches. Interventions incorporating an energy-deficit diet plus exercise, underpinned by behavioural interventions, are most clinically effective[9,10] and recent treatment guidelines developed in the UK recommend multi-component approaches as an integral part of weight management[11,12]. Overweight or obese patients should also be offered a choice of individual or group-based weight management programmes[12]. Moderate, sustained weight loss of 5–10% (approximately 5–10 kg) has been shown to be associated with significant clinical benefits in individuals with obesity and is therefore considered a worthwhile treatment goal[9,13–15]. The majority of evidence is based on absolute, rather than percentage, weight reduction[12].

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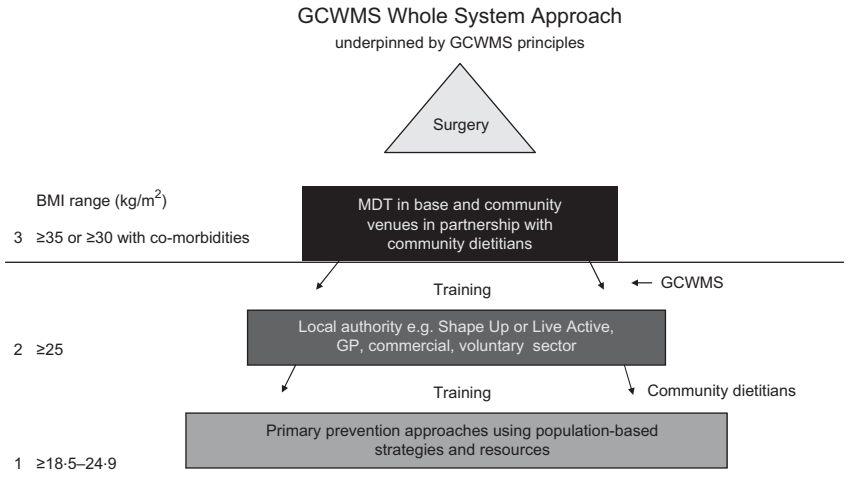

Fig. 1 Glasgow and Clyde Weight Management Service (GCWMS): hierarchy of services according to BMI (MDT, multidisciplinary team; GP, general practitioner)

Glasgow and Clyde Weight Management Service (GCWMS) was developed in 2004 to offer equitable access and consistent treatment approaches and to optimise current resources already being directed towards weight management across the National Health Service (NHS) Board area. It forms the third tier between primary prevention and bariatric surgery in an overall strategy to reduce the prevalence and associated health-care costs of obesity and to provide a more structured pathway to surgery (Fig. 1). GCWMS piloted its treatment approaches and protocols within a small geographical area before incrementally extending its coverage to the entire Health Board population by 2008.

The aim of the present study was to evaluate the effectiveness of phase 1 of the GCWMS weight management programme in achieving 5 kg or more weight loss. We explored the effects of age, sex and initial BMI as well as co-morbidities and medications with known metabolic effects.

Methods

Setting

Greater Glasgow and Clyde Health Board area in the West of Scotland, UK, has a population of 1·2 million individuals and includes a diverse mixture of urban and rural populations. Thirty-one per cent of the Board's population lives in very deprived areas compared with 15 % of Scotland's population as a whole[16].

Glasgow and Clyde Weight Management Service

GCWMS is provided by a team that comprises dietitians, psychologists, physiotherapists and administrative staff. The unique integration of psychologists within the service ensures that all patients benefit from having psychosocial approaches incorporated throughout their journey as these interventions were included in the standard programme, delivered by dietitians but designed and supported by psychologists. Access to additional, timely psychological support was also provided if indicated. Patients were eligible for referral to the service if they had a BMI $\geq 30\,kg/m^2$ with co-morbidities (including sleep apnoea, diabetes, poorly controlled hypertension or poor mobility) or a BMI $\geq 35\,kg/m^2$ with no co-morbidities. Pregnancy[17], being unable to attend an outpatient clinic, in early stages of a quit smoking attempt or current poorly controlled psychiatric illness all indicate exclusion from the service. Re-referral is suggested when appropriate. At initial assessment, all patients complete the Hospital Anxiety and Depression Scale questionnaire. Evening groups are provided to increase accessibility to the service. Small groups are available for those with sensory impairment, literacy issues, anxiety, mild learning difficulties and where English is not the first language. Treatment pathways and goals were developed based on best evidence and national guidelines[18] and the service was provided in both NHS community and outpatient hospital settings. The service's goal was to support individuals to achieve weight loss at least 5 kg. In phase 1 all patients were treated with a 16-week group programme comprising nine fortnightly sessions with a combination of diet, exercise and behavioural interventions. The diet was a 2510 kJ (600 kcal) deficit diet[12] calculated for each patient with recommended portions from the five food groups. Psychological interventions for weight loss were incorporated into each part of the programme with the aim of supporting adherence to the diet and activity changes advised. These included a range of cognitive behavioural approaches that have been highlighted in guidelines[12] due to their beneficial effect, for example: goal setting, self-monitoring, cognitive restructuring and relapse prevention, among others. At the end of the first intervention phase those who do not succeed in losing at

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least 5 kg are offered further options (lower-energy structured diet or pharmacological treatment) in a second phase, which is not described here.

Data and statistical methods

We obtained data for all referrals made to GCWMS from its inception in November 2004. Follow-up data on weight loss in phase 1 were available to December 2007 and we therefore selected referrals until December 2006 inclusive so that patients had sufficient time to be offered, to accept and to complete phase 1 of the GCWMS programme. Where the same individual was referred more than once, information on the earlier referral only was included. Records with a height of 1 m or less, a weight loss of more than 30 kg or a BMI below 20 kg/m^2 were excluded as they were unlikely to be valid data. Co-morbidity information (binary data on the presence or absence of diabetes mellitus, chronic obstructive pulmonary disease, heart disease, hypertension, stroke, osteoarthritis and hypothyroidism) were obtained from patients' general practitioner (GP) referral forms. Medications were recorded in free text and several electronic searches with partial search terms were made to identify drugs and classify them according to British National Formulary categories. Patients were classified as having diabetes mellitus if it was either recorded on their GP referral form or if they were prescribed biguanides. Anxiety and depression were assessed using the Hospital Anxiety and Depression Scale (HADS)[19]. The HADS was developed to screen for anxiety and depression in patients attending medical centres. It is widely used in clinical settings as it is recognised that these common forms of psychological disturbance can impact on patients' response to medical interventions. The scale assesses for presence of morbidity and gives an indication of severity with a score of 10/11 indicating 'probable anxiety' and 14/15 being a 'severe disorder'. A score of ≥12 for either anxiety or depression was used to indicate 'caseness' in the current sample. Patients' socio-economic circumstances were estimated using the Scottish Index of Multiple Deprivation (SIMD)[20], an area-based index that uses seven domains (current income; employment; health; education, skills and training; geographic access to services; housing; and crime) to describe the level of deprivation in small geographic areas (data zones). All data zones in Scotland are ranked from 1 (most deprived) to 6505 (least deprived) and a variety of quantiles are available for their further categorisation. We used quintiles of the Scottish population, ranging from 1 (least deprived) to 5 (most deprived). Completion of phase 1 was defined before analysis as completion of programme with four or more sessions attended. This definition has both face validity, in that it defines completers as those who attended at least half of the sessions, and it is consistent with a definition of completion used in another weight management programme in the UK[21].

Data cleaning and analysis were carried out independently by N.G., G.A. and D.S.M. and compared for quality assurance. The two continuous variables (age and BMI) were analysed both in continuous and categorical forms. A conventional statistical significance cut-off of 5 % was used. All analyses were performed using the STATA statistical software package version 10·1 (StataCorp, College Station, TX, USA).

Three separate analyses were performed. The first looked at potential factors affecting weight loss among all referrals; the second looked at potential factors affecting weight loss among those referred who completed the programme; and the third looked at potential factors affecting completion of the programme. The potential factors examined were the same in all three analyses; age, sex, BMI, SIMD quintile, co-morbidities and drug regimens where weight changes were cited as side-effects in the British National Formulary[22].

Univariate logistic regression was used in each analysis to identify which factors were likely to influence the outcome variables of weight loss or completion. All variables with P value $<0{\cdot}3$ in the univariate logistic regression were then entered into multivariate logistic regression analyses. The first stage of the multivariate logistic regression identified variables with a P value $<0{\cdot}1$. These variables were then examined by Kendall's rank correlation coefficients with Bonferroni adjustments for possible correlations and where these were identified as significant ($P<0{\cdot}05$) they were subsequently entered as interaction terms into a second multivariate regression analysis. The final multivariate model was chosen to include all variables (and interactions) with $P<0{\cdot}05$. Many of the variables were found to be correlated with sex so it was decided to carry out additional analyses for males and females separately. Our study was principally an evaluation of the effectiveness of a service with the primary aim of improving its quality. A full report of our findings was provided to GCWMS and used to modify current practice. We did not seek ethics committee approval for this evaluation because it formed part of clinical audit rather than primary research.

Results

Between November 2004 and December 2006, 3170 referrals were made to GCWMS. After exclusion of 177 re-referrals and a further seventeen patients with non-valid data as defined above, data on 2976 individuals were included in the analysis. Figure 2 provides a flowchart of patients from referral to successful weight loss. Women were more likely than men to opt in (73·6 % *v.* 69·4 %, respectively; $\chi^2 = 5{\cdot}174$, $P = 0{\cdot}02$) but among those who opted in there was no significant difference between the sexes in the proportion who completed the programme ($\chi^2 = 1{\cdot}239$, $P = 0{\cdot}27$). An additional six patients, who are

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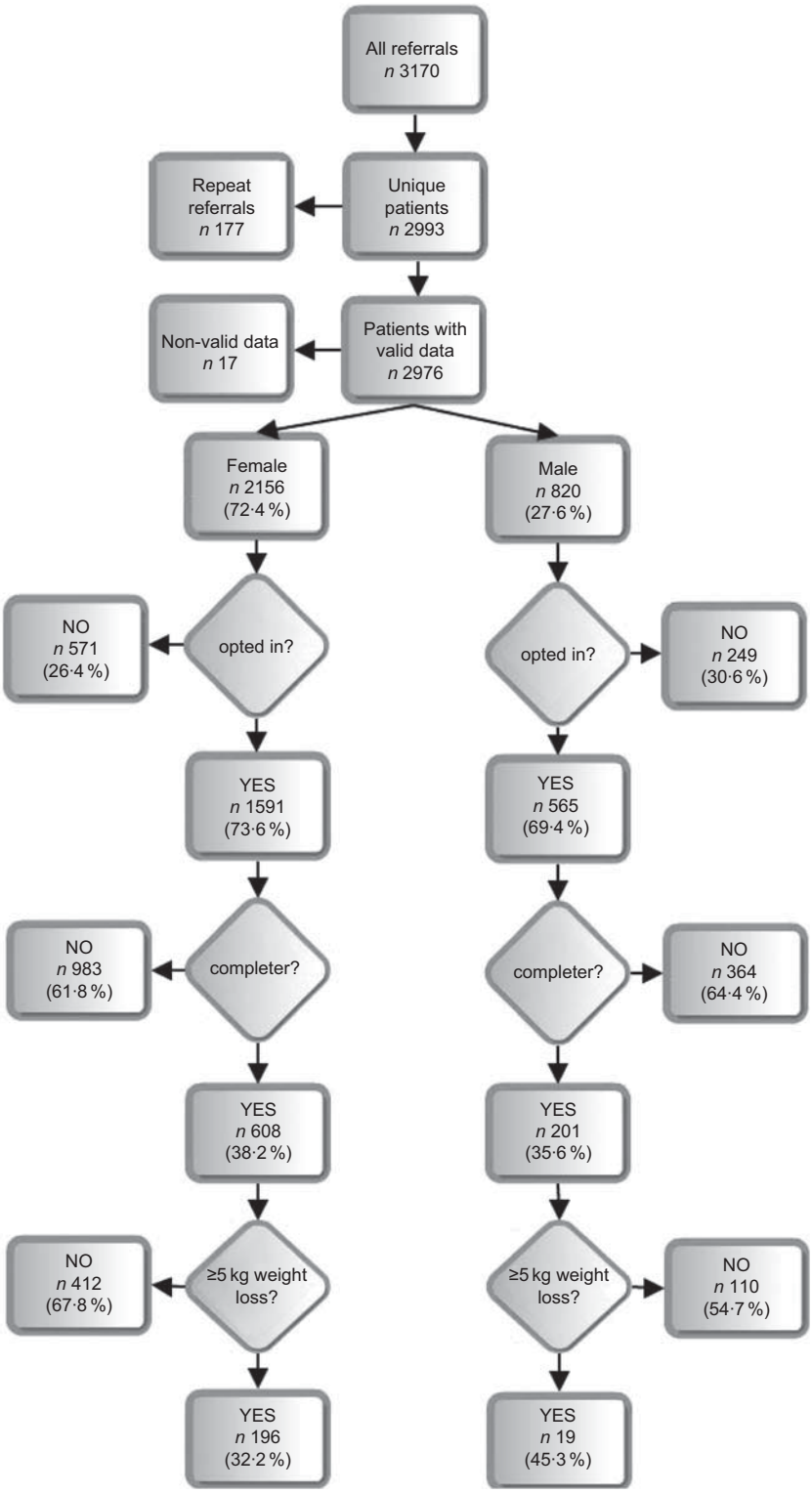

Fig. 2 Flowchart showing all referrals to Glasgow and Clyde Weight Management Service (GCWMS) between November 2004 and December 2006

not shown, lost 5 kg or more but did not satisfy the criteria for completion of the programme. Three-quarters (2156, 72·4 %) of patients were female and the mean ages of men and women were 47·5 and 44·6 years, respectively (t test of independent samples, $P < 0{\cdot}01$). The majority (n 1848, 62·1 %) of patients were from the most deprived areas (SIMD 5) with 3 % from the most affluent areas (SIMD 1; n 95, 3·2 %), reflecting the deprived catchment

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area for the service. Higher BMI was associated with 'caseness' for both anxiety ($\chi^2_{trend} = 18{\cdot}83$, $P < 0{\cdot}01$) and depression ($\chi^2_{trend} = 22{\cdot}67$, $P < 0{\cdot}01$). Two thousand one hundred and fifty-six patients (72·4 %) opted into the service of whom 809 (37·5 %) completed phase 1. Socio-economic deprivation was associated with higher prevalence of both anxiety and depression. The prevalence of 'caseness' for anxiety was 18·9 % in patients from the most affluent areas and increased to 24·2 % in patients from the most deprived areas ($\chi^2_{trend} = 6{\cdot}526$, $P = 0{\cdot}01$). The prevalence of depression was 9·5 % in patients from the most affluent areas and 18·6 % in patients from the most deprived areas ($\chi^2_{trend} = 4{\cdot}984$, $P = 0{\cdot}03$).

Two hundred and ninety-three patients lost the target weight of 5 kg or more and this proportion was not significantly different in 2004, 2005 or 2006 ($\chi^2_{trend} = 1{\cdot}05$, $P = 0{\cdot}31$). This represents 9·8 % of all patients referred and 13·6 % of those who opted into the service. Among 809 patients who completed phase 1, 287 (35·5 %) lost at least 5 kg. Table 1 gives numbers, proportions and odds ratios, respectively, for ≥5 kg weight loss among all referrals in different strata. After adjustment in both sexes combined, age ≥40 years, male sex, BMI ≥50 kg/m^2 and depression were associated with greater likelihood of ≥5 kg weight loss in phase 1 of GCWMS. Patients from the most deprived areas were significantly less likely to succeed but there was no clear trend across other socio-economic groups. Presence of diabetes mellitus about halved the odds of significant weight loss. In sex-specific adjusted models, men with histories of osteoarthritis and depression were significantly more likely to lose weight while heart disease reduced likelihood of weight loss by about two-thirds. In women, age ≥40 years, BMI ≥ 50 kg/m^2 and anxiety increased the odds of success while diabetes mellitus halved it.

Overall success in phase 1 is likely to reflect a mixture of compliance with, or completion of, the programme as well as its efficacy. We therefore analysed separately determinants of weight loss among completers (Table 2) and determinants of completion itself – defined as attending four or more sessions with GCWMS – among patients who had opted in (Table 3).

Among all 809 completers (Table 2) men were nearly twice as likely as women to lose the target weight of at least 5 kg, while diabetes reduced odds of success by 55 % ($P < 0{\cdot}01$). In sex-specific analyses, the effect of diabetes was more pronounced in men (OR = 0·37, 95 % CI 0·18, 0·76) than women (OR = 0·49, 95 % CI 0·29, 0·82).

Determinants of completion of phase 1 of GCWMS are shown in Table 3. In both sexes combined, age ≥40 years and BMI ≥ 50 kg/m^2 were associated with greater likelihood of completion. Chronic obstructive pulmonary disease (COPD) and living in the most socio-economically deprived areas were associated with lower likelihood of completion although no overall socio-economic trend was apparent. In sex-specific models, a clearer socio-economic pattern was evident in men, with those from the most affluent areas being nearly four times (OR = 3·74, 95 % CI 1·41, 9·95) more likely to complete the programme compared with patients from the most deprived areas. Among women, those aged ≥40 years were more likely to lose at least 5 kg, while the higher odds of weight loss in those with BMI ≥ 50 kg/m^2 was of borderline significance. Women with histories of COPD and stroke were at reduced likelihood of completion of the programme.

Discussion

The results of the present study outline the functioning of the first two years of the first phase of a larger weight management programme provided under routine publicly funded health-care conditions. About one in seven patients (13·6 %) who opted into GCWMS lost at least 5 kg in phase 1 of the programme. Among patients who completed phase 1, over a third (35·5 %) lost their target weight. Overall effectiveness was determined by greater efficacy of the programme for some patient groups and by greater likelihood of completing the programme in others. Thus, although there was no significant difference in completion rates between the sexes, men who did complete the programme were more likely to lose their target weight. In contrast, patients with a BMI ≥ 50 kg/m^2 were more likely than those with a BMI between 35 and 39 kg/m^2 to complete the programme but no more likely to lose weight when they did. Diabetes mellitus reduced the likelihood of achieving the ≥5 kg target weight loss irrespective of attendance. The association between diabetes and poorer weight loss has been previously reported[11]. Heart disease reduced likelihood of weight loss in men only, but as it was neither a predictor of weight loss among completers nor of completion, the significance of this association remains uncertain.

Weight management programmes are consistently poorly taken up by men[23]. This may be because the service fails to recognise gender-specific issues or because of differences in concern with body weight and physical appearance between men and women[24,25]. Developing more gender-focused approaches may help to improve uptake and retention by men in weight loss programmes and preliminary findings from such initiatives are promising[23]. We are considering possible ways to make GCWMS appeal specifically to men. Such modifications might involve increased emphasis on the 'masculinisation' of advice about exercise; use of humour which has been found to be more important to men; and spending more time on specific nutrition information such as portion size and alcohol use and less emphasis on the link between food and emotions[23]. The lower referral rate of men to the service is consistent with others' findings. Men are less likely to consult their doctor over signs of illness and are less likely to engage with health services generally for many conditions[26,27]. Even when they

Table 1 Univariate and multivariate logistic regression on odds of weight loss of 5 kg or more in phase 1 of GCWMS. First referrals from November 2004 to December 2006 inclusive (*n* 2976)

		≥5 kg weight loss				Male			Female			All		
	n	*n*	%	Univariate OR	*P*	Multivariate OR	95 % CI	*P*	Multivariate OR	95 % CI	*P*	Multivariate OR	95 % CI	*P*
Total	2976	293	9·85											
Age group (years)														
<40 (ref.)	990	73	7·37	1·00	0·02				1·00		<0·01	1·00		<0·01
40–49	829	94	11·34	1·61					2·00	1·35, 2·97		1·52	1·09, 2·12	
50–59	690	73	10·58	1·49					1·79	1·16, 2·75		1·47	1·03, 2·11	
≥60	467	53	11·35	1·61					2·66	1·67, 4·22		2·12	1·44, 3·14	
Sex														
Female (ref.)	2162	200	9·25	1·00	0·08							1·00		0·02
Male	814	93	11·43	1·27								1·39	1·05, 1·82	
BMI (kg/m^2) at referral														
<35	338	18	5·33	0·53					0·32	0·15, 0·71		0·56	0·33, 0·95	
35–39 (ref.)	1082	103	9·52	1·00	<0·01				1·00		<0·01	1·00		<0·01
40–49	1253	125	9·98	1·05					1·03	0·74, 1·43		1·10	0·82, 1·46	
≥50	303	47	15·51	1·75					1·74	1·12, 2·69		1·70	1·14, 2·54	
Co-morbidities														
COPD	146	12	8·22	0·81	0·50									
Heart disease	288	23	7·99	0·78	0·27	0·36	0·13, 0·99	0·05						
Hypertension	272	32	11·76	1·25	0·27									
Stroke	129	11	8·53	0·85	0·61	2·94	0·98, 8·79	0·05						
Osteoarthritis	79	11	13·92	1·50	0·22	3·93	1·53, 10·10	<0·01						
Hypothyroidism	48	1	2·08	0·19	0·10									
Diabetes mellitus	515	36	6·99	0·64	0·02				0·53	0·33, 0·85	0·01	0·55	0·38, 0·81	<0·01
Anxiety	679	87	12·81	1·49	<0·01				1·59	1·16, 2·18	<0·01			
Depression	518	73	14·09	1·67	<0·01	1·82	1·03, 3·22	0·04				1·81	1·35, 2·44	<0·01
Drugs														
β-Adrenoceptor blocking drugs	345	37	10·72	1·11	0·56									
SSRI	186	22	11·83	1·25	0·35									
Thyroid hormones	144	15	10·42	1·07	0·81									
SIMD quintile														
1 least deprived	95	12	12·63	1·58								1·77	0·94, 3·35	
2	228	24	10·53	1·29								1·31	0·83, 2·08	
3	240	29	12·08	1·50								1·57	1·03, 2·41	
4	439	58	13·21	1·67								1·71	1·23, 2·36	
5 most deprived (ref.)	1848	155	8·39	1·00	0·02							1·00		0·01

GCWMS, Glasgow and Clyde Weight Management Service; ref., referent category; COPD, chronic obstructive pulmonary disease; SSRI, selective serotonin reuptake inhibitors; SIMD, Scottish Index of Multiple Deprivation.

Table 2 Univariate and multivariate logistic regression results for odds of weight loss of 5 kg or more in phase 1 of GCWMS. First referrals from November 2004 to December 2006 inclusive (completers only, *n* 809)

		≥5 kg weight loss				Male			Female			All		
	n	*n*	%	Univariate OR	*P*	Multivariate OR	95 % CI	*P*	Multivariate OR	95 % CI	*P*	Multivariate OR	95 % CI	*P*
Total	809	287	35·48											
Age group (years)														
<40 (ref.)	211	70	33·18	1·00	0·78									
40–49	246	93	37·80	1·22										
50–59	202	71	35·15	1·09										
≥60	150	53	35·33	1·10										
Sex														
Female (ref.)	608	196	32·24	1·00	<0·01							1·00		<0·01
Male	201	91	45·27	1·74								1·85	1·33, 2·58	
BMI (kg/m^2) at referral														
<35	66	18	27·27	0·68										
35–39 (ref.)	291	103	35·40	1·00	0·36									
40–49	344	122	35·47	1·00										
≥50	108	44	40·74	1·25										
Co-morbidities														
COPD	33	11	33·33	0·91	0·79									
Heart disease	76	22	28·95	0·72	0·21									
Hypertension	82	31	37·80	1·12	0·62									
Stroke	29	10	34·48	0·96	0·91									
Osteoarthritis	25	11	44·00	1·45	0·37									
Hypothyroidism	13	1	7·69	0·15	0·07									
Diabetes mellitus	149	34	22·82	0·48	<0·01	0·37	0·18, 0·76	0·01	0·49	0·29, 0·82	0·01	0·45	0·29, 0·68	<0·01
Anxiety	249	84	33·73	0·89	0·49									
Depression	181	71	39·23	1·23	0·23									
Drugs														
β-Adrenoceptor blocking drugs	117	36	30·77											
SSRI	53	21	39·62											
Thyroid hormones	51	15	29·41											
SIMD quintile														
1 least deprived	36	12	33·33	0·97										
2	75	24	32·00	0·92										
3	79	29	36·71	1·13										
4	138	57	41·30	1·37										
5 most deprived (ref.)	442	150	33·94	1·00	0·56									

GCWMS, Glasgow and Clyde Weight Management Service; ref., referent category; COPD, chronic obstructive pulmonary disease; SSRI, selective serotonin reuptake inhibitors; SIMD, Scottish Index of Multiple Deprivation.

Table 3 Determinants of completion (≥4 visits and ≥4 weights recorded) in phase 1 of GCWMS. First referrals from November 2004 to December 2006 inclusive (patients who opted-in, *n* 2156)

		Completion				Male			Female			All		
	n	*n*	%	Univariate OR	*P*	Multivariate OR	95 % CI	*P*	Multivariate OR	95 % CI	*P*	Multivariate OR	95 % CI	*P*
Total	2156	809	37·52											
Age group (years)														
<40 (ref.)	679	211	31·08	1·00	<0·01				1·00		<0·01	1·00		<0·01
40–49	617	246	39·87	1·47					1·56	1·19, 2·03		1·49	1·18, 1·89	
50–59	511	202	39·53	1·45					1·60	1·21, 2·12		1·53	1·19, 1·96	
≥60	349	150	42·98	1·67					2·25	1·63, 3·12		1·89	1·43, 2·51	
Sex														
Female (ref.)	1591	608	38·21	1·00	0·27									
Male	565	201	35·58	0·89										
BMI (kg/m^2) at referral														
<35	212	64	31·13	0·77					0·72	0·48, 1·09		0·76	0·54, 1·07	
35–39 (ref.)	788	291	36·93	1·00	0·02				1·00		0·05	1·00		0·02
40–49	916	344	37·55	1·03					0·97	0·77, 1·22		1·05	0·85, 1·28	
≥50	240	108	45·00	1·39					1·38	0·99, 1·94		1·46	1·07, 1·98	
Co-morbidities														
COPD	118	33	27·97	0·63	0·03				0·53	0·31, 0·89	0·02	0·56	0·37, 0·86	0·01
Heart disease	212	76	35·85	0·92	0·60									
Hypertension	211	82	38·86	1·06	0·67									
Stroke	97	29	29·90	0·69	0·11				0·38	0·19, 0·76	0·01			
Osteoarthritis	55	25	45·45	1·40	0·22									
Hypothyroidism	33	13	39·39	1·08	0·82									
Diabetes mellitus	380	149	39·21	1·09	0·45									
Anxiety	678	249	36·73	0·95	0·60									
Depression	517	181	35·01	0·87	0·18									
Drugs														
β-Adrenoceptor blocking drugs	274	117	42·70	1·28	0·06									
SSRI	144	53	36·81	0·97	0·85									
Thyroid hormones	113	51	45·13	1·39	0·09									
SIMD quintile														
1 least deprived	73	36	49·32	1·85		3·74	1·41, 9·95					1·88	1·16, 3·02	
2	190	75	39·47	1·24		1·26	0·69, 2·30					1·29	0·94, 1·77	
3	187	79	42·25	1·39		1·87	1·06, 3·31					1·44	1·05, 1·98	
4	328	138	42·07	1·38		1·86	1·15, 3·01					1·39	1·08, 1·79	
5 most deprived (ref.)	1285	442	34·40	1·00	0·01	1·00		0·01				1·00		<0·01

GCWMS, Glasgow and Clyde Weight Management Service; ref., referent category; COPD, chronic obstructive pulmonary disease; SSRI, selective serotonin reuptake inhibitors; SIMD, Scottish Index of Multiple Deprivation.

are referred for weight management there is further poorer uptake by men to weight loss programmes[28]. These combinations of men seeking help less and poorer engagement in health services may account for some of the apparent reluctance of men to engage in GCWMS. We found that women were less likely than men to succeed in losing weight in GCWMS, suggesting that further work is needed to make the programme more efficacious in women rather than to improve retention. Attrition rates in lifestyle interventions are often high and present a challenge for services that require long-term behaviour change before improvements are noticed in the presenting problem. Bradshaw *et al.*[29] reported completion rates of 58% among women (compared with 38% in our study) in a non-dieting intervention in New Zealand, using a higher threshold than ours to define programme completion. Higher educational attainment and healthier nutritional behaviours were found to predict greater completion[29]. The poorer completion rates in patients from more deprived circumstances that we found are consistent with an association between lower educational attainment and poorer attendance.

Our finding that severe psychopathology is associated with higher levels of obesity is consistent with previous reports[30–32]. The associations between depression in men and anxiety in women and greater likelihood of target weight loss might be explained by the high level of psychological support provided in GCWMS. Psychological support aims to facilitate attendance by overcoming potential barriers. A multidisciplinary team infrastructure with immediate direct access to clinical psychology facilitates this process. Furthermore, a significant minority of obese clients attending specialist weight loss services will have more serious problems with disordered eating patterns, describing episodes of binging associated with feelings of loss of control and significant distress[33]. Problems of this kind can be a potential barrier to engaging with and remaining in treatment if not actively managed[34]. While the ultimate goal for programmes such as this is weight loss, the service also encompasses supporting clients to change habits surrounding their use of food. We are developing an innovative treatment approach to address severe disordered eating in combination with the standard weight loss programme. Achieving long-term behaviour change is necessary to reduce the health risks and psychosocial and economic costs associated with obesity.

Individuals from the most deprived areas were about half as likely to lose weight and complete phase 1 as those from the most affluent areas, with a clearer association seen in men compared with women. Lower socio-economic status has consistently been found to predict non-attendance and early termination from health services although the underlying reasons are not clear[35]. They include greater practical obstacles to attending[35]. The group programme was delivered as geographically close as possible for the lighter clients (those <120 kg were seen in local community venues which represents 60% of the overall client group) with the heavier clients attending our base within a main city centre hospital location where an adapted environment had been created[11]. Therefore equity of access in terms of geographical location is unlikely to be a major factor for this group of clients. In an effort to further support this group of patients in accessing this service we are working in partnership with the anticipatory care programme Keep Well, GCWMS being one of a menu of choices offered to this targeted population[36]. It has also been found that there is a higher prevalence of psychological problems among the poorest sections of society yet these are the patients who are least likely to continue in and benefit from health services[37]. We found that weight loss among completers did not vary by socio-economic circumstances and therefore an emphasis should now be placed on improving retention within the service for patients who have opted in from more deprived areas.

Strengths and limitations

A particular strength of our study is that we report on outcomes among all patients referred to the GCWMS rather than only on those who completed the programme. Our study benefits from a relatively large sample size, a diverse socio-economic catchment population, and objective measures of height and weight. However, there are a number of limitations. At the time of writing, data were only available on outcomes for phase 1 of the GCWMS's two-phase weight loss programme; the true effectiveness of the service in achieving at least 5 kg weight loss will be higher than 10% of initial referrals or 14% of opted-in patients. Changes to information technology systems should provide both more recent data and information on outcomes for phase 2 in the future. GCWMS is managed with a cycle of continuous improvement, adopting new evidence-based practices over time, and it might be expected that more recent data may indicate improvements in retention and efficacy. Health-care professionals need to consider the willingness of a patient to undertake the necessary behaviour change required for effective weight management[12] before they refer to a specialist service. Over a quarter (27·6%) of patients who are referred do not opt into the treatment programme. Assessment of willingness to change weight-related behaviour is an integral part of the GCWMS model, but uptake rates might be improved if the referrer raised the issue of motivation for weight loss prior to referring on any individual who alleges a commitment to weight loss. Further work is needed to educate and inform GP so that patients who are motivated to change their behaviour – and therefore likely to benefit from a specialist weight management service – are most effectively identified. Further work is also needed to evaluate weight loss, and weight loss maintenance, over longer time scales.

Conclusions

Strategies to reduce overweight and obesity require both primary and secondary preventive interventions and we have described an effective, replicable, multidisciplinary approach to treating obesity within routine health services. Most evaluations of secondary interventions have been within commercial or trial settings. The model described is the first phase of a much broader weight management pathway that comprises several phases and a full evaluation with a longer follow-up period is needed to determine its overall effectiveness. GCWMS outcomes are similar to those of a primary-care-based weight management programme[38]. However, because GCWMS is delivered through group rather than individual sessions, it is likely to be more cost-effective. Further work is required to carry out a formal economic evaluation of the service once more data become available.

The first phase of the GCWMS programme is clinically effective for those who engage in treatment and complete the programme, among whom 36 % will be successful in losing at least 5 kg. The service can be provided under routine clinical conditions.

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