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Obesity: a window of opportunity to intervene? Characteristics and management of morbidly obese adult inpatients in three trusts in southern England

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Abstract – Obesity affects 22% of men and 24% of women over the age of 16 years in the general population of the UK and is associated with multiple comorbidities. Little is known about the magnitude of the obesity problem among hospitalised adults and, although significant focus has been given to the identification and treatment of the malnourished inpatient, it is not known to what extent obese inpatients are equally targeted. National guidelines for consideration of bariatric surgery exist, but it is not known to what extent potentially eligible individuals are referred. This multi-centre study demonstrates a significant burden of obesity (defined as body mass index [BMI] ≥30 kg/m^2) among those in hospital, affecting 22% of patients. This was more marked among orthopaedic patients and all-comers to intensive care units than on medical or surgical wards. Of those with BMI ≥35 kg/m^2, only 21% had been reviewed by dietetics and only 10% of patients who were potentially eligible for bariatric surgery had been referred to bariatric services. This study shows that there is an opportunity to recognise obesity and intervene in its management during hospital admission.

Keywords: Prevalence, obesity, bariatric surgery, bariatric services, dietetics

Introduction

The number of people in the UK with obesity is rising. Figures from 2009 estimated the prevalence of obesity (defined as body mass index [BMI] ≥30 kg/m^2) in England to be 22% of men and 24% of women over the age of 16 years,[1] with similar figures from Scotland.[2] There may be a genetic component to this trend but it is widely accepted that environmental changes are the predominant causal factors. This was reflected in the Foresight report on tackling obesity,[3] which outlined issues such as the increased availability of food and drink, design of the urban environment to encourage vehicular transport and food marketing strategies such as 'buy one get one free' deals as some of the significant contributors.

The increase in obesity is associated with a rise in comorbidities that are directly related to excess weight including, but not limited to, type 2 diabetes mellitus, ischaemic heart disease, dyslipidaemia, obstructive sleep apnoea (OSA) and osteoarthritis. Increased life expectancy also means that the number of patients living longer with chronic disease and obesity is rising. These patients require access to basic diagnostics and treatment, and in some cases to specialised bariatric equipment (eg beds, chairs and hoists) and transport. The provision of appropriate long-term care is not only a logistical challenge for the National Health Service (NHS) but also a financial burden: the direct NHS costs of managing obesity were £1 billion in 2002 with a projected rise to £10 billion by 2050.[4]

The British Association for Parenteral and Enteral Nutrition (BAPEN) reports annually on malnutrition and BMI in healthcare facilities and provides information on dietetic support and nutritional interventions for patients who are underweight. By contrast, there are no equivalent studies of the obese population and their access to dietetics and nutritional review while in hospital as inpatients, nor are there data on the use of specialised bariatric equipment in this group.

Table 1. Criteria, by trust, for consideration of bariatric surgery.

	Criteria
National referral guidelines	BMI ≥35 kg/m^2 with one or more associated comorbidities, or a BMI ≥40 kg/m^2
Royal Berkshire NHS Foundation Trust	BMI ≥45 kg/m^2 with a comorbidity that is likely to improve with weight loss, or a BMI ≥50 kg/m^2 with or without comorbidities
Guy's and St Thomas' Hospital NHS Foundation Trust	BMI ≥50 kg/m^2 with no comorbidities, BMI ≥45 kg/m^2 with one comorbidity or BMI ≥40 kg/m^2 with two comorbidities
Buckinghamshire Healthcare NHS Trust	BMI ≥50 kg/m^2 and type 2 diabetes mellitus or severe dysmobility interfering with activities of daily living

BMI = body mass index; NHS = National Health Service.

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Significant effort has been made to address increasing population obesity through advocacy of healthy lifestyles and the use of pharmacology. When appropriate, surgical techniques such as gastric banding and gastric bypass surgery are effective.[5] National guidelines provide advice on criteria for referral to bariatric services for consideration of bariatric surgery: BMI ≥35 kg/m^2 with one or more associated comorbidities[6] or a BMI ≥40 kg/m^2, and all appropriate non-surgical measures have been tried but have failed to achieve or maintain adequate, clinically beneficial, weight loss for at least 6 months.[7] However, it is likely that many potentially eligible patients are not referred to bariatric services either due to a lack of awareness or because there are no local bariatric services despite national priorities and initiatives.[8] Anecdotally, there also appears to be variation in service provision across the country, with only some areas providing a bariatric service that is based on the national referral guidelines and many setting alternative criteria.

This study assessed the inpatient population of three hospital trusts in southern England to ascertain the magnitude of the inpatient obesity problem, the proportion of eligible patients referred to bariatric services and the extent of involvement of dietetic services and the availability of specialised equipment, both of which are important in the management of obese inpatients.

Methods

The study was performed across three NHS trusts: The Royal Berkshire NHS Foundation Trust (RBH), consisting of the Royal Berkshire Hospital, a large district general hospital with 912 beds; Buckinghamshire Healthcare NHS Trust (WYC), consisting of Wycombe Hospital and Stoke Mandeville Hospital, both smaller district general hospitals with a total bed number of 729; and Guy's and St Thomas' Hospital NHS Foundation Trust (GSTT), consisting of Guy's Hospital and St Thomas' Hospital, both teaching hospitals with a total of 1,090 beds. These hospitals were chosen as they reflect the range of hospital sizes seen in England.

All data were collected on the 29 March 2012 from all patients aged ≥18 years who were current inpatients on a medical, surgical, orthopaedic or intensive care (ICU) (all-comers regardless of specialty) ward, including high-dependency areas. Patients on maternity, women's health and paediatric wards were excluded. We decided that BMI and weight data from dialysis patients might be inaccurate because of fluid shifts and that data from specialist units might not be applicable to most hospitals. Therefore, we specifically excluded: the specialist spinal injuries and burns units at Stoke Mandeville Hospital; the renal/dialysis, thoracic surgery and ear-nose-throat surgery patients at Guy's Hospital; and dialysis patients at the Royal Berkshire Hospital. In addition, patients in the ICU at Wycombe and Stoke Mandeville hospitals were excluded as there was no facility to weigh them, which could have introduced inaccuracy to the study. The orthopaedic ward at Stoke Mandeville Hospital was excluded due to lack of staff to collect data on the study day. Patients were also excluded if the information could not be ascertained at the time of study, for example, if the patient was not at the bedside or if patient notes were not available. The data from audited wards at Stoke Mandeville Hospital and Guy's Hospital were incorporated alongside their paired hospitals (Wycombe Hospital and St Thomas' Hospital, respectively).

BMI was recorded for all eligible patients on standardised proformas and categorised according to NICE guidelines: A (underweight) = <18.5 kg/m^2; B (healthy weight) = 18.5–24.9 kg/m^2; C (overweight) = 25–29.9 kg/m^2; D (obesity I) = 30–34.9 kg/m^2; E (obesity II) = 35–39.9 kg/m^2; F (obesity III) = ≥40 kg/m^2.

Specifically for those patients with a BMI ≥35 kg/m^2, further data were collected on obesity-related comorbidities, history of

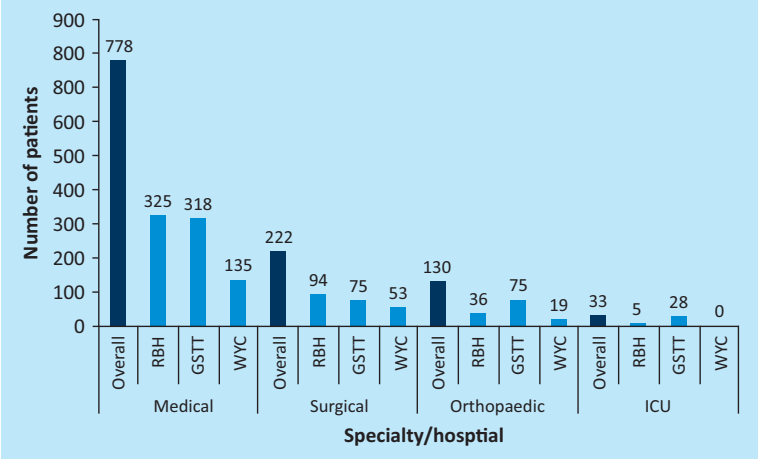

Fig 1. Distribution of patients by specialty and hospital. RBH = Royal Berkshire Hospital; GSTT = Guy's and St Thomas' Hospital; WYC = Wycombe/Stoke Mandeville Hospital; ICU = intensive care unit.

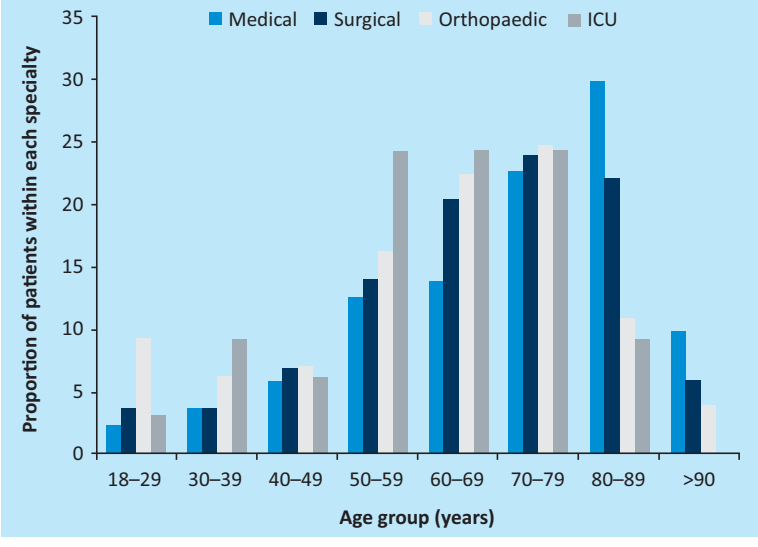

Fig 2. Distribution of patients by specialty and age group. ICU = intensive care unit.

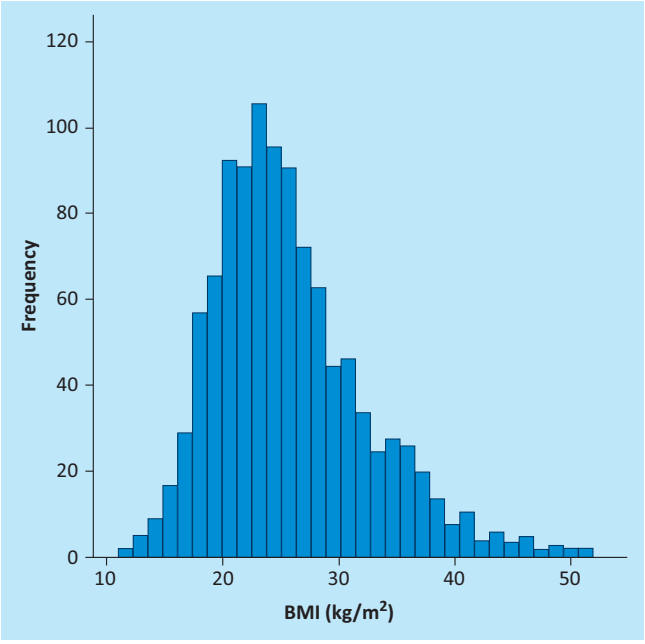

Fig 3. Histogram of BMI distribution. BMI = body mass index.

Table 2. BMI and BMI category by specialty.

BMI category	Overall	Medical	Surgical	Orthopaedic	ICU
A	103 (9%)	80 (10%)	18 (8%)	3 (2%)	2 (6%)
B	503 (43%)	360 (46%)	94 (42%)	41 (32%)	8 (24%)
C	297 (26%)	191 (25%)	53 (24%)	39 (30%)	14 (42%)
D	157 (13%)	91 (12%)	36 (16%)	24 (18%)	6 (18%)
E	66 (6%)	38 (5%)	12 (5%)	15 (12%)	1 (3%)
F	37 (3%)	18 (2%)	9 (4%)	8 (6%)	2 (6%)
Total	1,163	778	222	130	33
Mean BMI (kg/m^2)	25.6±6.3	25.1±5.98	26.3±6.91	27.8±6.61	27.3±5.94
(95% CI)		(25.0–25.6)	(25.3–27.1)	(26.6–29.0)	(25.2–29.4)
Excluded*	88	16	53	19	0

BMI = body mass index; CI = confidence interval; ICU = intensive care unit
*Some audited patients did not have a numeric BMI recorded, only a category, and therefore these are excluded from calculation of the mean.

Table 3. Number of comorbidities per patient.

Number of comorbidities per patient	Number of patients
0	6
1	19
2	14
3	26
4	17
5	10
6	9
7	2

obesity-related cancers and alcohol and smoking status. Data were also collected on the involvement of dietetics, use of bariatric equipment, awareness of local bariatric services amongst senior ward staff and whether patients were eligible for, and had been referred to, local bariatric services according to national recommendations. Local referral guidelines varied from the national criteria (Table 1).

Results

Demographics

A total of 1,163 patients were audited, which included 575 males and 588 females (RBH: 214 male, 246 female; WYC: 95 male, 112 female; GSTT: 266 male, 230 female). A further 164 patients were not audited because the bed space was unallocated or empty (119 patients), the notes were unavailable (22 patients) or for other reasons (23 patients). 67% of patients were in medical beds with smaller numbers in surgical (19%), orthopaedic (11%) and intensive care (3%) beds (Fig 1).

The mean age of the patients was 69.3 years (±17.4, median 73, range 18–101), mean weight 71.7 kg (±18.9), mean height 1.67 m (±0.1), and mean BMI 25.6 kg/m^2 (±6.3). There was a significant ($p<0.001$) difference in mean age between specialties (medical 71.4, surgical 67.7, orthopaedic 61.9, ICU 60.4) and this was independent of the hospital studied. Fig 2 illustrates the range of ages amongst the specialties.

Body mass index

The proportion of patients in each BMI category is shown in Table 2, along with mean BMI. Fig 3 illustrates the overall spread of BMI in our cohort.

Although there were significant differences in BMI between the three hospital sites, this disappeared after correction for age, gender and ward type. Therefore, the data from all centres have been analysed together. The orthopaedic and ICU patients had a higher BMI than their medical or surgical counterparts ($p<0.001$), even after controlling for age and gender. There was also an independent effect of increasing age on higher BMI ($p=0.001$), but no effect of gender ($p=0.439$).

Characteristics of those with body mass index ≥35 kg/m^2

Of the 103 patients (36 male, 67 female) with a BMI of ≥35 kg/m^2, 36% (37 patients; 10 male, 27 female) had grade III obesity (BMI ≥40 kg/m^2). The mean BMI was 39.1 kg/m^2 with a maximum of 52.5 kg/m^2. Seven additional patients who were categorised did not have a numeric BMI recorded, only a category A to F.

Obesity-related comorbidities

Among our cohort, 95 patients (91%) demonstrated at least one obesity-related comorbidity, commonly hypertension, type 2

diabetes mellitus, osteoarthritis and gastro-oesophageal reflux disease (GORD) (Fig 4).

Of particular note was the presence of multiple comorbidities in the same individual (Table 3), some with as many as seven distinct comorbidities (mean 3.02±1.75).

Cancer

Twenty of our patients (20%) had a history of an obesity-related cancer: two leukaemia, four breast, one pancreatic, six endometrial, one renal and six colorectal.

Alcohol and smoking status

62 of the patients (60%) denied consuming any alcohol; of those who did consume alcohol, the average was 4.7 units per week. For 12 patients it was not possible to ascertain the amount of alcohol consumed. Only 9 patients (9%) were active smokers.

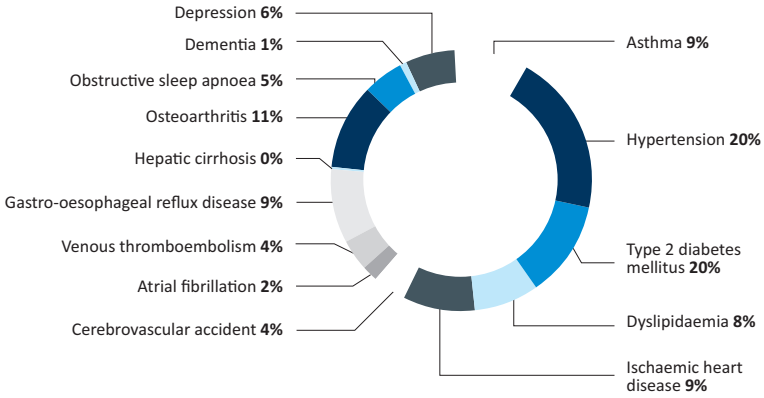

Fig 4. Comorbidities of the severely obese inpatient population.

Care of the inpatient obese population

Dietetic involvement

Only 22 of our 103 morbidly obese patients (categories E and F: BMI >35 kg/m^2), underwent formal dietetic review as inpatients, and it was uncertain as to whether this was for their obesity *per se* or for specific comorbidities. Of these, 20 had a formal diet plan created and two underwent follow-up only. 79% of the morbidly obese patients did not undergo any dietetic assessment during their inpatient stay.

Use of specialised bariatric equipment

Conventional equipment has a maximum tolerated weight, which varies by manufacturer. There is a risk of damage to staff and equipment if heavier inpatients are not managed with specialised bariatric equipment. Although none of our patients met the specific weight criteria for specialised equipment, 12 patients were using such equipment; this may have been due to adverse patient dimensions although this was not ascertained as part of this study.

Bariatric services

We ascertained that 91 patients (88%) were potentially eligible for bariatric surgery on the basis of the NICE criteria and may therefore have benefited from assessment in a specialist bariatric clinic if alternative methods for weight loss had been attempted. Of these, only 9 (10%) had actually been referred to the local services.

In 29 of the 91 cases (32%), senior nursing staff on the wards concerned were not aware that there were local bariatric services to which these patients could be referred, suggesting that knowledge of these services could be increased.

Discussion

In a cross-sectional survey, we have documented the BMI distribution of hospital inpatients in three trusts in southern England, including both smaller and larger hospitals, focussing in particular on the frequency of obesity. The data on BMI are comparable to those published in the recent BAPEN Nutrition Screening Week (NSW) report,[9] although we note a lower average BMI in our audit (25.6 kg/m^2 vs 26.7 kg/m^2 in the NSW report), which might represent small regional variations as well as differences between ward prevalence (used in this study) and admission prevalence (used by NSW). Patients with severe obesity (categories E and F) accounted for 9% of the inpatient population, which is equivalent to the number with severe undernutrition (category A). The proportion of inpatients with any category of obesity (BMI ≥30 kg/m^2) was 22%, which is approaching the proportion of patients identified as 'at risk of malnutrition' in the four BAPEN Nutrition Screening Weeks (25–34%), suggesting that both obesity and malnutrition are major problems, both requiring attention and neither at the expense of the other.

Inpatients on orthopaedic wards had a higher BMI than their medical and surgical counterparts. This has implications for resource allocation and the need for specialised equipment and might also lead to increased rates of post-operative complications. The greater number of obese patients among the ICU population is of doubtful significance given the small numbers in this group. There was a relationship between increasing BMI and increasing age up to the seventh decade, which has age-related resource implications given our increasingly ageing population.

Of those patients with severe obesity (BMI ≥35 kg/m^2), many had multiple comorbidities, commonly hypertension, type 2 diabetes mellitus and osteoarthritis. Osteoarthritis may partially account for the increased prevalence of raised BMI among orthopaedic inpatients.

Living with morbid obesity can be a physical and psychological challenge for patients, some of whom may be unable to attend their general practitioners to ask for advice on weight loss and to receive appropriate support. Some regions may not have strategies in place to help these patients, even if they were to

attend. When admitted to hospital, there is a window of opportunity to intervene and it might be possible to exploit this further. Progress has been made in identifying malnourished patients through the implementation of the Malnutrition Universal Screening Tool (MUST) score. Despite the fact that the MUST score identifies patients with high BMIs, few of those with a BMI of ≥35 kg/m^2 underwent dietetic review during their admission. Only 21% received a formal dietetic opinion although, reassuringly, most of these had a formal diet plan put in place. A dietitian or specialist nurse with an interest in inpatient bariatrics could be one way of assessing an individual's willingness and fitness to engage in weight loss, liaising with the local bariatric services and the patient's general practitioner to provide ongoing support after discharge (eg implementation of a diet plan) which might also provide benefits. The BMI component of the MUST score could easily be used to identify obese patients and to trigger dietetic review.

While guidelines exist regarding referral for consideration of bariatric surgery, the extent to which eligible patients are referred is not known and would be difficult to assess at the population level. We have measured the rates of non-referral to bariatric services among obese hospital inpatients. Of those patients who met the BMI and comorbidity criteria laid out in the NICE guidance, 90% had not been referred to the local bariatric services. This may be due not only to variation in the provision of bariatric services across the three regions but also to a lack of awareness of local services and which patients should be referred.

A number of methodological issues that relate to this study merit discussion. One challenge was how best to identify obesity among inpatients. Many different techniques are used but perhaps the most convenient and straightforward is BMI. This variable is highly correlated with adiposity in adults, but it is limited in that it does not assess the distribution of fat or differentiate between fat and muscle,[7] which means it may overestimate the true adiposity of muscular people. Other techniques, including waist circumference, may be more discerning in people with a BMI of <35 kg/m^2. Waist circumference is particularly useful in ascertaining the proportion of truncal fat, which has been linked to increased morbidity. As waist circumference and BMI are different anthropometric measurements, with different clinical implications, a case could be made for measuring both variables as the basis for referral to bariatric services and when monitoring the effects of surgical intervention.

We recognise that not all of the wards in two of our hospitals were audited. There are, however, sufficient data to indicate the type of problems that exist in identifying and managing patients with gross obesity. Regarding referral to bariatric services, we did not identify those patients who were too elderly, too medically unfit, or unwilling to undergo weight loss interventions in the form of diet and/or exercise, pharmacology or surgery. Nevertheless, our data suggest that a significant number of eligible patients in the population as a whole are not referred for consideration of bariatric surgery.

In summary, this study demonstrates a significant burden of obesity in hospital inpatients in three trusts in southern England. The magnitude of this problem is similar to that of malnutrition in inpatients. While the malnourished are identified at admission and receive targeted intervention during their inpatient stay, the same cannot be said for the obese population. The MUST score could easily be used to identify obese patients at admission and trigger review. There is potentially a large discrepancy between those patients eligible for weight loss surgery and those patients who are actually referred for consideration of this surgery. Provision of inpatient bariatric services to complement outpatient services might merit consideration. A particular challenge that remains is how to identify these patients at a younger age, so that effective intervention can be offered before the onset of comorbidities, hospital admissions and the requirement for multiple medications. The gap between clinical and public heath interventions is large and in need of strategic coordination.

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