

**Body Mass Index at a Medium Secure Unit:  
A Four-Year Service Evaluation**

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## **Body Mass Index at a Medium Secure Unit: A Four-Year Service Evaluation**

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This study investigated changes in body mass index (BMI) in male patients at a medium secure unit (MSU) and the subsequent effects of several healthy initiatives over a period of four years. Data was collected from 2005 to 2009 and BMI was calculated on admission and subsequently at least once a year.

### **Results**

The average BMI increased markedly over the years. A significant number of patients shifted from being overweight to clinically obese. Weight gain occurred mostly in the first year of admission and in most patients efforts to ensure a healthier lifestyle were unsuccessful.

### **Clinical Implications**

The physical health of patients in secure units needs to be prioritised and healthy lifestyle choices maximised, particularly in the first year following admission. Obesity management requires a person-centered approach, but a pragmatic shift in attitudes, of both patients and staff, towards calorie intake is also required.

**Key words:** Schizophrenia, Weight gain, Secure units, Obesity, Antipsychotics, Body Mass Index.

### **Introduction**

It is well established that excess body fat significantly increases morbidity. Body mass index (BMI) is an easy, cheap and non-invasive means of assessing excess body fat (National Obesity Observatory 2009). Bjorntorp (1993) has termed the current obesity epidemic as 'civilization syndrome', implying that the positive energy balance (i.e. more calorie intake and less exercise) is dependent on the modern urbanised environment of physical inactivity, stress, smoking and alcohol consumption.

The Health Survey for England (2004) showed that only 29 per cent of the adult male population had a BMI in the desirable range of 20 to 25. 42 per cent on the other hand were overweight (BMI= 25 to 30) and 23 per cent were obese (BMI  $\geq$ 30). In addition, almost 1 per cent had a BMI of 40 and above. The survey also revealed that between 1993 to 2004, the number of individuals classed as obese had almost doubled.

Obesity is associated with significant morbidity, including hypertension, ischaemic heart disease, type 2 diabetes, dyslipidemia and certain malignancies (Newcomer 2005).

A diagnosis of mental illness has also been associated with weight gain. This is particularly marked in patients suffering from schizophrenia (Goethelf et al 2000).

Antipsychotics, particularly atypicals, such as clozapine, risperidone and olanzapine, used in the treatment of psychotic illnesses such as schizophrenia, have been associated with weight gain and the development of metabolic syndrome (Newcomer 2000; Leadbetter et al 1992; Tadger et al 2008). This is a condition characterised by weight gain (central obesity), hypertension, dyslipidemia and insulin resistance.

The National Institute of Clinical Excellence guidelines (NICE Obesity 2006) recommend multi-component interventions for weight management. This includes increasing physical activity, improving eating behaviour and quality of diet and reducing energy intake (calorie restriction).

Medium secure units (MSU) provide care for relatively long-stay patients in a highly regulated environment. Patients in MSUs are relatively inactive and have access to high calorie food.

This service evaluation aims to establish trends in weight gain among inpatients at an MSU and the effects of several public health interventions over a four year period.

## **Method**

The hospital is a 60 bed medium secure unit that admits males between 18 and 65 years with a primary diagnosis of mental illness (predominantly schizophrenia).

On admission all patients have a thorough physical assessment that includes height and weight measurements, general and systemic examinations, baseline blood tests and review of any co-morbidities. In the current study we chose to focus on BMI and therefore elected not to use data from the other parameters.

In this study, we set out to evaluate the management of physical health of adult inpatients on our unit. We investigated one specific aspect of this service provision, i.e. whether all inpatients had their weight and BMI measured on admission and at least once yearly subsequently. All consenting inpatients were weighed. However, this did not always cover the whole inpatient population as some patients either refused to participate or were too unwell to be included in the study. One of the authors (SB) kept a record of all patients having had a physical health review and measured the weight and calculated their BMIs at least once every year. The staff on the ward took consent from patients before they were weighed and documented it in the notes.

Following initial weighing on admission, patients were weighed at least yearly until the end of the study in April 2009. All data collected were then anonymised and entered into a secure database. Statistical analyses, including descriptive tests, were performed. The findings were presented to peers at the local clinical governance meetings. The clinical implications of the study were extensively discussed and recommendations for improving the service were put forward. These proposals were implemented in subsequent years and their impacts evaluated.

## **Results**

### **Population, Duration of Stay and Medication**

The unit occupancy and inpatient population varied at the different sampling points. In August 2005 we were able to record data from 52 patients, 40 in February 2006, 44 in November 2006, 52 in July 2007, 51 in February 2008 and 46 in April 2009. The variation is also partly secondary to refusal to consent and inability to participate due to severity of illness at the time. The unit admits male patients only. 94 per cent were white British, 4 per cent Afro-Caribbean and 2 per cent Asian in origin

The overall mean duration of admission was 28.7 months. 31 per cent of patients had been inpatients for more than 26 months and a further 17 per cent had been in hospital for more than 48 months. This represented the general trend at the unit and was not specific to the

study period. The samples at each point were somewhat different as some new patients were admitted whilst others were discharged through the four year course of the study. There were only nine inpatients who had been there for more than four years and hence were represented in each study cycle. Therefore, the patient sample was somewhat different at the end when compared to the beginning.

The vast majority of patients were prescribed regular atypical antipsychotic medication. 37 per cent were on clozapine tablets, 14 per cent on risperidone depot, 12 per cent were on typical antipsychotic depot (zuclopenthixol, flupentixol, fluphenazine, haloperidol), 11% on risperidone tablets, 10 per cent on olanzapine tablets, 9 per cent on quetiapine tablets, 7 per cent on aripiprazole tablets, 5 per cent on amisulpride tablets and the remaining 3 per cent were on either haloperidol or sulpride tablets. 4 per cent of patients were not prescribed any antipsychotics. Up to 11 per cent of patients were on two or more antipsychotics simultaneously.

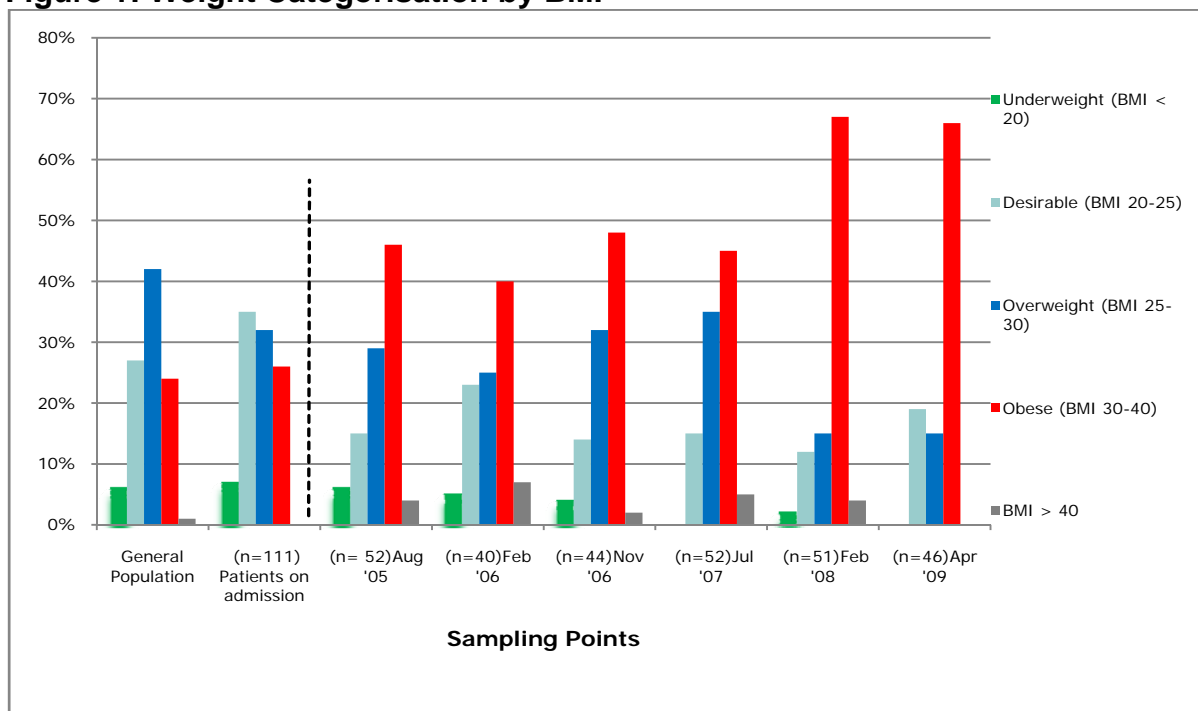
### Change in Body Mass Index (BMI)

BMI of patients on admission are compared to the general male population in Figure 1. The 'BMI on admission' in this graph represents the average BMI of all the newly admitted patients (n =111) over the course of the study.

There is a wide range of patient weight change over the duration of the study, varying from - 8.5kg (weight loss) to + 65kg (weight gain). However the mean BMI at each sampling point exceeds the mean BMI of the general population such that a significant percentage of patients at each sampling point are clinically obese (BMI ≥30).

Moreover, there is a net increase in the number of overweight and obese patients at each sampling point and a significant number of patients shifted from the overweight to the obese category (Figure 1). 51 per cent of the all the inpatients (n =111) weighed over the course of four years gained an average of 14.1 kilograms (range = 4kgs to 38kgs) in the first year of their admission to the unit.

**Figure 1: Weight Categorisation by BMI**



It appears that the most rapid increase in weight occurs in the few months following admission after which there is little variation. Subset analysis of a small sample of five patients, who were admitted around the same time (August - October 2006) and followed for approximately three years, shows that the steepest rise in weight gain (mean increase in BMI = 10.2) occurred in the first 12 months following admission. The weight gain of these patients has yet to plateau although all of them were already clinically obese in the most recent analysis.

Admission data for a group of patients (2009 cohort, n=46, mean duration of stay 23 months) was retrospectively reviewed for changes in BMI (Table 1). The data confirms weight gain over duration of hospital stay.

**Table 1: BMI changes in the April 2009 cohort (n=46)**

<b>BMI</b>	<b>Mean (s.d)</b>	<b>95% CI</b>
Admission	27.6 (5.31)	26 – 29.2
April 2009	30.6 (5.05)	29.1 - 32.1
Net Change	+3.04 (3.88)	1.89- 4.19

BMI - Body mass index  
s.d. - Standard Deviation  
95% CI - (95% Confidence Interval)  
N - number of patients

### **Non-Pharmacological Management of Weight Gain**

Between 2005 and 2008, as the study progressed, interim results were discussed at clinical governance meetings at least yearly. In response to our findings, the unit promoted hospital-wide public health and individual care plans between 2006 and 2009, aimed at addressing the high rates of obesity.

A plated meals service to reduce variation in portion size was introduced. There was also a promotion of healthier options on the hospital's catering menu and in vending machines. Inpatients therefore had access to healthier foods with less energy contents (such as fruits and vegetables). The vending machine items were also replaced from high calorie food to those with fewer calories and less energy (such as whole-meal grain bars, diet soft drinks etc.).

The ordering of high calorie take-away foods by patients was limited to once a week (prior to this study patients could order take-away foods as often as they wanted to). Limits were also imposed on foods introduced into the hospital via carers and patients going on shopping trips.

Finally, healthy living groups were set up to promote healthy dieting and exercise. Patients were encouraged to attend these groups, however few did.

Despite these initiatives, there was a steady increase in patients' weight in each study sample. The most substantial rise in mean BMI occurred between July 2007 and February 2008. This may have been related to the introduction of a hospital-wide smoke-free policy in April 2007.

## Figure 2: Mean BMI Following Healthy Living Initiatives

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### Discussion

Admission to a medium secure unit can possibly result in weight gain for patients. The causes of weight gain in a relatively closed institution are probably multi-factorial in origin, reflecting restricted physical activity, the ready availability and consumption of high calorie food. Other causes not incorporated in the study may be illness-related (e.g. negative symptoms of schizophrenia), medication-related (e.g. sedation and weight gain due to antipsychotics), age-related (older people are more likely to gain weight) and/or ethnicity-related. These associations could have been explored further and are being considered for future projects at the unit.

Smoking cessation is known to be associated with weight gain (Matsushita et al 2010; Munafo et al 2009) and in the course of our study a smoke-free policy was introduced in 2007 which in all probability contributed significantly to the subsequent peak in weight gain observed.

Weight gain in individuals with mental disorders, can deleteriously affect medication adherence and rate of relapse (Weiden et al 2004). These consequences of weight gain can be prevented through dietary modification and physical activity, which are basic and essential components of a healthy lifestyle programme.

We found that limiting calorie intake was difficult to achieve at the unit. Initiatives aimed at curbing weight gain were resisted by many staff and patients. They were criticized as being punitive, restrictive and denying choice to a patient population with restricted liberty. Attempts to reduce calorie intake across the unit as a whole or through targeted care planning thus proved unsuccessful.

Implementing lifestyle changes are always tough to accomplish. It is therefore, not only important to assess the willingness, readiness and motivation of the patient to change but we also need to encourage healthy lifestyle for staff working within such units to help and create a healthier ethos. Education for patients and staff alike about the hazards of obesity may be the first and most important step in this process.

For individuals who are overweight or obese, reduction in weight is more likely to be successfully achieved by setting realistic targets for weight loss (0.5-1 kg/week), providing pragmatic options for physical activity and constantly encouraging healthy eating in general i.e. decrease calorie intake (NICE Obesity 2006). There is also a role for motivational interviewing which helps patients have a healthy dietary intake and improve involvement in physical exercise (Marley et al 2011). It works by highlighting and then helping them to resolve their ambivalence towards a healthy lifestyle.

Weight management and fitness programmes can help achieve reduction in BMI and waist size in a high secure environment (Cormac et al 2008). With regards to antipsychotic induced weight gain, drugs such as clozapine and olanzapine can be introduced gradually in order to minimise dose-dependent metabolic side effects (Simon et al 2009). Alternatively, agents such as Metformin may also have a role to play in the management of antipsychotic induced weight gain (Wu et al 2008). More research is needed to help us understand the role of established anti-obesity pharmacological interventions such as Orlistat and Sibutramine in our patient group (NICE Obesity 2006).

The study population had a mean BMI comparable to the general population at the time of admission and gained weight despite regular monitoring and healthy lifestyles interventions. This demonstrates that sometimes *en-masse* policies are not able to cater for individual needs. Any future policy making should incorporate person-centred care, taking into account individual needs and preferences.

Secure units are 'obesogenic' environments and this has important long-term implications for the physical health and emotional well-being of patients. Individuals, who become overweight in secure units through lack of physical activities and healthy food options or as a result of treatment with antipsychotics, could potentially hold the hospital liable for failing to protect their physical health.

The legal and ethical issues surrounding the desirability of additional restrictions on calorie intake for patients in secure units are complex. An increasingly risk averse culture has led to more paternalistic restrictions in certain areas, such as smoke-free or child visiting policies, whereas more liberal attitudes to food consumption prevail. Hence, we need to first build consensus amongst mental health policy makers on this issue and develop clear national guidelines targeting obesity in general and in particular for patients who have gained excessive weight secondary to their clinical management.

Should long-stay institutions adopt a more assertive public-health approach to inpatient obesity? This would entail careful design of menus, ensuring nutritional balance whilst setting limits on calorie intake, combined with the imposition of strict curbs on foods brought into the unit. At the same time these institutions would be obliged to provide a range of accessible physical activities and health promotion as part of general rehabilitation.

Some patients may not wish to consume healthy foods or engage in a healthier lifestyle and if they have capacity with regards to these decisions, it could be argued that we have to respect them, however unwise they may be. However, we also have a duty to look after individuals under our care holistically, ensuring that both their physical and mental health needs are met.

A change in culture and attitude of both staff and patients towards excessive weight gain may hold the key to winning the 'war on obesity' in secure units.

### **Clinical Implications**

Primary prevention of obesity is probably more achievable than a cure and has the ability to be more effective, acceptable, cost-efficient and beneficial (Alvarez-Jiménez et al 2008). Obesity prevention should include educating staff and patients alike about the risks of weight gain, more robust monitoring and classification of obesity and mandatory provision of multi-component interventions for lifestyle change, including access to psychological therapies like motivational enhancement therapy. The critical period for health promotion interventions appears to be the first few months of hospital admission and it is suggested that this should be the target of future health promotion interventions.

### **Strengths and Limitations of the Study**

The prescribing trends and changes to medication were not part of the study objectives; this could have had an impact on our understanding of weight gain at the unit and potentially help in highlighting medications which were more responsible than others in causing weight gain.

Our study did not use subdivisions of BMI as recommended by NICE guidelines (December 2006) which states that people classified as obese should be categorized as obesity I (BMI 30- 34.9), obesity II (BMI 35- 39.9) and obesity III (BMI 40 or more). The risks should then be assessed by comparing their BMI classification against waist circumference. It is also known that BMI may be less accurate in highly muscular people, Asian adults and older people. Other parameters such as waist/hip ratio, measuring skin fold thickness (over the biceps, triceps or below the shoulder etc) could have been a better indicator of excess body fat.

The suggestion of rapid weight gain occurring in the first 12 months is based on a very small subsample (five patients) and as previously discussed, the observation may have been due to multiple confounding factors. We acknowledge that the most significant rise in weight coincided with the introduction of a hospital wide no smoking policy. Furthermore, comparisons drawn on variations in BMI at different sampling times with different study samples may possibly not be generalisable. Hence, future service evaluation efforts at the unit would be focused around individual analysis of the admission ward and long stay ward (acutely disturbed admission ward patients v very settled patients in rehabilitation). We also plan to incorporate other parameters of physical health (e.g. baseline bloods) in future studies.

To our knowledge no other study in the UK on weight gain in secure units has incorporated data extending over a period of four years.

This study has highlighted that weight gain is a major problem in our patient group. It has assisted us in reflecting on this matter and initiated a process of change at the unit towards a healthier future.



## References

- Alvarez-Jiménez, M; Hetrick, S.E; González-Blanch, C; Gleeson, J. F; McGorry, P.D. 2008. Non-pharmacological management of antipsychotic-induced weight gain: systematic review and meta-analysis of randomised controlled trials. *British Journal of Psychiatry* 193 (2): 101-7.
- Bjorntorp, P. 1993. Visceral obesity: a "civilisation syndrome." *Obesity Research* May; 1 (3): 203-5.
- Cormac, I; Halford, S; Hart, L; Creasey, S; Ferriter, M. 2008. Evaluation of an integrated weight management and fitness programme in a high-security psychiatric setting. *Psychiatry Bulletin* 32: 95 - 98.
- Gothelf, D, Brand-Gothelf, A; Apter, A; Philip, M; Weizman, A; Fainaru, M. 2000. Weight gain due to antipsychotic medication. *Harefuah* 138: 572–577.
- Health Survey of England (Table 6), 2004: <http://www.ic.nhs.uk/statistics-and-data-collections/health-and-lifestyles-related-surveys/health-survey-for-england/health-survey-for-england-2004-updating-of-trend-tables-to-include-2004-data> Date accessed: 20/ 11 / 2010.
- Leadbetter, R; Shutty, M; Pavalonis, D; Vieweg, V; Higgins, P; Downs, M. 1992. Clozapine-induced weight gain: prevalence and clinical relevance. *American Journal of Psychiatry* 149: 68–72.
- Marley, S. C; Carbonneau, K; Lockner, D; Kibbe, D; Trowbridge, F. 2011. Motivational Interviewing Skills are Positively Associated with Nutritionist Self-efficacy. *Journal of Nutrition Education and Behavior* 43 (1): 28-34.
- Matsushita, Y; Nakagawa, T; Yamamoto, S; Takahashi, Y; Noda, M; Mizoue, T. 2010. Associations of Smoking Cessation with Visceral Fat Area and Prevalence of Metabolic Syndrome in Men: The Hitachi Health Study. *Obesity* October doi: 10. 1038 /oby. 2010. 237.
- Munafò, MR; Tilling, K; Ben-Shlomo, Y. 2009. Smoking status and body mass index: a longitudinal study. *Nicotine and Tobacco Research* 11 (6), 765-71.
- National Institute for Clinical Excellence. December 2006. Obesity: Guidance on the prevention, identification, assessment and management of overweight and obesity in adults and children. NHS, National Collaborating Centre for Primary Care and the Centre for Public Health Excellence at NICE.
- National Obesity Observatory. June 2009. Body mass index as a measure of obesity. NHS, Association of public health observatories.
- Newcomer, JW. 2005. Second- generation (atypical) antipsychotics and metabolic effects: a comprehensive literature review. *CNS Drugs* 19 (suppl 1): 1-93.
- Simon, V; Winkel, R.V; Hert, M.D. July 2009. Are weight gain and metabolic side effects of atypical antipsychotics dose dependent? A literature review. *The Journal of Clinical Psychiatry* 70 (7): 1041-50.
- Tadger, S; Melamed, Y. 2008. Weight gain due to long term antipsychotic treatment of persistent mental disorders. *Psychiatria Danubina* Vol. 20, No 1, 37–41.

Weiden, P.J; Mackell, J.A; McDonnell, D.D. 2004. Obesity as a risk factor for antipsychotic noncompliance. *Schizophrenia Research* 66: 51–7.

Wu, R.R; Zhao, J.P; Jin, H; Shao, P; Fang, M.S; Guo, X.F; He, Y.Q; Liu, Y.J; Chen, J.D; Li, L.H. 2008. Lifestyle intervention and metformin for treatment of antipsychotic-induced weight gain: a randomized controlled trial. *The Journal of American Medical Association* 9; 299 (2): 185-93.