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The Accuracy of Self-Perception of Obesity in a Rural Australian Population: A Cross-Sectional Study

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Abstract

Introduction: Obesity is a major public health concern. Accurate perception of body weight may be critical to the successful adoption of weight loss behavior. The aim of this study was to determine the accuracy of self-perception of BMI class. **Methods:** Patients admitted to the acute medical service in one regional hospital completed a questionnaire and classified their weight as: "underweight," "normal," "overweight," or "obese." Reponses were compared to clinically measured BMIs, based on the WHO Classification. Patients were also questioned about health-related behavior. Data were analyzed via Pearson's Chi-squared test. **Results:** Almost 70% of the participating patient population (n = 90) incorrectly perceived their weight category, with 62% underestimating their weight. Only 34% of patients who were overweight and 14% of patients with obesity correctly identified their weight status. Two-thirds of patients who were overweight and one-fifth of patients with obesity considered themselves to be "normal" or "underweight." Patients with obesity were 6.5-fold more likely to misperceive their weight status. Amongst patients with overweight/obesity, those who misperceived their weight were significantly less likely to have plans to lose weight. Almost 60% had not made any recent health behavior changes. This is one of the first regional Australian studies demonstrating that hospitalized patients significantly misperceive their weight. **Conclusion:** Patients with overweight/obesity had significantly higher rates of weight misperception and the majority had no intention to lose weight or to undertake any health behavior modification. Given the association between weight perception and weight reduction behavior, it introduces barriers to addressing weight loss and reducing the increasing prevalence of obesity in rural Australia. It highlights that doctors have an important role in addressing weight misperception.

Keywords

behavior, BMI, hospitalized patients, obesity, overweight, self-perception, weight loss

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Introduction

Obesity is a major public health concern. Despite well-established obesity management guidelines and health campaigns to promote weight loss, the prevalence of obesity continues to increase worldwide.[1-3] This might be due to a number of individual cultural and societal factors[4] such as socio-economic status, ethnicity, education, presence of an obesogenic environment, willingness to make health behavior changes, and self-perception of weight.[5-7]

Studies have shown that accurate weight perception is associated with lifestyle/health behavior changes to reduce weight, independent of the clinical BMI class.[8-11] If an

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individual is unaware that they are overweight or obese then they will not perceive the associated health risks and are unlikely to engage in weight loss practices. Many studies have shown that the general population does not accurately perceive their weight status, especially in individuals who are overweight or obese.[10,12-16] These studies have reported that, in some instances, more than half of the overweight/obese individuals underestimate their weight and, consequently, may not understand the associated health complications. Other studies have also acknowledged that despite the existence of various public health programs, weight perception has not improved.[9,12] Hence, it is possible that the failure to accurately perceive weight status is contributing to the obesity epidemic. These findings have implications for weight management strategies as accurate weight perception is associated with subsequent health behavior modifications. Therefore, self-perception of weight could be considered a potential target for health interventions. The modification of weight perception in adults with overweight/obesity, to bring it in line with clinical weight status, could ultimately promote weight reduction practices.

While several studies have demonstrated that weight misperception is an issue, there is sparse literature in Australian adults[14,17,18] and very little information regarding the perception of weight status by rural Australians or their understanding of the health implications of obesity.[14] Obesity is more prevalent in rural areas[19] and more difficult to treat due to the inherent challenges with rural medicine.[20] Therefore, these population groups may be at risk of developing chronic health issues and obesity-related comorbidities. Although a few studies have explored the perception of weight in hospitalized patients, none were in rural ares.[13,21] The patient group represents a high-risk population that is unwell and a misperception of their weight status may lead them to develop significant obesity related-illnesses and early mortality.[13] Additionally, weight misperception might be a contributor to future hospital admissions.[21]

International data suggest that patients, especially those with multiple comorbidities, have a poor perception of their weight status.[13,21] Anecdotally, this has also been observed by several specialist physicians at Wagga Wagga Base Hospital. This is the only rural referral hospital within the local health district (LHD), serving a population of almost 250 000 people from rural and remote communities. Given the high prevalence of obesity in the LHD, a misperception of body weight may lead to the poor implementation of adequate lifestyle modifications and the higher levels of obesity-related morbidities seen in the patients admitted to Wagga Wagga Base Hospital. This study aimed to investigate the accuracy of weight perception in patients admitted to the acute medical service of a regional referral hospital in Australia.

Methods

Adult patients admitted to the medical ward and coronary care unit at one regional public hospital in New South Wales (NSW) were recruited within a 2-month study period. Nontreating medical or nursing staff distributed questionnaires to all admitted patients. Patients were excluded if their height/weight could not be measured due to physical disability, they were unable to consent to the questionnaire (language barrier or acute mental illness) or pregnant.

Sociodemographic questions related to education, employment, marital status, income, and ancestry. Patients were asked to classify themselves as underweight, normal, overweight or obese, with no listed (clinical) definitions. Their response was compared to the patients' clinically measured body mass index (BMI in kg/m^2). BMI classification cut-offs were adopted from the WHO International Classification: underweight ($<$18.50); normal (18.50-24.99); overweight ($\geq$25.00); obese ($\geq$30.00).[22] Patients were also questioned about health-related behavior such as self-perception of health, plans to change weight, food intake, smoking status, etc. Medical records of the patients were accessed to retrieve their anthropometric measurements and gather information about their cardiovascular risk factors.

Statistical analyses were performed using SPSS® (version 23.0) with statistical significance set at $P < .05$. Descriptive statistics were used to describe the patient population. Pearson chi-square analysis, Fisher's exact test and Student's *t*-test were used, as appropriate for analysis. Cohen's kappa was used to measure agreement between clinically measured BMI and self-perceived BMI classification. A kappa of 0.21 to 0.40 indicates "fair" agreement, and less than 0.20 is "slight" agreement.[23] Chi-square analyses were used to identify any associations between sociodemographic and health-related behavioral characteristics, and cardiovascular risk factors with weight perception. Binary logistic regression was used to determine odds ratios and 95% confidence intervals (95%CI). Ethics approval was granted by The University of Notre Dame Australia and Greater Western Human Research Ethics Committees. All enrolled participants gave written informed consent.

Results

Study Population

Over the 2-month study period, there were 595 admissions (166 in the coronary care unit; 429 in the medical ward). Although 100 patients responded to the questionnaire, 10 were excluded because of missing or incomplete data. Overall, 90 patients (55 men, 35 women) participated in the study with a mean age of 68 ($\pm$16) years. Only 12% of the participants were aged $<$50 years. (Table 1). The mean Index of Relative Socio-economic Advantage and Disadvantage (IRSAD) was 4 ($\pm$2) indicating that people lived in a

Table 1. Patient Characteristics.

Characteristic	Value
Female n (%)	25 (38.9)
Age (years) n (%)	
<50	11 (12.2)
50-64	20 (22.2)
65-79	38 (42.2)
80+	21 (23.3)
Rurality of residence (ASCGRA)	
Inner regional (RA2)	69 (76.7)
Outer regional (RA3)	20 (22.2)
Remote (RA4)	1 (1.1)
Education (highest level achieved)	
Primary school	26 (28.9)
High school	44 (48.9)
TAFE	10 (11.1)
university	10 (11.1)
Employment	
Full time	12 (13.3)
Part time/casual	8 (8.9)
Unemployed	11 (12.2)
Retired	59 (65.6)
Income	
<$50 000	64 (71.1)
$50 000-$100 000	21 (23.3)
$100 000-$150 000	4 (4.4)
>$150 000	1 (1.1)
Marital status	
Single	9 (10.0)
Married	52 (57.8)
Divorced	14 (15.6)
Widowed	15 (16.7)
Australian ancestry	79 (87.9)

relative area of moderate socio-economic disadvantage. Only 20 patients (22%) had completed tertiary education; 22% were currently employed; and 71% had a combined annual household income of less than $50 000. Around 12% reported having non-Australian ancestry.

Almost 60% of patients were current (14.4%) or former smokers (43.3%). Overall, 17% of patients drank more than the recommended daily alcohol intake (2 standard drinks) with significantly more men surpassing the upper limit (26% vs 3% in women, $P = .005$). Half (51.1%) of the patients did not undertake recommended weekly targets of 150 minutes of moderate intensity physical activity, and there was no difference between BMI classes in reported levels of physical activity. Hypertension was diagnosed in 55.6% of patients and 26.7% of patients had been diagnosed with diabetes.

Mean BMI was 29.4 kg/m^2 ($\pm$7.1). Three-quarters of the patients enrolled in this study were either in the overweight (36%) or obese (39%) BMI class, 23% were classed as normal and 2% were underweight. More male patients were overweight/obese than female patients ($P = .044$). Two-thirds of patients with clinical overweight/obesity indicated that they had not been told of their overweight/obese status by their doctor and 61% rated their health to be poor or average. Of the patients with overweight/obesity, 45% had no plans to lose weight and more than 50% reported no recent weight loss and had not tried any health behavior modifications (diet, exercise, or both) recently. Almost 60% of patients with obesity had a diagnosis of hypertension and 31% suffered from diabetes.

Accuracy of Perception

The majority of participants (68.9%) did not accurately perceive their body weight, with 56/90 (62.2%) patients underestimating their BMI category. The proportion of patients who accurately identified their BMI category was different across BMI categories ($P < .001$), with more patients misperceiving their weight category with increasing BMI category (Figure 1). Patients with clinical obesity were 6.5 (95%CI 1.9-22.9, $P = .003$) times more likely to underestimate their BMI category. Kappa statistics for the inter-rater agreement between clinically measured BMI and self-perceived weight category was only "slight" ($\kappa = 0.12$, $P < .05$) indicating little concordance between perceived weight class and measured BMI.

Almost 60% of patients with a normal BMI accurately identified their BMI class; only 19% overestimated their weight status and 21% underestimated their weight status. Both patients who were clinically underweight perceived that they had a normal BMI. No patient with overweight or obesity overestimated their BMI category. One third of patients who were overweight correctly identified themselves as overweight and only 14% of patients with obesity accurately identified themselves as being obese. Around 6% of patients with overweight considered themselves to be underweight and 20% of patients with obesity considered themselves to be underweight or in the normal BMI class. Overall, there was no difference in the accuracy between men and women. However, when patients with obesity were considered separately, women were better at correctly assigning themselves to the obese category, with one-third of women correctly identifying as obese versus the 4.3% of men ($P = .038$).

To account for expected underestimation in patients with obesity who were just above the threshold BMI for overweight classification, a subgroup analysis was conducted on only those patients clinically categorized as having class II (BMI $\geq$ 35-39.9 kg/m^2) or class III obesity (BMI $\geq$ 40 kg/m^2). Combined, less than 30% identified as obese. The majority identified as being overweight, however, one patient with a BMI of 37.8 kg/m^2 identified as

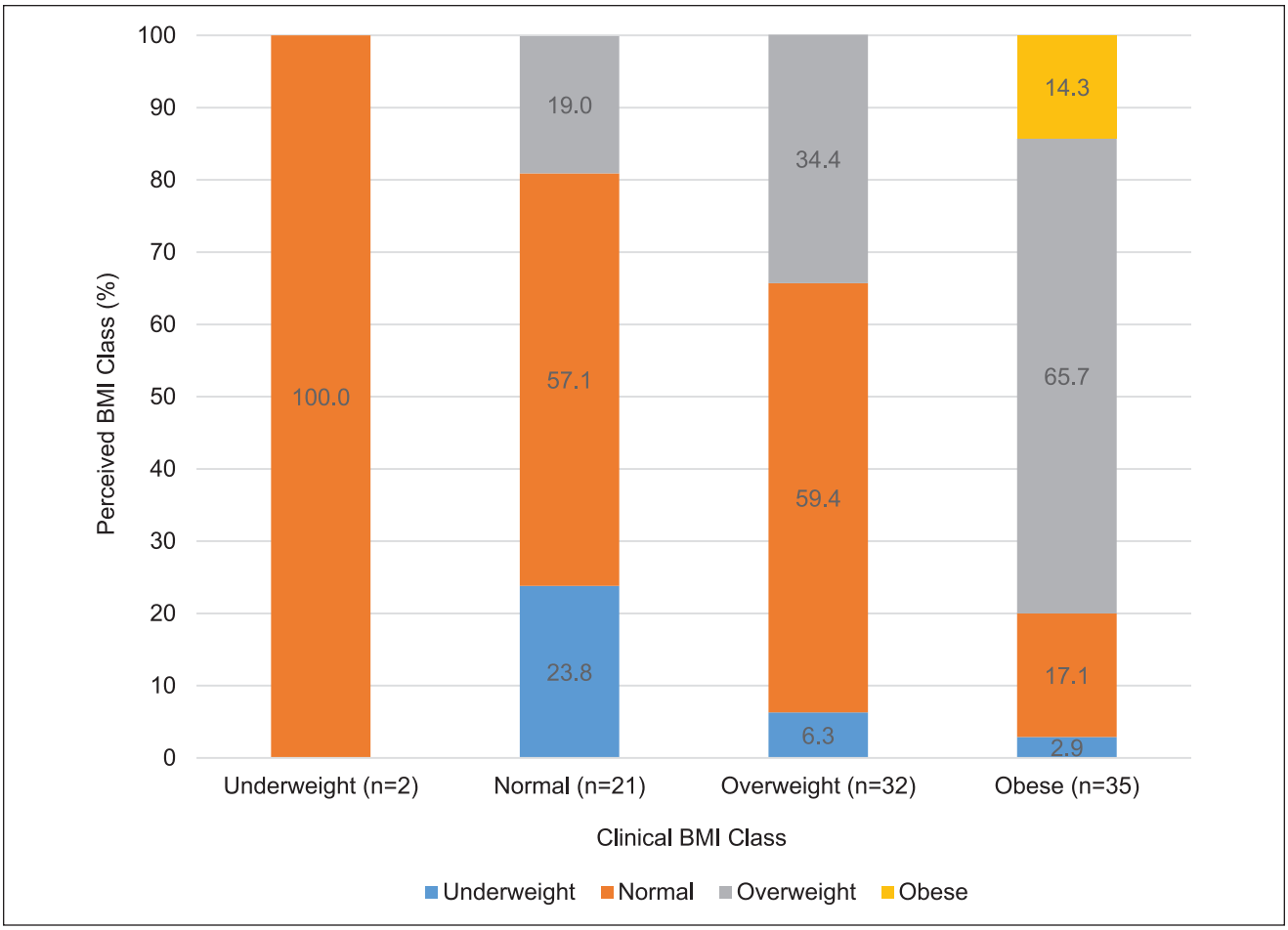

Figure 1. Accuracy of weight perception for different body mass index (BMI) classes.

being underweight and another patient with a BMI of 39.8 kg/m^2 identified as being of normal weight. Clinical obesity was significantly associated with an inaccurate perception of weight.

There was no difference between correct and incorrect perceivers in the proportion who had been told by their doctor of their weight status with almost three-quarters of patients indicating that they had not been told. Around one-third of patients with overweight/obesity had been informed by their doctor of their weight status. Almost 20% of obese patients who had been told by their doctor of their weight status identified as being obese, with only 6% of men accurately identifying themselves as obese, versus 60% of women (FET, $P = .028$). Nine in ten (90.1%) patients who incorrectly perceived their weight acknowledged that obesity was an issue in Australia.

In the analysis of factors associated with perception in patients who were overweight or obese only, incorrect perceivers were less likely to have plans to lose weight, with less than half (47.1%) reporting having intentions to lose weight versus 81.3% of correct perceivers ($P = .016$). Correct perceivers were 4.9 times more likely to have plans to lose weight (95%CI 1.2-19.2, $P = .023$). While 87.0% of patients with overweight/obesity who been informed by a doctor of their overweight/obese status had plans lose weight, only 38.6% of patients who had not been informed wanted to do so ($P < .001$). The odds of intending to lose weight were 10.6 times higher if the patients had been informed of their overweight/obese status by their doctor (95%CI 2.7-41.1, $P < .001$). Looking at only those patients with overweight/obesity who had underestimated their weight status, 85.7% of those who had been informed of their status had intentions to lose weight, versus only 25.8% of patients who had not been informed ($P < .001$).

Self-reported health-related behavioral characteristics such as self-rated health, fast food intake, level of exercise or sociodemographic variables such is schooling, employment, income, IRSAD, ancestry, age and gender were not associated with weight perception for both the whole patient population and the group of patients with overweight or obesity only.

Discussion

The rates of overweight (36%) and obesity (39%) in the study population were higher than the figures for the region of 28.4% overweight and 35.1% obesity.[24] This may reflect that the study population was acute medical hospitalized adults who may be more likely to represent the high-risk and unwell population. These patients might have obesity as a concomitant illness with their presenting complaint or might have presented to the hospital due to existing obesity-related comorbidities. Similarly, the rates of diagnosed hypertension (56%) and diabetes (27%) were also higher than the figures of 8% and 9%, respectively, within the LHD, which may also be due to the study being based in a hospital setting where patients present with multiple co-morbidities.[24]

There was a high rate of misperception of weight status amongst patients admitted to the acute medical service in a regional hospital setting, especially those with clinical overweight or obesity. Overall, 31% of patients accurately perceived their BMI class. Only 34% of patients who were overweight and 14% of patients with obesity correctly perceived their weight status. Even patients who were categorized under class II or class III obesity had high levels of misperception, with less than 30% correctly identifying their obesity. The high level of misperception in the patients with overweight/obesity was supported by responses to questions about the implementation of health-modification behaviors, with more than half of patients indicating no recent weight loss or plans to undertake health behavior modification with exercise or dietary changes.

Weight misperception is a common finding in community-based studies from various countries.[8-11,18,25] An Australian study set in rural Queensland demonstrated that almost 60% of males who were overweight considered their weight to be in the healthy range.[14] One study reported that a higher proportion of patients with overweight correctly perceived their weight category than patients with obesity.[26] There is less literature about weight misperception in medical patients.[13,21] A study on ambulatory patients at the Mayo Clinic found that self-reported BMI was much lower than actual BMI, with only 6% of patients with obesity recognizing that they were obese.[21] In this current study, the rate of weight underestimation was lower for the group that was overweight (66%) but higher for patients with obesity (86%). This suggests that perceived weight category is a poor indicator of clinically measured BMI and adults with overweight/obesity substantially underestimate their weight status, with higher rates in a hospital setting and in rural regions.

Several studies have shown that weight perception is influenced by social and cultural attitudes toward weight.[10,25,27] In some populations, body weight has traditionally been regarded as a symbol of health, prosperity, and wealth.[28] This is also true for rural populations where individuals still consider excess weight to be associated with good health.[29] These cultural attitudes would enforce the acceptability of overweight as the ideal weight and may prevent these individuals from attempting weight loss.

Self-perception of weight might also be influenced by the culturally-specific meaning of the terms ‘overweight and “obese.”[18,30] The high underestimation rate might be attributed to a misinterpretation of terminology rather than a true underestimation. Additionally, the BMI classification cut-offs could have influenced an individual’s assessment of their perceived weight category. In overweight/obese adults who are just above the BMI class thresholds, some degree of underestimation may be expected. However, even when subgroup analysis was conducted for patients with class II or III obesity, ≤30% of patients identified as being obese. Therefore, whilst the terminology of BMI classification may play a role in influencing the degree of weight perception, it is not the sole reason for the high rate of reported misperception.

Furthermore, the hospital setting could have influenced weight self-perception, as the patient population comprises a group of unwell individuals who are more likely to misperceive their weight.[12,13,21] Despite it being common practice for nurses to inform inpatients of their height, weight and BMI after it has been measured, there was still a high level of misperception in these patients.

Amongst patients with overweight/obesity, misperceivers were much less likely to have plans to lose weight, a finding that was supported in other studies.[12,15] The proportion of individuals with overweight/obesity who had no existing plans to lose weight was higher in this study, perhaps due to the hospital setting and the nature of the disease of some of the patients making them reluctant to seek weight-modifying behavior.[21]

The Health Belief Model proposes that that the individual must perceive the risks associated with their disease (weight status) before any change in behavior will occur. This study highlighted the importance of having a health professional raise the issue of overweight/obesity with a patient. The odds of intending to lose weight increased dramatically if the patient had been informed of their overweight/obese status by their doctor (OR 10.6), and if the patient accurately perceived their weight status (OR 4.9). These trends are similar to the results of Post et al.[31], a US cross-sectional study of non-geriatric participants, however, a greater proportion had been informed of their overweight/obese status by their doctor. In the current study, only one-third of patients with overweight and obesity reported being informed of their weight status by a doctor versus 45.2% and 66.4% of patients with overweight and obesity, respectively, in Post et al.[31]

Participants in our study represent an older and unwell population, as participants were recruited through the

medical ward and coronary care unit at a regional hospital. Only 21.2% (n = 7/33) of patients with overweight and obesity aged at least 70 years had been informed of their weight status by a doctor, versus 47.1% of those aged <70 years (n = 16/34, $P = .026$). These patients might have overweight/obesity as a concomitant illness which is secondary to their presenting complaint.

The benefits of intentional weight loss need to be managed in light of the contrasting concern of frailty in geriatric patients. Obesity is associated with a higher risk of falling in aged populations,[32] and is a risk factor for cardiovascular disease and diabetes mellitus.[33] However, the potential for loss of bone mineral density and muscle mass associated with weight loss/reduced caloric intake is an important consideration in older adults. In a randomized control trial of a food-based weight loss intervention in patients with obesity aged at least 60 years, the group prescribed a higher proportion of protein in their diet lost a similar amount of weight as the control group, however, had improved physical function (lower-body strength, balance and gait speed) at 6 months.[34] Although there was no exercise component in the aforementioned study, it has been shown that the loss of muscle mass during weight loss intervention can be somewhat mitigated by exercise and resistance training.[35] As physical abilities of older adults with overweight and obesity widely vary, targeted exercise advice "should be individually tailored based on the individual's functional status and capacity."[36]

Limitations

The small sample size of this study increases the probability of a type II error and might not have shown associations of various factors with weight perception that are actually present and have been reported by other studies. Additionally, as the participants were derived from a convenience sample, the self-selection aspect of the study might have introduced a bias due to willingness to participate in this study or having an existing interest in this area. This limits the generalizability of this study as it might not be possible to extrapolate these results outside this population. Hospitalized patients may reflect a population with more severe illness, which may suggest poorer understanding of disease and treatment. The issue of obesity becomes particularly important in people who are hospitalized as it may lead to greater complications. Thus, it is important to identify misperception in this cohort. This study is potentially relevant to hospitalized patients in general, particularly in rural and regional areas.

In addition, using BMI as a measure of obesity has limitations. Although BMI is a commonly used indicator for obesity, BMI may fail to classify obesity or underestimate it for certain ethnicities[37] and overestimate it for athletes due to their larger muscle mass.[38,39] Finally, this study relied on patient-reported data for some health-related questions such as attempts to lose weight (diet and exercise), presence of absence of discussions about weight with doctor, smoking status and alcohol consumption.

Implications for Practice

This disjuncture between perceived body weight and clinically measured weight has consequences for executing health behavior changes to lose weight. A positive association between correct weight perception and subsequent weight loss behavior has been demonstrated.[8-11,25] If an individual is unaware they are overweight, they may not appreciate the consequences of their weight and are unlikely to participate in weight loss behavior. The health belief model proposes that before behavioral change occurs, the individuals must perceive the threat of their disease.[16] However, in rural populations there is a higher prevalence of obesity, coupled with increased likelihood of misperceiving their weight.[14,18,29] In the current study, 20% of patients with obesity considered themselves to be in the underweight or normal BMI class, while a recent US study[40] found that <1% of participants with obesity estimated their weight category based on BMI to be underweight or normal. Some studies report that overweight is so widely prevalent in Australia, it is considered socially acceptable.[8,18,41] This disagreement between perceived weight and measured weight creates a barrier for the implementation of successful interventions to address obesity and usually results in a failure of treatment.[11] It is important that patients with overweight/obesity recognize their true weight to encourage them to undertake health behavior modifications to improve their health outcomes.

Strengths

There is limited published literature exploring weight misperception in rural Australia, despite the high reported prevalence of obesity in rural areas and the associated development of obesity-related comorbidities and potential early mortality. In addition, minimal research has been done on weight misperception in hospitalized patients, despite the fact that weight misperception might be a contributor to future hospital admissions. The current study highlights the role that physicians can play in raising awareness and that this population group is also a key target for secondary prevention measures to reduce their cardiovascular disease and prevent further hospital admissions. Physicians can take advantage of the health belief model and target these population groups to implement interventions to enhance weight perception.

Conclusion

This is one of the first Australian studies based in a rural/regional area demonstrating that hospitalized patients significantly misperceive their weight, with almost two-thirds of the patients underestimating their BMI category. Patients with overweight/obesity had significantly higher rates of weight misperception and the majority had no intention to lose weight or to undertake any health behavior modification. It is also plausible that an inaccurate weight perception contributes to the high prevalence of obesity in this rural region and significantly adds to the burden of cardiovascular disease. Given the association of weight perception with weight reduction behavior, it introduces barriers to addressing weight loss and reducing the increasing prevalence of obesity in rural Australia. Those patients who reported having discussed their weight status with their doctor were more likely to accurately perceive their weight and correct perceivers were more likely to have plans to lose weight. Despite the level of discomfort that may exist surrounding discussing weight with patients, this study highlights that doctors have an important role in addressing weight misperception.

Declaration of Conflicting Interests

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Ethics Statement

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