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Improving residents' clinical approach to obesity: impact of a multidisciplinary didactic curriculum

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Abstract

Background/Objectives—Obesity has been declared a 21st century pandemic by WHO. Yet surveys reveal physicians-in-training are uncomfortable managing obesity. One major barrier is the lack of residency education on obesity management. This study incorporates an obesity-specific didactic curriculum into an internal medicine (IM) residency programme and assesses its impact on residents' knowledge, attitudes, practice behaviours, and clinical outcomes in patients with obesity.

Methods—The intervention consisted of four, 1 h, obesity-specific lectures in the University of Florida Resident Noon Conference. Lectures were taught by multidisciplinary experts and offered to 75 IM residents every 2 weeks from 5 November 2010 to 17 December 2010. Impact on IM residents' knowledge and attitudes was assessed by a pre- and post-intervention Obesity Awareness Questionnaire (OAQ). IM residents' clinical performance was assessed by chart reviews of 238 patients with body mass index >25 kg/m² in residents' clinics 4 months pre- and 6 months post-intervention for three clinical outcomes and seven practice behaviours on obesity

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management. Pre- and post-intervention outcomes were compared via paired t tests (quantitative data) or McNemar's test (binary data).

Results—Mean lecture attendance was 25/75 residents (33%) per lecture. Survey response was 67/75 residents (89%) pre-OAQ and 63/75 residents (84%) post-OAQ. While most attitudes remained unchanged, IM residents gained significant confidence in exercise counselling, safety of bariatric surgery, and patients' weight loss potential; they were more likely to address obesity in the plan and referrals to bariatric surgery. Clinical outcomes and IM residents' knowledge demonstrated no improvement.

Conclusions—Our brief lecture-based curriculum has the potential to improve IM residents' attitudes and practice behaviours towards obesity. The lack of improvement in clinical outcomes and resident knowledge prompts the need for multimodal, longitudinal curricula with experiential application of obesity medicine.

INTRODUCTION

Obesity has been declared a 21st century pandemic by WHO and its prevalence is rapidly increasing in developed countries.¹ With over 500 million people worldwide diagnosed with obesity,² it has become a major public health and medico-economic crisis.³⁴ Obesity is associated with the top 10 mortality and morbidity causes of death in the USA⁵ and increases the risk of several chronic diseases, including cardiovascular disease,⁶ diabetes mellitus,⁷ sleep apnoea,^{8–10} cancer,¹¹ reproductive disorders,¹² endocrine disorders,¹³ psychological disorders,^{14–17} bone, joints and connective tissue disorders,^{18,19} and gastrointestinal disorders.²⁰

Physicians are in a key position to combat the obesity pandemic. Yet, survey studies reveal both residents and primary care physicians feel uncomfortable managing obesity^{21–29} including one survey conducted by the Obesity Society to its physician members.³⁰ The major barriers to obesity management cited in these studies include knowledge deficits about weight-related patient services; cynicism over the effectiveness of obesity counselling and treatments; lack of infrastructure for weight-related referral services; patient inertia for change; and inadequate training in effective weight counselling, nutritional plans, and behavioural modifications. These authors determined poor education during medical school and residency to be a leading factor for these barriers. Education in obesity medicine is barely mentioned in the guidelines for the American Board of Internal Medicine (ABIM) examination and is only addressed in the Accreditation Council of Graduate Medical Education (ACGME) guidelines through other disease-specific topics (ie, diabetes, fatty liver). While some resident-focused curricula have demonstrated improvement in the quality of counselling about obesity^{31–33} and weight loss in patients with obesity,³⁴ the curricula were relatively resource-intensive (eg, utilising standardised patients and delivering to a small cohort of residents), did not report the impact on residents' clinical practice behaviours, and have not been replicated elsewhere.^{32–38}

This medical education study aims to assess the feasibility of a multidisciplinary obesity-specific didactic curriculum on: (1) enhancing internal medicine (IM) residents' knowledge, attitudes, and subsequent clinical practice behaviours on obesity management; and (2)

improving future clinical outcomes among patients with obesity managed by IM residents in their own continuity clinics.

METHODS

Study setting

This study ran from July 2010 to June 2011 and was approved by the University of Florida (UF) Institutional Review Board (IRB).

The UF IM Residency programme is a large university-based postgraduate programme with 10 medicine subspecialty divisions, training 75 IM residents over a 3-year period (also known as categorical residents). Residents receive formal didactic education on important research and clinical topics in IM through once weekly mortality and morbidity conferences, once weekly medicine grand rounds, daily 1 h morning reports, daily 1 h resident noon conferences, and monthly 1 h conferences before continuity clinic. For experiential training, residents rotate through two large hospitals—Malcolm Randall Veterans Affairs Medical Center (VAMC), the second largest US veterans' hospital system with 239 beds; and UF Health Shands Hospital, an 850-bed, nonprofit tertiary care referral centre for the south-eastern USA. Categorical residents are also assigned to a 3-year continuity clinic at one of three sites (UF Medical Plaza, UF Tower Hill, or VAMC) where they provide ambulatory care to a longitudinal panel of primary care patients one half-day per week.

Participants

Physician-participants included all postgraduate year 1 (PGY-1), PGY-2, and PGY-3 categorical IM residents in the 2010–2011 academic year who had managed a panel of their own continuity clinic patients for at least 4 months before and 6 months after the multidisciplinary obesity-specific didactic sessions (MODS) curriculum. Being in a 3-year postgraduate training programme, these residents were present for our entire educational intervention.

Medical records of patients with body mass index (BMI) $>25 \text{ kg/m}^2$ in the three IM residents' clinic sites were reviewed retrospectively for clinical outcomes and residents' clinical practice behaviours related to obesity management. The patient population in our large urbanised academic clinic consisted of a 1.5 : 1 female : male ratio with average age of 52 years old, a variety of chronic medical conditions (ie, coronary artery disease, chronic obstructive pulmonary disease, diabetes), and a sizeable population of vulnerable, indigent patients (35% non-Caucasian, 13% Medicaid, 10% uninsured). Patient eligibility included age >18 years, BMI $>25 \text{ kg/m}^2$, and established care in the IM residents' clinics at least 4 months before and 6 months after the MODS intervention. The only exclusion criterion was pregnancy.

Educational intervention: multidisciplinary obesity-specific didactic sessions

The educational intervention consisted of four 1 h obesity-specific didactic sessions scheduled during the IM resident noon conference every 2 weeks over an 8-week time period from 5 November 2010 to 17 December 2010 (figure 1). These lectures were

delivered by a multidisciplinary team of academic expert lecturers with extensive research and clinical training in obesity medicine. The team included an endocrinologist, a psychiatrist, a public health physician, a nutritionist, a physical therapist, a bariatric surgeon, and the residency associate programme director who spearheaded the MODS. MODS aligns with the educational curriculum from the Certified Obesity Medical Physician (COMP) programme by the Obesity Society³⁰ and from the American Board of Bariatric Medicine (ABBM) programme by the American Society of Bariatric Physicians.³⁹ Box 1 details the specific topics delivered in the MODS curriculum.

Resident knowledge and attitudes measures

To evaluate IM residents' knowledge and attitudes towards obesity management, an Obesity Awareness Questionnaire (OAQ) (see online supplementary appendix A) was administered to the IM residents 2 weeks before the intervention and again 6 months later. The OAQ questions were randomly selected from the validated questionnaire developed by the ABBM and COMP programmes. It consisted of 10 questions on general obesity knowledge and 10 questions on attitudes towards obesity management. Pre- and post-OAQ resident data were collected and reported in aggregate due to regulations by our IRB and residency administration for participant de-identification. The expert lecturers were blinded to the OAQ contents.

Residents' clinical practice behaviours

To evaluate IM residents' practice behaviours toward obesity management, the following seven guideline-specific performance measures⁴⁰ were tracked through retrospective chart reviews of eligible patients managed in the residents' continuity clinics: (1) referrals to nutritionist/dietitian; (2) referrals to other community resources including exercise physical therapist and/or psychiatry for food addiction/anxiety/depression as indicated; (3) referrals to bariatric surgery; (4) initiation of obesity-related medicines (eg, orlistat) or adjustment of medication regimen to avoid weight gain side-effects; (5) obesity listed as an active problem list; (6) development and counselling of dietary plan, physical activity, or behavioural modification plan recorded in the note; (7) frequency of glycated haemoglobin (%HbA1c) or low density lipoprotein (LDL) cholesterol measurement (if concurrent diabetes or hyperlipidaemia, respectively). Time periods compared were the 4 months before and 6 months after the MODS intervention.

Clinical outcomes measures

The primary patient-specific clinical outcome measure was change in BMI pre- (4 months before) and post- (6 months after) MODS intervention. Secondary clinical outcomes were % HbA1c and LDL cholesterol values (if concurrent diabetes and hyperlipidaemia, respectively). Goals were BMI <25 kg/m², % HbA1c <7%, and LDL cholesterol <100 mg/dL.

Data analysis

This study compared outcomes 4 months before and 6 months after exposure of the resident to the MODS intervention. The main outcomes analysed were resident knowledge and

attitudes. The secondary outcomes were patient-specific clinical outcomes and residents' clinical practice behaviours. Data abstraction for patient-specific clinical outcomes and residents' clinical practice behaviours was done retrospectively by three consistent individuals, utilising a standardised chart abstraction checklist to reduce inter-rater variability. For further consistency, one individual was assigned to one specific clinic site for data abstraction and retrospectively reviewed the medical record of every eligible study patient scheduled in each individual resident's clinic at that site. Due to IRB regulation for subject de-identification, pre- and post-intervention patient and resident data were collected and reported in aggregate.

Statistical analysis

All inferential analyses were paired comparisons pre- versus post-intervention. The one sample t test was utilised for quantitative outcomes. The exact McNemar's test was utilised for binary data. ORs represent conditional ORs given pair is discordant (one positive, one negative). Statistical Analysis Systems (SAS), V.9.3 was utilised for all analyses.

For the OAQ, the total score (number of correct answers) was treated as a continuous variable. Based on experience with similar tests, we expected the total score to follow a Gaussian ('normal') distribution. For patient-resident dyadic binary data, comparisons were made by ORs. Because this study was mainly descriptive, we did not control for study wise error. Significant findings need to be verified by an independent study before considering them definitive.

De-identification of the patients prevented us from conducting subset analysis based on patient-resident dyads.

RESULTS

Participants

Residents—The intervention was offered to 75 IM categorical residents. Mean lecture attendance was 25/75 residents (33%) per lecture. Resident attendance of each lecture varied between the four lectures, ranging from 20/75 residents (26%) to 30/75 residents (40%). Attendance rate decreased with the number of lectures delivered; only eight of 75 residents (11%) attended all four lectures (table 1). For survey responses, 67 of 75 residents (89%) completed the pre-OAQ and 63 of 75 residents (84%) completed the post-OAQ. The demographics of the IM residents were similar pre-OAQ versus post-OAQ (table 2).

Patients—A total of 238 clinic patients met inclusion criteria for retrospective review of their medical records. At baseline, the mean BMI was 34.7 kg/m²(8.2); %HbA1c 7.3(1.6%); and LDL cholesterol 97.6 mg/dL(36.5). The number of clinic visits did not differ pre- versus post-intervention, averaging about two visits per intervention.

Impact on residents' knowledge and attitudes

There were modest improvements in IM residents' attitudes towards patients with obesity and obesity treatment (table 3). Although most attitudes did not change, IM residents did

feel significantly more confident in their patients' potential to lose weight ($p=0.002$); in the safety of bariatric surgery for weight loss in class III obesity ($p=0.02$); in their skill to prescribe a detailed exercise programme ($p=0.02$); and in their own ability to calculate BMI ($p=0.05$). However, residents remained uncomfortable referring patients to bariatric surgery ($p=0.72$). Most continue to voice frustration over treating patients with obesity ($p=0.47$).

Residents' knowledge of obesity medicine did not change significantly (table 4). Baseline knowledge was particularly high for complications of obesity, weight loss benefits, and surgical treatment modalities. Persistently low-scoring questions include behavioural and pharmacologic therapies for obesity. Residents' knowledge did not improve with the number of lectures they attended (table 1).

Impact on clinical outcomes

No significant differences were seen in all three patient-specific clinical outcome measures (ie, BMI, LDL cholesterol, and % HbA1c) (table 5).

Impact on residents' clinical practice behaviours

IM residents significantly improved their performance in three of the seven clinical practice behaviours, specifically the identification of obesity in the problem list, referrals to bariatric surgery, and frequency of %HbA1c measurement (table 6).

DISCUSSION

Although our brief didactic educational intervention has the potential to improve IM residents' attitudes and clinical practice behaviours in obesity care, there was no impact on their knowledge of obesity or the clinical outcomes of their clinic patients with obesity. These negative findings are consistent with other studies showing that obesity medicine remains difficult to manage for residents despite various forms of curricular training.²³³¹³²³⁵⁴¹ Our study demonstrates the challenges of conducting successful educational intervention and research in chronic disease management. Certain confounders include limited time on rotations, difficulty engaging residents to attend lectures, external factors beyond our control (ie, residents' competing duties), and weak cohort design due to small sample size and residents' ever-changing attitudes. It is unclear why our curriculum showed an impact on some attitudes and clinical practice behaviours but not on knowledge or clinical outcomes. We speculate that our curriculum may have raised residents' awareness of obesity as an important, treatable problem and made them recognise their lack of knowledge and skills to treat obesity themselves without the assistance of a comprehensive obesity-dedicated management programme. Indeed, this adheres to the US Preventative Services Task Force recommendation that patients with obesity receive intensive, multicomponent behavioural intervention⁴² which is often difficult to achieve in a primary care visit. We were not surprised by our inability to produce weight-related outcomes; primary care-based weight management has not been proven in the literature to promote weight loss.⁴³ Jay *et al.*³⁴ found that patients of residents who received their 5 h curriculum did lose more weight than those of residents who did not (-1.53 kg vs 0.31 kg, $p=0.03$). However, they excluded several patients who did not have at least 1 follow-up visit at 12 months; when they included

39 patients with no follow-up in the analyses, their results were no longer statistically significant.

There are several limitations to our study design. Six-month evaluation of clinical outcomes may be too short a time period to expect a significant decrease in weight loss; it is possible that BMI values may continue to improve with time, as seen in Jay *et al*'s study.³⁴ Second, implementation of the curriculum requires considerable support from residency directors and coordination with faculty experts in obesity medicine. A third limitation is the reliance of study data from medical record documentation by residents which may not accurately reflect their actual clinical practice. It is possible that the residents did address obesity care during visits but failed to document the discussion. Fourth, there were inherent system constraints in data collection. Some patients did not obtain lab work or follow-up in clinic for timely obesity care. Lastly, there was no distinct control group; residents may have acquired knowledge and clinical practice behaviours on obesity medicine over time during their residency training. Indeed, residents are impressionable learners by nature of their professional growth and may have evolving attitudes and behaviours independent of any formal education. A Hawthorne effect is also possible; residents may have been motivated to improve their behaviour due to scrutiny of their performance.

Being mostly negative, this study has taught us key lessons on how to design an effective MODS curriculum. First, the attendance rates to the lectures were low. High compliance rates by residents are difficult to achieve given their busy schedules, suggesting that more frequent educational offerings in smaller groups may be necessary. The lack of knowledge improvement with higher attendance rates implies that an effective curriculum requires multiple pedagogical tactics to improve residents' knowledge and attitudes towards obesity management. A single instructional method or the passive mode of learning from didactic sessions is insufficient. The low lecture attendance rate may explain the lack of improvement in resident knowledge. However, residents' knowledge of obesity medicine was already high at baseline, yet it did not translate into improved practice behaviours or clinical outcomes. This finding supports the need for future educational interventions to target their efforts on residents' practice behaviours. It also highlights the importance of a pre-intervention needs assessment to understand better the audience and to teach to their learning deficits. Such a needs assessment for our curriculum would have helped tailor our lectures to low scoring topics and attitudes, such as behavioural and medication therapies. Furthermore, the short duration of our intervention does not permit effective resident education of such a chronic disease as obesity; there remains the unmet need for obesity-focused residency curricula to develop a longitudinal experiential training that teaches the concepts of the chronic care model⁴⁴⁴⁵ with multidisciplinary collaboration⁴⁶⁴⁷ and motivational interviewing techniques.³²⁴⁸ Such curricula may close the gap among residents' knowledge, practice behaviours, and clinical outcomes in patients with obesity. Indeed, the studies by Jay *et al*,³⁴ demonstrating patient weight loss with improved quality of counselling, utilised an active approach that included small group learning, motivational interviewing and goal-setting practice, use of standardised patients, and videotape review of encounters with residents' own patients. Unfortunately, not all programmes have dedicated time and resources to support this model. With the public health crisis from the obesity pandemic, we advocate for

potential ACGME support towards training residents in a multidisciplinary, skills-based, longitudinal approach.

In conclusion, our study highlights the various challenges and the key lessons learned in implementing successful educational interventions on chronic disease management such as obesity. With all its limitations and shortcomings, we hope to expand this didactic intervention into a multimodal, skills-based curriculum, including a longitudinal, multidisciplinary clinic to foster resident knowledge, attitudes, practice behaviours, and clinical outcomes in their patients with obesity.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Box 1**Obesity-specific topics in the multidisciplinary obesity didactic sessions (MODS)**

- The first lecture focused on ‘Basic Science and Diagnosis of Obesity’, taught by our University of Florida (UF) obesity-specialised endocrinologist. Basic science topics included epidemiology, pathophysiology, behavioural and environmental aetiology of obesity. Diagnosis topics focused on diagnostic testing, medical history, and nutritional and physical examination evaluation for obesity.
- The second lecture on ‘Treatment of Obesity’ was taught by a visiting guest, who was the 2009–2010 president of the Obesity Society. Topics include lifestyle therapy, pharmacotherapy, weight gain prevention strategy, and management of comorbidities.
- The third lecture on ‘Bariatric Surgery and Psychiatry of Obesity’ was co-taught by the UF bariatric surgeon in charge of the Bariatric Surgery Center of Excellence and the UF psychiatrist specialising in food addiction. Bariatric surgery topics include indications, risks vs benefits, and postoperative management of surgery. Psychiatry topics include psychological disorders related to obesity such as food addiction as well as behavioural modification.
- The last lecture focused on available ‘Community Resources for Obesity management’, including nutrition, physical therapy, and stress management.

Postscript

The obesity didactic curriculum still exists at our institution since the study completion. However, this intervention has undergone a few changes that have made it difficult to sustain in its original format:

- The University of Florida Residency programme has since shifted its priority for the resident noon conference to topics heavily-focused on the ABIM certifying exam. As such, our obesity didactic sessions are no longer given in the resident noon conference. Instead the curriculum has been condensed into two didactic sessions and is now delivered in the monthly residents' pre-clinic conference as part of their ambulatory education. The two didactic sessions focus on diagnoses and treatment of obesity medicine and on bariatric intervention and ancillary resources for obesity management. With the change in teaching venue, resident participation has become more interactive as small group sessions but attendance still remains poor due to competing ward rotations.
- The roster of expert faculty lecturers has changed multiple times due to faculty attrition. The endocrinologist and the psychiatrist have left our institution and the field of food addiction, respectively. Their replacements have been difficult to maintain. The curriculum is taught now by a different physical therapist and nutritionist, but the same bariatric surgeon and the same residency associate programme director are involved.
- With the limited number of faculty experts in obesity medicine at our institution, we are still struggling to implement a longitudinal, obesity-specialised multidisciplinary clinic within our residency training programme.

Main messages

- The culture of negativity in obesity management persists among internal medicine residents and correlates with knowledge deficits in treatment options and available resources. Residency curricula on obesity medicine need to target these knowledge deficits and reconcile negative attitudes on obesity care in order to improve residents' clinical practice behaviours.
- Certain challenges exist in implementing didactic educational intervention and research in chronic disease management. These include limited time on rotations, difficulty engaging residents to attend lectures, external factors beyond our control, and weak cohort design due to small sample size and residents' ever-changing attitudes and practice behaviours.
- Expansion to a multimodal, skills-based curriculum comprised of an intensive longitudinal clinic with multidisciplinary collaboration is needed to enhance resident knowledge, practice behaviours, and clinical outcome measures in patients with obesity.

Current research questions

- Will a multimodal, skills-based curriculum be a cost-effective programme to improve residents' knowledge and practice behaviours of obesity medicine while balancing institutional resources and faculty time?
- How do academic institutions effectively engage faculty to teach learners obesity medicine?
- What specific Accreditation Council of Graduate Medical Education guidelines are needed to secure graduate medical education resources for training in obesity medicine?

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Figure 1. Multidisciplinary obesity-specific didactic sessions (MODS) curriculum process map.

Table 1

Residents' attendance at the multidisciplinary obesity-specific didactic sessions lectures

Number of lectures	Attendance (%)	Impact on knowledge per lecture attendance		
		Number of lectures attended	Mean (SD)	p Value
0 lectures	21 (28)	<2	13.30 (0.93)	0.17
1 lecture	5 (0.70)	2	13.48 (0.99)	
		0	13.44 (0.30)	0.50
► Lecture 1	20 (27)	1	13.23 (0.19)	
► Lecture 2	26 (35)	2	13.58 (0.21)	
► Lecture 3	30 (40)	3	13.20 (0.29)	
► Lecture 4	22 (29)	4	12.50 (0.65)	
2 lectures	17 (23)			
3 lectures	8 (11)			
4 lectures	8 (11)			

Table 2

Demographics of the internal medicine residents in the MODS curriculum

	Pre-MODS N=67	Post-MODS N=63
BMI—mean (SD)	24.8 (3.3)	24.3 (3.5)
Female gender (%)		
Ethnicity (%)	32 (49)	25 (44)
White	37 (55)	30 (48)
Asian/Indian	17 (25)	14 (23)
Black	2 (3)	2 (3)
Hispanic	2 (3)	2 (3)
Middle East	1 (1)	5 (8)
N/A	8 (12)	10 (16)
Primary care (%)	11 (16)	17 (23)
Perception of prevalence of obesity within their continuity clinics (%)	48	40

BMI, body mass index; MODS, multidisciplinary obesity-specific didactic sessions.

Table 3

Attitudes of the internal medicine residents towards obesity

	Pre-MODS N=67 residents		Post-MODS N=63 residents		p Value
	Agree N (%)	Disagree N (%)	Agree N (%)	Disagree N (%)	
Most obese patients are well aware of the health risks of obesity	24 (36)	43 (64)	32 (52)	30 (48)	0.08
Most obese patients could reach a normal weight (for their height) if they were motivated to do so	48 (72)	19 (28)	41 (66)	21 (34)	0.57
Bariatric surgery is a safe option for weight loss in patients with class III (extreme) obesity	39 (58)	28 (42)	48 (77)	14 (23)	0.02
Bariatric surgery is an effective option for weight loss in patients with class III (extreme) obesity	54 (81)	13 (19)	55 (89)	7 (11)	0.23
It is difficult for me to feel empathy for an obese patient	26 (39)	41 (61)	18 (29)	44 (71)	0.28
Obesity is primarily caused by behavioural factors	53 (79)	14 (21)	47 (76)	15 (24)	0.68
Treating obese patients is very frustrating	55 (82)	12 (18)	54 (87)	8 (13)	0.47
Obesity is a treatable condition	62 (93)	5 (7)	55 (89)	7 (11)	0.55
I have been successful in treating patients for obesity	14 (21)	53 (79)	20 (32)	42 (68)	0.16
The best role for a physician in weight management is to provide referral rather than treatment	13 (19)	54 (81)	9 (9)	53 (85)	0.49
Most obese patients will not lose a significant amount of weight	47 (70)	20 (30)	27 (44)	35 (56)	0.003
I feel physicians get adequate training to treat obese patients	6 (9)	61 (91)	10 (16)	52 (84)	0.29
Recognition and screening for common psychosocial problems in obese patients should include depression, food addiction, emotional eating, and binge eating	64 (96)	3 (4)	60 (97)	2 (3)	0.99
I feel comfortable referring patients for bariatric surgery	34 (51)	33 (49)	34 (55)	28 (45)	0.72
I am able to respond to a patient's question regarding treatment options on obesity including behavioural changes, medications, and surgery	37 (55)	30 (45)	42 (68)	20 (32)	0.15
When there are alternatives available, it is important to choose medications that are less likely to cause further weight gain in obese individuals	64 (96)	3 (4)	57 (92)	5 (8)	0.48
I am able to determine BMI from weight and height measurements	62 (93)	5 (7)	62 (98)	0 (0)	0.06
Medications can play a significant role in a patient's risk of becoming obese	48 (72)	19 (28)	45 (73)	17 (27)	0.99
I feel comfortable prescribing a detailed exercise programme to my obese patients	23 (34)	44 (66)	34 (55)	28 (45)	0.02
I feel comfortable prescribing a detailed dietary programme to my obese patients.	26 (39)	41 (61)	31 (50)	31 (50)	0.23

Partly adapted and modified from Jay *et al.*³⁶

BMI, body mass index; MODS, multidisciplinary obesity-specific didactic sessions.

Table 4

Knowledge of internal medicine residents on obesity medicine

	Pre-MOD, SN=67 Correct (%)	Post-MOD, SN=63 Correct (%)	p Value
Waist circumference is not a reasonable measure of obesity	49 (73)	52 (84)	0.20
10% is an ideal baseline weight reduction as initial goal of weight loss	59 (88)	57 (92)	0.56
Obesity by itself is not a risk factor for cervical cancer	27 (40)	36 (58)	0.05
Obesity by itself is a risk factor for hyperlipidaemia	58 (87)	50 (81)	0.48
Weight gain is usually associated with smoking cessation	62 (93)	56 (90)	0.76
For weight reduction, the recommended amount of physical activity is 2 days/week	62 (93)	59 (95)	0.72
Obesity by itself is a risk factor for hypertension	65 (97)	62 (100)	0.50
Weight loss maintenance is most effective with frequent physician contacts	65 (97)	57 (92)	0.26
Obesity by itself is a risk factor for diabetes mellitus type 2	64 (96)	62 (100)	0.25
Behavioural therapy is useful for long term weight loss	8 (12)	2 (3)	0.09
I should refer all my obese patients to bariatric surgery	66 (99)	61 (98)	0.99
Obese patients should be screened for anxiety and addictions	65 (97)	61 (98)	0.99
Obesity by itself is a risk factor for sleep apnoea	66 (99)	62 (100)	0.99
Bariatric surgery improves some but not all obesity-related comorbidities (ie, diabetes mellitus, fatty liver or hypertension)	61 (91)	54 (87)	0.58
A 1200 kcal diet is ideal for a class III morbidly obese patient	44 (66)	35 (56)	0.37
Physical activity improves weight control	67 (100)	62 (100)	0.99
Orlistat is an appetite suppressor	45 (67)	38 (60)	0.78
Able to calculate their own BMI correctly	41 (61)	33 (52)	0.64
Knows the minimum BMI to diagnose a patient with obesity	46 (69)	50 (80)	0.32

BMI, body mass index; MODS, multidisciplinary obesity-specific didactic sessions.

Table 5
Clinical outcomes of patients with obesity in the internal medicine residents' continuity clinics

Clinical outcomes	Pre-MODS			Post-MODS			Differences (changes between curriculum)	
	N	Mean (SD)		N	Mean (SD)		Mean (SD)	p Value
Height (cm)	238	171.32 (10.56)		235	171.32 (10.56)			
Weight (kg)	238	101.97 (26.94)		235	101.63 (23.73)			
BMI (kg/m ²)	238	34.65 (8.17)		235	34.51 (7.05)		0.14 (1.81)	0.78
%HbA1c (%)	90	7.31 (1.62)		102	7.25 (1.66)		0.06 (1.48)	0.86
LDL (mg/dL)	143	97.58 (36.53)		139	93.79 (32.76)		3.79 (34.61)	0.12
Visits per patient	238	2.05 (0.88)		235	2.07 (0.84)		-0.02 (0.91)	0.72

BMI, body mass index; %HbA1c, glycated haemoglobin; LDL, low density lipoprotein; MODS, multidisciplinary obesity-specific didactic sessions.

Table 6

Residents' clinical practice behaviours on patients with obesity

Clinical practice behaviours	Pre-MODS N=238	Post-MODS N=238	OR	95% CI for OR	p Value
Obesity added to the problem list	0	16	∞	3.76 to ∞	<0.001
Prescribed obesity medications	2	4	2.00	0.28 to 24.0	0.68
Measurement of %HbA1c	11	24	2.18	1.04 to 4.88	0.04
Patients with LDL <100 mg/dL	39	28	0.72	0.43 to 1.17	0.22
Patients with BMI <30 kg/m ²	9	8	0.89	0.30 to 2.57	0.99
Patients with %HbA1c <7%	8	15	1.88	0.72 to 5.25	0.21
Referral to bariatric centre	0	7	∞	1.43 to ∞	0.02
Referral to community resources*	5	8	1.60	0.47 to 6.14	0.58
Referral to dietitian	5	12	2.40	0.79 to 9.00	0.14

*Community resources included available weight loss programmes (ie, Weight Watchers), food addiction clinic by psychiatry, exercise programmes (ie, gym attendance), etc.
 BMI, body mass index; %HbA1c, glycated haemoglobin; LDL, low density lipoprotein; MODS, multidisciplinary obesity-specific didactic sessions.