



Review

Early training in tackling patient obesity: A systematic review of nurse education

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SUMMARY

Objectives: This systematic review aims to identify studies that have assessed educational interventions in undergraduate nurse training regarding obesity, and to investigate the interventions' effectiveness.**Background:** Obesity is a prominent global issue and nurses have an increased role in weight management with patients. The literature has identified various theory-based behaviour change techniques that successfully assist weight management in patients. Thus, training nurses in obesity-related behaviour change techniques is appropriate in preparing them for their future professional role. However, effectiveness of these educational interventions has not yet been assessed.**Methods:** The Centre for Reviews and Dissemination guidelines informed this systematic review. Four databases were systematically searched and articles were assessed against inclusion criteria. Data extraction and quality appraisal forms were developed and completed to identify salient features within the articles.**Results:** Eight studies met inclusion criteria. Only two included both baseline and outcome measures, one of which was a randomised controlled trial. Additionally, only one study included an explicitly identified behaviour change technique. Interventions were delivered through a range of methods, however, quality appraisal indicated that all of the studies had poor methodologies and had high risks of bias.**Conclusions:** Studies in this area of research are sparse and are not methodologically robust. Therefore, it is not possible to identify effective educational interventions for nursing students on weight management.**Implications:** More robust research is needed to investigate how nurses can be trained to facilitate weight management. Greater transparency of intervention descriptions, particularly around what behaviour change techniques were taught, would allow for replication and appropriate evaluation. Until then, it is not known if current teaching adequately equips nurses to manage obese and overweight patients.

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Introduction

Overweight and obesity are included as leading risks for global deaths (The World Health Organisation; WHO, 2011) and 502 million adults are reported to be obese across 199 countries (Finucane et al., 2011). Overweight and obesity have increased in recent decades in various populations including the USA, the UK, China and Japan (Ogden et al., 2004; Rennie and Jebbs, 2005; Wang et al., 2007; Yoshiike et al., 2002). Obesity causes around three million deaths per year worldwide

(Prospective Studies Collaboration, 2009) and is accountable for a range of comorbid disorders including type 2 diabetes, cardiovascular disease and many cancers (Guh et al., 2009). Additionally, obesity-related illness has direct and indirect costs to the economy (Wang et al., 2011), with obese individuals having additional conditions associated with obesity that lead to 30% higher medical costs compared with their normal weight peers (Withrow and Alter, 2011).

The need to tackle obesity actively is reflected by recommendations from the National Institute for Health and Clinical Excellence (National Institute for Health and Excellence, 2006) that require health professionals to be trained to provide support and advice to people around weight management. However, research reveals that health professionals perceive many barriers to fulfilling this role successfully. Barriers include uncertainty about their role, not having faith in existing treatment options (Epstein and Ogden, 2005), and low personal self-efficacy and abilities in obesity management (Perrin et al., 2005). Health professionals report avoiding behaviour change talk during consultations due to a feeling of being inadequately trained and fearful of damaging relationships (Chisholm et al., 2012a; Keyworth et al., 2012).

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Nurses in particular have an increasing role in providing lifestyle interventions to support weight management (Department of Health, 2006) and graduate nurses are expected to be able to use behaviour change techniques (BCTs) to promote health in patients (American Association of Colleges of Nursing, 2008). Project 2000 was implemented in the early 90s and initiated the importance of course-based learning and linking theory with practice within nursing education (Crotty, 1993; UKCC, 1986). Rather than simply treating ill health, nurses were encouraged to promote health and prevent illness (Crotty, 1993). Research shows that nurses have the ability to successfully deliver behaviour change interventions to patients in relation to weight management. For example, Whittemore et al. (2004) found that nurses delivered successful interventions in patients with type 2 diabetes.

However, previous studies demonstrate that the attitudes and perceptions of trainee and qualified nurses around obesity are not always positive (Clark and Maben, 1998; Howard, 2001; Jowett et al., 1994; Poon and Tarrant, 2009). Attitudes and skills are not developed with age and experience, but are developed at undergraduate level (Dunn and Hunsford, 1997). Hence targeting undergraduate nurse education is an opportunity to assist student nurses to develop their skills and confidence in working positively with overweight patients. However, university training can lack focus around providing student nurses with the techniques to facilitate behaviour change, and they feel ill-equipped with the skills to communicate effectively with patients around weight management (Brown and Thomsson, 2007; Keyworth et al., 2012). It is important that training is evidence-based as students can perceive theoretical aspects of their course as irrelevant to clinical practice and 'common sense' (Howard, 2001, p. 34).

However, a systematic review conducted on medical students identified that effective training around obesity management is scarce (Chisholm et al., 2012b). Only 12 studies met inclusion criteria and intervention content tended to be poorly reported and measures to control for the risk of bias were rarely utilised. Other research has also highlighted that medical educators encounter difficulties implementing and delivering obesity management education in accordance with the General Medical Council's guidelines to medical students (Chisholm et al., 2013). Qualitative interviews with medical educators described these difficulties as being due to a lack of Faculty support and available guidance about *what* behaviour change education includes (Chisholm et al., 2013). Together this may explain reports of insufficient medical education in this area (Moser and Stagnaro-Green, 2009). It remains unknown if the situation is similar for nurse training.

Addressing the obesity epidemic is complex and it has been argued that public interventions are likely to have the greatest effect compared with the small gains achieved through individual lifestyle interventions (Jain, 2005; Loveman et al., 2011). However, given the opportunities that nurses consistently encounter with patients, it is important that they are able to and are confident enough to intervene where obesity is a relevant issue to patients' health. Hence it is relevant to investigate whether interventions regarding obesity are being implemented into undergraduate nursing courses.

The present study sought to conduct a systematic review to identify studies that have assessed educational interventions in undergraduate nurse training on obesity management. It aimed to address the following: Are obesity-related educational interventions present in undergraduate nursing curricula? If so, how effective are they and what is the quality of these interventions? The PICOS (Population, Intervention, Comparators, Outcomes, Study Design) criteria guided this review and inclusion criteria were developed alongside it in order to determine relevant articles for review. This systematic review should identify what makes up effective obesity management education for student nurses, thus informing better preparation of nurses for practice and would allow for the synthesis of evidence regarding effective educational interventions in this area.

Method

Search strategy

A systematic review was undertaken in order to collate literature that evaluates obesity-related educational interventions within undergraduate nursing curricula. The following databases were systematically searched (final search on 13th September 2011): PsycInfo, OvidMedline, British Nursing Index and Embase (guided by The Centre for Reviews and Dissemination, CRD, 2009). The PICOS criteria were used to develop the search terms and inclusion criteria. Search terms referred to the target population (undergraduate nursing students), intervention (educational methods used) and outcomes. The inclusion criteria aimed to retrieve research published in English that included undergraduate nursing students. Studies had to include an educational or training programme that related, explicitly or implicitly, to obesity (e.g., topics such as weight loss or increasing exercise). The outcomes of the research needed to contain at least one qualitatively or quantitatively measured outcome. Therefore, research that contained no measured outcomes was excluded due to the focus of the review being to establish the effectiveness and quality of interventions. The comparator and study design components of the PICOS criteria were not considered during the selection of studies since these are common within educational research which tends not to include a comparison or control group (Cook et al., 2007). Additionally, studies were included if they involved other populations (for example, undergraduate midwives) provided that some proportion of the sample comprised undergraduate nurses. Table 1 provides a list of the search terms. Search terms were combined from these three sets using 'AND' whilst the truncation function (\$) was used to explode the search terms and the '.mp' function was used to search titles, abstracts and full texts. To limit results, an advanced search was applied: 'English 1990–Present'. It was appropriate to search from 1990 as this was when Project 2000 (UKCC, 1986) was being implemented and nurses' roles were becoming more focused on health promotion. This search strategy was applied to all databases that were used within the review. Only published data were included to ensure the findings would be replicable.

Study selection

Initially, titles and abstracts were screened (by AF) in order to assess whether they were relevant to the review's aims: did they include a reference to nurse education and an obesity-related topic? Potentially

Table 1
Terms used within systematic review search strategy.

1.	undergraduate nur\$/ or student nurs\$/ or undergraduate nurs\$ training/ or undergraduate nurs\$ education.mp
2.	obes\$.mp
3.	weight management.mp
4.	weight control.mp
5.	weight loss.mp
6.	exercis\$.mp
7.	health promot\$.mp
8.	nutrition.mp
9.	intervention\$.mp
10.	obes\$ prevention.mp
11.	exercis\$ promotion.mp
12.	lifestyle.mp
13.	behavi\$ change.mp
14.	behave\$ change intervention\$.mp
15.	weight management intervention\$.mp
16.	attitude\$.mp
17.	confiden\$.mp
18.	skill\$.mp
19.	knowledge.mp
20.	2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15
21.	16 or 17 or 18 or 19
22.	1 and 20 and 21
23.	Limit 22 to (English language:1990–current)

relevant full-text articles were then retrieved and systematically assessed (by AF) against the inclusion criteria (see Table 2) and duplicates were removed. Articles not meeting the PICOS criteria (e.g., not including undergraduate nursing students or not implicitly or explicitly refer to obesity) were omitted and those that were eligible were held for review (a list of excluded full-text articles and reasons for exclusion is available from the authors).

To minimise bias in the selection of the studies, an independent researcher (MN) repeated the selection process of the full-text articles against the inclusion criteria and good inter-rater reliability was established ($n = 24$; Cohen's $k = 0.68$). Disagreements about inclusion were resolved through discussions between AF and MN where reasons for including or excluding an article in relation to the inclusion criteria were noted and a decision mutually agreed upon. Fig. 1 depicts the process of study selection from each database.

Tools for analysis

Data extraction and quality appraisal tools were created according to CRD (2009) recommendations and other standardised forms used in previous studies (Effective Public Health Practice Project, 1998; Public Health Resource Unit, 2006). This enabled us to extract descriptive data and to assess the quality of the studies based on their methodological characteristics. The headings used for data extraction were study aim, study design, participants, intervention content, intervention structure, outcome data, reported findings and reported conclusions. Using these, key design features and characteristics of each study were consistently extracted for comparison. This enabled us to assess study quality by examining the same information about methods and intervention design across all studies. Quality appraisal forms sought the adequacy of: 1) the reported content of the intervention; 2) measures used to control for risk of bias; 3) whether reported conclusions were supported by reported findings. See Appendix A and Appendix B for data extraction and quality appraisal forms.

Table 2
PICOS inclusion and exclusion criteria for systematic review of nursing education strategies relative to weight management.

Category	Inclusion criteria	Exclusion criteria
Population	<ul style="list-style-type: none"> Undergraduate nursing students Studies can include other groups of the population as well as undergraduate nursing students 	<ul style="list-style-type: none"> Qualified nurses Postgraduate nursing students Students of other undergraduate course subjects
Intervention	Educational/training programmes given to nursing students that relate to obesity. Can include: <ul style="list-style-type: none"> Obesity on its own Obesity related topics where obesity is implicitly measured (e.g., weight loss, reducing body fat/calorie intake, increasing exercise) Interventions that relate to students' own obesity health issues with reference to their role in helping patients 	<ul style="list-style-type: none"> Interventions given to nursing students that do not relate to obesity specifically Interventions that relate to students' own obesity issues but have no relation to helping patients
Comparators	<ul style="list-style-type: none"> Any studies to be included with or without comparison groups 	
Outcomes	<ul style="list-style-type: none"> Must be at least one measured outcome evident (qualitative or quantitative) of the intervention (e.g., questionnaire/attitude) 	<ul style="list-style-type: none"> Studies that do not provide measured outcomes of the intervention
Study design	<ul style="list-style-type: none"> Any study design Published in any country 	<ul style="list-style-type: none"> Insufficient detail is provided to determine any of the study design

Data extraction

Data extraction forms were completed by AF for all eight articles, and were then split and given to two other members of the research team (SP & JH). These researchers completed forms for four articles each. In order to promote reliable coding, guidelines were created for researchers to use when completing the quality appraisal forms. This aimed to reduce ambiguity by explicitly describing what was considered to be included. The percentage of agreements for each component of the data extraction forms can be found in Table 3 below. For quality appraisal there was 80% agreement. Disagreements were subsequently discussed and resolved during a team meeting.

Results

A total of 558 articles were retrieved by initial searches and screened for relevance. Of these, 24 (4%) full-text articles were deemed relevant and were assessed against inclusion criteria, resulting in eight articles (1%) being selected for review. Due to the diversity within the methodologies, a narrative synthesis was undertaken (CRD, 2009). Results are presented under the following five headings: (1) characteristics of the studies; (2) intervention implementation; (3) intervention content; (4) intervention outcome measures and reported findings; and (5) quality of the studies and risk of bias.

Study characteristics

The eight articles reviewed were published in seven countries between 2002 and 2011 (five of these published within the last five years). Study details were generally poorly reported. Six (75%) studies reported sample size, four (50%) of which reported attrition rates, and two (25%) studies reporting no sample size. Gender and age was only reported in four studies (50%, age range 16–50 years). Ethnicity was only reported in one (13%) study. Regarding research designs, five (63%) studies were cross-sectional, two (25%) were longitudinal and the remaining study employed a qualitative design. Only two (25%) studies included both baseline and outcome measures, with only one (13%) of these employing a 'randomised controlled trial', whilst the other was a 'before and after study'. The remaining six (75%) studies were classified as 'intervention studies' which only obtained outcome measures after the implementation of the intervention and did not contain a control group. Further details of study characteristics are provided in Table 4.

Intervention implementation

The interventions were delivered via a range of methods and varied largely in terms of where they were delivered within the nursing curricula. Interventions were implemented as part of a health promotion module in four (50%) studies (Healy and McSharry, 2011; Hsaio et al., 2005; Reising et al., 2008; Tarrant and Chan, 2002), whilst one (13%) study integrated the intervention into a module titled 'Children's Nursing' (Ben-Sefer, 2009). One (13%) study developed the 'Community Partnership Model' in order to frame nursing students' service-learning (Brosnan et al., 2005), whilst another (13%) integrated three mentoring programmes based on adolescent health (Shin and Rew, 2010). The final study (13%) did not implement the intervention into the course directly: nursing and midwifery students who were attending educational lectures on nutrition counselling were recruited to take part in a study based on a planning intervention (Luszczynska and Haynes, 2009).

A range of educational methods were used including lectures, seminars, group work, group discussion, oral presentations, written assessments, reflective diaries and practical work including literature reviews and group projects. In two (25%) studies, the methods used to deliver the interventions were inadequately reported. Table 4 includes further details about the intervention.

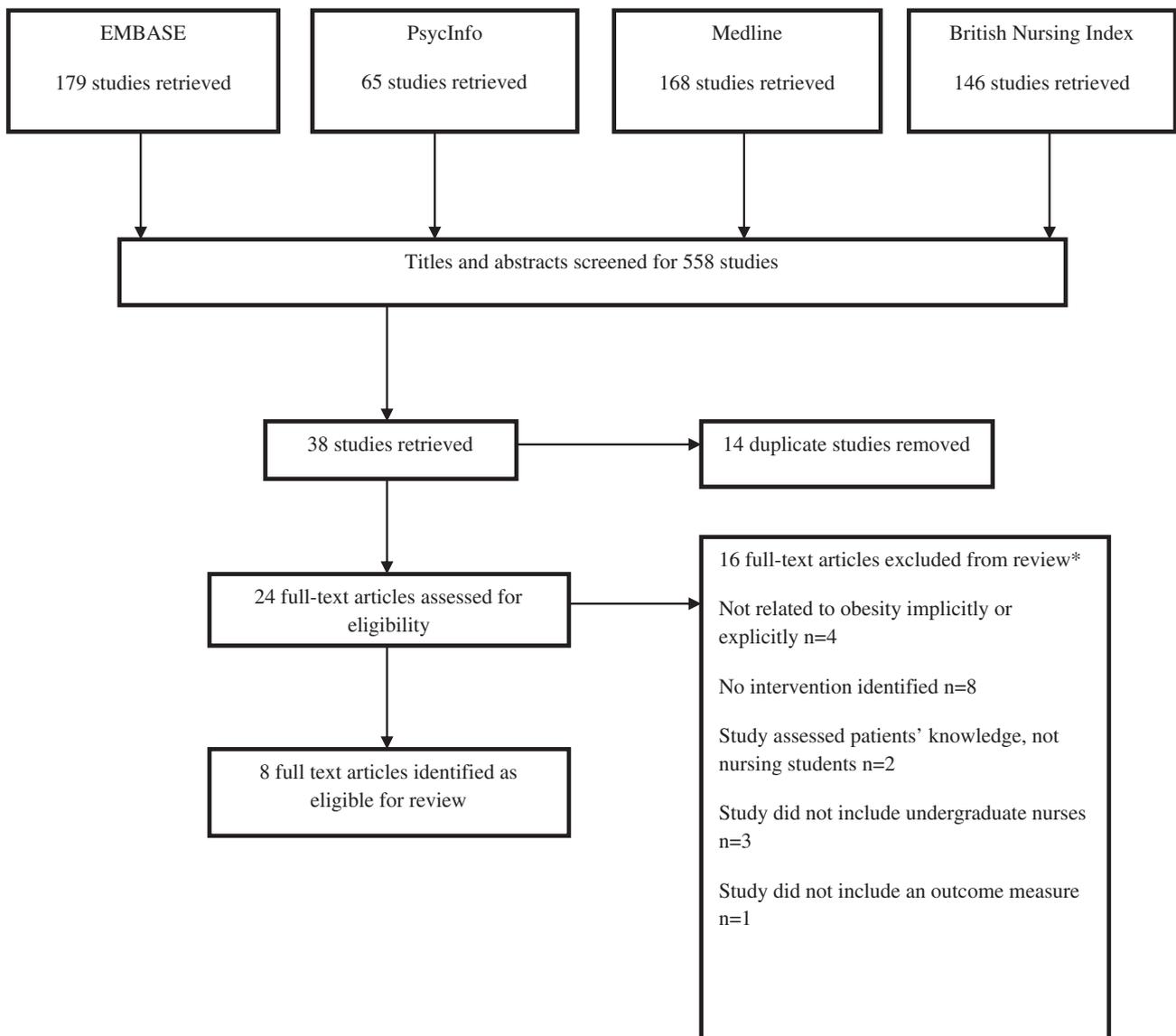


Fig. 1. Flowchart of the systematic review study selection process. * total number of excluded studies is >16 due to 2 studies being excluded for 2 of the above reasons.

Intervention content

Three (38%) different interventions in three separate studies were found to explicitly relate to obesity, however they took different perspectives: one referred to obesity alongside smoking and sedentary

lifestyle (Tarrant and Chan, 2002); one referred to obesity alongside hypertension and type 2 diabetes (Brosnan et al., 2005); one was explicitly linked to childhood obesity independent of other factors (Ben-Sefer, 2009). The remaining five (63%) studies were found to be implicitly related to obesity and referred to exercise, diet/nutrition and obesity-related disorders such as diabetes and hypertension (Healy and McSharry, 2011; Hsaio et al., 2005; Luszczynska and Haynes, 2009; Reising et al., 2008; Shin and Rew, 2010).

In general, authors focused on reporting the method of delivery rather than the content of the intervention. Therefore, extracting the intervention content from within the articles was challenging. For each intervention the content was scrutinised for any description of a technique directed to change behaviour. Due to the inadequate reporting of the content, behaviour change techniques (BCTs) used within the interventions could only be identified in one study (Luszczynska and Haynes, 2009). The BCT 'action planning' (Michie et al., 2011a, 2011b) was used as the intervention group was given a planning form in which to make their own plans about fruit and vegetable intake and physical exercise. This study also described the Social Cognitive Theory (Bandura, 1997), however, this was not considered to be related to the

Table 3

Percentage of agreement between raters for each component of the data extraction form.

Component	Percentage agreement ^a
Study aim	100%
Study design	81%
Participants	87%
Intervention content	88%
Intervention structure	69%
Outcome data	92%
Reported findings	100%
Reported conclusions	75%

^a Percentage calculated as a total of agreements on each individual component.

Table 4
Study characteristics for eight studies containing an obesity-related educational intervention within undergraduate nursing training.

Source	Country of publication	No. of participants	Gender (%)	Ethnicity (%)	Year of nursing course	Study design
Ben-Sefer (2009)	Australia	207 ^a	N/R	N/R	Year 2	Cross-sectional/intervention study
Brosnan et al. (2005)	USA	N/R	N/R	N/R	N/R	Cross-sectional/intervention study
Healy and McSharry (2011)	Ireland	65 ^a	N/R	N/R	Year 1 semester 2	Cross-sectional/intervention study
Hsaio et al. (2005)	Taiwan	65	100% female	N/R	Year 3	Longitudinal/before and after study
Luszczynska and Haynes (2009)	England	120	89% female	82% white, 7% black, 3% Asian and 8% chose not to report their ethnicity	N/R	Longitudinal/randomised controlled trial
Reising et al. (2008)	USA	173	'Majority' were female	N/R	Throughout year 2 and year 3	Cross sectional/intervention study
Shin and Rew (2010)	South Korea	30	92% female; 8% male	N/R	26 students in year 2; 4 students in year 3	Qualitative/intervention study
Tarrant and Chan (2002)	Hong Kong	N/R	N/R	N/R	Year 1, semester 2	Cross-sectional/intervention study

N/R indicates that data were not reported.

^a Where attrition rates were not reported.

intervention content, but instead as a rationale for developing the 'model's' behaviours. Therefore, from the information provided by the reviewed articles it would appear that none of the papers explicitly used theory to inform their intervention.

Intervention outcome measures and reported findings

Seven (88%) studies assessed student reflection or evaluation of the intervention by questionnaire as their primary outcome measure. In the only study where baseline data were obtained (Luszczynska and Haynes, 2009), significant differences were found between pre- and post-test questionnaires indicating that the intervention had an effect on their reported health behaviours. Course evaluations consistently yielded positive comments from students by indicating that they had enjoyed the module and had been able to develop various skills. This was reported across the eight studies. Skills that were reported to have developed through student reflection and course evaluations included the ability to link theory with practice, an increase in communication skills and confidence in health promotion and clinical skills, and the ability to perceive the reality of nursing as a profession. Other measures included measures of knowledge via assessment (method used in three studies [38%]). Two of these studies included assessment of written assignments as a by-product of the intervention, whilst one study included multiple-choice questions (MCQs) within the intervention, however, the outcomes of this were not reported in the article. Additionally, one study measured participants' self-efficacy beliefs on fruit and vegetable consumption and found that higher self-efficacy ratings were related to BMI reduction. The study also assessed the effects of the planning intervention in the experimental group and found that the intervention had a medium effect on fruit and vegetable consumption (Cohen's $d = 0.51$). Table 5 displays details of outcome measures used and reported outcomes of each study.

Quality of the studies and risk of bias

Quality of the studies was assessed by three members of the research team (AF, SP & JH). Quality appraisal sought to identify the following: 1) adequacy of the reported content of the intervention; 2) control for risk of bias; and 3) if reported conclusions were supported by reported findings.

Reported content of intervention

Of the eight studies none were judged to have reported the content of the intervention adequately. Content topics were well defined in six

(75%) studies (Ben-Sefer, 2009; Brosnan et al., 2005; Healy and McSharry, 2011; Hsaio et al., 2005; Luszczynska and Haynes, 2009; Tarrant and Chan, 2002), however, they did not clearly report who delivered the intervention and the duration by which it was delivered. In one (13%) study (Shin and Rew, 2010), the aims of the Health Promotion module were stated but the description of how, and for how long, the mentoring programme was administered was unreported. Additionally, two (25%) studies (Ben-Sefer, 2009; Reising et al., 2008) provided an adequate outline of what the intervention comprised of but reports of the teaching methods used were lacking. All studies were deemed to have inadequately reported content of intervention, including delivery methods and could not be replicated.

Controlling for risk of bias

Methods such as randomisation of participants, control groups, baseline measures and an attempt to identify possible confounders were deemed to actively control for a risk of bias within studies. Of the eight studies, only one attempted to control for risk of bias (Luszczynska and Haynes, 2009). This study included a control group, randomisation of participants to conditions and baseline measures of self-efficacy beliefs, BMI, fruit and vegetable intake and amount of physical activity. One (13%) study included baseline measures but not a control group (Hsaio et al., 2005). The remaining six (75%) studies (Ben-Sefer, 2009; Brosnan et al., 2005; Healy and McSharry, 2011; Reising et al., 2008; Shin & Rew, 2011; Tarrant and Chan, 2002) did not use any of the above controls for risk of bias.

Reported conclusions

Of the eight studies, authors' conclusions for three (38%) (Hsaio et al., 2005; Luszczynska and Haynes, 2009; Reising et al., 2008) were deemed to be supported by the reported findings. Reasons why the remaining five (63%) studies' (Ben-Sefer, 2009; Brosnan et al., 2005; Healy and McSharry, 2011; Shin & Rew, 2011; Tarrant and Chan, 2002) conclusions were inadequate relative to the reported findings was due to the inability to control for risk of bias and the lack of clarity in reporting the intervention content.

Discussion

This systematic review identified eight studies containing educational interventions for nursing students aimed at improving nurses' abilities in facilitating lifestyle change within obese/overweight patients. The number of studies relevant to this review was low. Due

Table 5
Details of the intervention aims, content and delivery methods, along with outcome measures used and the reported outcomes of each intervention.

Source	Aim	Intervention		Findings	
		Content	Delivery methods	Outcome measures	Reported outcomes
Ben-Sefer (2009)	To assist students in learning about the health problems associated with childhood obesity and to encourage their own sense of creativity and lateral thinking	To discuss the problems of childhood obesity and develop a creative strategy to teach children about the problem	Lectures, written report, practical work	Assessment of assignment and student evaluations of the assignment	185/207 students had positive comments – extended their understanding of the issues surrounding childhood obesity. 110 students agreed that the assignment highlighted a different thought process.
Brosnan et al. (2005)	To use the Community Partnership Model to frame nursing students' service learning and to identify obesity, hypertension, type 2 diabetes and their predictors in a high risk student population	Health screened children in schools	Lectures, written report, oral presentation, practical work	Course evaluations, written and oral presentation	Evaluated very positively with emphasis on ability to link lecture with clinical practice. 'Written papers were of excellent quality'.
Healy and McSharry (2011)	To report the experience of developing, facilitating, delivering and evaluating a health awareness workshop and to highlight the importance of health promotion within the nursing curriculum	Health awareness workshop. Phase 1: health assessment Phase 2: baseline observations Phase 3: self-assess stress levels Phase 4: relaxation techniques	Seminars, practical work, reflective diaries	Anonymous module evaluation including student opinions, questionnaires and MCQs	100% of students agreed that the learning outcome for the workshop were met. 75.4% rated the module between 8 and 10 on a Likert Scale for enjoyment (0–10), 15.4% rated it as 7 and 1.5% rated it as 6.
Hsaio et al. (2005)	To develop a teaching course on health promotion for nursing students and to examine the effects of this course	Lectures taught students how to practice a healthy lifestyle. Each student then chose an unhealthy behaviour and created a plan to attempt to change that behaviour	Lectures, written report, demonstrations, reflective diary of behaviour change	Pre- and post-test questionnaire scores and content analysis	Significant differences between pre- and post-test questionnaires. 87.7% reported that they had achieved their goals once the period had ended. Content analysis – experienced the struggle, experienced the benefits, increased self-confidence and increased empathy with patients.
Luszczynska and Hayne (2009)	Evaluate the influence of the planning intervention on F&V intake, physical activity and BMI among student nurses and midwives	Time 1-health behaviours, body weight and height measured Education materials and planning forms received. Time 2–4 months after T1	Not clear – 'education materials and planning forms'	Self-report questionnaire; ANCOVA on F&V intake; physical activity and BMI; regression analysis on self-efficacy before and after intervention	Intervention had a medium effect (Cohen's $d = 0.51$) on fruit and veg consumption. BMI reduced in overweight and obese participants. Those with strong beliefs benefited from intervention compared to controls and those with low self-efficacy.
Reising et al. (2008)	Determine the effectiveness of service-learning education programmes and screening on community knowledge	Literature search, designed and implemented own education programme and presentation	Practical work	Likert scale and 2 open ended questions – descriptive statistics and content analysis	Overall positive experience. Students could see health promotion theory in action, develop a professional and civic sense of responsibility
Shin and Rew (2010)	Examine the issues encountered during nursing students' participation in three mentoring programmes to promote adolescent health	Health education course where students were taught about health promotion, health behaviours, theories related to health behaviour and strategies to design health promoting programmes	N/R	Content analysis of written records and memos	Personal satisfaction – developed self efficacy in teaching, improved leadership and communication skills, gained confidence in technical clinical skills; problem solving, critical thinking, decision making and interpersonal skills. Sense of reality to nursing and learned traits of a good role model and strategies in health promotion
Tarrant and Chan (2002)	Assess the effectiveness of a Health Promotion Project	Literature review, group problem solving, written proposal, presentation of project and a marked written assignment	Seminars, group work, written proposal, group presentation, assignment on health promotion	Analysis of student reflections within the assignment	Strengthened understanding of nursing role, increased confidence in health promotion, application of theory to practice, learned group skills and communication with agencies and institutions

N/R indicates that data were not reported.

to the poor methodologies of all studies, the effectiveness of the interventions could not be established.

Nursing students' feedback of the interventions tended to be positive. Comments generally indicated that students gained the ability to link theory with practice and developed confidence in communicating with others and with other institutions. However, content and duration of interventions, as well as who delivered the intervention, were inadequately reported, thus preventing other researchers replicating the studies. Another issue concerning replication and also transparency was that information was missing regarding the characteristics of participants. The number and age of participants was missing in two (25%) and four (50%) studies, respectively, whilst ethnicity was only reported in one study. Again, replication would be limited as it is difficult to establish who underwent the intervention and to draw conclusions about the reported findings, particularly regarding generalisability.

All studies had poor methodological rigour with only a quarter including both baseline and outcome measures, enabling the effects of the interventions to be assessed. Moreover, only one of these included a control group. The remaining seven studies did not contain any method to control for risk of bias. Consequently, it is impossible to draw conclusions about the effectiveness of the interventions as other factors that may have influenced the findings were not highlighted.

These findings provide evidence that obesity-related educational interventions may be being implemented into undergraduate nursing courses, yet their effectiveness cannot be established due to the poor reporting of the interventions and study methodology. These conclusions fit with previous research (Chisholm et al., 2012b; Cook et al., 2007). Chisholm et al.'s (2012b) systematic review of obesity training for undergraduate medics found that only four of the 12 studies reviewed had controlled for risk of bias, with none including a randomised controlled group. Similarly, participant characteristics and intervention content were generally underreported. Unlike the current review where studies were published across seven countries, studies on medical students were mainly published in the USA (75%), with none published in the UK (Chisholm et al., 2012b). This suggests that research on obesity management training is more globally delivered in undergraduate nursing education as opposed to undergraduate medical education which appears restricted to the USA. In the current study, quality appraisal highlighted unreliable study designs through poor methods of control such as lack of control groups. Additionally, studies lacked transparency around intervention content and limited reporting around participant characteristics, thus resulting in low methodological quality and difficulties associated with replication. Together the results indicate that the methodologies and evaluations of training in both undergraduate nurse and medical education are poor.

Importantly, these findings are also in line with other research highlighting that studies do not adequately report the specific details of the intervention they are assessing, thus preventing replication (Michie et al., 2011a). This was found in the current review, with BCTs being identified in just one study. The current study's review methods can be discussed with regard to the data extraction and quality appraisal forms used. These analytic tools were not standardised, but were developed alongside previously used standardised forms (Effective Public Health Practice Project, 1998; Public Health Resource Unit, 2006). They were developed in this way due to the methodological diversities of the included studies so that the most appropriate components of other standardised forms could be tailored to the aims of the present review. Additionally, it is worth noting that the lowest agreement amongst quality appraisal components was found to occur among the 'intervention structure' (69% agreement), whereas other components showed high agreement. This was discussed and resolved within the research team. It was concluded that poor reporting on behalf of authors resulted in details often being difficult to interpret, thus affecting the extraction of information regarding intervention structure.

A possible limitation of the current review is that relevant articles may have been missed due to the search strategy being limited to 'English; 1990–present' and only four databases being searched. Therefore, articles published before 1990 and in another language other than English that assessed the effectiveness of an obesity-related educational intervention in undergraduate nursing training will not have been included. Additionally, the grey literature was not examined. Therefore, it is advised that these findings should not be generalised beyond the parameters set within this review.

Implications

The current findings have several implications for future nursing education research. The studies reviewed indicate that nurses are highlighted as having an important role in health promotion, particularly with regard to weight management. However, it is clear that research needs to be improved in terms of their design assessments and reporting clarity before it can be understood how best to equip future nurses for this role.

Some studies found that implementing obesity as a topic into undergraduate nurse training increased student confidence and empathy towards obese patients, potentially becoming more comfortable in approaching the topic with patients in their future career. However, the literature is limited in quantity and quality and without more rigorously reported interventions and improved study designs the efficacy cannot be established.

A large literature exists of which behaviour change techniques (BCTs) are effective when used by healthcare professionals (Abraham and Michie, 2008; Michie et al., 2011b). Frameworks that collate the most effective techniques to facilitate behaviour change that are based on theory and evidence (e.g., Michie et al., 2011a; Dixon and Johnston, 2010) could be useful guides to designing the content of nurse training programmes to train nurses to help people change unhealthy behaviours (e.g., diet, exercise). Using such guides during the reporting of interventions would allow researchers to develop and report their educational interventions consistently and precisely which enables replication, comparison and integration of findings (Michie, 2008). In doing so, the most effective techniques regarding weight management in undergraduate nursing courses can be established. As a result, student nurses will begin to develop the appropriate knowledge base and skill set to deliver these interventions in their role as a qualified nurse.

Conclusion

To conclude, studies in this area of research are not methodologically robust, nor do they report adequate details of their assessed interventions. Consequently, replication cannot be achieved. Additionally, it is impossible to construct conclusions regarding what makes up effective interventions regarding weight management in undergraduate nursing training. Therefore, it is currently unknown to what extent nursing students are being prepared to tackle obesity within patients.

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Appendix A. Data extraction form

Data extraction undertaken by:

Author	Title	Study record number	Type of publication (journal, book, etc.)	Country in which study was conducted	Year of study

Date of data extraction:

1) **Study aim(s)** (state whether the aim is related explicitly or implicitly to obesity: see inclusion/exclusion criteria for specific guidance on this)

2) **Study design** (check appropriate)

2a) **Design features**

- Cross-sectional
- Longitudinal
- Included control group
- Included outcome measures
- Included baseline measures
- Between participants
- Within participants

2b) **Design labels**

- Randomised controlled trial
 - Includes participant randomisation to conditions*
 - Includes control and intervention group*
 - Includes baseline and outcome measures*
- Non-randomised controlled trial
 - No randomisation to allocate participants to conditions*
 - Includes control and intervention group*
 - Includes baseline and outcome measures*
- Before and after study
 - Includes intervention group only*
 - Includes baseline and outcome measures*
- Intervention study
 - Includes outcome measures*
 - No baseline measures*

Additional comments about design features and design labels to be written here:

3) **Participants**

3a) **Characteristics** (state 'unknown' if information is missing)

- Age range:
- Gender (%):
- Ethnicity (%):
- Total N (if reported, state any incidence of attrition):

3b) **Where a control group was included, what was N? What was N for intervention group?** (skip this section if not applicable or state 'unknown' if information is missing)

- Intervention: N =
- Control: N =

4) **Intervention content**

4a) **Health topics stated within the description of the intervention** (can relate implicitly or explicitly to obesity. For example, obesity on its own, obesity related conditions such as diabetes or health related behaviours such as exercise or dietary habits)

4b) **Theoretical basis of the intervention** (include theories that are explicitly described within the article; should be stated with reference to the intervention, can be described in the Introduction, Rationale, etc.)

4c) **State any behaviour-change techniques within the interventions directed at altering patients' behaviours**

5) **Intervention structure**

5a) **Methods undertaken in delivering the intervention** (check where appropriate or state 'unknown' if information is missing)

- Lectures:
- Seminars:
- Written report:
- Oral presentation:
- Practical work (e.g., workshops):

If other methods were used, state them here

5b) **What year of the undergraduate nursing degree was the intervention held?** (Be as specific as possible, e.g., Year 1, semester 2. If the information is missing state 'unknown')

5c) **How long was the intervention held for?** (state in hours, days, weeks etc or state 'unknown' where information is missing)

6) **Outcome data**

6a) **What methods were used for data collection?** (For example, questionnaires, exams, reflective diaries, etc.)

6b) **What analysis was used to determine the outcome of the data?** (State the tools used in the assessment of the data. If the description of analysis is not specific enough then state 'information missing'.)

6c) **If applicable, state which statistical analysis was used. Also, state what results were reported** (for example, confidence intervals, means, p statistic, etc.)

7) **Reported findings**

8) **Reported conclusions**

Appendix B. Quality appraisal form

Guidelines in completing this form are provided in a separate document. Please ensure guidelines are followed in order to gain high agreement between coders.

Assessment completed by:

Date completed:

Article reference:

1. Is the study design appropriate for the aim of the investigation?	Yes	No	Unsure
Additional comments:			
2. Is the content of the intervention adequately described and reported?	Yes	No	Unsure
Additional comments:			
3. Are the methods used clearly described and reported? (intervention implementation, data collection, analysis)	Yes	No	Unsure
Additional comments:			
4. Is the intervention implemented in an appropriate and useful way?	Yes	No	Unsure
Additional comments:			
5. Does the article explicitly describe a theoretical framework with reference to the intervention?	Yes	No	Unsure
Additional comments:			
6. Has the study controlled for risk of bias? (for example, control/comparison groups, confounding variables, baseline measures, randomisation of participants etc)	Yes	No	Unsure
Additional comments:			
7. Are the stated conclusions supported by the findings of the study?	Yes	No	Unsure
Additional comments:			
8. Do the findings suggest that undergraduate nurses' benefited from the intervention?	Yes	No	Unsure
Additional comments:			

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