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Obesity competencies for healthcare professionals: a scoping review

Kenneth Verboven[1], Camilla Wikström-Grotell[2], Susanna Lehtinen-Jacks[3], Mary E. Davis[4], Gráinne O'Donoghue[4], Pipsa P. A. Tuominen[5], Anouk Agten[6], Fiona Curran[4] and Caitriona Cunningham[4*]

Abstract

Background The Obesity Policy Engagement Network (OPEN)-EU manifesto, led by the European Association for the Study of Obesity (EASO), underscores the urgent need for enhanced, evidence-based education for healthcare professionals (HCPs) involved in obesity care. This scoping review aims to identify and profile relevant literature that reports on obesity-related competencies for HCPs and to synthesise identified competencies into obesity competency domains and subdomains to inform HCP education.

Methods A scoping review was conducted in accordance with the Joanna Briggs Institute and PRISMA guidelines, including a comprehensive search strategy targeting PubMed, CINAHL Plus and ERIC databases (2014–2024). Based on clear inclusion criteria, full-text articles which focused on obesity-related competencies in HCP education were identified. Thematic analysis of all reported competencies was conducted to generate obesity-related competency domains and subdomains.

Results Twenty-two studies were included in the scoping review (out of 1286 unique records resulting from database searches) with a diversity of HCP disciplines represented. Multiple obesity competencies were identified, spanning eleven key domains: Obesity Background, Clinical Assessment, Clinical Management, Evidence-Based Practice, Communication, Professionalism/ethical standards, Patient Centred Care, Advocacy/influencing, HCP Education, Public Health/Health promotion and Health Systems. The most frequently reported competencies fell within the domains of Clinical Assessment and Clinical Management.

Conclusion This scoping review identified and synthesised obesity related competencies from HCPs education and professionalisation literature into eleven key domains and related subdomains. These findings highlight the multifaceted nature of obesity management, postulating the usefulness of comprehensive, competency-based training for HCPs.

Keywords Competency, Obesity, Healthcare professional education, Learning outcomes

*Correspondence:
Caitriona Cunningham
caitriona.g.cunningham@ucd.ie
[1]Rehabilitation Research Center (REVAL), Faculty of Rehabilitation Sciences, Hasselt University, Hasselt, Belgium
[2]Graduate School and Research, Arcada University of Applied Sciences, Helsinki, Finland
[3]Division of Public Health Sciences, School of Health, Care and Social Welfare, Mälardalen University, Västerås, Sweden
[4]School of Public Health, Physiotherapy and Sports Science, University College Dublin, Dublin, Ireland
[5]School of Social Services and Health Care, Tampere University of Applied Sciences, Tampere, Finland
[6]U-RISE-UHasselt Research Group on Innovative and Society-Engaged Education, School for Educational Studies, Hasselt University, Hasselt, Belgium

Background

Obesity is one of the most serious global public health challenges of the 21st century (World Health Organization [1]). It affects one in six adults and one in eight children across EU countries. According to the WHO's projections, Europe is facing a major obesity crisis with many countries likely to see half of adults above the healthy weight limit, by 2030 [2]. As of June 2021, the European Commission officially classified obesity as a chronic disease [3] and the Obesity Policy Engagement Network (OPEN)-EU [4], led by the European Association for the Study of Obesity (EASO), identified improved education for healthcare professionals (HCPs) as a priority action to facilitate more effective and informed multidisciplinary care for people with obesity.

As obesity is increasingly acknowledged as a complex, multifactorial disease, with evolving opinions and strategies for prevention, diagnosis, treatment and management across the life span [5–7], HCP education must also evolve to reflect the latest evidence. However, many HCPs practicing today have received minimal obesity education or training [8] and what they have experienced is mostly based on an outdated, overly simplified understanding of obesity [9], which does not align with current scientific and clinical understanding. This, together with the lack of consensus relating to specific, scientifically accurate and appropriate language [10, 11] that should be used when communicating with people living with obesity, can leave HCPs feeling uncertain or uncomfortable discussing obesity with patients [12]. Delivery of high quality, evidence-based contemporary obesity healthcare warrants integration of comprehensive, up-to-date obesity education at entry and graduate level as well as in continuous professional development programmes for HCPs.

To design and implement effective, transformative HCP curricula, competency-based education (CBE) offers a framework that focuses on the desired performance characteristics and demonstrable proficiencies of HCPs [9, 13]. Although 'competence' has always been the implicit goal of more traditional educational frameworks, CBE makes this explicit by establishing observable and measurable performance metrics that learners must attain to be deemed competent [14]. CBE begins with a careful consideration of the competencies desired in the HCP workforce to address health care priorities. This establishes a shared understanding and use of concepts for education, assessment and regulation, a major benefit of CBE, playing a crucial role in fostering coherent, multidisciplinary healthcare provision for people living with obesity [9, 15]. While frameworks such as the 2019 Obesity Competencies for Medical Education by the Obesity Medicine Education Collaborative (OMEC) exist [16] or are recommended by the UK Obesity Care Competencies Working Group [17], it is important to consider what competencies might be required across other HCP disciplines and also to capture even more recent publications, given the rapidly evolving understanding of obesity as a complex, multifactorial disease. As an initial step in enhancing obesity-related education for HCPs across disciplines, a scoping review of the existing obesity competency literature is therefore proposed. Findings can be leveraged in the development of obesity competency frameworks which can be utilised by multiple HCP disciplines involved in obesity management. Individual disciplines may then consider if any additional discipline specific competencies are required to reflect the more unique elements of their scope of practice. Such a CBE approach may enhance obesity education and ultimately drive forward more cohesive, evidence-based multidisciplinary healthcare for people living with obesity. Therefore, the objectives of this scoping review are (1) to identify and profile relevant literature that reports on obesity-related competencies for HCPs, and (2) to synthesise and categorise reported identified obesity-related competencies into obesity competency domains for HCP education.

Methods

Design

A scoping review protocol was registered on the Open Science Framework: https://osf.io/2c3tn. The scoping review was guided by the framework developed by Arksey and O'Malley [18] and in accordance with the Joanna Briggs Institute guidelines for scoping reviews [19]. Results were reported according to the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) extension for Scoping Reviews [20].

Identifying the research question

The objectives of this scoping review were (1) to identify and profile relevant literature that reports on obesity related competencies for HCPs, and (2) to identify, summarise and categorise reported obesity-related competencies into obesity competency domains for HCP education. Aligned with the review's objectives, the primary research question was: 'What are the obesity related competencies for HCPs reported in the literature?'. Additionally, in line with the purpose of the current scoping review the following question was also proposed: 'What is the scale and profile of the research being conducted on obesity competencies in HCP education?'.

Identifying relevant studies

To ensure a comprehensive search of all relevant literature, PubMed, CINAHLplus and ERIC databases were searched from Jan 1st 2014 to May 22, 2024, using database specific search strings. A rigorous search strategy

was developed in collaboration with academic librarians (Mälardalen University, Sweden) and in accordance with the Peer Review of Electronic Search Strategies (PRESS) for systematic reviews [21]. The full search strategy for each database is available in Appendix Tables 1, 2 and 3, respectively. Electronic database searches were supplemented by cross-checking the reference list of included articles. All search results were saved to Covidence (Veritas Health Innovation, Melbourne, Australia), and the reference list was deduplicated. Additional duplications not identified by Covidence were removed manually during the screening process.

Study Selection - Screening process

A bank of reviewers from across all participating universities (KV, CC, SLJ, GOD, CW-G, AA, PPAT) met to ensure a shared understanding of review objectives, to discuss any varying interpretations of terminology that arose initially (e.g., understanding of term 'competencies') and to discuss and agree on inclusion/exclusion criteria. Since this was a scoping review, the emphasis was on using a broad approach, thereby ensuring that no potentially important competencies were excluded. Original research papers, regardless of study design, published in English and focused on competencies, related to obesity within the context of HCP education, were included. Non-original research, including scoping, systematic and narrative reviews, meta-analyses, protocol papers or case studies ($n = 8$), dissertations ($n = 2$) or commentary/reflection manuscripts ($n = 6$), were excluded (Fig. 1). Within Covidence, all potential records were reviewed independently by at least two reviewers throughout the process. Where discrepancies arose, the opinion of a third researcher was sought to reach consensus. Titles and abstracts were screened initially, followed by full text screening.

Data charting and collating

Data charting tables were developed to extract and record key data from the included papers, aligned with the research questions. A pilot charting of data from three papers was conducted and reviewed to ensure satisfactory and consistent data extraction methods among the data extraction team (MD, CC, KV). Data fields were further refined and the charting table was updated accordingly, followed by data extraction for included papers. Data extracted included information on author(s), year of publication, country of origin, stated purpose of study, study design, educational intervention (if applicable), study's target group and mechanism for assessment of learning outcome or competence (Table 1).

Summarising and reporting: identifying competency domains and subdomains

The scoping review generated an extensive list of competencies (Table 2 and further detailed in Appendix Table 4) and deduplication was first required. For data synthesis, an approach based on Braun and Clarke's method for qualitative thematic analysis was applied [41], with the following six steps: familiarisation with data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report. Then, initial codes for potential competency domains (themes) were generated (CC), followed by an independent data review and coding by a second researcher (MD). These researchers (MD, CC) then met to discuss themes, identify any discrepancies and reach consensus on the competency domains. Within domains, coding for subthemes was also conducted (MD, CC), resulting in the generation of competency subdomains listed in detail in Appendix Table 4. During the process, an additional reviewer (GOD) was co-opted as required to resolve any discrepancies and team consensus (KV, CC, SLJ, GOD, CW-G, AA, PPAT) was reached on the final competency domains and subdomains, which represent a synthesis of all competencies reported in the 22 included papers (Table 2).

Results

Study selection

A total of 1,657 records were identified from three databases (PubMed, CINAHL Plus, and ERIC). After deduplication ($n = 371$ duplicates), 1,286 titles and abstracts were screened, resulting in 143 full-text papers being assessed for eligibility. During full-text review, 121 papers were excluded, resulting in 22 papers for inclusion in the final review (Fig. 1) [42].

Profile of included studies

Table 1 presents a comprehensive synthesis of all included papers [12, 16, 17, 22–40], highlighting key differences and similarities across study designs, educational interventions (if applicable), target groups for education and mechanisms to assess learning outcome achievement or competency achievement. The studies were primarily conducted in the USA, Canada, United Kingdom and Australia, with the majority focusing on obesity-related HCP curricula in higher education institutions. Heterogeneity in the study designs was present among included studies, comprising pre-post education intervention evaluations (using sequential mixed-methods approaches in some papers) [12, 23, 26–29, 31, 32, 34, 37, 38, 40], (cluster) randomised controlled trials [25, 33], consensus-building approaches (including proposition papers for setting up frameworks) [16, 17, 22, 36], qualitative analyses [35, 39] and cross-sectional

Table 1 Summary of studies included in scoping review

Study Author, Year, Country	Stated Purpose of the study	Study Design	Education Intervention	Target Group	Mechanism for Assessment of Learning/Competence
Abraham Roshan et al. [22] 2023 Canada	To set out the process by which an updated set of competencies were developed for obesity education in medical education, that could be translated more broadly into other health professions	Development process for educational competencies in obesity care: ● Analysis of overall 2015 CanMEDS Competency Framework and medical program competencies at two Canadian institutions and cross-referenced them with the OMEC competencies to create a baseline set of key and enabling competencies ● Tailoring of competencies and creation of new competencies (if gap identified) ● Consensus reaching	not applicable	HCPs	not applicable
Ahuja et al. [23] 2023 USA	To describe the impact of an educational training session on paediatric weight management counselling	Post education Intervention evaluation	Educational intervention (pilot) including didactic lecture, peer-to-peer role-play, large-group faculty role-play, counselling demonstration	Medical students (undergraduate)	Self-assessment survey; Objective structured clinical examination
Alexander [24] 2020 USA	To describe public health nursing principles in the design and delivery of food literacy interventions among children and adolescents (school setting)	Report on university education intervention (cross-sectional)	Clinical Practicum - community schools as partners and includes student delivery of food literacy intervention + 3 credit university course	Nursing students (undergraduate)	Assessment of student learning: pass/no credit; reflective diaries; faculty assessment of competence using standardised tools
Allison et al. [25] 2023 USA	To evaluate online 'weight management for osteoarthritis' education training program	2 parallel arm, superiority randomized controlled trial	Online programme 'Weight Management for Osteoarthritis' (control group without education)	Physical therapists	Custom self-report questionnaire; Self-reported confidence; Self-perceived competence; Antifat attitudes questionnaire
Capehorn et al. [17] 2022 United Kingdom	To provide a framework of obesity care competencies for HCPs involved in specialist obesity care	UK Expert Working Group Consensus Approach	Not applicable	HCPs in obesity care	Not applicable
Cook et al. [26] 2021 USA	To improve knowledge and make students aware of the possibility of bias in their management of patients with obesity	Pre and post education intervention evaluation	Flipped classroom learning experience (including prereading) focused on educating students about the impacts and management of patients with obesity and bariatric surgery on pregnancy and reproductive health.	Medical students (undergraduate)	Workshop evaluation (questionnaire; Kirckpatrick 1); evaluation of knowledge (quizzes; Kirckpatrick 2)

Table 1 (continued)

Study Author, Year, Country	Stated Purpose of the study	Study Design	Education Intervention	Target Group	Mechanism for Assessment of Learning/Competence
Harris et al. [27] 2022 Canada	To evaluate HCP satisfaction with educational intervention; measure change in knowledge, competence, and performance following intervention, and to identify the remaining educational gaps	Post education intervention evaluation	Short, case-based, multidisciplinary web-based continuing medical education activities	HCPs	Moore expanded outcomes framework (levels 1–5), including self-assessed knowledge, competence and performance
Iachini et al. [28] 2016 USA	To evaluate the perceived impact of an Interprofessional education intervention on students' learning regarding roles/responsibilities and teams/teamwork	Sequential mixed-methods approach with pre and post education Intervention evaluation	Interprofessional educational course including: ● classes with explicit interprofessional education content ● service-learning sessions implementing childhood obesity prevention curriculum in interprofessional teams ● structured reflections	Undergraduate and graduate students from diverse academic programs including: exercise science, pharmacy, pre-medicine, political science, public health, social work	Self-reported surveys on: ● perceptions of teamwork competencies ● perceptions of the roles/responsibilities of other professionals in addressing childhood obesity Reflection assignments
Ingraham et al. [29] 2016 USA	To develop, implement and evaluate two curricula designed to improve providers' cultural competency and motivational interviewing skills to enhance their ability to provide high-quality care to lesbian and bisexual women of size	Pre and post education Intervention evaluation	Academic format training ● program focusing on training medical providers and frontline staff to be more culturally competent about issues affecting their patients with different sexual orientation Clinic format training ● didactic lecture on body size diversity ● motivational interviewing session	Practicing physicians, residents and medical students	Self-reported changes in knowledge and attitudes on lesbian and bisexual barriers; Subjective evaluation questions related to intention to change motivational interviewing skills
Katz et al. [30] 2022 Canada	1) To examine the knowledge and self-reported competence of final-year Canadian medical students in managing patients living with obesity;2) 3) To explore how management of patients living with obesity is currently taught within the Undergraduate medical curricula in Canada	Cross-sectional survey	Not applicable	Final year medical students, and undergraduate medical education Deans at English-speaking Canadian medical schools	Students' self-reported survey on ● knowledge ● competence in managing patients with obesity Deans' survey on ● course hours in curriculum ● teaching modalities ● specific course programmes
Khalafalla et al. [31] 2020 USA	To reframe the interprofessional Coaching, Health, and Movement Program with Students into an efficient, innovative nutrition and lifestyle training activity for interprofessional teams of healthcare students	Pre and post education Intervention evaluation	Interprofessional Coaching, Health, and Movement Program with Students (CHAMPS) including: ● readiness material prior to didactic sessions ● in-class assurance tests ● advanced application exercises (including discussions)	pharmacy students, dietetic students	Students' self-reported survey on ● knowledge & mentorship skills ● perceptions of healthy nutrition ● interprofessional collaborative competencies Interprofessional reflection worksheet (including thematic analysis)

Table 1 (continued)

Study Author, Year, Country	Stated Purpose of the study	Study Design	Education Intervention	Target Group	Mechanism for Assessment of Learning/Competence
Kushner et al. [16] 2019 USA	To describe the developmental process for the OMEC obesity focused competencies	Development process in three stages: ● review existing competencies ● consensus building ● external feedback	Not applicable	Undergraduate medical and graduate medical training for physicians (assistants) and nurse practitioners	Each competency (set of 32 across 6 domains) contains five descriptive measurement benchmarks for evaluator rating
Mainor et al. [32] 2014 USA	To evaluate the effect of an educational training program on competency self-assessment in public health practitioners	Pre and post education Intervention evaluation	Yearly 5-day in person course including: ● plenary lectures ● stories from the field ● skill-building application sessions ● networking roundtables Focus on competencies with low confidence and high need for training; yearly revised and selection of some (not all) competences	Public health practitioners working in obesity prevention (CPD)	Self-reported surveys on: ● confidence ● impact on professional work (completion of 3 objectives in clinical practice)
Ockene et al. [33] 2021 USA	To evaluate the effect of a multi-modal education intervention on effective weight management counseling	Cluster Randomized Controlled Trial with post education intervention evaluation	Multi-Modal Education, (3-year curriculum) including: ● an evidence-supported, competency-based web course (year 1) ● role-play exercise (year 1) ● web-patient encounter with feedback (year 2) ● enhanced internship working with individuals with obesity and trained mentors (year 3) Traditional educational program (control)	Undergraduate medical students (1st to 3rd year)	Weight management-specific Objective Structured Clinical Examination (case-based, blindly rated) Self-reported survey on ● perceived skills in performing 5 A's (ask, advise, assess, assist, arrange)
Okemah et al. [34] 2023 USA	To evaluate the effects on a web-based educational activity on knowledge, competence and self-reported performance related to patient education and medical treatment	Post education intervention	Free access to faculty-led, web-based multidisciplinary activity comprising: ● 3 short videos on the role of multidisciplinary HCP's in the management of individuals with T2DM and obesity	Endocrinologists (CPD)	Self-reported surveys on: ● knowledge ● competence (including self-reported and patient data-based performance)
Olson et al. [35] 2024 USA	To analyse the elective course reflections and identify themes about the course's value and areas to improve.	Qualitative descriptive study with thematic analysis	Multi-modal education intervention including: ● weekly synchronous virtual lectures ● journal club ● Q&A session with bariatric surgery patient representative ● shadowing session with obesity medicine physician ● shadowing session at a distance (intensive lifestyle/behavior programme) ● student presentations	Medical students (undergraduate to PhD level)	Qualitative thematic analysis of written feedback (anonymized reflection transcripts) following completion of elective course

Table 1 (continued)

Study Author, Year, Country	Stated Purpose of the study	Study Design	Education Intervention	Target Group	Mechanism for Assessment of Learning/Competence
Pannala et al. [36] 2020 USA	To provide a framework of core concepts and to suggest goals and modes for properly delivering obesity-related content for gastroenterology education programs	Practice guideline, proposing a framework	not applicable	Gastroenterology trainers & trainees	not applicable
Sanchez-Ramirez et al. [12] 2018 Canada	To evaluate the effect of an interprofessional education activity on professional skills, attitudes and perceived challenges toward obesity management	Pre and post education Intervention evaluation	Interprofessional educational activity (1-day) composed of: ● presentations ● workshops ● small group & individualised training sessions ● interdisciplinary round-table discussions	HCPs (CPD)	Self-reported surveys on ● perceived skills levels ● knowledge on interprofessional referral ● professional attitudes ● perceived challenges
Tenedero et al. [37] 2024 Canada	To explore factors impacting perceived comfort and competence in performing physical examinations	Sequential mixed-methods approach	Not applicable	Undergraduate medical students (> 1 year of training)	Self-reported questionnaire and focus groups on ● perceived comfort and competence of performing physical examinations of patients with obesity ● students' experiences and attitudes in conducting physical exams
Thang et al. [38] 2023 USA	To evaluate teaching kitchen curriculum impact on knowledge, attitudes and practical application	Descriptive curriculum development study with pre and post education intervention evaluation	Multimodal education intervention including: ● hands-on cooking/kitchen experience ● service-based learning where students need to cook for patients ● didactic sessions (lectures, self-study modules)	HCPs undergraduate and graduate students (medicine, dentistry, nursing)	Self-reported surveys on ● knowledge ● competence ● practices ● culinary skills
Thanh Le et al. [39] 2015 Australia	To survey learning experiences and perceived preparedness following regular educational program	Qualitative study using semistructured focus groups and grounded theory analysis	not applicable	Undergraduate radiography students	Thematic analyses of focus groups revealing key concepts affecting confidence and perceived preparedness for imaging individuals with obesity
Um et al. [40] 2016 Australia	To evaluate a competency-based weight management skills workshop	Pre and post education Intervention evaluation	In-person workshop focused on ● active and collaborative learning (group-based) ● video case-based learning ● group discussion ● hands-on experience ● patient-centered role play)	Undergraduate pharmacy students	Self-reported questionnaire on ● self-confidence ● attitudes ● knowledge Qualitative feedback

CanMeds Canadian Medical Education Directives for Specialists, *CPD* Continuing Professional Development, *HCPs* Healthcare professionals, *OMEC* Obesity Medicine Education Collaborative, *T2DM* Type 2 Diabetes Mellitus

studies [24, 30]. Four included papers proposed frameworks for competency development or provided practice guidelines without direct intervention [16, 17, 22, 36]. Of interest, two papers were more comprehensive with one being focused on reaching consensus on a required set of obesity competencies for medical and nursing professionals [16], and another one on adapting these to build a competency framework which would serve a broader range of HCPs [17]. While most studies [12, 23–29, 31–35, 38, 40] aimed to assess the impact of novel obesity-related education interventions on knowledge, competence and attitudes, others [30, 37, 39] mainly focused on exploring the learning experience and job preparedness. Content and modalities of education interventions (if any) were heterogeneous and included didactic lectures [23, 29, 32, 38], online modules [25, 27, 33–35, 40],

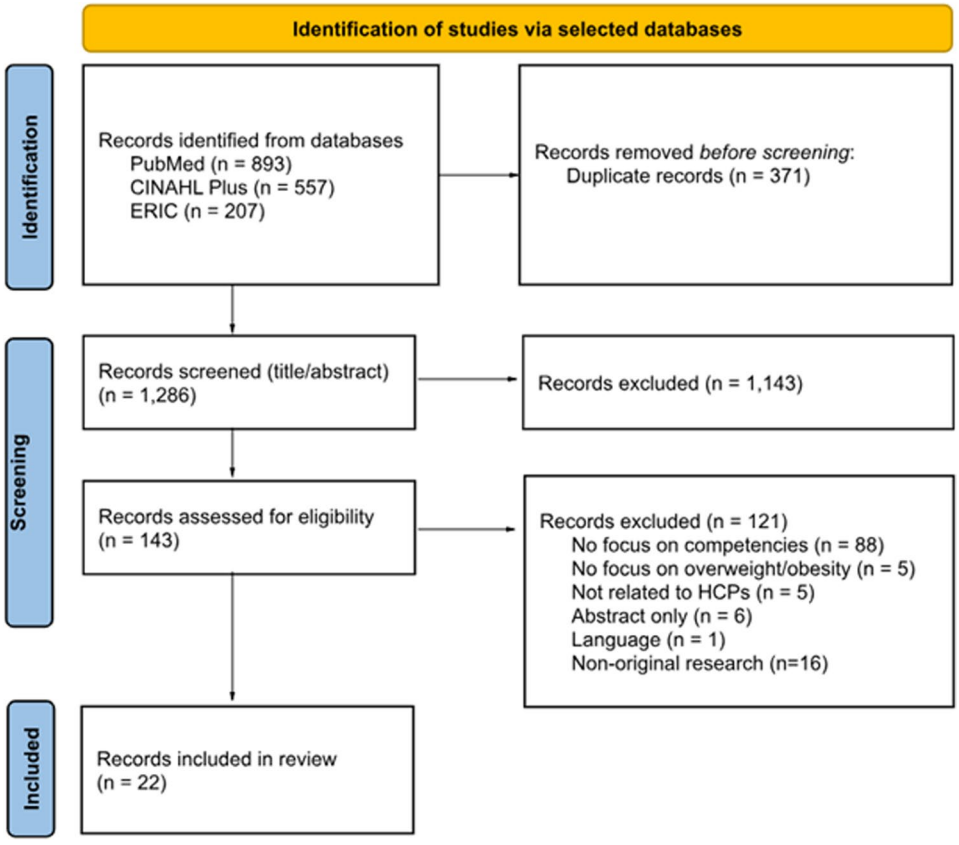

Fig. 1 PRISMA flow diagram for the literature search and resulting included studies
Non-original research, included scoping, systematic and narrative reviews, meta-analyses, protocol papers or case studies (*n*=8), dissertations (*n*=2) or commentary/reflection manuscripts (*n*=6)

flipped-classrooms [26], role-playing exercises [23, 33, 40], hands-on workshops [24, 29, 32, 33, 35, 38, 40] and interprofessional training programmes [12, 28, 31]. Target groups ranged from undergraduate/graduate HCP students [23, 24, 26, 28, 30, 31, 33, 35–40] to practicing HCPs (continuing professional development) [12, 16, 17, 22, 25, 27, 29, 32, 34, 36]. The cross-study variability in targeted HCPs, including physiotherapists [25], nurses [16, 24, 38], dietitians [31], pharmacists [28, 31, 40], radiographers [39] and physicians [16, 23, 26, 29, 30, 32–38], point toward the relevance of obesity-related competencies across disciplines. Reported mechanisms to evaluate learning outcome achievement or accomplishment of HCP competencies mainly comprised subjective measures (including self-reported assessments and reflection assignments) [12, 25, 27–32, 34, 35, 38, 40], while a minority of studies included objective measures (including structured clinical examinations; practical or theoretical exams) [24, 26] or both [23, 33]. The studies of Olson et al. [35] and Thanh Le et al. [39] used qualitative thematic analysis of written feedback or following focus groups, respectively (Table 1).

Competencies

Multiple obesity competencies were identified, spanning eleven key domains: Obesity Background, Clinical Assessment, Clinical Management, Evidence-Based Practice, Communication, Professionalism/ethical standards, Patient Centred Care, Advocacy/influencing Policy, HCP Education, Public Health/Health promotion and Health systems. Within these eleven domains, forty-one subdomains were identified and are also outlined in Table 2, and with details of all reported competencies in Appendix Table 4. The most frequently reported competencies fell within the domains of Clinical Assessment and Clinical Management, suggesting these are heavily emphasized domains in clinical education. Clinical assessment encompassed both physical and subjective assessment competencies, alongside diagnostics (e.g., selecting and interpreting appropriate laboratory tests). Assessing lifestyle behaviours and readiness for change were among the subjective assessment competencies. Other assessment competencies related to identification of risk factors and comorbidities. Physical assessment competencies included assessment of weight status (e.g., body mass index) and overall physical examination of the person living with obesity. Clinical Management

Table 2 Domains and subdomains of competencies in the included papers

Domains	Subdomains	Study references
Obesity background	Pathophysiology	[16, 17, 25, 31, 35, 36]
	Epidemiology	[16, 17, 25, 35, 36, 38]
	Obesity as Disease	[25, 38, 39]
	Comorbidities	[16, 17, 25, 27, 34]
	Medical Knowledge	[12, 16, 17, 25–27, 35, 36, 40]
	Weight bias/stigma	[25, 35, 38]
Clinical assessment	Diagnostics	[16, 17, 36, 38, 40]
	Physical assessment	[16, 17, 22, 25, 30, 31, 36, 37, 40]
	Subjective/History Taking	[12, 16, 17, 22, 23, 25, 30, 31, 33, 36, 40]
	Determine patient readiness for change	[16, 17, 30, 33, 36]
	Lifestyle behaviours assessment	[12, 30, 33, 40]
	Assessment of comorbidities	[25, 27, 30, 33, 36, 38, 40]
	Risk factor assessment	[25, 33, 40]
Clinical management	Clinical Reasoning	[12, 16, 17, 22, 25, 27, 30, 32, 36, 38, 40]
	Exercise/Physical Activity	[16, 17, 23, 25, 30, 32, 35, 36, 38, 40]
	Diet	[16, 17, 23, 25, 30, 32, 35, 36, 38, 40]
	Behaviour Change/Motivational interviewing	[16, 17, 23, 25, 29–31, 33, 38, 40]
	Pharmacotherapy	[16, 17, 25–27, 35, 36, 40]
	Surgery	[16, 17, 25, 26, 35, 36, 40]
	Patient Education	[16, 17, 25, 30, 33, 34, 38, 40]
	Managing Comorbidities	[16, 25, 27, 30, 34, 36]
	Interprofessional care	[12, 16, 17, 22, 24, 25, 30, 33, 36, 40]
Evidence-based practice	-	[16, 17, 22, 24, 25, 31, 32, 39]
Communication	Patient communication	[12, 16, 17, 23, 25, 33, 39]
	Communication with community/group	[24, 32]
	Communication with peers and other professionals	[16, 17, 24]
Professionalism/ethical standards	Clinician awareness of implicit attitudes/beliefs	[25, 26, 39]
	Professional/Ethical practice	[16, 17, 22, 24, 39]
	Reflection on practice/performance/knowledge	[16, 17, 24]
	Professional team working	[24, 28]
Patient Centred Care	Goal setting/Shared decision making	[16, 17, 22–25, 30, 32, 33]
	Empathetic or sensitive approach/understanding patient perspective	[16, 17, 23, 25, 29, 33, 35]
	Cultural competence	[16, 17, 24, 29]
	Personalised care/plans	[16, 17, 22, 27, 38, 40]
	Role of clinician to increase patient confidence/support self-management	[33, 40]
Advocacy/influencing policy	-	[16, 17, 22, 24, 32]
Healthcare professional education	Mentoring	[16, 17, 22, 29, 31]
	Practice-based learning/Continued learning	[22, 24, 39]
Public Health/Health promotion	Assessment of public communities' health/services	[12, 24, 29, 38]
	Disease Prevention/Health Promotion/Public Health strategies and initiatives	[16, 17, 24, 32]
Health Systems	Service development, implementation and enhancement	[12, 16, 17, 22, 24, 32, 36]
	Service economics	[16, 24]
	Information technology/eHealth	[16, 17]

encompassed nine subdomains (e.g., clinical reasoning, exercise/physical activity, diet, behaviour change/motivational interviewing, and patient education), with frequent mentions of interprofessional care to manage obesity and its comorbidities, reinforcing the need for multidisciplinary strategies (Table 2).

Other frequently reported competencies related to application of a wide range of background knowledge, ranging from understanding of obesity as a chronic disease, with related comorbidities, to determinants of obesity, staging of obesity and knowledge of lifestyle, pharmacological and surgical interventions, indicating a strong focus on foundation knowledge and stigma

awareness. Patient-centred care competencies (e.g., shared decision making, cultural competence) and those relating to professionalism were also to the foreground, suggesting a shift towards emphasising inclusive, empathetic care models. Due to the frequent mention of communication related competencies across papers, a dedicated communication domain was generated, with three subdomains; Clinician-patient communication, Communication with communities/group and Communication with peers and other professionals, reflecting a broader understanding of competence in communication, beyond patient interaction. Competencies in the public health domain primarily related to health promotion for disease prevention or community health surveillance. In the health systems domain, competencies included obesity service development and enhancement and incorporating information technology infrastructure and e-health tools (e.g. smartphone applications and wearable devices) into healthcare. Demonstrating an understanding of the costs of obesity was also a recognised competence in this domain, highlighting the need for understanding of the broader health system context. Several papers also referred to competence in advocacy for people living with obesity, including advocating for better health services and policies which are free of bias and stigma [17]. Additionally, being competent in providing and availing of HCP obesity education was recognised across a number of papers, with specific reference to competence in mentoring staff. Finally, evidence-based practice competencies were identified, as they related to obesity healthcare.

Discussion

This scoping review provides a comprehensive overview of papers published regarding HCP competencies for obesity prevention and management. The identified competencies have been classified and presented in competency domains and subdomains and will inform HCP curriculum developers, educators and professional organisations who seek to enhance HCP obesity education with the ultimate goal of impacting positively on healthcare for people at risk or living with obesity.

Papers included in the scoping review comprised a variety of study designs, with the majority set in higher education institutions and originating from a limited number of countries (UK, Canada, Australia, USA). Most papers included were published in the last five years, which likely reflects the recent and growing emphasis on the need for specific obesity education in HCP curricula across disciplines, as highlighted by the OPEN-EU priority action to promote enhanced multidisciplinary care for people with obesity [4]. Indeed, the multidisciplinary nature of obesity care was reflected in the current review, with multiple HCP disciplines represented (i.e. nursing, physiotherapy, dietetics, pharmacy, radiography and medicine). However, under-representation of some HCP disciplines across papers may have led to less emphasis on certain competencies, either shared or monodisciplinary. In this regard and despite their recognised role in evidence-based management of obesity [43], clinical psychologists were absent among the named disciplines in the included papers. Notwithstanding, many psychological approaches were evident amongst the identified competencies (e.g. application of behaviour change techniques, motivational interviewing), reflecting the broader appreciation of the need for such holistic approaches [44]. Nonetheless, the unique competencies of clinical psychologists, in evidence-based obesity care models, need to be reflected in competency frameworks, given the known complexity of the risk factors for obesity, its consequences and the challenges to its successful management. Physiotherapists were the named target group for education in one study only [25] and were the only named HCP discipline with specialist exercise expertise represented among the papers in this review. Exercise science students were among the target cohort in another study [28] with their levels of professional recognition and integration across international healthcare systems being inconsistent [45]. Competencies specifically related to paediatric practice were limited in number across the small number of papers that did refer to obesity in children [23, 24, 28, 37, 38], which is of concern given the high and rising prevalence of childhood obesity [2]. Additionally, approaches to paediatric versus adult obesity do differ in many regards requiring achievement of specific paediatric obesity competencies (e.g., anthropometric measures, communication with children, health promotion approaches etc.), which need to be articulated in a competency framework. HCP education needs to prepare graduates to be competent in weight management counselling, given the recognised ability of HCP to effectively change weight and cardiometabolic risk factors in children with obesity [46, 47]. Such education should go towards resolving known barriers like a lack of HCP confidence in discussing weight-related issues with family members and the fear of parental reactions [48].

The eleven competency domains (listed in Table 2) generated in this review are applicable to multiple chronic diseases, not solely obesity. While many of the reported competencies are potentially relevant across various diseases, some are specific to obesity (e.g. prescription of obesity medications, bariatric care, recognition of obesity bias and stigma). There was significant agreement in the competencies identified by differing HCP disciplines. As expected, greater divergence in competencies existed in the clinical assessment and management domains, which likely incorporate the more unique elements of each discipline's scope of practice. In contrast, competencies in

overarching domains, such as communication and professionalism, were generally more consistent across disciplines. Understanding how obesity-related competencies converge and diverge across disciplines will be key to ultimately guide curriculum content development that can serve multiple HCP disciplines, as well as in determining the specialized content required for individual disciplines. Moreover, decisions will need to address competencies for entry-level versus graduate programs in HCP education, as well as those competencies for specialist obesity services [17] versus non-specialist services.

Despite the similarity in identified competencies across papers, some of the included papers do not fully mirror the evolved understanding of obesity as a complex, formally recognised chronic disease [3], gaining traction in HCP communities only in very recent years. Whilst competencies specific to obesity bias and stigma were identified across a number of papers [16, 17, 25, 35], these were less prevalent than might be expected given the extent to which weight bias presence is acknowledged across various HCPs within healthcare [49]. As there is a growing body of evidence linking obesity stigma in healthcare with poor health outcomes [50, 51], the public health domain (including primary, secondary and tertiary prevention) may be best placed to address internal bias in healthcare [52], which reduces healthcare seeking behaviours in the people living with obesity. To facilitate demonstrable achievement by HCPs, competencies relating to bias and stigma will require more explicit articulation than being regarded as background knowledge [24] only, or being assumed as part of a person-centred approach or in relation to policy [17]. Indeed, confidence in knowledge does not necessarily equate to competence [53], consolidating the concept of competence not being a static achievement but requiring lifelong learning and professional development to keep up with evolving healthcare needs, technologies, and best practices [54]. Therefore, obesity competency frameworks for HCP education should reflect core aspects of modern obesity care, grounded in current evidence [5]. As highlighted by Batt et al. [55], such framework development should follow a systematic, theory-informed process. Their proposed six-step method includes defining the purposes and user audience, (e.g., single or multidisciplinary), considering real-world contexts, exploring current practices, identifying relevant competencies, reporting the development process and establishing a plan for future framework updates. Moreover, frameworks must navigate disparate scientific perspectives, such as the emerging diagnostic criteria debate [5, 7] to advance rather than impede educational progress and qualitative obesity care.

Incorporating competency-related content and assessment into educational programmes will require HCP educators to integrate complex knowledge of pathophysiology, pharmacotherapy, behavioural counselling and interdisciplinary care, among other competencies listed in Table 2. To achieve this, further discussion and synthesis by educators will be required across and within specific disciplines to establish agreed-upon competencies for the given context. The findings from this scoping review will inform the development of HCP competency frameworks aimed at guiding comprehensive, evidence-based and competency-driven HCP obesity education development. This work is already underway for the physiotherapy profession, being led by the current authors as part of the PROMINENCE obesity education for physiotherapy project [56]. Other disciplines have chosen and may choose to do similar. Alternatively, an increased emphasis on multidisciplinary frameworks or chronic disease frameworks with a disease-specific inclusion for obesity may be deemed more effective and efficient for educators with recognition of the competing demands on overall curriculum capacity. The implementation of competency-based obesity education content may be facilitated by structural, external support requiring that curricula include content relating to the major disease burdens on society, including but not limited to obesity. Embedding obesity-related CBE into professional accreditation and evaluation frameworks would help ensure educators and students recognise its importance, mandating them to address these obesity related competencies.

One of the major strengths of this review is that it has identified and synthesised published obesity competencies for many HCPs through a robust scoping review methodology. The search did not include a grey literature search, which may be of value in revealing additional important competencies for curriculum developers. Additionally, the search was limited to paper written in English. Any future competency framework development team will need to agree and articulate clear definitions for competencies, what constitutes their achievement and implement a consistent mechanism for presenting competencies within the framework.

Conclusion

This scoping review of published literature identified multiple obesity-related competencies for HCPs and synthesised these into domains. Some gaps in competencies exist in the context of current research and individual HCP disciplines will likely require additional competencies or rearticulation of existing competencies to align with their scope of practice. Findings from this review will inform HCP curriculum developers, professional HCP and obesity organisations wishing to develop both mono- and multidisciplinary competency frameworks and related curricula with a view to driving comprehensive, competency-based obesity education for HCPs.

Appendix

Table 3 Key words and Search Strategy for PubMed

	Search strings	Hits
Healthcare Professionals [1]	"nutritionist*"[Title/Abstract] OR "dietician*"[Title/Abstract] OR "physician*"[Title/Abstract] OR "general practitioner*"[Title/Abstract] OR "endocrinologist*"[Title/Abstract] OR "surgeon*"[Title/Abstract] OR "nurse*"[Title/Abstract] OR "physical therapist*"[Title/Abstract] OR "physiotherapist*"[Title/Abstract] OR "occupational therapist*"[Title/Abstract] OR "psychotherapist*"[Title/Abstract] OR "psychiatrist*"[Title/Abstract] OR "paramedic*"[Title/Abstract] OR "trainee*"[Title/Abstract] OR "undergraduate*"[Title/Abstract] OR "student*"[Title/Abstract] OR "clinical exercise physiologist*"[Title/Abstract] OR "Health Personnel"[Title/Abstract] OR "medical doctor*"[Title/Abstract] OR "Health care professional*"[Title/Abstract] OR "medical practitioner*"[Title/Abstract] OR "teacher*"[Title/Abstract] OR "supervisor*" [Title/Abstract] OR "lecturer*"[Title/Abstract] OR "educator*"[Title/Abstract] OR "Nutritionists"[MeSH Terms] OR "Physicians"[MeSH Terms: noexp] OR "general practitioners"[MeSH Terms] OR "endocrinologists"[MeSH Terms] OR "surgeons"[MeSH Terms] OR "nurses"[MeSH Terms] OR "Physical therapists"[MeSH Terms] OR "Occupational Therapists"[MeSH Terms] OR "Psychotherapists"[MeSH Terms] OR "Psychiatrists"[MeSH Terms] OR "paramedics"[MeSH Terms] OR "Students, Health occupations"[MeSH Terms] OR "Faculty"[MeSH Terms] OR "Universities"[MeSH Terms] OR "Educational Personnel"[MeSH Terms] OR "Health Educators"[MeSH Terms] OR "Health Personnel"[Mesh: NoExp]	1,776,770
Exposure [2]	"Education*"[Title/Abstract] OR "teaching"[Title/Abstract] OR "training"[Title/Abstract] OR "instruct*"[Title/Abstract] OR "learning"[Title/Abstract] OR "professional development"[Title/Abstract] OR "CPD"[Title/Abstract] OR "workshop*"[Title/Abstract] OR "literacy program*"[Title/Abstract] OR ("course*"[Title/Abstract] OR "Education"[MeSH Terms] OR "Learning"[Mesh])	3,236,893
	("Overnutrition"[MeSH Terms] OR "obesity"[Title/Abstract] OR "overweight"[Title/Abstract] OR "overnutrition"[Title/Abstract] OR "body composition"[Title/Abstract] OR "adiposity"[Title/Abstract])	496,129
Outcomes [3]	"Clinical Competence"[MeSH Terms] OR "Curriculum"[MeSH Terms] OR "curricul*"[Title/Abstract] OR "competenc*"[Title/Abstract] OR "capability*"[Title/Abstract] OR "skill*"[Title/Abstract]	668,182
Combined	[1] + [2] + [3]	1,555
Limits	Time (2014–2024)	
	Language (English)	
Total		893

Table 4 Key words and search strategy for ERIC

	Search strings	Hits
Health Care Professional [1]	(TI "nutritionist*" OR AB "nutritionist*") OR (TI "dietician*" OR AB "dietician*") OR (TI "physician*" OR AB "physician*") OR (TI "general practitioner*" OR AB "general practitioner*") OR (TI "endocrinologist*" OR AB "endocrinologist*") OR (TI "surgeon*" OR AB "surgeon*") OR (TI "nurse*" OR AB "nurse*") OR (TI "physical therapist*" OR AB "physical therapist*") OR (TI "physiotherapist*" OR AB "physiotherapist*") OR (TI "occupational therapist*" OR AB "occupational therapist*") OR (TI "psychotherapist*" OR AB "psychotherapist*") OR (TI "psychiatrist*" OR AB "psychiatrist*") OR (TI "paramedic*" OR AB "paramedic*") OR (TI "trainee*" OR AB "trainee*") OR (TI "undergraduate*" OR AB "undergraduate*") OR (TI "student*" OR AB "student*") OR (TI "clinical exercise physiologist*" OR AB "clinical exercise physiologist*") OR (TI "Health Personnel" OR AB "Health Personnel") OR (TI "medical doctor*" OR AB "medical doctor*") OR (TI "Health care professional*" OR AB "Health care professional*") OR (TI "medical practitioner*" OR AB "medical practitioner*") OR (TI "teacher*" OR AB "teacher*") OR (TI "supervisor*" OR AB "supervisor*") OR (TI "lecturer*" OR AB "lecturer*") OR (TI "educator*" OR AB "educator*") OR (DE "Health Personnel") OR (DE "Allied Health Personnel") OR (DE "Physicians") OR (DE "Nurses") OR (DE "School Nurses") OR (DE "School Health Services") OR (DE "Physical Therapy") OR (DE "Occupational Therapy") OR (DE Psychotherapy") OR (DE "Psychiatry") OR (DE "Premedical Students") OR (DE "Undergraduate Students") OR (DE "College Students") OR (DE "Nursing Students") OR (DE "Teachers") OR (DE "Faculty") OR (DE "Medical School Faculty") OR (DE "Graduate School Faculty") OR (DE "Collage Faculty") OR (DE "Universities") OR (DE "Colleges") OR (DE "Higher Education")	1,256,212

Table 4 Key words and search strategy for ERIC

	Search strings	Hits
Exposure [2]	(TI "Education*" OR AB "Education*") OR (TI "teaching*" OR AB "teaching*") OR (TI "training*" OR AB "training*") OR (TI "instruct*" OR AB "instruct*") OR (TI "learning*" OR AB "learning*") OR (TI "professional development" OR AB "professional development") OR (TI "CPD" OR AB "CPD") OR (TI "workshop*" OR AB "workshop*") OR (TI "literacy program*" OR AB "literacy program*") OR (TI "course*" OR AB "course*") OR (DE "Education") OR (DE "Academic Education") OR(DE "Adult Education") OR (DE "Allied Health Occupations education") OR (DE "Clinical Teaching (Health Professions)") OR (DE "Health Education") OR (DE "Medical Education") OR (DE "Graduate Medical Education") OR (DE "Adult Vocational Education") OR (DE "Professional Continuing Education") OR (DE "Continuing Education") OR (DE "Nursing Education") OR (DE "Professional Education") OR (DE "Learning") OR (DE "Adult Development") OR (DE "Continuing Education Units") OR (DE "Lifelong Learning") OR (DE "Continuing Education Centers") OR (DE "Professional Education") OR (DE "Faculty Development") OR (DE "Professional Development")	1,283,206
	(TI "obesity" OR AB "obesity") OR (TI "overweight" OR AB "overweight") OR (TI "overnutrition" OR AB "overnutrition") OR (TI "body composition" OR AB "body composition") OR (TI "adiposity" OR AB "adiposity") OR (DE "Obesity") OR (DE "Body Weight") OR (DE "Body Composition")	6,820
Outcomes [3]	(TI "curricul*" OR AB "curricul*") OR (TI "competenc*" OR AB "competenc*") OR (TI "capability*" OR AB "capability*") OR (TI "skill*" OR AB "skill*") OR (DE "Clinical Experience") OR (DE "Curriculum") OR (DE "Competence") OR (DE "Achievement") OR (DE "Skills") OR (DE "Expertise")	447,823
Combined	[1] + [2] + [3]	472
Limits	Time (2014-2024)	
	Language (English)	
Total		207

Table 5 Key words and search strategy for CINAHL Plus

	Search strings	Hits
Health Care Professional [1]	(TI "nutritionist*" OR AB "nutritionist*") OR (TI "dietician*" OR AB "dietician*") OR (TI "physician*" OR AB "physician*") OR (TI "general practitioner*" OR AB "general practitioner*") OR (TI "endocrinologist*" OR AB "endocrinologist*") OR (TI "surgeon*" OR AB "surgeon*") OR (TI "nurse*" OR AB "nurse*") OR (TI "physical therapist*" OR AB "physical therapist*") OR (TI "physiotherapist*" OR AB "physiotherapist*") OR (TI "occupational therapist*" OR AB "occupational therapist*") OR (TI "psychotherapist*" OR AB "psychotherapist*") OR (TI "psychiatrist*" OR AB "psychiatrist*") OR (TI "paramedic*" OR AB "paramedic*") OR (TI "trainee*" OR AB "trainee*") OR (TI "undergraduate*" OR AB "undergraduate*") OR (TI "student*" OR AB "student*") OR (TI "clinical exercise physiologist*" OR AB "clinical exercise physiologist*") OR (TI "Health Personnel" OR AB "Health Personnel") OR (TI "medical doctor*" OR AB "medical doctor*") OR (TI "Health care professional*" OR AB "Health care professional*") OR (TI "medical practitioner*" OR AB "medical practitioner*") OR (TI "teacher*" OR AB "teacher*") OR (TI "supervisor*" OR AB "supervisor*") OR (TI "lecturer*" OR AB "lecturer*") OR (TI "educator*" OR AB "educator*") OR (MH "Nutritionists") OR (MH "Physicians") OR (MH "Physicians, Family") OR (MH "Endocrinologists") OR (MH "Surgeons") OR (MH "Nurses+") OR (MH "Physical Therapists+") OR (MH "Occupational Therapists+") OR (MH "Psychotherapists+") OR (MH "Psychiatrists") OR (MH "Paramedics") OR (MH "Students, Health Occupations+") OR (MH "Faculty+") OR (MH "Colleges and Universities+") OR (MH "Health Educators+") OR (MH "Health Personnel") OR (MH "Teachers")	1,150,469
Exposure [2]	(TI "Education*" OR AB "Education*") OR (TI "teaching*" OR AB "teaching*") OR (TI "training*" OR AB "training*") OR (TI "instruct*" OR AB "instruct*") OR (TI "learning*" OR AB "learning*") OR (TI "professional development" OR AB "professional development") OR (TI "CPD" OR AB "CPD") OR (TI "workshop*" OR AB "workshop*") OR (TI "literacy program*" OR AB "literacy program*") OR (TI "course*" OR AB "course*") OR (MH "Education+") OR (MH "Learning+)	1,614,615
	(TI "obesity" OR AB "obesity") OR (TI "overweight" OR AB "overweight") OR (TI "overnutrition" OR AB "overnutrition") OR (TI "body composition" OR AB "body composition") OR (TI "adiposity" OR AB "adiposity") OR (MH "Overnutrition") OR (MH "Obesity+") OR (MH "Body Composition+")	182,287
Outcomes [3]	(TI "curricul*" OR AB "curricul*") OR (TI "competenc*" OR AB "competenc*") OR (TI "capability*" OR AB "capability*") OR (TI "skill*" OR AB "skill*") OR (MH "Clinical Competence+") OR (MH "Curriculum+")	285,331

Table 5 Key words and search strategy for CINAHL Plus

	Search strings	Hits
Combined	[1] + [2] + [3]	930
Limits	Time (2014-2024)	
	Language (English)	
Total		557

Table 6 Competencies in included papers

Ref.	Study	Domain	Subdomains
[22]	Abraham Roshan et al. 2023		
	Apply medical knowledge and professional values to the provision of patient centered obesity care	Patient centred care	Personalised care/plans
		Professionalism/Ethical Standards	Professional/Ethical practice
	Perform and document a comprehensive, obesity-focused, patient-centered clinical assessment	Clinical assessment	Physical Assessment Subjective/History taking
	Co-construct a comprehensive, obesity-focused management plan with the patient and family	Patient centred care	Goal setting/Shared decision making
	Establish personalized relationships with patients with obesity and their families	Patient centred care	Personalised care/plans
	Collaborate effectively with other colleagues and trainees in the health professions to provide care for patients with obesity	Clinical management	Interprofessional care
	Contribute to the improvement of obesity care delivery in teams, organizations and systems	Health systems	Service development, implementation and enhancement
	Respond to the individual needs of a patient with obesity by advocating with the patient within the clinical environment and beyond	Advocacy/Influencing policy	
	Respond to the needs of the patient population living with obesity by advocating collaboratively for system-level change	Advocacy/Influencing policy	
	Engage in ongoing learning to enhance obesity care to patients	HCP education	Practice-based learning/Continued learning
	Teach junior and senior colleagues, and colleagues in the health care professions around obesity care	HCP education	Mentoring
	Integrate best available evidence on obesity care into clinical practice	Evidence based practice	
	Demonstrate a commitment to patients by applying best practices of obesity care to all clinical setting and adhering to high ethical standards	Professionalism/Ethical Standards Evidence based practice	Professional/Ethical practice
[23]	Ahuja *et al.* 2023		
	Weight management counselling: Respond to feelings of negativity associated with unhealthy weight by reframing it in a more positive way,	Clinical assessment	Subjective/History taking
	Weight management counselling: Ask permission to explain the growth chart,	Clinical assessment	Subjective/History taking
	Weight management counselling: Gather the complete details of what you consume in a typical day/within the last 24 hours? (meal details, fluids, snacks).	Clinical assessment	Subjective/History taking
	Communication skills: Use the skills of empathy in relation to an expressed or potential feeling/emotion;	Communication Patient centred care	Patient communication Empathetic or sensitive approach/understanding patient perspective
	Communication skills: Initiate the teaching conversation by asking an open-ended question regarding tests, treatments, diagnosis, or lifestyle;	Communication	Patient communication
	Communication skills: Was the discussion about the diagnosis/plan a dialogue between doctor and patient as opposed to a lecture	Communication Patient centred care	Patient communication Goal setting/Shared decision making
	Brief Action Planning: Ask if there is anything the patient would like to do for their health/nutrition/lifestyle in the next week or two/or near future?	Clinical management Patient centred care	Behaviour change/Motivational interviewing Diet Exercise/PA Goal setting/Shared decision making

Table 6 Competencies in included papers

Ref.	Study	Domain	Subdomains
	Brief Action Planning: Help you to create a specific plan?	Patient centred care	Goal setting/Shared decision making
	Brief Action Planning: Ask your confidence level regarding your ideas/plans?	Patient centred care	Goal setting/Shared decision making
	Brief Action Planning: Ask you for permission to check in at a later date?	Patient centred care	Goal setting/Shared decision making
[24]	Alexander et al. 2020		
	Assessment and Analytical Skills: Assess health status, health literacy, and health determinants of the school community	Public Health/ Health promotion	Assessment of public communities' health/ services
	Assessment and Analytical Skills: Use epidemiological data and ecological perspective	Public Health/ Health promotion	Assessment of public communities' health/ services
	Assessment and Analytical Skills: Collect valid, reliable qualitative and quantitative data	Public Health/ Health promotion	Assessment of public communities' health/ services
	Assessment and Analytical Skills: Interpret data, making clear comparisons	Public Health/ Health promotion	Assessment of public communities' health/ services
	Assessment and Analytical Skills: Contribute to comprehensive school community health assessment	Public Health/ Health promotion	Assessment of public communities' health/ services
	Assessment and Analytical Skills: Apply ethical/legal principles for data use	Public Health/ Health promotion	Assessment of public communities' health/ services
	Assessment and Analytical Skills: Use evidence-based strategies to promote health in the school community	Evidence Based practice	
		Public Health/ Health promotion	Disease Prevention/ Health Promotion/ Public Health strategies and initiatives
	Policy Development/ Programme planning skills: Identify local, state, and national policy issues relevant to the health of the school community	Advocacy/Influencing policy	
		Public Health/ Health promotion	Assessment of public communities' health/ services
	Policy Development/ Programme planning skills: Provide information that will inform policy decisions	Advocacy/Influencing policy	
	Policy Development/ Programme planning skills: Implement programs based on policy decisions	Health systems	Service development, implementation and enhancement
	Policy Development/ Programme planning skills: Use organizational strategic plans and decision-making methods to develop program goals and objectives	Health systems	Service development, implementation and enhancement
	Policy Development/ Programme planning skills: Function as a team member in planning while complying with relevant policies and guidelines	Health systems	Service development, implementation and enhancement
	Policy Development/ Programme planning skills: Use program planning skills and participatory methods to engage the school community in decision-making	Patient centred care	Goal setting/Shared decision making
	Policy Development/ Programme planning skills: Apply methods to access public health information for the school community	Public Health/ Health promotion	Assessment of public communities' health/ services
	Communication skills: Apply critical thinking and cultural awareness to all communication modes	Patient centred care	Cultural competence
		Communication	Communication with communities/group
	Communication skills: Use input from the school community for program planning	Patient centred care	Goal setting/Shared decision making
	Communication skills: Use varied methods to provide public health information to the school community	Public Health/ Health promotion	Disease Prevention/ Health Promotion/ Public Health strategies and initiatives
	Communication skills: Create a presentation of targeted health information	Public Health/ Health promotion	Disease Prevention/ Health Promotion/ Public Health strategies and initiatives
	Communication skills: Communicate information to multiple audiences	Public Health/ Health promotion	Disease Prevention/ Health Promotion/ Public Health strategies and initiatives
		Communication	Communication with communities/group

Table 6 Competencies in included papers

Ref.	Study	Domain	Subdomains
	Communication skills: Apply communication techniques, including conflict resolution, in all peer and team interactions	Communication	Communication with peers and other professionals
	Cultural competency skills: Use determinants of health effectively when working with diverse members of the school community	Patient centred care	Cultural competence
		Evidence based practice	
	Cultural competency skills: Use data and evidence to understand the impact of determinants of health on the members of the school community	Patient centred care	Cultural competence
		Public Health/ Health promotion	Assessment of public communities' health/ services
	Cultural competency skills: Deliver culturally responsive public health nursing services within the school community	Patient centred care	Cultural competence
		Health Systems	Service development, implementation and enhancement
	Cultural competency skills: Demonstrate the use of evidence-based cultural models when providing services within the school community	Patient centred care	Cultural competence
		Evidence based practice	
		Health systems	Service development, implementation and enhancement
	Community dimensions of practice skills Use assessment data, develop plans, implement, and evaluate interventions in the school community	Health systems	Service development, implementation and enhancement
	Community dimensions of practice skills Assist the school community to identify resources in the local community to improve health outcomes	Health systems	Service development, implementation and enhancement
		Public Health/ Health promotion	Disease Prevention/ Health Promotion/ Public Health strategies and initiatives
	Community dimensions of practice skills Function effectively with key stakeholders to address public health issues impacting the school community	Advocacy/Influencing policy	
		Public Health/ Health promotion	Disease Prevention/ Health Promotion/ Public Health strategies and initiatives
	Community dimensions of practice skills Use community assets and cross-sectoral resources to promote the health of the school community	Health systems	Service development, implementation and enhancement
		Public Health/ Health promotion	Disease Prevention/ Health Promotion/ Public Health strategies and initiatives
	Community dimensions of practice skills Interview subgroups of the school community to identify preferences, and incorporate into intervention planning	Patient centred care	Goal setting/Shared decision making
		Health systems	Service development, implementation and enhancement
	Public health sciences skills: Use determinants of health and evidence-based practices from public health and nursing science to promote health in the school community	Evidence based practice	
		Health Systems	Service development, implementation and enhancement
		Public Health/ Health promotion	Disease Prevention/ Health Promotion/ Public Health strategies and initiatives
	Public health sciences skills: Determine the relationship between access to food and health in the school community	Public Health/ Health promotion	Assessment of public communities' health/ services
	Public health sciences skills: Use a wide variety of sources/methods to access public health information	Public Health/ Health promotion	Assessment of public communities' health/ services
	Public health sciences skills: Use research to inform public health nursing practice in the school setting	Evidence based practice	
	Public health sciences skills: Demonstrate compliance with guidelines to assure privacy and confidentiality for all members of school community	Professionalism/ethical standards	Professional/Ethical practice
	Financial planning, Evaluation, and Management skills: Implement operational procedures for public health programs in the school community	Health Systems	Service development, implementation and enhancement
	Financial planning, Evaluation, and Management skills: Select data for inclusion in the health promotion program budget in the school community	Health systems	Service economics

Table 6 Competencies in included papers

Ref.	Study	Domain	Subdomains
	Financial planning, Evaluation, and Management skills: Explain PHN services and program needs to inform budget priorities	Health systems	Service economics
	Financial planning, Evaluation, and Management skills: Identify data to evaluate PHN services and programs in the school community	Health systems	Service development, implementation and enhancement
	Financial planning, Evaluation, and Management skills: Contribute to the evaluation plan for PHN services and programs in the school community	Health systems	Service development, implementation and enhancement
	Financial planning, Evaluation, and Management skills: Provide input into the fiscal and narrative components of proposals to secure funding for programs in the school community	Health systems	Service economics
	Financial planning, Evaluation, and Management skills: Use self-reflection to identify one's performance of PHN skills (clinical evaluation tools)	Professionalism/ethical standards	Reflection on practice/performance/knowledge
	Financial planning, Evaluation, and Management skills: List contributions to overall team performance	Professionalism/ethical standards	Professional team working
	Leadership and systems thinking skills: Demonstrate ethical standards of practice as the basis of all interactions within the team and the school community	Professionalism/ethical standards	Professional/Ethical practice
	Leadership and systems thinking skills: Apply systems thinking in PHN practice in the school setting	Health systems	Service development, implementation and enhancement
	Leadership and systems thinking skills: Participate in stakeholder meetings to identify a shared vision, values, and principles for community action	Patient centred care	Goal setting/Shared decision making
	Leadership and systems thinking skills: Identify opportunities for interprofessional collaboration to improve the health of the school community	Clinical management	Interprofessional care
	Leadership and systems thinking skills: Use learning opportunities for personal and professional development as a PHN.	HCP Education	Practice-based learning/Continued learning
	Leadership and systems thinking skills: Interpret organization dynamics within the school and collaborating agencies	Health systems	Service development, implementation and enhancement
	Leadership and systems thinking skills: Influence health as a shared value through engagement with the school community and inclusion of all members	Patient centred care	Goal setting/Shared decision making
[25]	Allison et al. 2023		
	Describe the relationship between overweight and obesity and the development, progression, and symptoms of OA	Obesity Background	Pathophysiology, Comorbidities
	Explain the potential mechanisms by which overweight and obesity can influence the OA disease process and illness experience	Obesity Background	Pathophysiology, Comorbidities
	Explain the benefits of weight loss for people with knee OA who have overweight or obesity	Obesity Background	Comorbidities
	Define obesity class and anthropometric weight classifications and outline their limitations	Obesity Background	Obesity as a disease
	Describe obesity staging classification	Obesity Background	Obesity as a disease

Table 6 Competencies in included papers

Ref.	Study	Domain	Subdomains
	Outline the epidemiology of obesity in Australia and worldwide	Obesity Background:	Epidemiology
	List the complications of overweight and obesity	Obesity Background	Comorbidities
	The biological and physiological processes by which body weight is regulated	Obesity Background	Pathophysiology
	Explain the body's physiological compensatory (to a patient) response to weight loss and why achievement and maintenance of weight loss are difficult	Obesity Background	Pathophysiology,
	Outline factors influencing weight gain	Obesity Background	Pathophysiology
	Explain what weight stigma is, its pervasiveness in health care, and its causes	Obesity Background	Weight bias/stigma
	Describe the impact of weight stigma on individuals and engagement with health care	Obesity Background	Weight bias/stigma
	Recognize the broad array of extrinsic factors outside an individual's control (social and environmental influences) that contribute to overweight and obesity	Obesity Background	Obesity as a disease
	Provide examples of how patients who are overweight or have obesity may feel in a clinical setting	Patient centred care	Empathetic or sensitive approach/understanding patient perspective
	Identify their personal attitudes and behaviors related to overweight and obesity in clinical practice and how clinicians' beliefs about weight influence their discussions and interactions with patients about weight loss	Professionalism/ethical standards	Clinician awareness of implicit attitudes/beliefs
	Provide an environment or safe space to minimize patient discomfort when discussing weight	Communication	Patient communication
		Patient centred care	Empathetic or sensitive approach/understanding patient perspective
	Explain and implement the Five A steps approach for addressing overweight or obesity in a clinical setting	Clinical management	Behaviour change/Motivational interviewing
		Clinical assessment	Subjective/History Taking Physical assessment Risk factor assessment Assessment of comorbidities
	Demonstrate different ways to sensitively raise the topic of weight with a patient and communicate with patients about weight without compromising rapport or patient engagement with treatment	Patient centred care	Empathetic or sensitive approach/understanding patient perspective
		Communication	Patient communication
	Explain the important elements of the assessment of overweight or obesity in a physiotherapy setting	Clinical assessment	Physical assessment
	Outline topic areas that may be relevant for discussion with patients when addressing weight management	Clinical management	Patient education
		Obesity background	Medical knowledge
	Outline potential indications for referral for medical, dietetic, and psychological evaluation and support for people with overweight and obesity	Clinical management	Interprofessional care, Clinical reasoning
		Obesity background	Medical knowledge
		Evidence based practice	
	Outline the components of treatment of overweight and obesity	Obesity background	Medical knowledge
	Summarize healthy eating recommendations	Clinical management	Diet
		Obesity background	Medical knowledge
	Describe the different types of diets (including hypocaloric diets) for weight loss and supporting evidence	Clinical management	Diet
		Obesity background	Medical knowledge
	Explain the role of physical activity and exercise in weight management and treatment of knee OA (including the role of aerobic exercise in weight loss and weight maintenance)	Clinical management	Exercise/PA, Managing comorbidities
		Obesity background	Medical knowledge

Table 6 Competencies in included papers

Ref.	Study	Domain	Subdomains
	Outline the role of pharmacotherapy and bariatric surgery in the management of obesity	Clinical management Obesity background	Pharmacotherapy-Surgery Medical knowledge
	Engage in a discussion with patients about dietary intervention and referral options for weight loss	Clinical management Patient centred care	Diet Interprofessional care Goal setting/Shared decision making
	Outline the elements of quality care for chronic musculoskeletal disease management	Obesity background	Medical knowledge, Comorbidities
	Describe the determinants of behavior and health behavior change	Obesity Background	Medical knowledge
	Outline the role of self-efficacy in behavior change	Obesity Background	Medical knowledge
	Identify common barriers and facilitators to engaging with weight management interventions	Obesity Background	Obesity as a disease
	Describe appropriate behavior change techniques to support weight management	Clinical management	Behaviour change/ Motivational interviewing
	Explain the principles of motivational interviewing and how it can be applied to weight management	Clinical management	Behaviour change/ Motivational interviewing
	Codevelop with patients appropriate weight loss goals and tailored and appropriate strategies to overcome barriers related to weight management	Patient centred care	Goal setting/Shared decision making
[17]	Capehorn et al. 2022		
	Obesity knowledge: Demonstrates knowledge of obesity epidemiology	Obesity Background	Epidemiology
	Obesity knowledge: Demonstrates knowledge of energy homeostasis and weight regulation	Obesity Background	Pathophysiology
	Obesity knowledge: Demonstrates knowledge of anthropometric (body composition) measurements and clinical assessments of energy intake and expenditure	Obesity Background	Medical knowledge
	Obesity knowledge: Demonstrates knowledge of aetiologies, mechanisms, and biology of obesity	Obesity Background	Pathophysiology
	Obesity knowledge: Demonstrates knowledge of obesity-related comorbidities and corresponding benefits of body weight reduction	Obesity Background	Medical knowledge Comorbidities
	Obesity knowledge: Demonstrates knowledge of emerging treatment modalities in the treatment of obesity	Obesity Background	Medical knowledge
	Patient care and procedural skills: Elicits comprehensive obesity-focused medical, social and wellbeing history	Clinical assessment	Subjective/History taking
	Patient care and procedural skills: Performs and documents comprehensive physical examination for the assessment of obesity	Clinical assessment	Physical assessment
	Patient care and procedural skills: Uses evidence and applies clinical reasoning skills when ordering and interpreting appropriate biochemistry and diagnostic tests during the evaluation of patients with obesity	Clinical assessment	Diagnostics
	Patient care and procedural skills: Recognises emergent obesity-related complications and responds appropriately on the basis of their scope of practice	Clinical management Evidence based practice	Clinical reasoning

Table 6 Competencies in included papers

Ref.	Study	Domain	Subdomains
	Patient care and procedural skills: Utilises evidence-based models of health behaviour change to assess patients' readiness to change in order to effectively counsel patients for weight management	Clinical management	Behaviour Change/ Motivational interviewing
		Clinical assessment	Determine patient readiness for change
	Patient care and procedural skills: Uses patient-centric techniques to engage patients and their support systems (e.g. family and friends) in shared decision-making by incorporating their values and preferences in the development of a comprehensive, personalised obesity management care plan	Patient centred care	Goal setting/Shared decision making
	Patient care and procedural skills: Applies knowledge of the principles of primary, secondary, and tertiary prevention of obesity to the development of a comprehensive, personalised care plan for patients with overweight or obesity	Patient centred care	Goal setting/Shared decision making
		Evidence based practice	
		Obesity Background	Medical knowledge
	Patient care and procedural skills: Applies knowledge of obesity treatment guidelines to develop a comprehensive, personalised obesity management care plan and/or provides personalised obesity treatment within their scope of practice	Patient centred care	Personalised care/ plans
		Evidence based practice	
		Obesity Background	Medical knowledge
	Patient care and procedural skills: Applies knowledge of nutrition interventions to develop a comprehensive, personalised obesity management care plan and/or provide personalised obesity treatment within their scope of practice	Clinical management	Diet
		Evidence based practice	
		Patient centred care	Personalised care/ plans
	Patient care and procedural skills: Applies knowledge of using physical activity interventions to develop a comprehensive, personalised obesity management care plan and/or provide personalised obesity treatment within their scope of practice	Clinical management	Exercise/PA
		Evidence based practice	
		Patient centred care	Personalised care/ plans
	Patient care and procedural skills: Applies knowledge of using behavioural interventions to develop a comprehensive, personalised obesity management care plan and/or provide personalised obesity treatment within their scope of practice	Clinical management	Behaviour Change/ Motivational interviewing
		Evidence based practice	
		Patient centred care	Personalised care/ plans
	Patient care and procedural skills: Applies knowledge of using pharmacological treatments of obesity as part of a comprehensive, personalised obesity management care plan and/or provide personalised obesity treatment within their scope of practice	Clinical management	Pharmacotherapy
		Evidence based practice	
		Patient centred care	Personalised care/ plans
	Patient care and procedural skills: Applies knowledge of surgical treatments of obesity as part of a comprehensive, personalised obesity management care plan and/or provide personalised obesity treatment within their scope of practice	Clinical management	Surgery
		Evidence based practice	
		Patient centred care	Personalised care/ plans
	Practice-based learning and improvement: Evaluates strengths and deficiencies of own knowledge, experience, and skills in managing and/or treating individuals with obesity and sets and achieves goals for improvement	Professionalism/ethical standards	Reflection on practice/performance/ knowledge

Table 6 Competencies in included papers

Ref.	Study	Domain	Subdomains
	Practice-based learning and improvement: Analyses local practice systems using quality improvement methods to monitor patient outcomes and wellbeing, and optimise obesity care	Health systems	Service development, implementation and enhancement
	Practice-based learning and improvement: Uses information technology related to obesity treatment to optimise delivery of care beyond routine use of electronic health records, such as software applications, and related devices (i.e. self-management health applications, accelerometers and resting metabolic rate/body composition analysis technology), when available and/or appropriate	Health systems	Information technology/eHealth
	Practice-based learning and improvement: Provides evidence-based education and guidance to patients, students, health professionals and others about the complexity and causes of obesity	HCP education Clinical management	Mentoring Patient education
	Professionalism and interpersonal communication skills: Uses appropriate patient-first language in verbal, nonverbal, and written communication that is nonbiased, non-judgmental, respectful, compassionate, empathetic and considers others' levels of knowledge and understanding when communicating with patients with obesity, their support networks, and other healthcare professionals or staff (e.g. interpreters, learning disability teams)	Communication Patient Centred Care	Patient communication Communication with peers and other professionals Empathetic or sensitive approach/understanding patient perspective
	Professionalism and interpersonal communication skills: Demonstrates awareness of how an individual's gender, social background, deprivation and culture impact on body weight perception and obesity management when communicating with the patient, family and other HCPs or staff	Patient centred care	Cultural competence
	Professionalism and interpersonal communication skills: Displays compassion and respect toward all patients and families who are living with overweight or obesity	Patient centred care Professionalism/ethical standards	Empathetic or sensitive approach/understanding patient perspective Professional/Ethical practice
	Systems-based practice: Works collaboratively within an interdisciplinary team dedicated to obesity prevention and/or treatment strategies, where organisational structure permits	Clinical management	Interprofessional care
	Systems-based practice: Advocates for policies that are respectful and free of weight bias and stigma	Advocacy/Influencing policy	
	Systems-based practice: Utilises chronic disease treatment and prevention models to advance obesity intervention and/or prevention efforts within the clinical, community, and public policy domains	Public Health/Health promotion Health Systems	Disease Prevention/Health Promotion/Public Health strategies and initiatives Service development, implementation and enhancement

Table 6 Competencies in included papers

Ref.	Study	Domain	Subdomains
[26]	Cook et al 2021		
	Explain the maternal and fetal effects of obesity on pregnancy.	Obesity Background	Medical knowledge
	Identify the indications for using pharmacotherapy versus bariatric surgery to manage obesity in a patient who desires future fertility.	Obesity Background	Medical knowledge
		Clinical Management	Pharmacotherapy Surgery
	Discuss the effects bariatric surgery has on future fertility and contraception.	Obesity Background	Medical knowledge
	Understand the impact bariatric surgery can have on future pregnancies	Obesity Background	Medical knowledge
	Reflect on how implicit bias impacts the delivery of patient care to obese patients.	Professionalism/ethical standards	Clinician awareness of implicit attitudes/beliefs
[27]	Harris et al 2022		
	Evaluate the unmet need regarding achieving glycemic control in patients with T2D and the associated reasons	Clinical assessment	Assessment of comorbidities
	Decide how to apply individualized glycemic targets according to patient characteristics	Clinical management	Clinical reasoning
		Patient centred care	Personalised care/plans
	Choose appropriate treatments with properties relevant to the individual patient to help achieve glycemic control.	Clinical management	Managing Comorbidities
	Describe the relationship between T2D and obesity,	Obesity background	Comorbidities
	Predict the beneficial effects of weight loss with glucagon-like peptide-1 (GLP-1) receptor agonist (GLP-1 RA)–based therapy and/or sodium-glucose cotransporter 2 inhibitor (SGLT2i) therapy on outcomes in patients with T2D and obesity,	Obesity background	Medical knowledge
	Perform appropriate selection of antihyperglycemic therapy with weight loss benefits for patients with T2D and obesity.	Clinical management	Pharmacotherapy
[28]	Iachini et al. 2016		
	Interprofessional Education (Teamwork): Students perceptions of their ability to work with other professions in health, the value in working with other professions and the comfort in working with other professions in addressing childhood obesity. Student belief in the importance of communication and reflection in interprofessional teams when work together.	Professionalism/ethical standards	Professional team working
	Interprofessional Education (Roles and responsibilities): students' perceptions and gaining knowledge of the roles/responsibilities of other professions in addressing childhood obesity.	Professionalism/ethical standards	Professional team working
[29]	Ingraham et al. 2016		
	Define the diversity of the LB population,	Patient centred care	Cultural Competence
	Identify the individual, structural, and institutional factors that affect access to care among the lesbian, bisexual, and transgender population,	Public Health/Health promotion	Assessment of public communities' health/services
	Use Motivational Interviewing techniques such as asking open-ended questions, reflective listening, and change talk for addressing patient issues related to obesity, identify barriers that might interfere with applying principles of cultural competency and MI to their provider practice while developing solutions for addressing these barriers.	Clinical management	Behaviour Change/Motivational interviewing
		Patient centred care	Cultural Competence

Table 6 Competencies in included papers

Ref.	Study	Domain	Subdomains
	Increase health center staff knowledge of body size diversity and cultural competency;	HCP education	Mentoring
	Identify barriers LB women who are overweight or obese face in accessing competent and safe medical care;	Public Health/ Health promotion	Assessment of public communities' health/ services
	Discuss how to make the clinic a safe and welcoming environment for LB patients who are overweight or obese.	Patient centred care	Empathetic or sensitive approach/understanding patient perspective
[30]	Katz et al. 2022		
	Determine body mass index (BMI) from weight and height measurements	Clinical assessment	Physical assessment
	Assess diet for common unhealthy behaviours associated with obesity (e.g. sweetened beverages, nutritional quality of snacks, frequent meals from fast food restaurants, etc.)	Clinical assessment	Lifestyle behaviours assessment
	Assess current level of physical activity and provide guidance for setting physical activity goals for optimal health	Clinical assessment	Lifestyle behaviours assessment
	Prescribe plan for exercise/physical activity	Clinical management	Exercise/PA
	Ascertain each patient's readiness and ability to work on weight loss according to health beliefs and stage of change	Clinical assessment	Determine patient readiness for change
	Take a targeted history and conduct a physical examination to identify common comorbidities (e.g. arthritis, diabetes, PCOS...)	Clinical assessment	Subjective/History Taking Physical assessmentAssessment of comorbidities
	Discuss the effect of obesity on present and future health and personalize risk to each patient	Clinical management	Patient education
	Assist patient in setting realistic goals for weight loss based on making permanent lifestyle changes	Clinical management Patient centred care	Exercise/PA Diet Goal setting/Shared decision making
	Recognize and refer patients with eating disorders	Clinical management	Managing Comorbidities Interprofessional care
	Recognize and screen for common psychosocial problems in obese patients including depression, emotional eating, and binge eating	Clinical assessment	Assessment of comorbidities
	Collaborate with registered dieticians and refer to community nutrition resources when appropriate	Clinical management	Clinical reasoning Interprofessional care
	Use motivational interviewing to change behaviour	Clinical management	Behaviour Change/ Motivational interviewing
	Use 24-hour recall, food record, or food frequency to obtain diet history	Clinical assessment	Lifestyle behaviours assessment
	Provide brief counseling intervention to help patient lose weight	Clinical management	Behaviour Change/ Motivational interviewing
	Respond to a patient's questions regarding treatment options including behaviour change, medications, and surgery	Clinical management	Patient education
[31]	Khalafalla et al. 2020		
	List obesity causes and assessment tools	Obesity background Clinical assessment	Pathophysiology Physical Assessment Subjective/History Taking
	Discuss considerations in coaching key behaviors, overcoming barriers, finding motivation, leading a coaching session	Clinical management	Behaviour Change/ Motivational interviewing
	Identify and applying the four constructs of the 5–2–1-0 curriculum	Evidence based practice	
	Develop a plan to implement each construct of the curriculum	Evidence based practice	
	Apply the curriculum to a scenario	Evidence based practice	
	Practice acquired skills with immediate feedback from registered dietitian	HCP education	Mentoring
[16]	Kushner et al. 2019		

Table 6 Competencies in included papers

Ref.	Study	Domain	Subdomains
	Practice-Based Learning and Improvement: Evaluates strengths and deficiencies in knowledge of obesity medicine and sets and achieves goals for improvement	Professionalism/ethical standards	Reflection on practice/performance/knowledge
	Practice-Based Learning and Improvement: Analyzes practice systems using quality improvement methods to monitor and optimize obesity care	Health systems	Service development, implementation and enhancement
	Practice-Based Learning and Improvement: Utilizes resources to locate, interpret, and apply evidence from scientific studies regarding obesity treatment and its comorbidities	Evidence based practice	
		Clinical management	Managing comorbidities
	Practice-Based Learning and Improvement: Uses information technology related to obesity treatment to optimize delivery of care including electronic health records, software applications, and related devices (i.e., accelerometers and resting metabolic rate/body composition analysis technology)	Health Systems	Information technology/eHealth
	Practice-Based Learning and Improvement: Effectively educates patients, students, residents, and other health professionals on the disease of obesity	HCP education	Mentoring
		Clinical management	Patient education
	Patient Care and Procedural Skills: Elicits comprehensive obesity-focused medical history	Clinical assessment	Subjective/History Taking
	Patient Care and Procedural Skills: Performs and documents comprehensive physical examination for the assessment of obesity	Clinical assessment	Physical assessment
	Patient Care and Procedural Skills: Effectively applies clinical reasoning skills when ordering and interpreting appropriate laboratory and diagnostic tests during the evaluation of patients with obesity	Clinical assessment	Diagnostics
		Clinical management	Clinical Reasoning
	Patient Care and Procedural Skills: Utilizes evidence-based models of health behavior change to assess patients' readiness to change in order to effectively counsel patients for weight management	Clinical management	Behaviour Change/Motivational interviewing
		Clinical assessment	Determine patient readiness for change
	Patient Care and Procedural Skills: Engages patients and their support systems in shared decision-making by incorporating their values and preferences in the development of a comprehensive, personalized obesity management care plan	Patient centred care	Goal setting/Shared decision making
	Systems-Based Practice: Works collaboratively within an interdisciplinary team dedicated to obesity prevention and treatment strategies	Clinical management	Interprofessional care
	Systems-Based Practice: Advocates for policies that are respectful and free of weight bias	Advocacy/Influencing policy	
	Systems-Based Practice: Utilizes chronic disease treatment and prevention models to advance obesity intervention and prevention efforts within the clinical, community, and public policy domains	Public Health/Health promotion	Disease Prevention/Health Promotion/Public Health strategies and initiatives
		Health Systems	Service development, implementation and enhancement
	Systems-Based Practice: Describes costs of obesity intervention and prevention with regards to the individual, health care system, and community	Health Systems	Service economics

Table 6 Competencies in included papers

Ref.	Study	Domain	Subdomains
	Medical Knowledge: Demonstrates knowledge of obesity epidemiology	Obesity Background	Epidemiology
	Medical Knowledge: Demonstrates knowledge of energy homeostasis and weight regulation	Obesity Background	Pathophysiology
	Medical Knowledge: Demonstrates knowledge of anthropometric (body composition) measurements and clinical assessments of energy expenditure	Obesity Background	Medical knowledge
	Medical Knowledge: Demonstrates knowledge of etiologies, mechanisms, and biology of obesity	Obesity Background	Pathophysiology
	Medical Knowledge: Demonstrates knowledge of obesity-related comorbidities and corresponding benefits of BMI reduction	Obesity Background	Medical knowledge-Comorbidities
	Medical Knowledge: Applies knowledge of the principles of primary, secondary, and tertiary prevention of obesity to the development of a comprehensive, personalized obesity management care plan	Obesity Background Patient centred care	Medical knowledge Personalised care/ plans
	Medical Knowledge: Applies knowledge of obesity treatment guidelines to the development of a comprehensive, personalized obesity management care plan	Evidence based practice Patient centred care	 Personalised care/ plans
	Medical Knowledge: Applies knowledge of using nutrition interventions to develop a comprehensive, personalized obesity management care plan	Obesity Background Clinical management	Medical knowledge Diet
	Medical Knowledge: Applies knowledge of using physical activity interventions to develop a comprehensive, personalized obesity management care plan	Obesity Background Clinical management	Medical knowledge Exercise/PA
	Medical Knowledge: Applies knowledge of using behavioral interventions to develop a comprehensive, personalized obesity management care plan	Obesity Background Clinical management	Medical knowledge Behaviour Change/ Motivational interviewing
	Medical Knowledge: Applies knowledge of using pharmacological treatments of obesity as part of a comprehensive, personalized obesity management care plan	Obesity Background Clinical management	Medical knowledge Pharmacotherapy
	Medical Knowledge: Applies knowledge of surgical treatments of obesity as part of a comprehensive, personalized obesity management care plan	Clinical management Obesity Background	Surgery Medical knowledge
	Medical Knowledge: Applies knowledge of emerging treatment modalities for obesity to the development of a comprehensive, personalized obesity management care plan	Obesity Background Patient Centred care	Medical knowledge Personalised care/ plans
	Interpersonal and Communication Skills: Uses appropriate language in verbal, nonverbal, and written communication that is nonbiased, nonjudgmental, respectful, and empathetic when communicating with patients with obesity	Communication Patient Centred care	Patient communication Empathetic or sensitive approach/understanding patient perspective
	Interpersonal and Communication Skills: Uses appropriate language in verbal, nonverbal, and written communication that is nonbiased, nonjudgmental, respectful, and empathetic when communicating about patients with obesity with colleagues within one's profession and other members of the health care team	Communication	Communication with peers and other professionals

Table 6 Competencies in included papers

Ref.	Study	Domain	Subdomains
	Interpersonal and Communication Skills: Demonstrates awareness of different cultural views regarding perceptions of desired weight and preferred body shape when communicating with the patient, family, and other members of the health care team	Patient centred care	Cultural competence
		Communication	Communication with peers and other professionals
			Patient communication
	Professionalism: Demonstrates ethical behavior and integrity when counseling patients and their families who are living with overweight or obesity	Professionalism/ethical standards	Professional/Ethical practice
	Professionalism: Displays compassion and respect toward all patients and families who are living with overweight or obesity	Patient Centred care	Empathetic or sensitive approach/understanding patient perspective
[32]	Mainor et al. 2014		
	Apply appropriate theories, models, and frameworks when selecting intervention strategies and designing and implementing nutrition and physical activity interventions.	Clinical management	Diet
			Exercise/PA
			Clinical reasoning
		Evidence based practice	
	Educate on development of formal and informal policy related to obesity prevention in states, communities and organizations	Public Health/ Health promotion	Disease Prevention/ Health Promotion/ Public Health strategies and initiatives
		Advocacy/Influencing policy	
	Apply concepts of systems thinking to develop and/or implement obesity prevention environmental change interventions in communities, workplaces, preschools, and health care settings	Public Health/ Health promotion	Disease Prevention/ Health Promotion/ Public Health strategies and initiatives
		Health Systems	Service development, implementation and enhancement
	Collaborate with traditional and non-traditional partners to implement and maintain nutrition and physical activity interventions that support complementary goals and address the needs and priorities of the community	Health Systems	Service development, implementation and enhancement
	Use media to raise awareness and encourage social change that supports health and reduces risk.	Advocacy/Influencing policy	
	Apply basic principles of social marketing to develop obesity prevention strategies that are linked to broader efforts to promote healthy eating and increased physical activity	Communication	Communication with communities/group
		Public Health/ Health promotion	Disease Prevention/ Health Promotion/ Public Health strategies and initiatives
	Use evidence-informed nutrition and physical activity approaches in developing and/or implementing multi-level interventions.	Evidence based practice	
		Health Systems	Service development, implementation and enhancement
	Engage critical stakeholders in the planning, implementing, and evaluating statewide public health programs, policies, and interventions.	Health Systems	Service development, implementation and enhancement
		Public Health/ Health promotion	Disease Prevention/ Health Promotion/ Public Health strategies and initiatives
	Assess the potential public health impact of an intervention based on its reach, effectiveness, adoption, implementation, and maintenance.	Health systems	Service development, implementation and enhancement
	Lead efforts to change social systems in support of healthy eating, physical activity and chronic disease prevention.	Health systems	Service development, implementation and enhancement
		Public Health/ Health promotion	Disease Prevention/ Health Promotion/ Public Health strategies and initiatives
	Work with communities to build capacity and infrastructure to address prevention of obesity, and other chronic diseases.	Public Health/ Health promotion	Disease Prevention/ Health Promotion/ Public Health strategies and initiatives
	Develop participatory and collaborative partnerships with communities using a variety of formal and informal mechanisms to inform program design and implementation.	Health systems	Service development, implementation and enhancement

Table 6 Competencies in included papers

Ref.	Study	Domain	Subdomains
	Work with communities to change organizations, policies, and environments for prevention and control of obesity and other chronic diseases	Advocacy/Influencing Policy	
	Create and communicate a shared vision, mission and core values for groups, organizations, and communities	Patient centred care	Goal setting/Shared decision making
		Communication	Communication with communities/group
	Consider the impact of decisions, programs, and policies on health disparities, including unintended consequences.	Health systems	Service development, implementation and enhancement
	Identify the role of cultural, social, and behavioral factors in determining the delivery of public health interventions and/or services.	Health systems	Service development, implementation and enhancement
[33]	Ockene et al. 2021		
	Reviewed medical risk factors with the patient	Clinical assessment	Risk factor assessment
	Discussed weight history and prior weight loss experience	Clinical assessment	Subjective/History Taking
	Asked about current diet and dietary habits.	Clinical assessment	Lifestyle behaviours assessment
	Discussed current level of physical activity.	Clinical assessment	Lifestyle behaviours assessment
	Shared BMI/concerns related to weight with patient	Clinical Management	Patient education
	Advised that weight loss is recommended	Clinical Management	Patient education
	Provided information on health benefits of losing 3-5% of current weight	Clinical Management	Patient education
	Assessed patient's level of motivation/commitment/readiness to make changes	Clinical assessment	Determine patient readiness for change
	Assessed patient's level of confidence/self-efficacy	Clinical assessment	Subjective/History Taking
	Discussed perceived barriers and concerns	Communication	Patient Communication
	Provided relevant information regarding relationship between weight, diet, and physical activity.	Clinical Management	Patient education
	Partnered with the patient to encourage development of specific goals and plans	Patient centred care	Goal setting/Shared decision making
	Assisted the patient by discussing behavior change strategies	Clinical Management	Behaviour Change/Motivational interviewing
	Recommended or referred the patient to weight management resources	Clinical Management	Interprofessional care Patient education
	Proposed that weight and weight management be discussed again at the patient's next appointment.	Communication	Patient Communication
	Sharing with the patient their BMI and BMI classification	Communication	Patient Communication
	Identifying the patient's medical risk factors and co-morbidities of obesity	Clinical assessment	Assessment of comorbidities
	Assessing the patient's prior weight loss experiences	Clinical assessment	Subjective/History Taking
	Assessing the patient's current diet and dietary habits	Clinical assessment	Lifestyle behaviours assessment
	Assessing the patient's current level of physical activity	Clinical assessment	Lifestyle behaviours assessment
	Advising weight loss based on their personal health information (e.g. BMI and risk factors)	Clinical Management	Patient education
	Discussing with the patient the health benefits of losing about 5% of their current weight	Clinical Management	Patient education
	Assessing the patient's level of readiness to make lifestyle changes to achieve weight loss	Clinical assessment	Determine patient readiness for change
	Identifying and discussing with the patient their perceived barriers and concerns that make it hard to lose weight	Clinical assessment	Subjective/History taking

Table 6 Competencies in included papers

Ref.	Study	Domain	Subdomains
	Partnering with the patient to encourage development of their own set of goals and specific plans based on their interests and willingness to change behavior	Patient centred care	Goal setting/Shared decision making
	Assisting the patient by providing information regarding the relationship between weight, diet and physical activity	Clinical Management	Patient education
	Assisting the patient by identifying behavior change strategies that will help achieve their goals	Clinical Management	Behaviour Change/ Motivational interviewing
	Recommending or referring the patient to weight management resources in the clinic or in the community	Clinical Management	Interprofessional care Patient education
	Recognizing opportunities during the clinical encounter to enhance patient confidence	Patient centred care	Role of clinician to increase patient confidence/support self-management
	Proposing that weight and weight management be discussed again at their next appointment	Patient centred care	Goal setting/Shared decision making
	Demonstrating to the patient that you understand their perspective on weight management	Patient centred care	Empathetic or sensitive approach/understanding patient perspective
[34]	Okemah et al. 2023		
	To recognize the effect of incretin hormones and glucagon on metabolism in wellness and in T2D,	Obesity background	Comorbidities
	To evaluate the rationale and latest evidence for incretin-based dual-agonist therapies in patients with T2D and obesity,	Clinical management	Managing Comorbidities
	To apply early treatment intensification, weight loss, and patient education strategies in patients with T2D and obesity	Clinical management	Managing Comorbidities Patient education
[35]	Olson et al. 2024		
	Explain the field of obesity medicine.	Obesity background	Epidemiology
	Describe the prevalence of overweight and obesity, including social and physical environmental determinants that may affect the risk of obesity, and health disparities seen across populations.	Obesity background	Epidemiology
	Describe examples of weight bias and what physicians can do to combat it.	Obesity background	Weight bias/stigma
	Define the complex disease of obesity and its pathophysiology.	Obesity background	Pathophysiology
	Describe the basic regulators of appetite.	Obesity background	Pathophysiology
	Explain the genetic, behavioral, emotional, and physiologic mechanisms that contribute to the development of obesity.	Obesity background	Pathophysiology
	Define energy homeostasis and its role in weight regulation.	Obesity background	Pathophysiology
	Describe physiological barriers to weight loss maintenance.	Obesity background	Pathophysiology
	Describe the goals in treating obesity.	Obesity background	Medical knowledge
	Describe the obesity treatment pyramid and the importance of a comprehensive obesity treatment plan.	Obesity background	Medical knowledge
	Describe common dietary interventions.	Obesity background	Medical knowledge
		Clinical Management	Diet
	Demonstrate how to develop a nutrition plan to treat obesity.	Obesity background	Medical knowledge
		Clinical Management	Diet
	Demonstrate how to develop a physical activity plan to treat obesity.	Obesity background	Medical knowledge
		Clinical Management	Exercise/PA
	Explain the rationale for using anti-obesity medications.	Obesity background	Medical knowledge
		Clinical Management	Pharmacotherapy
	Explain the mechanism of action of anti-obesity medications.	Obesity background	Medical knowledge

Table 6 Competencies in included papers

Ref.	Study	Domain	Subdomains
	Recognize side effects and drug interactions of anti-obesity medications.	Obesity background	Medical knowledge
	Identify medications that promote weight gain and their alternatives.	Obesity background	Medical knowledge
	Use evidence-based medicine techniques to analyze and discuss a study.	Obesity background	Medical knowledge
	Describe the goals and indications for surgery.	Obesity background	Medical knowledge
		Clinical Management	Surgery
	Explain the different surgical procedures that are used to treat obesity.	Obesity background	Medical knowledge
	Describe the benefits and risks of different surgical procedures.	Obesity background	Medical knowledge
	Listen to a patient's perspective on the disease of obesity.	Patient Centred care	Empathetic or sensitive approach/understanding patient perspective
	Practice giving an "elevator pitch" on an obesity-related topic of your choice.	Obesity background	Medical knowledge
[36]	Pannala et al. 2020		
	Recognize the overall risks associated with endoscopic procedures in patients with obesity.	Clinical management	Surgery
	Adequately assess risk of airway problems with sedation in patients with obesity.	Clinical management	Surgery
	Select the appropriate setting for planned endoscopic procedures.	Clinical management	Surgery
	Identify patients with obesity who require anesthesia assistance to safely perform endoscopic procedures.	Clinical management	Surgery
	Provide recommendations and establish policies for endoscopy units to appropriately care for patients with obesity undergoing endoscopy.	Health systems	Service development, implementation and enhancement
	Assess and accurately report anatomy in common bariatric surgical procedures (Roux-en-Y gastric bypass and sleeve gastrectomy).	Obesity background	Medical knowledge
	Assess and treat basic pathology in the gastric pouch and at gastrojejunal anastomosis (ulcers, bleeding).	Clinical management	SurgeryInterprofessional care
	Accurately identify and report anatomy of various bariatric surgical procedures.	Obesity background	Medical knowledge
	Manage complex pathology (eg, refractory bleeding) in the gastric pouch and anastomosis.	Clinical management	Surgery
	Assessment and luminal therapeutic interventions at jejuno-jejunal anastomosis, Roux limb, and excluded stomach.	Clinical assessment	Physical assessment
	Device-assisted ERCP and interventional EUS-guided access procedures.	Clinical management	Surgery
	Acquire an understanding of the pathophysiology of obesity.	Obesity background	Pathophysiology
	Gut–brain–adipocyte regulation of energy intake including hormonal and neurohormonal signals.	Obesity background	Pathophysiology
	Gut microbial influence on food intake.	Obesity background	Pathophysiology
	Psychosocial influences on food consumption.	Obesity background	Pathophysiology
	Hormonal adaptation to weight loss.	Obesity background	Pathophysiology
	Alterations in glucose and lipid metabolism in obesity.	Obesity background	Pathophysiology
	Concepts of metabolically normal and metabolically abnormal obesity.	Obesity background	Pathophysiology
	Alterations in cell metabolism in obesity.	Obesity background	Pathophysiology
	Knowledge of the current rates of obesity and the trends in adult, adolescent, and childhood obesity.	Obesity background	Epidemiology

Table 6 Competencies in included papers

Ref.	Study	Domain	Subdomains
	Recognize various environmental, cultural, genetic, and behavioral factors that affect energy balance.	Obesity background	Epidemiology
	Recognize differences in rates of obesity based on sex, race/ethnicity, and socioeconomic status.	Obesity background	Epidemiology
	Knowledge of various genetic and epigenetic influences on obesity.	Obesity background	Epidemiology
	Obtain a comprehensive medical history in patients with obesity including weight history, medications (including those that can induce weight loss or gain), previous weight loss attempts, weight-related comorbidities, exercise, diet, and sleep patterns.	Clinical assessment	Subjective/History Taking
	Screen for obesity-related GI comorbidities.	Clinical assessment	Assessment of comorbidities
	Assess readiness to change.	Clinical assessment	Determine patient readiness for change
	Screen for and assess diseases that may affect weight loss (eating disorders, depression, obstructive sleep apnea).	Clinical assessment	Assessment of comorbidities
	Comprehensive clinical and laboratory assessment of the patient with obesity.	Clinical assessment	Physical assessment Diagnostics
	Recognize the components of lifestyle intervention: diet, exercise, and behavior modification.	Clinical management	Diet Exercise/PA Behaviour Change/ Motivational interviewing
	Define the correlation between intensity of therapy and weight loss outcomes.	Clinical management	Clinical reasoning
		Obesity background	Medical knowledge
	Identify lifestyle intervention as the foundation of obesity treatment.	Clinical management	Diet Exercise/PA Behaviour Change/ Motivational interviewing
		Obesity background	Medical knowledge
	Prescribe an appropriate caloric recommendation	Clinical management	Diet
	Advise patients on diets with different macronutrient components.	Clinical management	Diet
	Recommend an exercise program of appropriate intensity (including when to perform cardiac clearance before initiating an exercise program).	Clinical management	Exercise/PA
	Perform behavior coaching.	Clinical management	Behaviour Change/ Motivational interviewing
	Use lifestyle intervention for treatment of obesity-related GI diseases (nonalcoholic fatty liver disease, GERD, Barrett's esophagus, GI cancers).	Clinical management	Managing comorbidities
	Direct a multidisciplinary obesity program with other practitioners (registered dietitian, psychologist, nurse, etc).	Clinical management	Interprofessional care
	Knowledge of the common categories of medications that are associated with weight gain/weight loss as an adjunctive effect in addition to their primary indication.	Clinical management	Pharmacotherapy
		Obesity background	Medical knowledge
	Knowledge of medications used to treat obesity including basic indications and contraindications.	Clinical management	Pharmacotherapy
		Obesity background	Medical knowledge
	Comprehensive knowledge of and ability to prescribe pharmacotherapy options for treatment of obesity.	Clinical management	Pharmacotherapy
		Obesity background	Medical knowledge
	Recommend changes to patient's medication regimen to minimize medications that are contributing to weight gain or preventing weight loss.	Clinical management	Pharmacotherapy
	Knowledge of the increasing use of medications in combination with EBTs and in patients with weight regain after bariatric surgery.	Clinical management	Pharmacotherapy
		Obesity background	Medical knowledge
[12]	Sanchez-Ramirez et al. 2018		

Table 6 Competencies in included papers

Ref.	Study	Domain	Subdomains
	Identify emerging crises associated with obesity, particularly in high-risk people in lower socio-economic populations;	Public Health/ Health promotion	Assessment of public communities' health/ services
	Discuss the evolving roles of healthcare practitioners in intervention of obesity;	Clinical management	Interprofessional care
		Obesity background	Medical knowledge
	Implement novel, yet practical, ideas for obesity prevention and management in the practices of healthcare and social service professionals;	Health systems	Service development, implementation and enhancement
	Collaborate with professionals outside of your discipline to promote prevention of obesity, and enhance the potential for reduced morbidity in people who are obese.	Clinical management	Interprofessional care
	Identify barriers to discussing weight loss with patients;	Clinical management	Clinical reasoning
		Communication	Patient communication
		Clinical assessment	Subjective/History Taking
	Discuss how to effectively begin a conversation about a patient's weight;	Communication	Patient communication
		Clinical assessment	Subjective/History Taking
	Assess the patient's readiness for lifestyle modification to achieve a healthy weight;	clinical assessment	Lifestyle behaviours assessment
	Enhance proficiency in discussing obesity by practicing this skill set with standardized patients	Communication	Patient communication
[37]	Tenedero et al. 2024 (reworded from text)		
	Competence to do physical exams on patients with obesity	Clinical Assessment	Physical assessment
	Competence doing certain physical exams manoeuvres on patients with obesity	Clinical Assessment	Physical assessment
	Know how to modify physical exams to best suit patients with obesity	Clinical Assessment	Physical assessment
	When examining a patient with obesity, think about providing appropriately sized equipment (e.g blood pressure cuff, examination table, gowns)	Clinical Assessment	Physical assessment
	Confident doing physical exams on patients with obesity	Clinical Assessment	Physical assessment
	Difference in challenge of performing a physical exam on a patient with obesity and without obesity	Clinical Assessment	Physical assessment
	Success doing physical exams on patients with obesity	Clinical Assessment	Physical assessment
	Clinical skills training has equipped professional to confidently perform physical exams on patients of all sizes	Clinical Assessment	Physical assessment
	Comfort performing a physical exam on adult, peadiatric and teenage patients with obesity	Clinical Assessment	Physical assessment
	Comfort modifying physical exam techniques for a patient with obesity	Clinical Assessment	Physical assessment
[38]	Thang et al. 2023		
	Provider's Role in Managing Obesity (assessed by survey) It is the primary care provider's role to identify obesity in children.	Clinical Assessment	Diagnostics
	Provider's Role in Managing Obesity (assessed by survey) It is the primary care provider's role to provide dietary counseling to children and families.	Clinical Management	Diet
	Provider's Role in Managing Obesity (assessed by survey) Primary care providers can be effective in treating childhood obesity.	Clinical Management	Diet

Table 6 Competencies in included papers

Ref.	Study	Domain	Subdomains
	Provider's Role in Managing Obesity (assessed by survey) It is the primary care provider's role to counsel on healthy cooking strategies to children and families.	Clinical Management	Diet
	Provider's Role in Managing Obesity (assessed by survey) It is the primary care provider's role to support and counsel on breastfeeding.	Clinical Management	Diet
	Provider's Role in Managing Obesity (assessed by survey) It is the primary care provider's role to identify community resources that exist for children who are overweight or obese.	Clinical Management	Diet
	Provider's Role in Managing Obesity (assessed by survey) It is the primary care provider's role to counsel families on the benefits of cooking as it relates to emotional, physical and social well-being.	Clinical Management	Diet
	Provider's Role in Managing Obesity (assessed by survey) It is the primary care provider's role to collaborate with WIC centers to promote healthy eating strategies for young children.	Clinical Management	Diet
	Provider's Role in Managing Obesity (assessed by survey) It is the primary care provider's role to identify and learn the federal, state, and local food policies that influence eating for children and families	Evidence based practice	
	Confidence in Obesity Knowledge (assessed by survey) Describe the prevalence of childhood obesity and overweight by age group.	Obesity Knowledge	Epidemiology
	Confidence in Obesity Knowledge (assessed by survey) Describe the prevalence of childhood obesity by race/ethnic group.	Obesity Knowledge	Epidemiology
	Confidence in Obesity Knowledge (assessed by survey) Discuss with patients the American Academy of Pediatrics' recommendations for breastfeeding mothers.	Obesity management	Patient education
	Confidence in Obesity Knowledge (assessed by survey) Discuss with patients evidence-based nutrition related recommendations to prevent childhood overweight and obesity.	Clinical Management	Patient education
	Confidence in Obesity Knowledge (assessed by survey) Discuss with patients evidence based dietary guidelines for specific weight related comorbidities.	Clinical Management	Patient education
	Confidence in Obesity Knowledge (assessed by survey) Identify age-specific promoters and detractors of healthy eating in childcare, school, and university settings.	Public Health/ Health promotion	Assessment of public communities' health/ services
	Confidence in Obesity Knowledge (assessed by survey) Define food literacy and discuss the determinants of food literacy.	Obesity Knowledge	Obesity as Disease
	Confidence in Obesity Knowledge (assessed by survey) Discuss federal, state and local nutrition/ food policies that influence eating for children and families.	Public Health/ Health promotion	Assessment of public communities' health/ services

Table 6 Competencies in included papers

Ref.	Study	Domain	Subdomains
	Confidence in Obesity Knowledge (assessed by survey) Discuss how implicit weight bias can influence your own and others physical, emotional and social wellbeing.	Obesity Knowledge	Weight Bias/Stigma
	Confidence in Obesity Knowledge (assessed by survey) Define food insecurity and discuss the determinants of food insecurity.	Obesity Knowledge	Obesity as disease
	Confidence in Obesity Knowledge (assessed by survey) Identify the association between decreased sleep, physical activity, and other daily routines and obesity risk in children and young adults.	Obesity Background	Obesity as disease
	Confidence in Counseling Families about Obesity (assessed by survey) Make a difference in my patients' diet and eating habits.	Clinical Management	Diet
	Confidence in Counseling Families about Obesity (assessed by survey) Counsel my patients using open- ended questions.	Communication	Patient communication
	Confidence in Counseling Families about Obesity (assessed by survey) Counsel families on age-specific parenting skills to help support target behaviors around patient diet/ eating and physical activity.	Clinical Management Clinical Management Patient centred care	Diet Exercise/PA Personalised care/ plans
	Confidence in Counseling Families about Obesity (assessed by survey) Know what community resources exist for children who are overweight or obese.	Health systems	Service development, implementation and enhancement
	Confidence in Counseling Families about Obesity (assessed by survey) Counsel families using evidence based dietary guidelines for specific weight related comorbidities.	Clinical Management Evidence based practice	Diet
	Confidence in Counseling Families about Obesity (assessed by survey) Use motivational interviewing to influence eating habits and behaviors.	Clinical Management	Behaviour change/ Motivational interviewing
	Confidence in Counseling Families about Obesity (assessed by survey) Counsel on how to use cooking strategies to engage the whole family in behavior changes related to nutrition.	Clinical Management	Behaviour change/ Motivational interviewing Diet Clinical reasoning
	Confidence in Counseling Families about Obesity (assessed by survey) Counsel on the benefits of cooking as it relates to family food literacy.	Clinical Management	Diet
	Confidence in Counseling Families about Obesity (assessed by survey) Counsel families on age-specific hunger and satiety regulation.	Clinical Management	Patient education
	Confidence in Counseling Families about Obesity (assessed by survey) Counsel on the benefits of cooking as it relates to emotional, physical and social well-being.	Clinical Management	Patient education
	Confidence in Counseling Families about Obesity (assessed by survey) Screen and assess common mental health conditions associated with childhood obesity.	Clinical Assessment	Assessment of comorbidities
[39]	Thanh Le et al. 2015		

Table 6 Competencies in included papers

Ref.	Study	Domain	Subdomains
	Importance of practice-based learning for developing radiographic practice skills and radiographic technique involving obese patients	HCP education	Practice-based learning/Continued learning
	Knowledge of radiographic technique and hands-on experience influenced the confidence of participants when imaging obese patients.	HCP education	Practice-based learning/Continued learning
	Negative (weight bias) attitudes of student radiographers influenced by experiential learning and weight biases of supervising radiographers and radiologists	Clinical management	Weight Bias/Stigma
		Professionalism/ethical standards	Clinician awareness of implicit attitudes/beliefs
		HCP education	Practice-based learning/Continued learning
	Student radiographers' communication skills and comfort communicating with patients with obesity	Communication	Patient communication
	Knowledge of obesity, obesity classification and obesity epidemic	Obesity Background	Obesity as a disease
[40]	Um et al. 2016		
	Identify and engage individuals who may benefit from weight management;	Clinical Assessment	Diagnostics
	Assess for overweight or obesity.	Clinical Assessment	Diagnostics Subjective/History Taking Physical Assessment
	Collect a weight history and identify factors that may contribute to weight gain;	Clinical Assessment	Subjective/History Taking
	Assess for risk or presence of comorbidities;	Clinical Assessment	Assessment of Comorbidities Risk factor assessment
	Determine an individual's current lifestyle behaviors and assess their readiness to change.	Clinical Assessment	Lifestyle Behaviours Assessment
	Explain the risks associated with overweight and obesity;	Clinical Management	Patient Education
	Explain the benefits of weight loss.	Clinical Management	Patient Education
	Recommend lifestyle changes which addresses all three areas: diet, physical activity, and behavior change;	Clinical Management	Diet Exercise/PA Behaviour Change/Motivational interviewing
	Deliver patient-centered care;	Patient Centred Care	Personalised care/plans
	Support self-management.	Patient Centred Care	Role of clinician to increase patient confidence/support self-management
	Understand the role of intensive interventions: very low energy diets, weight loss medication, and bariatric surgery.	Clinical Management	Diet Exercise/PA Pharmacotherapy Surgery
		Obesity Background	Medical knowledge
	Understand the importance of reviewing and monitoring progress;	Clinical Management	Clinical reasoning
	Identify situations when referral to allied health care professionals and specialist services would be appropriate;	Clinical Management	Interprofessional care
	Consider the challenges of long-term weight management.	Clinical Management	Clinical reasoning
		Obesity Background	Medical knowledge

Abbreviations

CBE	Competency-based education
EASO	European Association for the Study of Obesity
HCPs	healthcare professionals
OMEC	Obesity Medicine Education Collaborative
OPEN-EU	Obesity Policy Engagement Network European Union
PRESS	Peer Review of Electronic Search Strategies
PRISMA	Preferred Reporting Items for Systematic reviews and Meta-Analyses
PROMINENCE	Promoting Obesity and Metabolic Rehabilitation INclusion in EU Entry-level Physiotherapy Curricula
WHO	World health organisation

Supplementary Information

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Supplementary Material 1

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Authors' contributions

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