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Title Page

Peripartum care and obesity: A scoping review of recommendations and practical tools for implementation

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Abstract

Objective: Despite the growing prevalence of obesity among reproductive aged persons in the U.S., evidence-based guidelines for peripartum care are lacking. The objective of this scoping review is to identify obesity-related recommendations for peripartum care, evaluate grades of evidence for each recommendation, and identify practical tools (e.g., checklists, toolkits, care pathways, bundles) to support their implementation in clinical practice.

Data sources: We searched MEDLINE, EMBASE, CINAHL, the Cochrane Central Register of Controlled Trials, and clinicaltrials.gov from inception to December 2020 for eligible studies addressing peripartum care in persons with obesity.

Study eligibility criteria: Inclusion criteria were published evidence-rated recommendations and practical tools for peripartum care of persons with obesity.

Study appraisal and synthesis methods: Pairs of independent reviewers extracted data (source, publication year, content and number of recommendations, level and grade of evidence, description of tool) and identified similarities and differences among the articles.

Results: Of 18,315 screened articles, 18 were included including 7 articles with evidence-rated recommendations and 11 practical tools (3 checklists, 3 guidelines, 1 care bundle, 1 flowchart, 1 care pathway, 1 care map, 1 protocol). Thirteen of 39 evidence-rated recommendations were based on expert opinion. Recommendations related to surgical antibiotic prophylaxis and subcutaneous tissue closure at cesarean delivery received the highest-grade of evidence. Some of the practical tools included a

checklist from the United States regarding anticoagulation after cesarean delivery (evidence supported recommendation), a bundle for surgical site infections after cesarean delivery in Australia (evidence did not support recommendation), and a checklist with content for several aspects of peripartum care from Canada (evidence supported seven of nine definitive recommendations).

Conclusion: The recommendations for peripartum care for persons with obesity are based on limited evidence and few practical tools for implementation exist. Future work should focus on developing practical tools based on high quality studies.

Strengths and limitations of this study:

- We may not have identified all articles with evidence-rated recommendations, though our search of available published literature was thorough including a search of appropriate web sites.
- Sites may have practical implementation tools that they use in the short- or long-term, but they may not be published or available in a more public domain.
- Although topics such as contraception and postpartum weight management are important in the postpartum care of persons with obesity, they were not specifically addressed in this review, which pertained to peripartum care in the immediate postpartum period.
- We did not include recommendations that were intended for patient education only in this review.

Keywords: obesity, peripartum care, pregnancy, tools

INTRODUCTION

Obesity has reached epidemic proportions in the United States.[1] In 2015-2016, 36.5% of reproductive age women (20-39 years) had obesity (BMI ≥ 30.0 kg/m^2), translating to a high percentage of persons with obesity during future pregnancies.[2] Of further concern, over 50% of persons with obesity exceed guidelines for weight gain during pregnancy, thus compounding their risks for adverse outcomes.[3-5] Adverse peripartum outcomes associated with obesity include cesarean delivery, infection, hemorrhage, thromboembolism (VTE), and anesthesia-related complications, such as failure of regional anesthesia and respiratory depression.[6] These adverse outcomes are amplified in persons with a BMI ≥ 50 kg/m^2.[7] Furthermore, obesity is cited as a contributing factor in over 50% of maternal deaths.[8]

Adaptations to prenatal care for persons with obesity include early screening for diabetes and limiting weight gain to 11-20 pounds. However, there is a lack of evidence-based recommendations for peripartum care, when the risk for adverse outcomes is a significant concern. For example, the National Institute for Health and Care Excellence (NICE) performed evidence-based reviews for the intrapartum management of obesity in 2019 and found no clinical evidence to suggest that the management of fetal monitoring or maternal positioning in labor should be altered.[9]

Strategies that have reduced adverse outcomes in obstetrics include the development of checklists or toolkits after identifying patient, provider, and systems factors for improvement in the care pathway.[10] Given the increasing incidence of obesity and obesity-related complications, it is critical to identify opportunities to improve the safe delivery of peripartum care.

Objectives

The objective of this scoping review is to identify obesity-related recommendations for peripartum care, evaluate levels or grades of evidence for each recommendation, and identify practical tools such as checklists, toolkits, or other comprehensive care pathways to support their implementation in clinical practice.

METHODS

Eligibility criteria, information sources, search strategy

The PRISMA extension for scoping reviews (PRISMA-ScR) checklist was used in developing and reporting this scoping review.[11] The inclusion criteria were: (1) published (in print or online) recommendations along with levels or grades of evidence for the peripartum care of persons with obesity (BMI ≥ 30.0 kg/m^2), and if possible, specifically for persons with a BMI ≥ 50 kg/m^2; or (2) published (in print or online) description of a tool such as a checklist, toolkit, or comprehensive care pathway for the peripartum care of obesity. To be included in the review, the identified recommendations needed to focus on actionable items or management strategies, as opposed to being a listing of comorbidities or risks that are associated with obesity in pregnancy. Actionable items might include giving or withholding a particular medication or device. Recommendations that exclusively related to "patient counseling" or imparting of knowledge to the patient were not included as the interpretation of counseling can have different meanings depending on the clinical setting (e.g., location of clinical practice, provider type). The recommendations could have been abstracted from articles pertaining to obesity alone, or other articles that specified recommendations pertaining to obesity (e.g., antibiotic use in pregnancy with a specific adaptation for persons with obesity). Because

recommendations could be published from varying health care systems (e.g., national guidelines from United States vs. United Kingdom), variances in evidence grading were identified and abstracted according to the health care system's grading method.

We searched PubMed MEDLINE, Embase (embase.com), Cochrane Central Register of Controlled Trials (Wiley), CINAHL (EbscoHost), and clinicaltrials.gov from inception through December 2020, with no date or language restrictions. The search for eligible studies involved controlled vocabulary (MeSH headings and thesauri of relevant databases) and the keywords of obesity, morbid obesity, super morbid obesity, guidelines, recommendations, checklist, toolkit, maternal care pathway, peripartum care, and pregnancy. The bibliographies of relevant reviews were hand-searched, as well as key websites including Google Scholar. A full list of the sources and search strategies is outlined in Appendix A.

Patient and Public Involvement

Patients were not directly involved in the design of this study.

Study Selection

The questions for this scoping review were: (1) What are the recommendations for peripartum care of persons with obesity published by either individual authors, national societies, or other government departments that provide levels or grades of evidence to support the recommendation? (2) What are the published tools for practical implementation of recommendations, either in the form of checklists, toolkits, or other comprehensive care pathways?

The primary outcomes were the number of recommendations per article, topic of recommendation, level or grade of evidence to support recommendations, and

similarities and differences between the recommendations across articles. For the identified checklists, toolkits, or other comprehensive care pathways for the peripartum management of obesity, their details were summarized and crosschecked with the aforementioned recommendations.

Data extraction

Four reviewers independently screened all citations using the Covidence review management software.[12] Initially, the reviewers were trained on a sample of 20 articles using the Covidence software to verify clarity and consistency regarding inclusion and exclusion criteria. A separate, 5th reviewer resolved all conflicts. Once agreement was obtained on articles meeting criteria for final inclusion, two reviewers independently extracted the following data from each article using a form that was tested and modified by the reviewers, as applicable: (1) source of recommendations (e.g., individual authors, national societies, etc.), (2) year of publication, (3) content and total number of recommendations, (4) level and grade of evidence for each of the recommendations, (4) system used to determine levels of evidence or classification of recommendations, (5) description of checklist, toolkit, comprehensive care pathway or other format used for implementation in the peripartum care of obesity. If articles were in abstract form only, we contacted the authors for updates on the status of the final publication.

Data synthesis

The data were summarized and abstracted into table format, noting key similarities and differences among the articles in terms of content and level and grade of evidence. For the identified checklists, toolkits, etc. similarities and differences among the content were highlighted. For this scoping review, we did not assess the effectiveness of the

findings or evaluate bias. The scoping review protocol is published at https://doi.org/10.18131/g3-gyms-ww23.

Ethics approval statement

Ethics approval was not required since the study was a review of previously published articles.

RESULTS

Study selection

After removal of duplicates, 18,328 articles were screened, resulting in 203 articles for full-text review. Figure 1 shows the flow diagram for study selection. A total of 7 evidence-rated articles and 11 tools met inclusion criteria for this review. Eight of the tools were selected from the results of Google Scholar searches.

Study characteristics

Table 1 displays the title, year of publication, source of recommendations, and references for evidence levels and grades (n=7 articles) identified from the search of all databases. For these articles, the content was either exclusively focused on the management of obesity or the content was about a high-risk condition during pregnancy and addressed obesity among other issues. Table 2 displays the topic, content of the recommendation, and evidence levels and grades for each recommendation from the seven articles in Table 1. For the tools, Table 3 displays the title, year of publication, source of recommendations, and content topic for the peripartum management of obesity identified from searches of PubMed MEDLINE, Embase, Cochrane Central Register of Controlled Trials, and CINAHL (n=3). Appendix B displays the same information identified from a search of key websites and Google Scholar for tools (n=8).

We found a wide range of tools including checklists, bundles, flow charts, guidelines, protocols, care pathways, and care maps from practices in the United States, Canada, and the United Kingdom.

Table 1. Title, year of publication, source of recommendations, evidence levels and grades for 7 articles related to peripartum management of obesity

Title	Date	Author/Source	Evidence Source
Management of prepregnancy, pregnancy, and postpartum obesity[13]	2020	McAuliffe et al International Federation of Gynecology and Obstetrics	GRADE[14] Grade strong or weak Evidence low, moderate, high or best practice
SMFM Consult Series #51: Thromboembolism prophylaxis for cesarean delivery[15]	2020	Society for Maternal-Fetal Medicine (United States); 1/6 recommendations pertain to obesity	GRADE[14] Grade strong or weak Evidence low, moderate, high or best practice
Guideline No. 247-Antibiotic prophylaxis in obstetric procedures[16]	2017	J van Schalkwyk, N Van Eyk Society of Obstetricians and Gynaecologists of Canada (Canada); 1/7 recommendations pertain to obesity	Canadian Task Force on Preventive Health Care [17] Levels I-III Classifications A-I
Guideline No. 392-Pregnancy and maternal obesity Part 2: Team planning for delivery and postpartum care[18]	2019, 2020 correction	Maxwell C, et al. Society of Obstetricians and Gynaecologists of Canada (Canada)	Canadian Task Force on Preventive Health Care [17] Levels I-III Classifications A-E,I
Care of women with obesity in pregnancy Green-top Guideline #72[19]	2018	Denison FC, et al. Royal College of Obstetricians and Gynaecologists (United Kingdom)	Clinical Governance Advice No.1 Development of RCOG Green-Top Guidelines Levels 1++ to 4 Grades A-D, and "checkmark"[20]
Reducing the risk of venous thromboembolism during pregnancy and the puerperium Green-top Guideline No.37a[21]	2015	Royal College of Obstetricians and Gynaecologists (United Kingdom)	Clinical Governance Advice No.1 Development of RCOG Green-Top Guidelines Levels 1++ to 4 Grades A-D, and "checkmark"[20]
Practice Bulletin #156 Obesity in pregnancy[22]	2015	American College of Obstetricians and Gynecologists Practice Bulletin (United States)	U.S. Preventive Services Task Force Grade A-C; Levels I-III

GRADE Grading of Recommendations Assessment, Development and Evaluation

SMFM Society for Maternal-Fetal Medicine

RCOG Royal College of Obstetricians and Gynaecologists

Table 2. Topics, recommendations, and level or grade of evidence among 7 articles related to peripartum management of obesity.

Topic	Recommendation	Level or grade of evidence
Route of delivery	The decision for a woman with maternal obesity to give birth by planned caesarean section should involve a multidisciplinary approach, taking into consideration the individual woman's comorbidities, antenatal complications and wishes.[19]	Level 2-, C
Labor induction	Induction of labor is recommended at 41+0 weeks of gestation for women with a BMI ≥ 35 owing to their increased risk of intrauterine death.[13]	Strong + + +
	Elective induction of labour at term in obese women may reduce the chance of caesarean birth without increasing the risk of adverse outcomes.[19]	Level 2+, B
	Where macrosomia is suspected, induction of labour may be considered. Parents should have a discussion about the options of induction of labour and expectant management.[19]	Level 1+, B
Fetal monitoring	Electronic fetal monitoring is recommended for women in active labor with a BMI ≥ 35. Intrauterine pressure catheters and fetal scalp electrodes may help.[13]	Conditional +
	(a) Electronic fetal monitoring can be considered for women in active labour with a body mass index > 35 kg/m^2. (b) Intrauterine pressure catheters may assist in assessment of labour contractions. (c) Fetal scalp electrodes may be helpful to ensure continuous fetal monitoring when indicated.[18]	III-B
Labor management	Allowing a longer first stage of labor before performing cesarean delivery for labor arrest should be considered in obese women.[22]	B, Level II-2,3
Blood pressure monitoring	Where available, an appropriately sized blood pressure cuff should be used for measurements. The cuff size used at the earliest time point should be documented in the medical records.[13]	Conditional ++
IV access	Establish venous access in early labor for women with a BMI ≥40 and consider a second cannula.[13]	Conditional +
	Women with a BMI 40 kg/m^2 or greater should have venous access established early in labour and consideration should be given to the siting of a second cannula.[19]	Checkmark
Regional anesthesia	In the case of vaginal delivery for women with a BMI ≥ 40, early placement of an epidural catheter is advisable in the case of an emergency cesarean delivery.[13]	Conditional + +
Antibiotic prophylaxis for cesarean delivery	Women with a BMI ≥ 30 having a cesarean delivery are at increased risk of wound infection and should receive prophylactic antibiotics at the time of surgery. Women with obesity may benefit from higher doses.[13]	Strong + + + +
	In patients with morbid obesity (BMI > 35), doubling the antibiotic dose may be considered.[16]	III-B
	Women with obesity may benefit from higher dosage of preoperative antibiotics for caesarean birth.[18]	I-A
	Women with class 1 obesity or greater having a caesarean section are at increased risk of wound infection and should receive prophylactic antibiotics at the time of surgery.[19]	Level 1++, A
Incision type, skin closure for cesarean delivery	There is a paucity of high-quality evidence to support the use of one surgical approach over another. Surgical approaches should therefore follow NICE CG132 but clinicians may decide alternative approaches are merited depending on individual circumstances.[19]	Checkmark
Subcutaneous tissue closure	It is recommended to reapproximate the subcutaneous tissue layers at the time of caesarean birth to reduce wound complications.[18]	II-2A
	Women undergoing caesarean section who have more than 2 cm subcutaneous fat should have suturing of the subcutaneous tissue space in order to reduce the risk of wound infection and wound separation.[19]	Level 1++, A

	Subcutaneous drains increase the risk of postpartum cesarean wound complications and should not be used routinely.[22]	Grade A, Level 1
	There is a lack of good-quality evidence to recommend the routine use of negative pressure dressing therapy, barrier retractors and insertion of subcutaneous drains to reduce the risk of wound infection in obese women requiring caesarean sections.[19]	Level 2- to 1+, B
Hemorrhage	Active management of the third stage should be recommended to reduce the risk of postpartum hemorrhage.[13]	Strong + + +
	Although active management of the third stage of labour is advised for all women, the increased risk of PPH in those with a BMI greater than 30 kg/m^2 makes this even more important.[19]	Level 2++, A or Level 1++, B [a]
VTE prophylaxis	Postoperative pharmacologic thromboprophylaxis should be prescribed based on maternal weight.[13]	Conditional + +
	Mechanical thromboprophylaxis is recommended before and after cesarean delivery. Where available, women with a BMI ≥ 35 should be given graduated compression stockings, or other interventions such as sequential compression devices, after cesarean delivery until mobilization, which should be encouraged early.[13]	Conditional + +
	When pharmacologic thromboprophylaxis is needed in pregnant women with class III obesity, we suggest the use of intermediate doses of enoxaparin [for cesarean delivery].[15]	2C
	Postoperative thromboprophylaxis is recommended, at appropriate dosing for the given body mass index, due to the greater risk of venous thromboembolism following caesarean birth with women with obesity.[18]	II-3 A
	All women with class 3 obesity (BMI greater than or equal to 40 kg/m^2) should be considered for prophylactic LMWH in doses appropriate for their weight for 10 days after delivery.[21]	D
	Women with two or more persisting risk factors listed in Table 1 should be considered for LMWH in prophylactic doses appropriate for their weight for 10 days after delivery. One risk factor = BMI ≥ 30kg/m^2.[21]	B
	Mechanical thromboprophylaxis is recommended before cesarean delivery, if possible, as well as after cesarean delivery.[22]	B, Level II-3
	Weight-based dosage for venous thromboembolism thromboprophylaxis may be more effective than BMI-stratified dosage strategies in class III obese women after cesarean delivery.[22]	B, Level II-3
Breastfeeding	Obesity is associated with low breastfeeding initiation and maintenance. Women with obesity in early pregnancy should receive specialist advice on the benefits of breastfeeding and appropriate antenatal and postnatal support for breastfeeding initiation and maintenance.[13]	Conditional + +
	Women with obesity should be offered lactation support in the postpartum period.[18]	III C
	Obesity is associated with low breastfeeding initiation and maintenance rates. Women with a booking BMI 30 kg/m^2 or greater should receive appropriate specialist advice and support antenatally and postnatally regarding the benefits, initiation and maintenance of breastfeeding.[19]	Checkmark, Level 1+
Anesthesiology consult	Antenatal assessment with obstetric anaesthesia may assist in planning for safer birth for women with obesity.[18]	III-A
	The on-duty anaesthetist covering the labour ward should be informed of all women with class III obesity admitted to the labour ward for birth. This communication should be documented by the attending midwife in the notes.[19]	Checkmark
Systems	Where possible, healthcare facilities should have clearly defined pathways for the management of pregnant women with obesity. The adequacy of resources and equipment available should be considered when making decisions around care, especially for women with a BMI ≥ 40.[13]	Conditional +
	Obstetric team planning may be helpful for women with obesity to navigate the steps in antenatal, labour and delivery, and postnatal care.[18]	III-3 A [b]
	Consultation with anesthesia service should be considered for obese pregnant women with OSA because they are at an increased risk of hypoxemia, hypercapnia, and sudden death.[22]	C

[a] The recommendation is reports as “Level 2++, A” on page 26 of the document and also reported as “Level 1++, B” on pages 8 and 30 of the document.

[b] The recommendation is reported as “III-3 A”, though this level and grade of evidence is not defined in the Society of Obstetricians and Gynaecologists of Canada document.

BMI body mass index

NICE CG National Institute for Health and Care Excellence Clinical Guidelines

VTE venous thromboembolism

PPH postpartum hemorrhage

IV intravenous

LMWH low molecular weight heparin

OSA obstructive sleep apnea

Table 3: Title, year of publication, source of recommendations, content topic, and evidence to support recommendations among 3 tools related to the peripartum management of obesity

Title	Year	Source or Site	Tool type	Content	Evidence to support content when a definitive recommendation was made in the tool
Society for Maternal-Fetal Medicine Special Statement: Checklist for thromboembolism prophylaxis after cesarean delivery[23]	2020	Society for Maternal-Fetal Medicine	Checklist	**VTE prophylaxis (after cesarean delivery)** For women with body mass index (BMI) 40 kg/m^2 or greater (class 3 obesity) who have thrombophilia or history of deep venous thrombosis or pulmonary embolism, intermediate-dose low-molecular-weight heparin (e.g., enoxaparin 40 mg SC every 12 hours); continue for 6 weeks postoperatively	SMFM[15] Level 2C
Reducing surgical site infections post-cesarean section in an Australian hospital, using a bundled care approach[24]	2020	NSW Local Health District, Australia	Bundle	**Subcutaneous tissue closure** Negative pressure wound therapy BMI>35 (PICO) BMI > 40 (Prevena) applied in operating suite at the time of incision closure and left in-situ for 7 days	RCOG[19] Level 1- to 1+, B does NOT support recommendation
Team Planning in Obstetrical Care for Women with Obesity[25]	2019	Mount Sinai Hospital in Toronto, Ontario Canada	Checklist	**General admission for delivery** PICC line recommended (checkbox) **Intrapartum** Type of delivery (spontaneous or induced labor or Cesarean delivery) (checkbox) Appropriate size [blood pressure] cuff Appropriate size gown, long monitoring belts Notify OB, Anesthesia, Respiratory therapist, Neonatology May need cross and type IUPC use (checkbox) Encourage ambulation **Cesarean delivery** Incision location	FIGO[13] Conditional ++ for BP cuff size RCOG[19] "Checkmark" for notify anesthesia

				Method of [incision] closure	
				Use of negative pressure wound system (checkbox).	
				Plan for prolonged length of stay if OSA/CPAP (checkbox)	
				Additional medication for gastric emptying/GERD and possible additional antibiotics	SOGC[16, 18] Level 1-A and Level III-B for additional antibiotics
				Equipment (OR table with side bars and pads, OR tray, hover mat, epidural/spinal needle and portable ultrasound, Troop pillow, need for difficult airway try, Mobius retractor and Sturgeon, Traxi Panniculus retractor, negative pressure wound system)	FIGO[13] Conditional 1+ for resources an equipment
				Need for increased length of stay due to anesthesia (checkbox) (e.g., CPAP for sleep apnea).	
				Postpartum	
				Bariatric bed required for a weight > 500 lbs. (check box)	FIGO[13] Conditional 1+ for resources an equipment
				Delay in suture or staple removal with the postoperative day entered for removal as an outpatient.	None
				Prophylactic anticoagulation, early ambulation encouraged	SMFM[15] Level 2C, FIGO Conditional ++[13], SOGC[18] II-3 A, RCOG[19] Grade B or D, ACOG[22] Grade B Level II-3
				Pain management plan with dosage changes	None
				Breastfeeding, lactation consultant	FIGO[13] Conditional ++, RCOG[19] “checkmark”, Level 1+
				Dietician follow-up	

SMFM Society for Maternal-Fetal Medicine

BMI body mass index

SC subcutaneous

NSW North South Wales

RCOG Royal College of Obstetricians and Gynecologists

PICC peripherally inserted central catheter

BP blood pressure

OB obstetrics

IUPC intrauterine pressure catheter

OSA obstructive sleep apnea

CPAP continuous positive airway pressure

FIGO International Federation of Gynecology and Obstetrics

SOCG Society of Obstetricians and Gynaecologists of Canada

OR operating room

VTE venous thromboembolism

ACOG American College of Obstetricians and Gynecologists

Synthesis of Results

The evidence-rated recommendations covered topics such as labor induction (e.g., indication and timing), intravenous access, fetal monitoring (e.g., scalp electrodes, intrauterine pressure catheters), management of the 1st and 3rd stages of labor, breastfeeding, and system-related preparedness. Several recommendations were specific to cesarean delivery (e.g., incision type, antibiotic prophylaxis and dose, subcutaneous tissue closure, negative pressure dressings, and VTE prophylaxis) and anesthesia (e.g., consultation, early placement of an epidural catheter). In several instances, recommendations for persons with obesity did not differ from recommendations for persons without obesity (e.g., antibiotic prophylaxis for cesarean delivery).[19] Three articles had one recommendation [15, 16, 21] and the highest number of recommendations was 11 in a single article.[13] The FIGO (International Federation of Gynecology and Obstetrics) Pregnancy and Non-Communicable Disease Committee published guidelines for the management of pre-pregnancy, pregnancy, and postpartum obesity. Their recommendations for peripartum management (n=11) were included in this analysis, but it should be noted that the recommendations were not unique to the article, but instead they were abstracted from previously published international articles.[13]

The recommendations that were of the highest grade (Strong, Level 1, or Grade A) were antibiotic prophylaxis for cesarean delivery,[13, 19] higher dosage of preoperative antibiotics for cesarean delivery,[16, 18] and subcutaneous tissue closure.[19, 22] We noted that 13 recommendations were based on expert opinion or the lowest level of evidence. We noted that topics such as antibiotic prophylaxis (n=4 recommendations),[13, 16, 18]

subcutaneous skin closure (n=4 recommendations),[18, 19, 22] and VTE prophylaxis (n=8 recommendations)[13, 15, 18, 22] were most commonly addressed. There were two instances where a particular intervention was not recommended (e.g., subcutaneous drains, negative pressure dressing therapy).[19, 22] We did not find any recommendations that directly opposed one other, but there were differences in the specifics of the recommendations. For example, the American College of Obstetricians and Gynecologists (ACOG) recommends an anesthesiology consult for persons with obesity and obstructive sleep apnea whereas RCOG recommends that the anesthetist "be informed of all women with class III obesity".[19, 22] In one guideline from the Society of Obstetricians and Gynaecologists of Canada (SOGC), the recommendation is for a "higher" dose [18] and another recommendation from the SOGC is for a "double dose" [16] of antibiotic prophylaxis. Regarding specific recommendations for persons with different classes of obesity, we only found recommendations for weight-based VTE prophylaxis dosing [15, 21, 22] and anesthesiology consultations.[19]

Regarding the practical tools for implementation (Table 3), the style varied. In a checklist and bundle, there were specific recommendations including "40 mg of enoxaparin subcutaneously twice daily for VTE prophylaxis after cesarean delivery" [23] and "negative pressure wound therapy…applied in operating suite at the time of incision closure and left-in-situ for 7 days", respectively.[24] Another checklist had several recommendations for intrapartum and postpartum care with check boxes (e.g., intrauterine pressure catheter use, incision type, negative pressure dressing therapy), ultimately leaving the decision to perform the intervention or not up to the individual provider.[25] Common terms found in the tools from Google Scholar searches included

"consider" a certain treatment option or "anticipate" a particular complication (Appendix B). We noted differences in these tools for continuous fetal monitoring, where two tools recommend continuous fetal monitoring,[26, 27] but one did not.[28] In addition, two tools [24, 29] recommended negative pressure dressing therapy for certain circumstances (e.g., BMI > 35 kg/m^2 or > 40 kg/m^2) whereas another tool states "avoid the use of wound vacs."[26]

We then evaluated the similarities and differences between the evidence-rated recommendations in Table 2 and any of the published tools in Table 3. The evidence to support or not support the content in the tools from Table 2 was provided in the last column of Table 3. Some of the differences noted are as follows. The one recommendation in the checklist from the Society for Maternal-Fetal Medicine was supported from its own clinical series article.[15, 23] The recommendation from the bundle for prophylactic negative pressure wound therapy to reduce surgical site infection at a hospital in New South Wales, Australia was not supported by any recommendations in Table 2.[24] We observed that evidence-rated recommendations supported the majority of the content in the checklist from Abdelmalek et al. These included to notify anesthesiology providers, have resources available to accommodate increased weight (e.g., operating room equipment, blood pressure cuffs), give prophylactic anticoagulation (though dose adjustments not specified), and have a lactation consultation.[25] However, content such as delay in staple removal or adjustments in postpartum pain management were not found in other evidence-rated recommendations in Table 2.

COMMENT

Principal Findings

In our scoping review of the peripartum management of obesity, we found seven articles with evidence-rated recommendations. The articles included national guidelines from the FIGO (n=11 recommendations), United States (n=6 recommendations), United Kingdom (n=13 recommendations), and Canada (n=9 recommendations). The majority of the levels of evidence were second or third tier (Level 2 from GRADE, Level II or III from Canadian Task Force on Preventive Health Care, or Grade B or C from US Preventive Services Task Force). The recommendation that was of the highest grade (Strong, Level 1 or Grade A) was antibiotic prophylaxis for cesarean delivery,[13, 19] yet these recommendations apply to persons of all weights. A higher dosage of preoperative antibiotics for cesarean delivery also had the highest grade in one article[18] as well as subcutaneous tissue closure.[19, 22] We noted that 13 recommendations were based on expert opinion, or the lowest level of evidence.

Although we did not find directly opposing recommendations, there were subtle differences in some of the recommendations including anesthesia consults and antibiotic dosing. There is considerable debate over appropriate prophylactic dosing of antibiotics for cesarean delivery in persons with obesity given that pharmacokinetic studies suggest improved or similar tissue concentrations with adjusted dosing,[30-33] whereas a study comparing clinical outcomes such as surgical site infections did not demonstrate significant differences when comparing standard vs. higher doses of antibiotics.[34] The variations in recommendations may reflect the uncertainty of whether to reach a physiological target vs. a clinical outcome.

Strengths and limitations in relation to other studies

A systematic review of guidelines available worldwide for the management of obesity in pregnancy found 32 clinical practice guidelines covering the domains of preconception care, care during pregnancy, diet and exercise during pregnancy, care immediately before, during and after delivery, and postpartum care.[35] For delivery and postpartum care, the authors identified the following recommendations: (1) obesity alone not an indication for induction of labor, (2) early establishment of venous access during labor for women with a BMI > 40 kg/m^2, (3) allowing for a longer 1st stage of labor before performing a cesarean delivery for labor arrest, and (4) active management of the 3rd stage of labor. Recommendations pertaining to cesarean delivery included: (1) obesity alone not an indication for elective cesarean delivery, (2) need for adequate staffing and equipment for maternal weight > 120 kg, (3) suturing subcutaneous tissue if > 2 cm of depth, (4) use of mechanical thromboprophylaxis before and after cesarean delivery, and (5) weight-based dosing of medication used to prevent VTE. Lastly, they also identified recommendations for breastfeeding support and lactation consultants. These recommendations were similar to the ones we identified from national guidelines in our scoping review.[18, 19, 22]

Several of the evidence-rated recommendations in Table 2 supported the content in the 11 tools we identified. However, we also found content not supported by evidence-rated recommendations such as a peripherally inserted catheter for difficult intravenous access and delayed staple removal. We identified a randomized controlled non-inferiority trial of early (post-operative day 3) or delayed (between post-operative days 7 and 10) staple removal for transverse skin incisions in persons with a BMI ≥ 30 kg/m^2.[36] Although the study was stopped prior to reaching the targeted sample size, the

occurrence of superficial wound dehiscence was 15.2% in the early and 11.5% in the delayed group (RR 1.3, 95% CI 0.7-2.4) and there were no other differences in the secondary outcomes of seroma, hematoma, surgical site infection, or pain scores among the two groups. Since the available evidence regarding timing of staple removal is limited, other clinical and non-clinical characteristics such as provider and patient preference likely contribute to decisions about staple removal timing. We found that the recommendation for prophylactic negative pressure therapy in one tool contradicted the Royal College of Obstetricians and Gynaecologists' recommendation regarding this practice ("There is a lack of good-quality evidence to recommend the routine use of negative pressure dressing therapy…").[19] We acknowledge the content in the tools may be unique to a site depending on available resources at the time of peripartum care as well as historical practice patterns, cost, ease of use, and risk/benefit ratio to maternal and fetal health. In the tools we reviewed, language such as "consider" or "anticipate" suggests that a concrete recommendation is not available and care needs to be individualized.

Strengths and limitations of this study

We acknowledge several limitations to our study. We may not have identified all articles with evidence-rated recommendations, though our search of available published literature was thorough including a search of appropriate web sites. Sites may have practical implementation tools that they use in the short- or long-term, but they may not be published or available in a more public domain. We identified clinical guidelines from other countries including Ireland and Australia,[37, 38] but they were not included in this review because they were not accompanied by evidence-rated recommendations.

Although topics such as contraception and postpartum weight management are important in the postpartum care of persons with obesity, they were not specifically addressed in this review, which pertained to peripartum care in the immediate postpartum period. Lastly, we did not include recommendations that were intended for patient education only in this review.

Meaning of the study

Based on this scoping review, we propose the following key content for a peripartum checklist or toolkit in Table 4. This content is based on evidence ratings and ease of implementation. In summary, persons with obesity are at high risk for morbidity and mortality, with an abundance of risk occurring during the peripartum period. Few guidelines exist for the care of these persons and the evidence to support care is limited. Thus, there is a need for high quality studies encompassing peripartum interventions.

Table 4: Proposed key content for a peripartum checklist or toolkit for persons with obesity

Content	Examples
Provider discussion on labor induction, delivery route, and labor management	Allow for longer labor Difficulties in fetal heart rate monitoring
Expert consultations	Anesthesiologists Lactation consultants
Prophylaxis for cesarean delivery	Mechanical devices for VTE prophylaxis Higher dose of antibiotic before delivery depending on BMI Higher dose of anticoagulant after delivery depending on BMI
Wound management	Close subcutaneous tissue without drains or wound therapy

Contributorship statement

MK designed the study protocol. LCO completed the database search of potential articles. MK, IC, JMP, AP, and PT reviewed abstracts, decided on inclusion and exclusion criteria, and reviewed the full-text of included articles. All authors contributed to the synthesis of results. All authors acknowledged approval of the final version for publication.

Competing interests

The authors have no competing interests to report.

Funding

There are no financial support resources to report.

Data sharing

The protocol is available for review at https://doi.org/10.18131/g3-gyms-ww23. A full list of the sources and search strategies is outlined in Appendix A.

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Figure 1: PRISMA flow diagram for study selection.

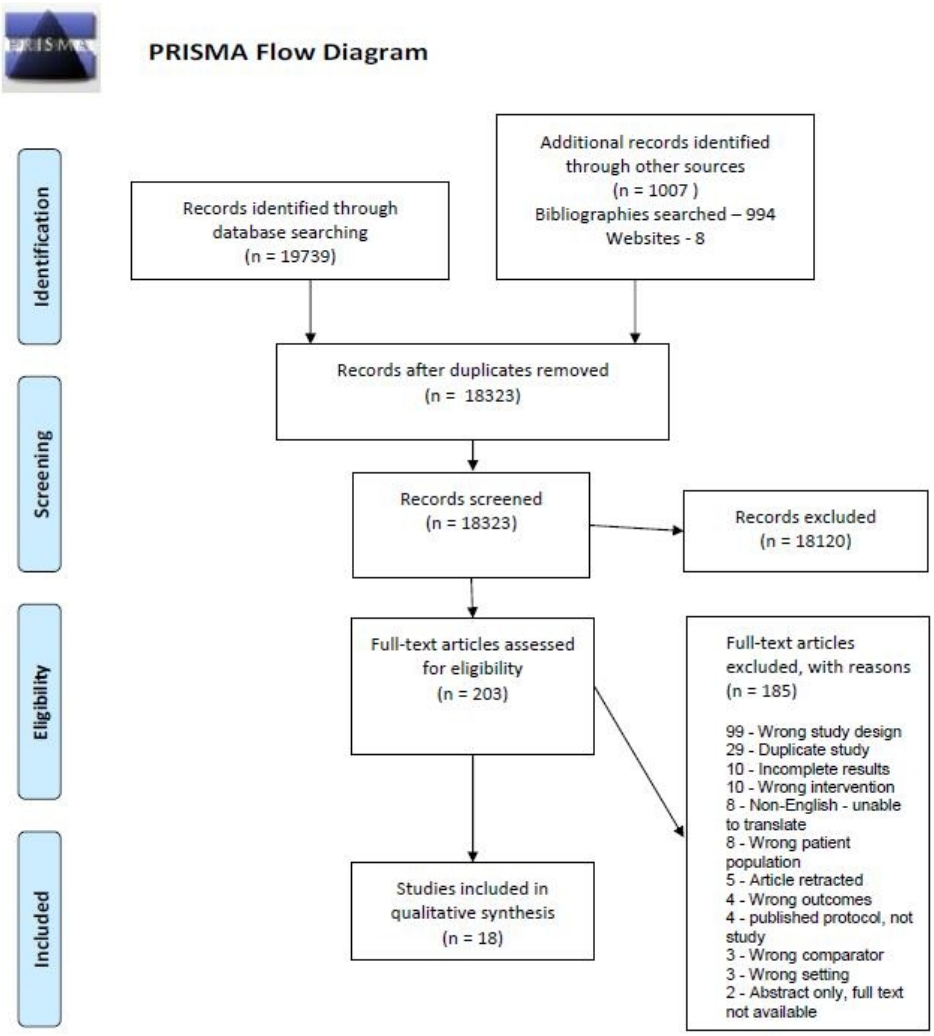

Figure 1

176x196mm (96 x 96 DPI)

Appendix A Search Strategy

PubMed MEDLINE

Guidelines search

("Obesity"[Mesh] OR Obesity[tiab] OR Obese[tiab] OR Superobesity[tiab]) AND ("Pregnancy"[Mesh] OR "Pregnancy Complications"[Mesh] OR "Pregnant Women"[Mesh] OR "Delivery, Obstetric"[Mesh] OR "Peripartum Period"[Mesh] OR "Perinatal Care"[Mesh] OR Pregnancy[tiab] OR Pregnancies[tiab] OR Pregnant[tiab] OR Parturition[tiab] OR Parturient[tiab] OR Parturients[tiab] OR Peripartum[tiab] OR Perinatal[tiab] OR Prenatal[tiab] OR Antenatal[tiab] OR Antepartum[tiab] OR Intrapartum[tiab] OR Postpartum[tiab] OR Cesarean[tiab]) AND (Toolkit[tiab] OR toolkits[tiab] OR Guideline[tiab] OR guidelines[tiab] OR Recommend*[tiab] OR Checklist[tiab] OR checklists[tiab] OR consensus[tiab] OR Evidence-based[tiab] OR “Best practice*”[tiab] OR “Clinical management” [tiab] OR “Anesthetic management”[tiab] OR anesthesia[tiab] OR anaesthesia[tiab] OR Standards[tiab] OR "Guideline" [Publication Type] OR "Practice Guidelines as Topic"[Mesh] OR "Practice Guideline" [Publication Type] OR "Meta-Analysis" [Publication Type] OR "Meta-Analysis as Topic"[Mesh] OR "Network Meta-Analysis"[Mesh] OR systematic[ti] OR scoping[ti] OR meta-analy*[ti])

Interventions search

("Obesity"[Mesh] OR Obesity[tiab] OR Obese[tiab] OR Superobesity[tiab]) AND ("Pregnancy"[Mesh] OR "Pregnancy Complications"[Mesh] OR "Pregnant Women"[Mesh] OR "Delivery, Obstetric"[Mesh] OR "Peripartum Period"[Mesh] OR "Perinatal Care"[Mesh] OR Pregnancy[tiab] OR Pregnancies[tiab] OR Pregnant[tiab] OR Parturition[tiab] OR Parturient*[tiab] OR Peripartum[tiab] OR Perinatal[tiab] OR Prenatal[tiab] OR Antenatal[tiab] OR Antepartum[tiab] OR Intrapartum[tiab] OR Postpartum[tiab] OR Cesarean[tiab])

AND (Toolkit*[tiab] OR Guideline*[tiab] OR Recommend*[tiab] OR Checklist*[tiab] OR consensus[tiab] OR Evidence-based[tiab] OR Best practice*[tiab] OR “Clinical management” [tiab] OR “Anesthetic management”[tiab] OR anesthesia[tiab] OR anaesthesia[tiab] OR Standards[tiab] OR "Guideline" [Publication Type] OR "Practice Guidelines as Topic"[Mesh] OR "Practice Guideline" [Publication Type] OR "Early Medical Intervention"[Mesh] OR "Patient Education as Topic"[Mesh] OR "Health Education"[Mesh] OR intervention*[tiab] OR therapy[subheading] OR therapy[tiab] OR treatment[tiab])

AND

(“Case-Control Studies”[Mesh:noexp] OR "retrospective studies"[mesh:noexp] OR “Control Groups”[Mesh:noexp] OR (case[TIAB] AND control[TIAB]) OR (cases[TIAB] AND controls[TIAB]) OR (cases[TIAB] AND controlled[TIAB]) OR (case[TIAB] AND comparison*[TIAB]) OR (cases[TIAB] AND comparison*[TIAB]) OR “control

group"[TIAB] OR "control groups"[TIAB] OR cohort studies[mesh:noexp] OR longitudinal studies[mesh:noexp] OR follow-up studies[mesh:noexp] OR prospective studies[mesh:noexp] OR retrospective studies[mesh:noexp] OR cohort[TIAB] OR longitudinal[TIAB] OR prospective[TIAB] OR retrospective[TIAB] OR randomized controlled trial[pt] OR controlled clinical trial[pt] OR randomized[tiab] OR placebo[tiab] OR clinical trials as topic[mesh:noexp] OR randomly[tiab] OR trial[ti] NOT (animals[mh] NOT humans [mh]))

Filters used for the interventions search:

http://libguides.sph.uth.tmc.edu/search_filters/pubmed_filters

https://work.cochrane.org/pubmed

Embase (embase.com)

Guidelines search

'obesity'/exp OR obesity:ti,ab OR superobesity:ti,ab

AND

'pregnancy'/exp OR 'pregnancy disorder'/de OR 'high risk pregnancy'/exp OR 'labor complication'/exp OR 'multiple pregnancy'/exp OR 'obstetric emergency'/exp OR 'placenta disorder'/exp OR 'pregnancy complication'/exp OR 'pregnancy disorders of endocrine origin'/exp OR 'pregnancy toxemia'/exp OR 'prolonged pregnancy'/exp OR 'puerperal disorder'/exp OR 'pregnant woman'/exp OR 'obstetric delivery'/exp OR 'perinatal period'/exp OR 'perinatal care'/exp OR Pregnancy:ti,ab OR Pregnancies:ti,ab OR Pregnant:ti,ab OR Parturition:ti,ab OR Parturient*:ti,ab OR Peripartum:ti,ab OR Perinatal:ti,ab OR Prenatal:ti,ab OR Antenatal:ti,ab OR Antepartum:ti,ab OR Intrapartum:ti,ab OR Postpartum:ti,ab OR Cesarean:ti,ab

AND

'guideline'/exp OR 'checklist'/exp OR 'consensus development'/exp OR 'evidence based practice'/exp OR 'practice guideline'/exp OR 'standards'/exp OR 'meta analysis'/exp OR 'systematic review'/exp OR 'scoping review'/exp OR Toolkit*:ti,ab OR Guideline*:ti,ab OR Recommend*:ti,ab OR Checklist*:ti,ab OR consensus:ti,ab OR Evidence-based:ti,ab OR 'Best practice*':ti,ab OR "Clinical management":ti,ab OR "Anesthetic management":ti,ab OR anesthesia:ti,ab OR anaesthesia:ti,ab OR Standards:ti,ab OR systematic:ti OR scoping:ti OR meta-analy*:ti

Interventions search

'obesity'/exp OR obesity:ti,ab OR superobesity:ti,ab

AND

'pregnancy'/exp OR 'pregnancy disorder'/de OR 'high risk pregnancy'/exp OR 'labor complication'/exp OR 'multiple pregnancy'/exp OR 'obstetric emergency'/exp OR 'placenta disorder'/exp OR 'pregnancy complication'/exp OR 'pregnancy disorders of endocrine origin'/exp OR 'pregnancy toxemia'/exp OR 'prolonged pregnancy'/exp OR 'puerperal disorder'/exp OR 'pregnant woman'/exp OR 'obstetric delivery'/exp OR 'perinatal period'/exp OR 'perinatal care'/exp OR Pregnancy:ti,ab OR Pregnancies:ti,ab OR Pregnant:ti,ab OR Parturition:ti,ab OR Parturient*:ti,ab OR Peripartum:ti,ab OR Perinatal:ti,ab OR Prenatal:ti,ab OR Antenatal:ti,ab OR Antepartum:ti,ab OR Intrapartum:ti,ab OR Postpartum:ti,ab OR Cesarean:ti,ab

AND

'guideline'/exp OR 'checklist'/exp OR 'consensus development'/exp OR 'practice guideline'/exp OR 'standards'/exp OR 'meta analysis'/exp OR 'systematic review'/exp OR 'scoping review'/exp OR toolkit*:ti,ab OR guideline*:ti,ab OR recommend*:ti,ab OR checklist*:ti,ab OR consensus:ti,ab OR 'evidence based':ti,ab OR 'best practice*':ti,ab OR 'clinical management':ti,ab OR 'anesthetic management':ti,ab OR standards:ti,ab OR 'intervention study'/exp OR 'patient education'/exp OR 'health education'/exp OR 'therapy'/exp OR intervention*:ti,ab OR therapy:ti,ab OR treatment:ti,ab

AND

'crossover procedure':de OR 'double-blind procedure':de OR 'randomized controlled trial':de OR 'single-blind procedure':de OR (random* OR factorial* OR crossover* OR cross NEXT/1 over* OR placebo* OR doubl* NEAR/1 blind* OR singl* NEAR/1 blind* OR assign* OR allocat* OR volunteer*):de,ab,ti OR 'clinical article'/exp OR 'controlled study'/exp OR 'major clinical study'/exp OR 'prospective study'/exp OR 'cohort analysis'/exp OR 'cohort':ti,ab OR 'compared':ti,ab OR 'groups':ti,ab OR 'case control':ti,ab OR 'multivariate':ti,ab

Filters:

https://guides.library.harvard.edu/c.php?g=309982&p=2079546

https://work.cochrane.org/embase

CENTRAL: Cochrane Register of Controlled Trials

Guidelines and intervention search

#1 MeSH descriptor: [Obesity] explode all trees

#2 (Obesity OR Obese OR Superobesity):ti,ab,kw

#3 #1 OR #2

#4 MeSH descriptor: [Pregnancy] explode all trees

#5 MeSH descriptor: [Pregnancy Complications] explode all trees

#6 MeSH descriptor: [Pregnant Women] explode all trees

#7 MeSH descriptor: [Delivery, Obstetric] explode all trees

#8 MeSH descriptor: [Peripartum Period] explode all trees

#9 MeSH descriptor: [Perinatal Care] explode all trees

#10 Pregnancy:ti,kw,ab OR Pregnancies:ti,kw,ab OR Pregnant:ti,kw,ab OR Parturition:ti,kw,ab OR Parturient*:ti,kw,ab OR Peripartum:ti,kw,ab OR Perinatal:ti,kw,ab OR Prenatal:ti,kw,ab OR Antenatal:ti,kw,ab OR Antepartum:ti,kw,ab OR Intrapartum:ti,kw,ab OR Postpartum:ti,kw,ab OR Cesarean:ti,kw,ab

#11 {OR #4-#10}

#12 Toolkit*:ti,kw,ab OR Guideline*:ti,kw,ab OR Recommend*:ti,kw,ab OR Checklist*:ti,kw,ab OR consensus:ti,kw,ab OR Evidence-based:ti,kw,ab OR Best practice*:ti,kw,ab OR “Clinical management”:ti,kw,ab OR “Anesthetic management”:ti,kw,ab OR anesthesia:ti,kw,ab OR anaesthesia:ti,kw,ab OR Standards:ti,kw,ab

#13 MeSH descriptor: [Practice Guidelines as Topic] explode all trees

#14 systematic:ti OR scoping:ti OR meta-analy*:ti

#15 #12 OR #13 OR #14

#16 #3 AND #11 AND #15

#17 MeSH descriptor: [Early Medical Intervention] explode all trees

#18 MeSH descriptor: [Patient Education as Topic] explode all trees

#19 MeSH descriptor: [Health Education] explode all trees

#20 MeSH descriptor: [Therapeutics] explode all trees

#21 intervention*:ti,kw,ab OR therapy:ti,kw,ab OR treatment:ti,kw,ab

#22 {OR #17-#21}

#23 #3 AND #11 AND #22

#24 #16 OR #23

CINAHL (EbscoHost)

Guidelines search

((MH "Obesity") OR (MH "Obesity, Morbid")) OR TI (Obesity OR Obese OR Superobesity) OR AB (Obesity OR Obese OR Superobesity)

AND

((MH "Pregnancy+") OR (MH "Pregnancy, Multiple+") OR (MH "Pregnancy Trimesters+") OR (MH "Pregnancy, Unplanned") OR (MH "Pregnancy, Unwanted") OR (MH "Expectant Mothers") OR (MH "Pregnancy Complications+") OR (MH "Obstetric Care+") OR (MH "Postnatal Care+") OR (MH "Postnatal Period+")) OR TI (Perinatal OR Pregnancy OR Pregnancies OR Pregnant OR Parturition OR Parturient* OR Peripartum OR Prenatal OR Antenatal OR Antepartum OR Intrapartum OR Postpartum OR Cesarean) OR AB (Perinatal OR Pregnancy OR Pregnancies OR Pregnant OR Parturition OR Parturient* OR Peripartum OR Prenatal OR Antenatal OR Antepartum OR Intrapartum OR Postpartum OR Cesarean)

AND

((MH "Practice Guidelines") OR (MH "Meta Analysis") OR (MH "Meta Synthesis")) OR TI (Toolkit* OR Guideline* OR Recommend* OR Checklist* OR consensus OR Evidence-based OR Best practice* OR “Clinical management” OR “Anesthetic management” OR anesthesia OR anaesthesia OR Standards) OR AB (Toolkit* OR Guideline* OR Recommend* OR Checklist* OR consensus OR Evidence-based OR Best practice* OR “Clinical management” OR “Anesthetic management” OR anesthesia OR anaesthesia OR Standards) OR TI (systematic OR scoping OR meta-analy*)

Interventions search

((MH "Early Intervention") OR (MH "Patient Education+") OR (MH "Health Education+") OR (MH "Pregnancy Outcomes") OR (MH "Treatment Outcomes+")) OR TI (Toolkit* OR Guideline* OR Recommend* OR Checklist* OR consensus OR Evidence-based OR Best practice* OR “Clinical management” OR “Anesthetic management” OR anesthesia OR anaesthesia OR Standards OR "Early Medical Intervention" OR "Patient Education as Topic" OR "Health Education" OR intervention* OR therapy OR treatment) OR AB (Toolkit* OR Guideline* OR Recommend* OR Checklist* OR consensus OR Evidence-based OR Best practice* OR “Clinical management” OR “Anesthetic management” OR anesthesia OR anaesthesia OR Standards OR "Early Medical Intervention" OR "Patient Education as Topic" OR "Health Education" OR intervention* OR therapy OR treatment)

AND

(MH "Prospective Studies") OR TI (cohort OR longitudinal OR prospective OR retrospective) OR AB (cohort OR longitudinal OR prospective OR retrospective) OR (((MH "Random Assignment") or (MH "Random Sample+") or (MH "Crossover Design") or (MH "Clinical Trials+") or (MH "Comparative Studies") or (MH "Control (Research)+") or (MH "Control Group") or (MH "Factorial Design") or (MH "Quasi-Experimental Studies+") or (MH "Placebos") or (MH "Meta Analysis") or (MH "Sample Size") or (MH "Research, Nursing") or (MH "Research Question") or (MH "Research Methodology+") or (MH "Evaluation Research+") or (MH "Concurrent Prospective Studies") or (MH "Prospective Studies") or (MH "Nursing Practice, Research-Based") or (MH "Solomon Four-Group Design") or (MH "One-Shot Case Study") or (MH "Pretest-Posttest Design+") or (MH "Static Group Comparison") or (MH "Study Design") or (MH "Clinical Research+")) or (clinical nursing research or random* or cross?over or placebo* or control* or factorial or sham* or meta?analy* or systematic review* or blind* or mask* or trial*))

Clinicaltrials.gov

Keyword searches included pregnancy and obesity.

Google searches

Recognizing that guidelines, toolkits, and checklists are often not published in the journal literature, we supplemented the guidelines search strategy with Google searches. To ensure more precision we limited the results to .org and .gov domains.

Searches were run in Google for “obesity pregnancy guideline” with the following limits:

1. Words in page title only
2. Words in URL only
3. .org domain
4. .gov domain
5. .gov.uk domain
6. .org.uk domain
7. .gov.au domain
8. .org.au domain

On the assumption that the Google search algorithm pushes the most relevant results to the top, one reviewer (MK) screened the first four pages of results for each search, looking for guidelines and checklists not already included in our previous search results. For the identified sites, the other authors (PT, AP, IC, JP) also voted to include or exclude the sites. The most recent search was conducted in April 2021.

Title	Year	Source or Site	Tool type	Content
Obesity in Pregnancy[1] [a]	8.2021	Department of Health in Queensland, AU Guideline: Obesity and pregnancy (including post bariatric surgery) (health.qld.gov.au)	Flow Chart	**Intrapartum** If BMI > 40 kg/m^2 Early assessment of IV access Recommend continuous fetal monitoring If prophylactic antibiotics, consider higher dosage Active third stage management Surveillance for shoulder dystocia/PPH **Postpartum** Surveillance for airway compromise Early mobilisation Assess risk of VTE and consider thromboprophylaxis Additional support for breastfeeding
Class 3 Obesity and Pregnancy [2]	7.2020	University of New Mexico Department of Obstetrics and Gynecology http://unmobgyn.pbworks.com/w/file/fetch/140915307/Class%203%20Obesity%20and%20Pregnancy.pdf	Standard operating procedure-guideline	**Intrapartum** No clear evidence for routine IOL solely for class 3 obesity Higher morbidity with TOLAC compared to repeat CD in this specific population Consider repeat CD in this population Alert team of increased risk of shoulder dystocia and PPH Anesthesia evaluation before admission, or early in admission Pneumatic compression stockings during labor Continuous fetal and uterine monitoring in labor Avoid use of wound vacs or drains **Postpartum** Low-molecular weight heparin for thromboprophylaxis for 5-6 days postpartum Weight based prophylaxis is better option Breast feeding encouraged due to higher risks of difficulties Lactation counseling Consider lactation consulting Incentive spirometry Early ambulation Avoid early hospital discharge
Obesity in Pregnancy [3]	4.2018	Alaska Native Medical Center https://anmc.org/wp-content/uploads/ClinicalGuidelinesMaster/Obesity.pdf	Guideline	**Intrapartum** Use appropriate sized blood pressure cuff Anticipate higher dose of oxytocin for induction or augmentation of labor Consider placement of prophylactic epidural catheter **If BMI > 40 kg/m^2** Consider early IUPC and FSE

				If BMI > 50 kg/m² Anesthesia consult on admission Consider additional use of IV famotidine and/or metoclopramide Anticipate higher rate of failed regional anesthesia Anticipate difficult airway (have videolaryngoscope available, have laryngeal mask airway available, have emergency cricothyroidotomy kit available) **If Cesarean delivery** Bariatric surgery should not be considered an indication for CD Anticipate greater time from incision to delivery Pfannenstiel incision carries less risk of infection and dehiscence than midline incision Consider retracting panniculus cephalad (or caudad) with tape or large "Ioban" drape Consider self-retaining retractor, extra-long instruments Close subcutaneous layer (34% decrease in wound disruption) Subcutaneous drains may be associated with a higher risk of infection Consider closure with polydioxanone (PDS) Consider Smead-Jones "mass closure" If staples used for skin closure, do not remove until 7-10 days postoperatively for a vertical incision and 5 days for a Pfannenstiel Increase dose of prophylactic cefazolin to 3 g IV before incision if BMI > 40 kg/m² Panniculectomy at the time of CD increases complications Early ambulation Intermittent pneumatic compression devices Consider using bariatric bed with frame and trapeze for mobility postoperatively Anticoagulation if 1 major or 2 minor ACCP risk factors for VTE Enoxaparin 40mg every 12 hours for BMI < 50 kg/m², 60 mg every 12 hours for BMI > 50 kg/m² or weight based dosing (e.g., enoxaparin 0.5 mg/kg every 12 hours)
Obesity in Pregnancy Guideline [4]	9.2020	National Health System Northern Devon Healthcare United Kingdom https://www.northdevo	Care Pathway	**Intrapartum** All blood pressure measurements should be taken using the appropriate size arm cuff. Complete a manual handling risk assessment to ensure the correct equipment is available and used.

		nhealth.nhs.uk/wp-content/uploads/2018/06/Obesity-in-Pregnancy-Guideline.pdf		Measure and fit TED anti-embolism stockings. Consider calf compression device for all women with BMI ≥ 40. Assess pressure areas and maintain skin integrity. Consider ultrasound scan to confirm fetal presentation. Be alert to increased risk of shoulder dystocia. The duty anaesthetist and duty obstetric registrar should be informed when a woman with a BMI ≥ 40 is admitted to labour ward. Women with a BMI ≥ 40 should have IV access early in labour with "FBC and group and save taken". For women with a BMI ≥ 40, prophylactic omeprazole should be administered as per prescription. Raised BMI alone is not an indication for continuous fetal monitoring in labour. **Postpartum** All women with a BMI ≥ 35 should be recommended to have active management of the third stage of labour Women with a BMI ≥ 30 should be encouraged to mobilise as early as practicable following childbirth to reduce the risk of thromboembolism. TED stockings or calf compression devices to be worn throughout hospital stay regardless of mode of delivery for women with BMI ≥ 35. Assess wound and observe for signs of dehiscence.
Obesity in Pregnancy, Labour and Puerperium [5]	2019	University Hospitals of Leicester NHS Trust United Kingdom Microsoft Word - Obesity in Pregnancy Labour 18 7 19 (leicestershospitals.nhs.uk)	Guideline	**Intrapartum:** Assessment of tissue viability by completing "Waterlow Risk Assessment Form"; if value > 10 then inspect skin daily via "BEST SHOT" guidance (also postpartum) Notify OR staff on admission if weight is > 140 kg **Postpartum:** Early mobilization Use compression stocking if ≥ 2 risk factors VTE prophylaxis for 7 days if ≥ 1 risk factors **If BMI ≥ 40:** Early IV access Consider early epidural Experienced obstetrician (≥ ST6) to perform CD or "rotational instrumental delivery" Active management of 3rd stage Consider IV syntocinon instead of IM route

				VTE prophylaxis regardless of delivery route Consider increased dose of antibiotic prophylaxis
Obesity Medicine Management of obesity in women's health care. Chapter 19: Checklists for Care: Care Maps for Pregnancy in the Obese Gravida [6]	2017	United States	CareMap	**Intrapartum** Obtain clear fetal heart tracing and uterine contraction assessment Place SCD Early consultation with anesthesia Confirm adequate equipment for anesthesia, labor and delivery, and operating room Discuss/plan for the following: delivery route, skin cleansing/preparation, antibiotic dosing for CD (consider 3g cefazolin if weight > 120 kg), postpartum VTE prophylaxis (SCD, LMWH), early ambulation, perineal laceration or incision care, address medical comorbidities, medication adjustments **Immediate postpartum** VTE prophylaxis Early ambulation Anticoagulation (if indicated) Lactation referral
Supporting a Plus-Size Pregnancy: A Checklist for Healthcare Providers [7]	2019	United States NIH/NICHD, National Child and Maternal Health Education Program NIH Pub.Number: 19-HD-8100 https://www.nichd.nih.gov/sites/default/files/2019-11/Healthcare_Provider_Checklist.pdf	Checklist	Ensure availability of appropriate birthing beds and monitoring/other equipment to care for plus-size patients (e.g., large chairs and wheelchairs, larger blood pressure cuffs). Assess appropriateness of gurneys and staffing plans and revise as needed (e.g., get motorized lifts for gurneys, increase staff to assist with moving the patient). Consider consulting with an anesthesia service, especially for patients with obstructive sleep apnea, in case the need for a surgical delivery arises. Consider early epidural catheter placement, and discuss the risks and benefits with the patient. Consider allowing a longer first stage of labor before performing cesarean delivery for labor arrest. Work with your patient to create a birthing plan, including pain management methods. Work with your patient to create a breastfeeding plan and help her get lactation support/consultation, if needed.
Antenatal Management of Obesity [8]	2018	Spectrum Health Medical Group Michigan, United States	Protocol	Anesthesia consult if BMI > 60 Prophylactic antibiotics "Azithro + Ancef (3g if >120kg)" Delivery timing 39-40 weeks

		www.spectrumhealth.org>mfm>protocol-obesity		Consider wound vac placement post op if Class III obesity with risk factors (DM, chorio) or BMI > 60 Postop prophylactic lovenox while inpatient for class I and II obesity with risk factors, >/= class III regardless of risk factors

Appendix B: Title, year of publication, source of recommendations, and content topic for tools for the peripartum management of obesity identified from searches of Google Scholar.

[a] During original Google scholar search on 4.1.21, the Queensland Clinical Guideline for "Obesity in pregnancy" was published in 2015. When the manuscript was updated for publication, a new version of the guideline was published in 8.2021 and therefore the most recent guideline was used for this manuscript since the prior link was no longer available.

IOL induction of labor

CD or CS cesarean delivery

IV intravenous

BMI body mass index

PPH postpartum hemorrhage

VTE venous thromboembolism

TOLAC trial of labor after cesarean

IUPC intrauterine pressure catheter

FSE fetal scalp electrode

PDS polydioxanone

ACCP American College of Chest Physicians

TED thrombo-embolus deterrent

OR operating room

NIBP non-invasive blood pressure

BP blood pressure

NB neuraxial blockade

LMWH low molecular weight heparin

DM diabetes

Reference List for Appendix B

1. Queensland Clinical Guidelines. Obesity and pregnancy (including post bariatric surgery). Guideline No. MN21.14-V6-R26. Queensland Health. 2021. Available from: http://www.health.qld.gov.au/qcg Accessed 9/24/21.

2. Gynecology UoNMSoMDoOa. Standard operating procedure-guideline class 3 obesity and pregnancy http://unmobgyn.pbworks.com/w/file/fetch/140915307/Class%203%20Obesity%20and%20Pregnancy.pdf 2020 [

3. Obesity in pregnancy - ANMC guideline Alaska Native Medical Center [Available from: https://anmc.org/wp-content/uploads/ClinicalGuidelinesMaster/Obesity.pdf

4. Obesity in pregancy guideline National Health System Northern Devon Healthcare2020 [Available from: https://www.northdevonhealth.nhs.uk/wp-content/uploads/2018/06/Obesity-in-Pregnancy-Guideline.pdf.

5. Obesity in pregnancy, labour and the puerperium University Hospitals of Leicester NHS Trust2019 [Available from: Microsoft Word - Obesity in Pregnancy Labour 18 7 19 (leicestershospitals.nhs.uk).

6. RK S. Obesity Medicine: Management of Obesity in Women's Health Care 1ed: McGraw-Hill Education; 2017.

7. Supporting a plus-size pregnancy: a checklist for healthcare providers NIH Pub.Number: 19-HD-8100: Eunice Kennedy Shriver National Institute of Child Health and Human Development; 2019 [Available from: https://www.nichd.nih.gov/sites/default/files/2019-11/Healthcare_Provider_Checklist.pdf.

8. Antenatal management of obesity: Spectrum Health The Medical Group Maternal Fetal Medicine; 2018 [Available from: www.spectrumhealth.org>mfm>protocol-obesity.

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	3
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	3
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	Cover letter
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	4
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	4, Appendix A
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Appendix A
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	4
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	5
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	5
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	5

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	5
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	5, figure 1
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	6, Table 1,2,Appendix B
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	Not applicable
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	6-7
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	6-7
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	8
Limitations	20	Discuss the limitations of the scoping review process.	10
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	9, Table 3
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	Title page

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.
* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.
† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).
‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.
§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMAScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850.

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Peripartum care of persons with obesity: A scoping review of recommendations and practical tools for implementation

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Title Page

Peripartum care of persons with obesity: A scoping review of recommendations and practical tools for implementation

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Abstract

Objective: Despite the growing prevalence of obesity among reproductive aged persons in the U.S., evidence-based guidelines for peripartum care are lacking. The objective of this scoping review is to identify obesity-related recommendations for peripartum care, evaluate grades of evidence for each recommendation, and identify practical tools (e.g., checklists, toolkits, care pathways, bundles) to support their implementation in clinical practice.

Data sources: We searched MEDLINE, EMBASE, CINAHL, the Cochrane Central Register of Controlled Trials, and clinicaltrials.gov from inception to December 2020 for eligible studies addressing peripartum care in persons with obesity.

Study eligibility criteria: Inclusion criteria were published evidence-rated recommendations and practical tools for peripartum care of persons with obesity.

Study appraisal and synthesis methods: Pairs of independent reviewers extracted data (source, publication year, content and number of recommendations, level and grade of evidence, description of tool) and identified similarities and differences among the articles.

Results: Of 18,315 screened articles, 18 were included including 7 articles with evidence-rated recommendations and 11 practical tools (3 checklists, 3 guidelines, 1 care bundle, 1 flowchart, 1 care pathway, 1 care map, 1 protocol). Thirteen of 39 evidence-rated recommendations were based on expert opinion. Recommendations related to surgical antibiotic prophylaxis and subcutaneous tissue closure at cesarean delivery received the highest-grade of evidence. Some of the practical tools included a

checklist from the United States regarding anticoagulation after cesarean delivery (evidence supported recommendation), a bundle for surgical site infections after cesarean delivery in Australia (evidence did not support recommendation), and a checklist with content for several aspects of peripartum care from Canada (evidence supported seven of nine definitive recommendations).

Conclusion: The recommendations for peripartum care for persons with obesity are based on limited evidence and few practical tools for implementation exist. Future work should focus on developing practical tools based on high quality studies.

Strengths and limitations of this study:

- We may not have identified all articles with evidence-rated recommendations, though our search of available published literature was thorough including a search of appropriate web sites.
- Sites may have practical implementation tools that they use in the short- or long-term, but they may not be published or available in a more public domain.
- Although topics such as contraception and postpartum weight management are important in the postpartum care of persons with obesity, they were not specifically addressed in this review, which pertained to peripartum care in the immediate postpartum period.
- Obesity was typically defined according to a BMI ≥ 30.0 kg/m^2, but in many instances the timing of the BMI was not provided (e.g., pre-pregnancy vs. at delivery).

- We did not include recommendations that were intended for patient education only in this review.

Keywords: obesity, peripartum care, pregnancy, tools

INTRODUCTION

Obesity has reached epidemic proportions in the United States.[1] In 2015-2016, non-Hispanic Black (54.8%) and Hispanic (50.6%) women had the highest prevalence of obesity and 36.5% of reproductive age women (20-39 years) had obesity (BMI ≥ 30.0 kg/m^2), translating to a high percentage of persons with obesity during future pregnancies and race-ethnicity health disparities.[2] Of further concern, over 50% of persons with obesity exceed guidelines for weight gain during pregnancy, thus compounding their risks for adverse outcomes.[3-5] Adverse peripartum outcomes associated with obesity include cesarean delivery, infection, hemorrhage, thromboembolism (VTE), and anesthesia-related complications, such as failure of regional anesthesia and respiratory depression.[6] These adverse outcomes are amplified in persons with a BMI ≥ 50 kg/m^2.[7] Furthermore, obesity is cited as a contributing factor in over 50% of maternal deaths.[8]

Adaptations to prenatal care for persons with obesity include early screening for diabetes and limiting weight gain to 11-20 pounds.[9] However, more evidence-based studies for peripartum care of persons with obesity, where the risk for adverse outcomes is a significant concern, are needed. For example, the National Institute for Health and Care Excellence (NICE) performed evidence-based reviews for the intrapartum management of obesity in 2019 and found no clinical evidence to suggest that the management of fetal monitoring or maternal positioning in labor should be altered.[10] Even fewer studies and evidence-based recommendations are available for those with a BMI ≥ 50 kg/m^2, who are at even higher risk for adverse outcomes.

Strategies that have reduced adverse outcomes in obstetrics include the development of checklists or toolkits after identifying patient, provider, and systems factors for improvement in the care pathway.[11] Given the increasing incidence of obesity and obesity-related complications, it is critical to identify opportunities to improve the safe delivery of peripartum care.

Objectives

The objective of this scoping review is to identify obesity-related recommendations for peripartum care, evaluate levels or grades of evidence for each recommendation, and identify practical tools such as checklists, toolkits, or other comprehensive care pathways to support their implementation in clinical practice. In this scoping review, we were specifically interested in recommendations that pertained to actionable items such as a treatment or decision option or a specialized consultation.

METHODS

Eligibility criteria, information sources, search strategy

The PRISMA extension for scoping reviews (PRISMA-ScR) checklist was used in developing and reporting this scoping review.[12] The inclusion criteria were: (1) published (in print or online) recommendations along with levels or grades of evidence for the peripartum care of persons with obesity (BMI ≥ 30.0 kg/m^2), and if possible, specifically for persons with a BMI ≥ 50 kg/m^2; or (2) published (in print or online) description of a tool such as a checklist, toolkit, or comprehensive care pathway for the peripartum care of obesity. We defined peripartum care to refer to care immediately before, during and after delivery, approximately 24 hours before and after delivery. To be included in the review, the identified recommendations needed to focus on

actionable items or management strategies, as opposed to being a listing of comorbidities or risks that are associated with obesity in pregnancy. Actionable items might include giving or withholding a particular medication or device. Recommendations that exclusively related to “patient counseling” or imparting of knowledge to the patient were not included as the interpretation of counseling can have different meanings depending on the clinical setting (e.g., location of clinical practice, provider type). The recommendations could have been abstracted from articles pertaining to obesity alone, or other articles that specified recommendations pertaining to obesity (e.g., antibiotic use in pregnancy with a specific adaptation for persons with obesity). Because recommendations could be published from varying health care systems and there were no restrictions placed on country of origin (e.g., national guidelines from United States vs. United Kingdom), variances in evidence grading were identified and abstracted according to the health care system’s grading method.

We searched PubMed MEDLINE, Embase (embase.com), Cochrane Central Register of Controlled Trials (Wiley), CINAHL (EbscoHost), and clinicaltrials.gov from inception through December 2020, with no date or language restrictions. The search for eligible studies involved controlled vocabulary (MeSH headings and thesauri of relevant databases) and the keywords of obesity, morbid obesity, super morbid obesity, guidelines, recommendations, checklist, toolkit, maternal care pathway, peripartum care, and pregnancy. The bibliographies of relevant reviews were hand-searched, as well as key websites including Google Scholar. A full list of the sources and search strategies is outlined in Appendix A.

Patient and Public Involvement

Patients were not directly involved in the design of this study.

Study Selection

The questions for this scoping review were: (1) What are the recommendations for peripartum care of persons with obesity published by either individual authors, national societies, or other government departments that provide levels or grades of evidence to support the recommendation? (2) What are the published tools for practical implementation of recommendations, either in the form of checklists, toolkits, or other comprehensive care pathways?

The primary outcomes were the number of recommendations per article, topic of recommendation, level or grade of evidence to support recommendations, and similarities and differences between the recommendations across articles. For the identified checklists, toolkits, or other comprehensive care pathways for the peripartum management of obesity, their details were summarized and crosschecked with the aforementioned recommendations.

Data extraction

Four reviewers independently screened all citations using the Covidence review management software.[13] Initially, the reviewers were trained on a sample of 20 articles using the Covidence software to verify clarity and consistency regarding inclusion and exclusion criteria. A separate, 5th reviewer resolved all conflicts. Once agreement was obtained on articles meeting criteria for final inclusion, two reviewers independently extracted the following data from each article using a form that was tested and modified by the reviewers, as applicable: (1) source of recommendations (e.g., individual authors, national societies, etc.), (2) year of publication, (3) content and

total number of recommendations, (4) level and grade of evidence for each of the recommendations, (4) system used to determine levels of evidence or classification of recommendations, (5) description of checklist, toolkit, comprehensive care pathway or other format used for implementation in the peripartum care of obesity. If articles were in abstract form only, we contacted the authors for updates on the status of the final publication.

Data synthesis

The data were summarized and abstracted into table format, noting key similarities and differences among the articles in terms of content and level and grade of evidence. For the identified checklists, toolkits, etc. similarities and differences among the content were highlighted. For this scoping review, we did not assess the effectiveness of the findings or evaluate bias. The scoping review protocol is published at https://doi.org/10.18131/g3-gyms-ww23.

Ethics approval statement

Ethics approval was not required since the study was a review of previously published articles.

RESULTS

Study selection

After removal of duplicates, 18,328 articles were screened, resulting in 203 articles for full-text review. Figure 1 shows the flow diagram for study selection. A total of 7 evidence-rated articles and 11 tools met inclusion criteria for this review. The majority (n=8) of the tools were selected from the results of Google Scholar searches.

Study characteristics

Table 1 displays the title, year of publication, source of recommendations, and references for evidence levels and grades for seven articles identified from the search of all databases. The publication years ranged from 2015-2020 representing three countries (US, UK, Canada) and one international guideline. Publication topics included thromboembolism, antibiotics prophylaxis, as well as the broad-spectrum of peripartum care. For these articles, the content was either exclusively focused on the management of obesity or the content was about a high-risk condition during pregnancy and addressed obesity among other issues. Table 2 displays the topic, content of the recommendation, and evidence levels and grades for each recommendation from the seven articles in Table 1. For the tools, Table 3 displays the title, year of publication, source of recommendations, and content topic for the peripartum management of obesity identified from searches of PubMed MEDLINE, Embase, Cochrane Central Register of Controlled Trials, and CINAHL (n=3). Appendix B displays the same information identified from a search of key websites and Google Scholar for tools (n=8). We found a wide range of tools including checklists, bundles, flow charts, guidelines, protocols, care pathways, and care maps from practices in the United States, Canada, and the United Kingdom.

Table 1. Source of recommendations, year of publication, title, evidence grading system and levels and grades for 7 articles related to peripartum management of obesity

Author/Source	Date	Title	Evidence Grading System Examples of grade and level ranges
McAuliffe et al International Federation of Gynecology and Obstetrics	2020	Management of prepregnancy, pregnancy, and postpartum obesity[14]	GRADE[15] [a] Grade strong or weak Evidence low, moderate, high or best practice
Society for Maternal-Fetal Medicine (United States); 1/6 recommendations pertain to	2020	SMFM Consult Series #51: Thromboembolism prophylaxis for cesarean delivery[16]	GRADE[15] [a] Grade strong or weak Evidence low, moderate, high or best practice

obesity			
J van Schalkwyk, N Van Eyk Society of Obstetricians and Gynaecologists of Canada (Canada); 1/7 recommendations pertain to obesity	2017	Guideline No. 247-Antibiotic prophylaxis in obstetric procedures[17]	Canadian Task Force on Preventive Health Care [18] [b] Levels I-III Classifications A-I
Maxwell C, et al. Society of Obstetricians and Gynaecologists of Canada (Canada)	2019, 2020 correction	Guideline No. 392-Pregnancy and maternal obesity Part 2: Team planning for delivery and postpartum care[19]	Canadian Task Force on Preventive Health Care [18] [b] Levels I-III Classifications A-E,I
Denison FC, et al. Royal College of Obstetricians and Gynaecologists (United Kingdom)	2018	Care of women with obesity in pregnancy Green-top Guideline #72[20]	Clinical Governance Advice No.1 Development of RCOG Green-Top Guidelines [21] [c] Grades A-D, and "checkmark" Levels 1++ to 4
Royal College of Obstetricians and Gynaecologists (United Kingdom)	2015	Reducing the risk of venous thromboembolism during pregnancy and the puerperium Green-top Guideline No.37a[22]	Clinical Governance Advice No.1 Development of RCOG Green-Top Guidelines [21] [c] Grades A-D, and "checkmark" Levels 1++ to 4
American College of Obstetricians and Gynecologists Practice Bulletin (United States)	2015	Practice Bulletin #156 Obesity in pregnancy[9]	U.S. Preventive Services Task Force Grade A-C [d] Levels I-III

GRADE Grading of Recommendations Assessment, Development and Evaluation

SMFM Society for Maternal-Fetal Medicine

RCOG Royal College of Obstetricians and Gynaecologists

[a] GRADE: 1A. Strong recommendation, high quality evidence; 1B. Strong recommendation, moderate-quality evidence; 1C. Strong recommendation, low quality evidence; 2A. Weak recommendation, high quality evidence; 2B. Weak recommendation, moderate-quality evidence; 2C. Weak recommendation, low quality evidence; Best practice

[b] Canadian Task Force on Preventive Health Care: Quality of evidence assessment: I: Evidence obtained from at least one properly randomized controlled trial. II-1: Evidence from well-designed controlled trials without randomization. II-2: Evidence from well- designed cohort (prospective or retrospective) or case-control studies, preferably from more than one centre or research group. II-3: Evidence obtained from comparisons between times or places with or without the intervention. Dramatic results in uncontrolled experiments (such as the results of treatment with penicillin in the 1940s) could also be included in this category. III: Opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees. Classification of recommendations: A. There is good evidence to recommend the clinical preventive action. B. There is fair evidence to recommend the clinical preventive action. C. The existing evidence is conflicting and does not allow to make a recommendation for or against use of the clinical preventive action; however, other factors may influence decision-making. D. There is fair evidence to recommend against the clinical preventive action. E. There is good evidence to recommend against the clinical preventive action. L. There is insufficient evidence (in quantity or quality) to make a recommendation; however, other factors may influence decision making.

[c] Clinical Governance Advice No.1 Development of RCOG Green-Top Guidelines: Classification of evidence levels: 1++ High-quality meta-analyses, systematic reviews of randomised controlled trials or randomised controlled trials with a very low risk of bias. 1+ Well-conducted meta-analyses, systematic

reviews of randomised controlled trials or randomised controlled trials with a low risk of bias. 1– Meta-analyses, systematic reviews of randomised controlled trials or randomised controlled trials with a high risk of bias. 2++ High-quality systematic reviews of case–control or cohort studies or high-quality case–control or cohort studies with a very low risk of confounding, bias or chance and a high probability that the relationship is causal. 2+ Well-conducted case–control or cohort studies with a low risk of confounding, bias or chance and a moderate probability that the relationship is causal. 2– Case–control or cohort studies with a high risk of confounding, bias or chance and a significant risk that the relationship is not causal. 3 Non-analytical studies, e.g. case reports, case series. 4 Expert opinion. Grades of recommendation: A At least one meta-analysis, systematic review or RCT rated as 1++, and directly applicable to the target population; or A systematic review of RCTs or a body of evidence consisting principally of studies rated as 1+, directly applicable to the target population and demonstrating overall consistency of results. B A body of evidence including studies rated as 2++ directly applicable to the target population, and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 1++ or 1+. C A body of evidence including studies rated as 2+ directly applicable to the target population, and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 2++. D Evidence level 3 or 4; or Extrapolated evidence from studies rated as 2+. “Checkmark” Recommended best practice based on the clinical experience of the guideline development group.

[d] U.S. Preventive Services Task Force: I Evidence obtained from at least one properly designed randomized controlled trial. II-1 Evidence obtained from well-designed controlled trials without randomization. II-2 Evidence obtained from well-designed cohort or case–control analytic studies, preferably from more than one center or research group. II-3 Evidence obtained from multiple time series with or without the intervention. Dramatic results in uncontrolled experiments also could be regarded as this type of evidence. III Opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees. Based on the highest level of evidence found in the data, recommendations are provided and graded according to the following categories: Level A—Recommendations are based on good and consistent scientific evidence. Level B—Recommendations are based on limited or inconsistent scientific evidence. Level C—Recommendations are based primarily on consensus and expert opinion.

Table 2. Topics, recommendations, and level or grade of evidence among 7 articles related to peripartum management of obesity.

Topic	Recommendation	Level or grade of evidence
Route of delivery	The decision for a woman with maternal obesity to give birth by planned caesarean section should involve a multidisciplinary approach, taking into consideration the individual woman's comorbidities, antenatal complications and wishes.[20]	Level 2-, C
Labor induction	Induction of labor is recommended at 41+0 weeks of gestation for women with a BMI ≥ 35 owing to their increased risk of intrauterine death.[14]	Strong + + +
	Elective induction of labour at term in obese women may reduce the chance of caesarean birth without increasing the risk of adverse outcomes.[20]	Level 2+, B
	Where macrosomia is suspected, induction of labour may be considered. Parents should have a discussion about the options of induction of labour and expectant management.[20]	Level 1+, B
Fetal monitoring	Electronic fetal monitoring is recommended for women in active labor with a BMI ≥ 35. Intrauterine pressure catheters and fetal scalp electrodes may help.[14]	Conditional +
	(a) Electronic fetal monitoring can be considered for women in active labour with a body mass index > 35 kg/m^2. (b) Intrauterine pressure catheters may assist in assessment of labour contractions. (c) Fetal scalp electrodes may be helpful to ensure continuous fetal monitoring when indicated.[19]	III-B
Labor management	Allowing a longer first stage of labor before performing cesarean delivery for labor arrest should be considered in obese women.[9]	B, Level II-2,3
Blood pressure monitoring	Where available, an appropriately sized blood pressure cuff should be used for measurements. The cuff size used at the earliest time point should be documented in the medical records.[14]	Conditional ++
IV access	Establish venous access in early labor for women with a BMI ≥40 and consider a second cannula.[14]	Conditional +
	Women with a BMI 40 kg/m^2 or greater should have venous access established early in labour and consideration should be given to the siting of a second cannula.[20]	Checkmark
Regional anesthesia	In the case of vaginal delivery for women with a BMI ≥ 40, early placement of an epidural catheter is advisable in the case of an emergency cesarean delivery.[14]	Conditional + +
Antibiotic prophylaxis for cesarean delivery	Women with a BMI ≥ 30 having a cesarean delivery are at increased risk of wound infection and should receive prophylactic antibiotics at the time of surgery. Women with obesity may benefit from higher doses.[14]	Strong + + + +
	In patients with morbid obesity (BMI > 35), doubling the antibiotic dose may be considered.[17]	III-B
	Women with obesity may benefit from higher dosage of preoperative antibiotics for caesarean birth.[19]	I-A
	Women with class 1 obesity or greater having a caesarean section are at increased risk of wound infection and should receive prophylactic antibiotics at the time of surgery.[20]	Level 1++, A
Incision type, skin closure for cesarean delivery	There is a paucity of high-quality evidence to support the use of one surgical approach over another. Surgical approaches should therefore follow NICE CG132 but clinicians may decide alternative approaches are merited depending on individual circumstances.[20]	Checkmark
Subcutaneous tissue closure	It is recommended to reapproximate the subcutaneous tissue layers at the time of caesarean birth to reduce wound complications.[19]	II-2A
	Women undergoing caesarean section who have more than 2 cm subcutaneous fat should have suturing of the subcutaneous tissue space in order to reduce the risk of wound infection and wound separation.[20]	Level 1++, A

Topic	Recommendation	Level or grade of evidence
	Subcutaneous drains increase the risk of postpartum cesarean wound complications and should not be used routinely.[9]	Grade A, Level 1
	There is a lack of good-quality evidence to recommend the routine use of negative pressure dressing therapy, barrier retractors and insertion of subcutaneous drains to reduce the risk of wound infection in obese women requiring caesarean sections.[20]	Level 2- to 1+, B
Hemorrhage	Active management of the third stage should be recommended to reduce the risk of postpartum hemorrhage.[14]	Strong + + +
	Although active management of the third stage of labour is advised for all women, the increased risk of PPH in those with a BMI greater than 30 kg/m^2 makes this even more important.[20]	Level 2++, A or Level 1++, B [a]
VTE prophylaxis	Postoperative pharmacologic thromboprophylaxis should be prescribed based on maternal weight.[14]	Conditional + +
	Mechanical thromboprophylaxis is recommended before and after cesarean delivery. Where available, women with a BMI ≥ 35 should be given graduated compression stockings, or other interventions such as sequential compression devices, after cesarean delivery until mobilization, which should be encouraged early.[14]	Conditional + +
	When pharmacologic thromboprophylaxis is needed in pregnant women with class III obesity, we suggest the use of intermediate doses of enoxaparin [for cesarean delivery].[16]	2C
	Postoperative thromboprophylaxis is recommended, at appropriate dosing for the given body mass index, due to the greater risk of venous thromboembolism following caesarean birth with women with obesity.[19]	II-3 A
	All women with class 3 obesity (BMI greater than or equal to 40 kg/m^2) should be considered for prophylactic LMWH in doses appropriate for their weight for 10 days after delivery.[22]	D
	Women with two or more persisting risk factors listed in Table 1 should be considered for LMWH in prophylactic doses appropriate for their weight for 10 days after delivery. One risk factor = BMI ≥ 30kg/m^2.[22]	B
	Mechanical thromboprophylaxis is recommended before cesarean delivery, if possible, as well as after cesarean delivery.[9]	B, Level II-3
	Weight-based dosage for venous thromboembolism thromboprophylaxis may be more effective than BMI-stratified dosage strategies in class III obese women after cesarean delivery.[9]	B, Level II-3
Breastfeeding	Obesity is associated with low breastfeeding initiation and maintenance. Women with obesity in early pregnancy should receive specialist advice on the benefits of breastfeeding and appropriate antenatal and postnatal support for breastfeeding initiation and maintenance.[14]	Conditional + +
	Women with obesity should be offered lactation support in the postpartum period.[19]	III C
	Obesity is associated with low breastfeeding initiation and maintenance rates. Women with a booking BMI ≥30 kg/m^2 or greater should receive appropriate specialist advice and support antenatally and postnatally regarding the benefits, initiation and maintenance of breastfeeding.[20]	Checkmark, Level 1+
Anesthesiology consult	Antenatal assessment with obstetric anaesthesia may assist in planning for safer birth for women with obesity.[19]	III-A
	The on-duty anaesthetist covering the labour ward should be informed of all women with class III obesity admitted to the labour ward for birth. This communication should be documented by the attending midwife in the notes.[20]	Checkmark
Systems	Where possible, healthcare facilities should have clearly defined pathways for the management of pregnant women with obesity. The adequacy of resources and equipment available should be considered when making decisions around care, especially for women with a BMI ≥ 40.[14]	Conditional +
	Obstetric team planning may be helpful for women with obesity to navigate the steps in antenatal, labour and delivery, and postnatal care.[19]	III-3 A [b]

Topic	Recommendation	Level or grade of evidence
	Consultation with anesthesia service should be considered for obese pregnant women with OSA because they are at an increased risk of hypoxemia, hypercapnia, and sudden death.[9]	C

[a] The recommendation is reports as “Level 2++, A” on page 26 of the document and also reported as “Level 1++, B” on pages 8 and 30 of the document.

[b] The recommendation is reported as “III-3 A”, though this level and grade of evidence is not defined in the Society of Obstetricians and Gynaecologists of Canada document.

BMI body mass index

NICE CG National Institute for Health and Care Excellence Clinical Guidelines

VTE venous thromboembolism

PPH postpartum hemorrhage

IV intravenous

LMWH low molecular weight heparin

OSA obstructive sleep apnea

Table 3: Title, year of publication, source of recommendations, content topic, and evidence to support recommendations among 3 tools related to the peripartum management of obesity

Title	Year	Source or Site	Tool type	Content	Evidence to support content when a definitive recommendation was made in the tool
Society for Maternal-Fetal Medicine Special Statement: Checklist for thromboembolism prophylaxis after cesarean delivery[23]	2020	Society for Maternal-Fetal Medicine	Checklist	**VTE prophylaxis (after cesarean delivery)** For women with body mass index (BMI) 40 kg/m^2 or greater (class 3 obesity) who have thrombophilia or history of deep venous thrombosis or pulmonary embolism, intermediate-dose low-molecular-weight heparin (e.g., enoxaparin 40 mg SC every 12 hours); continue for 6 weeks postoperatively	SMFM[16] Level 2C
Reducing surgical site infections post-cesarean section in an Australian hospital, using a bundled care approach[24]	2020	NSW Local Health District, Australia	Bundle	**Subcutaneous tissue closure** Negative pressure wound therapy BMI>35 (PICO) BMI > 40 (Prevena) applied in operating suite at the time of incision closure and left in-situ for 7 days	RCOG[20] Level 2- to 1+, B does NOT support recommendation
Team Planning in Obstetrical Care for Women with Obesity[25]	2019	Mount Sinai Hospital in Toronto, Ontario Canada	Checklist	**General admission for delivery** PICC line recommended (checkbox) **Intrapartum** Type of delivery (spontaneous or induced labor or Cesarean delivery) (checkbox) Appropriate size [blood pressure] cuff Appropriate size gown, long monitoring belts Notify OB, Anesthesia, Respiratory therapist, Neonatology May need cross and type IUPC use (checkbox) Encourage ambulation **Cesarean delivery**	FIGO[14] Conditional ++ for BP cuff size RCOG[20] “Checkmark” for notify anesthesia

				Incision location Method of [incision] closure Use of negative pressure wound system (checkbox). Plan for prolonged length of stay if OSA/CPAP (checkbox) Additional medication for gastric emptying/GERD and possible additional antibiotics Equipment (OR table with side bars and pads, OR tray, hover mat, epidural/spinal needle and portable ultrasound, Troop pillow, need for difficult airway try, Mobius retractor and Sturgeon, Traxi Panniculus retractor, negative pressure wound system) Need for increased length of stay due to anesthesia (checkbox) (e.g., CPAP for sleep apnea). **Postpartum** Bariatric bed required for a weight > 500 lbs. (check box) Delay in suture or staple removal with the postoperative day entered for removal as an outpatient. Prophylactic anticoagulation, early ambulation encouraged Pain management plan with dosage changes Breastfeeding, lactation consultant Dietician follow-up	SOGC[17, 19] Level 1-A and Level III-B for additional antibiotics FIGO[14] Conditional 1+ for resources an equipment FIGO[14] Conditional 1+ for resources an equipment None SMFM[16] Level 2C, FIGO Conditional ++[14], SOGC[19] II-3 B, RCOG[20] Grade B or D, ACOG[9] Grade B Level 2-3 None FIGO[14] Conditional ++, RCOG[20] “checkmark”, Level 1+

SMFM Society for Maternal-Fetal Medicine

BMI body mass index

SC subcutaneous

NSW North South Wales

RCOG Royal College of Obstetricians and Gynecologists

PICC peripherally inserted central catheter

BP blood pressure

OB obstetrics

IUPC intrauterine pressure catheter

OSA obstructive sleep apnea

CPAP continuous positive airway pressure

FIGO International Federation of Gynecology and Obstetrics

SOCG Society of Obstetricians and Gynaecologists of Canada

OR operating room

VTE venous thromboembolism

ACOG American College of Obstetricians and Gynecologists

Synthesis of Results

The evidence-rated recommendations covered topics such as labor induction (e.g., indication and timing), intravenous access, fetal monitoring (e.g., scalp electrodes, intrauterine pressure catheters), management of the 1st and 3rd stages of labor, breastfeeding, and system-related preparedness. Several recommendations were specific to cesarean delivery (e.g., incision type, antibiotic prophylaxis and dose, subcutaneous tissue closure, negative pressure dressings, and VTE prophylaxis) and anesthesia (e.g., consultation, early placement of an epidural catheter). In several instances, recommendations for persons with obesity did not differ from recommendations for persons without obesity (e.g., antibiotic prophylaxis for cesarean delivery).[20] Three articles had one recommendation [16, 17, 22] and the highest number of recommendations was 11 in a single article.[14] The FIGO (International Federation of Gynecology and Obstetrics) Pregnancy and Non-Communicable Disease Committee published guidelines for the management of pre-pregnancy, pregnancy, and postpartum obesity. Their recommendations for peripartum management (n=11) were included in this analysis, but it should be noted that the recommendations were not unique to the article, but instead they were abstracted from previously published international articles.[14]

The recommendations that were of the highest grade (Strong, Level 1, or Grade A) were antibiotic prophylaxis for cesarean delivery,[14, 20] higher dosage of preoperative antibiotics for cesarean delivery,[17, 19] and subcutaneous tissue closure.[9, 20] We noted that 13 recommendations were based on expert opinion or the lowest level of evidence. We noted that topics such as antibiotic prophylaxis (n=4

recommendations),[14, 17, 19] subcutaneous skin closure (n=4 recommendations),[9, 19, 20] and VTE prophylaxis (n=8 recommendations)[9, 14, 16, 19] were most commonly addressed. There were two instances where a particular intervention was not recommended (e.g., subcutaneous drains, negative pressure dressing therapy).[9, 20] We did not find any recommendations that directly opposed one other, but there were differences in the specifics of the recommendations. For example, the American College of Obstetricians and Gynecologists (ACOG) recommends an anesthesiology consult for persons with both obesity and obstructive sleep apnea whereas RCOG recommends that the anesthetist "be informed of all women with class III obesity".[9, 20] In one guideline from the Society of Obstetricians and Gynaecologists of Canada (SOGC), the recommendation is for a "higher" dose [19] and another recommendation from the SOGC is for a "double dose" [17] of antibiotic prophylaxis. Regarding specific recommendations for persons with different classes of obesity, we only found recommendations for weight-based VTE prophylaxis dosing [9, 16, 22] and anesthesiology consultations.[20]

Regarding the practical tools for implementation (Table 3), the style varied. In a checklist and bundle, there were specific recommendations including "40 mg of enoxaparin subcutaneously twice daily for VTE prophylaxis after cesarean delivery" [23] and "negative pressure wound therapy…applied in operating suite at the time of incision closure and left-in-situ for 7 days", respectively.[24] Another checklist had several recommendations for intrapartum and postpartum care with check boxes (e.g., intrauterine pressure catheter use, incision type, negative pressure dressing therapy), ultimately leaving the decision to perform the intervention or not up to the individual

provider.[25] Common terms found in the tools from Google Scholar searches included "consider" a certain treatment option or "anticipate" a particular complication (Appendix B). We noted differences in these tools for continuous fetal monitoring, where two tools recommend continuous fetal monitoring,[26, 27] but one did not.[28] In addition, two tools [24, 29] recommended negative pressure dressing therapy for certain circumstances (e.g., BMI > 35 kg/m^2 or > 40 kg/m^2) whereas another tool stated "avoid the use of wound vacs."[26]

We then evaluated the similarities and differences between the evidence-rated recommendations in Table 2 and any of the published tools in Table 3. The evidence to support or not support the content in the tools from Table 2 was provided in the last column of Table 3. Some of the differences noted are as follows. The one recommendation in the checklist from the Society for Maternal-Fetal Medicine was supported from its own clinical series article.[16, 23] The recommendation from the bundle for prophylactic negative pressure wound therapy to reduce surgical site infection at a hospital in New South Wales, Australia was not supported by any recommendations in Table 2.[24] We observed that evidence-rated recommendations supported the majority of the content in the checklist from Abdelmalek et al. These included to notify anesthesiology providers, have resources available to accommodate increased weight (e.g., operating room equipment, blood pressure cuffs), give prophylactic anticoagulation (though dose adjustments not specified), and have a lactation consultation.[25] However, content such as delay in staple removal or adjustments in postpartum pain management were not found in other evidence-rated recommendations in Table 2.

DISCUSSION

Principal Findings

In our scoping review of the peripartum management of obesity, we found seven articles with evidence-rated recommendations. The articles included national guidelines from the FIGO (n=11 recommendations), United States (n=6 recommendations), United Kingdom (n=13 recommendations), and Canada (n=9 recommendations). The majority of the levels of evidence were second or third tier (Level 2 from GRADE, Level II or III from Canadian Task Force on Preventive Health Care, or Grade B or C from US Preventive Services Task Force). The recommendation that was of the highest grade (Strong, Level 1 or Grade A) was antibiotic prophylaxis for cesarean delivery,[14, 20] yet these recommendations apply to persons of all weights. A higher dosage of preoperative antibiotics for cesarean delivery also had the highest grade in one article[19] as well as subcutaneous tissue closure.[9, 20] We noted that 13 recommendations were based on expert opinion, or the lowest level of evidence. We noted that the majority of these recommendations would be considered “low-risk” interventions such as lactation and anesthesia consults and developing a system or clinical care pathway for persons with obesity. Other expert opinion recommendations might be considered in the labor management for all persons depending on the clinical situation (e.g., intravenous access, fetal heart rate monitoring, IUPC use).

Although we did not find directly opposing recommendations, there were subtle differences in some of the recommendations including criteria for anesthesia consults and antibiotic dosing. There is considerable debate over appropriate prophylactic dosing of antibiotics for cesarean delivery in persons with obesity given that pharmacokinetic

studies suggest improved or similar tissue concentrations with adjusted dosing,[30-33] whereas a study comparing clinical outcomes such as surgical site infections did not demonstrate significant differences when comparing standard vs. higher doses of antibiotics.[34] The variations in recommendations may reflect the uncertainty of whether to reach a physiological target vs. a clinical outcome.

We found that the recommendation for prophylactic negative pressure therapy in one tool contradicted the Royal College of Obstetricians and Gynaecologists' recommendation regarding this practice ("There is a lack of good-quality evidence to recommend the routine use of negative pressure dressing therapy…").[20] We acknowledge the content in the tools may be unique to a site depending on available resources at the time of peripartum care as well as historical practice patterns, cost, ease of use, and risk/benefit ratio to maternal and fetal health. In the tools we reviewed, language such as "consider" or "anticipate" suggests that a concrete recommendation is not available and care needs to be individualized.

Strengths and limitations in relation to other studies

Other authors have published summaries of clinical guidelines, similar to the ones we identified. For example, a systematic review of guidelines available worldwide for the management of obesity in pregnancy found 32 clinical practice guidelines covering the domains of preconception care, care during pregnancy, diet and exercise during pregnancy, care immediately before, during and after delivery, and postpartum care.[35] For delivery and postpartum care, those authors identified the following recommendations: (1) obesity alone not an indication for induction of labor, (2) early establishment of venous access during labor for women with a BMI > 40 kg/m^2, (3)

allowing for a longer 1st stage of labor before performing a cesarean delivery for labor arrest, and (4) active management of the 3rd stage of labor. Recommendations pertaining to cesarean delivery included: (1) obesity alone not an indication for elective cesarean delivery, (2) need for adequate staffing and equipment for maternal weight > 120 kg, (3) suturing subcutaneous tissue if > 2 cm of depth, (4) use of mechanical thromboprophylaxis before and after cesarean delivery, and (5) weight-based dosing of medication used to prevent VTE. Lastly, they also identified recommendations for breastfeeding support and lactation consultants. These recommendations were similar to the ones we identified from national guidelines in our scoping review.[9, 19, 20]

Several of the evidence-rated recommendations in Table 2 supported the content in the 11 tools we identified. However, we also found content not supported by evidence-rated recommendations such as a peripherally inserted catheter for difficult intravenous access and delayed staple removal. We identified a randomized controlled non-inferiority trial of early (post-operative day 3) or delayed (between post-operative days 7 and 10) staple removal for transverse skin incisions in persons with a BMI ≥ 30 kg/m^2.[36] Although the study was stopped prior to reaching the targeted sample size, the occurrence of superficial wound dehiscence was 15.2% in the early and 11.5% in the delayed group (RR 1.3, 95% CI 0.7-2.4) and there were no other differences in the secondary outcomes of seroma, hematoma, surgical site infection, or pain scores among the two groups. Since the available evidence regarding timing of staple removal is limited, other clinical and non-clinical characteristics such as provider and patient preference likely contribute to decisions about staple removal timing.

Strengths and limitations of this study

We acknowledge several limitations to our study. We may not have identified all articles with evidence-rated recommendations, though our search of available published literature was thorough including a search of appropriate web sites. Sites may have practical implementation tools that they use in the short- or long-term, but they may not be published or available in a more public domain. We identified clinical guidelines from other countries including Ireland and Australia,[37, 38] but they were not included in this review because they were not accompanied by evidence-rated recommendations. Although topics such as contraception and postpartum weight management are important in the postpartum care of persons with obesity, they were not specifically addressed in this review, which pertained to peripartum care in the immediate postpartum period. Obesity was typically defined according to a BMI ≥ 30.0 kg/m^2, but in many instances the timing of the BMI was not provided (e.g., pre-pregnancy vs. at delivery). Some recommendations were specific to a particular BMI cut-off, but others pertained to obesity, in general, without specifying a BMI. Lastly, we did not include recommendations that were intended for patient education only in this review.

Meaning of the study

Based on this scoping review, we propose the following key content for a peripartum checklist or toolkit in Table 4. This content is based on evidence ratings and ease of implementation. In summary, persons with obesity are at high risk for morbidity and mortality, with an abundance of risk occurring during the peripartum period. Few guidelines exist for the care of these persons and the evidence to support care is limited. Thus, there is a need for high quality studies encompassing peripartum interventions.

Table 4: Proposed key content for a peripartum checklist or toolkit for persons with obesity

Content	Examples
Provider discussion on labor induction, delivery route, and labor management	Allow for longer labor Difficulties in fetal heart rate monitoring
Expert consultations	Anesthesiologists Lactation consultants
Prophylaxis for cesarean delivery	Mechanical devices for VTE prophylaxis Higher dose of antibiotic before delivery depending on BMI Higher dose of anticoagulant after delivery depending on BMI
Wound management	Close subcutaneous tissue without drains or wound therapy

Conclusion

The recommendations for peripartum care for persons with obesity are based on limited evidence and few practical tools for implementation exist. Future work should focus on developing practical tools based on high quality studies.

Contributorship statement

MK designed the study protocol. LCO completed the database search of potential articles. MK, IC, JMP, AP, and PT reviewed abstracts, decided on inclusion and exclusion criteria, and reviewed the full-text of included articles. All authors contributed to the synthesis of results. All authors acknowledged approval of the final version for publication.

Competing interests

The authors have no competing interests to report.

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Data sharing

The protocol is available for review at https://doi.org/10.18131/g3-gyms-ww23. A full list of the sources and search strategies is outlined in Appendix A.

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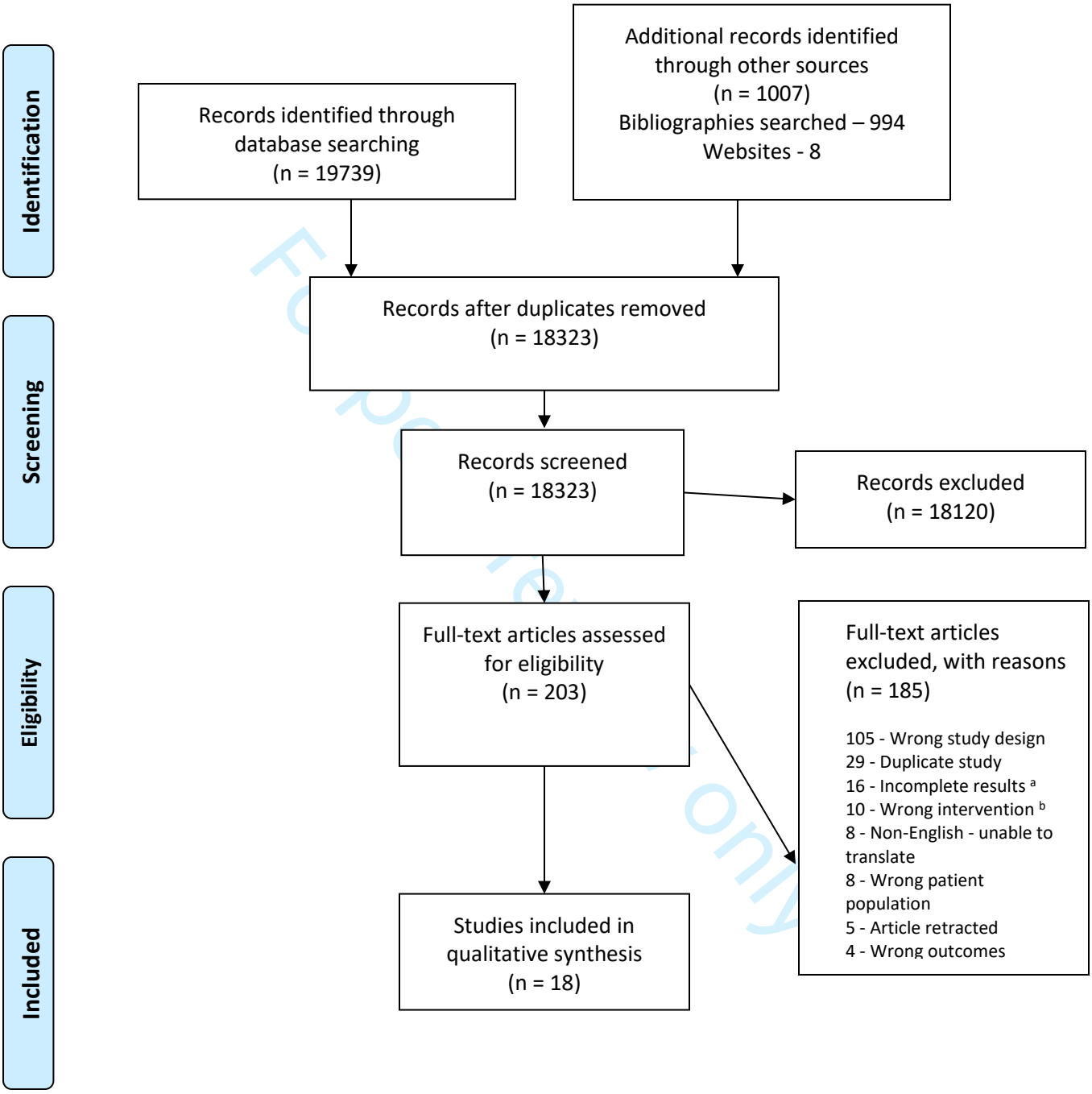
Figure 1: PRISMA flow diagram for study selection.

PRISMA Flow Diagram



Examples for exclusion:
[a] Only study protocol or abstract available
[b] Intervention may have occurred during prenatal care or postpartum, but not during delivery

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). *P*referred *R*eporting *I*tems for *S*ystematic Reviews and *M*eta-*A*nalyses: The PRISMA Statement. PLoS Med 6(6): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit www.prisma-statement.org.

Appendix A Search Strategy

PubMed MEDLINE

Guidelines search

("Obesity"[Mesh] OR Obesity[tiab] OR Obese[tiab] OR Superobesity[tiab]) AND ("Pregnancy"[Mesh] OR "Pregnancy Complications"[Mesh] OR "Pregnant Women"[Mesh] OR "Delivery, Obstetric"[Mesh] OR "Peripartum Period"[Mesh] OR "Perinatal Care"[Mesh] OR Pregnancy[tiab] OR Pregnancies[tiab] OR Pregnant[tiab] OR Parturition[tiab] OR Parturient[tiab] OR Parturients[tiab] OR Peripartum[tiab] OR Perinatal[tiab] OR Prenatal[tiab] OR Antenatal[tiab] OR Antepartum[tiab] OR Intrapartum[tiab] OR Postpartum[tiab] OR Cesarean[tiab]) AND (Toolkit[tiab] OR toolkits[tiab] OR Guideline[tiab] OR guidelines[tiab] OR Recommend*[tiab] OR Checklist[tiab] OR checklists[tiab] OR consensus[tiab] OR Evidence-based[tiab] OR “Best practice*”[tiab] OR “Clinical management” [tiab] OR “Anesthetic management”[tiab] OR anesthesia[tiab] OR anaesthesia[tiab] OR Standards[tiab] OR "Guideline" [Publication Type] OR "Practice Guidelines as Topic"[Mesh] OR "Practice Guideline" [Publication Type] OR "Meta-Analysis" [Publication Type] OR "Meta-Analysis as Topic"[Mesh] OR "Network Meta-Analysis"[Mesh] OR systematic[ti] OR scoping[ti] OR meta-analy*[ti])

Interventions search

("Obesity"[Mesh] OR Obesity[tiab] OR Obese[tiab] OR Superobesity[tiab]) AND ("Pregnancy"[Mesh] OR "Pregnancy Complications"[Mesh] OR "Pregnant Women"[Mesh] OR "Delivery, Obstetric"[Mesh] OR "Peripartum Period"[Mesh] OR "Perinatal Care"[Mesh] OR Pregnancy[tiab] OR Pregnancies[tiab] OR Pregnant[tiab] OR Parturition[tiab] OR Parturient*[tiab] OR Peripartum[tiab] OR Perinatal[tiab] OR Prenatal[tiab] OR Antenatal[tiab] OR Antepartum[tiab] OR Intrapartum[tiab] OR Postpartum[tiab] OR Cesarean[tiab])

AND (Toolkit*[tiab] OR Guideline*[tiab] OR Recommend*[tiab] OR Checklist*[tiab] OR consensus[tiab] OR Evidence-based[tiab] OR Best practice*[tiab] OR “Clinical management” [tiab] OR “Anesthetic management”[tiab] OR anesthesia[tiab] OR anaesthesia[tiab] OR Standards[tiab] OR "Guideline" [Publication Type] OR "Practice Guidelines as Topic"[Mesh] OR "Practice Guideline" [Publication Type] OR "Early Medical Intervention"[Mesh] OR "Patient Education as Topic"[Mesh] OR "Health Education"[Mesh] OR intervention*[tiab] OR therapy[subheading] OR therapy[tiab] OR treatment[tiab])

AND

(“Case-Control Studies”[Mesh:noexp] OR "retrospective studies"[mesh:noexp] OR “Control Groups”[Mesh:noexp] OR (case[TIAB] AND control[TIAB]) OR (cases[TIAB] AND controls[TIAB]) OR (cases[TIAB] AND controlled[TIAB]) OR (case[TIAB] AND comparison*[TIAB]) OR (cases[TIAB] AND comparison*[TIAB]) OR “control

group"[TIAB] OR "control groups"[TIAB] OR cohort studies[mesh:noexp] OR longitudinal studies[mesh:noexp] OR follow-up studies[mesh:noexp] OR prospective studies[mesh:noexp] OR retrospective studies[mesh:noexp] OR cohort[TIAB] OR longitudinal[TIAB] OR prospective[TIAB] OR retrospective[TIAB] OR randomized controlled trial[pt] OR controlled clinical trial[pt] OR randomized[tiab] OR placebo[tiab] OR clinical trials as topic[mesh:noexp] OR randomly[tiab] OR trial[ti] NOT (animals[mh] NOT humans [mh]))

Filters used for the interventions search:

http://libguides.sph.uth.tmc.edu/search_filters/pubmed_filters

https://work.cochrane.org/pubmed

Embase (embase.com)

Guidelines search

'obesity'/exp OR obesity:ti,ab OR superobesity:ti,ab

AND

'pregnancy'/exp OR 'pregnancy disorder'/de OR 'high risk pregnancy'/exp OR 'labor complication'/exp OR 'multiple pregnancy'/exp OR 'obstetric emergency'/exp OR 'placenta disorder'/exp OR 'pregnancy complication'/exp OR 'pregnancy disorders of endocrine origin'/exp OR 'pregnancy toxemia'/exp OR 'prolonged pregnancy'/exp OR 'puerperal disorder'/exp OR 'pregnant woman'/exp OR 'obstetric delivery'/exp OR 'perinatal period'/exp OR 'perinatal care'/exp OR Pregnancy:ti,ab OR Pregnancies:ti,ab OR Pregnant:ti,ab OR Parturition:ti,ab OR Parturient*:ti,ab OR Peripartum:ti,ab OR Perinatal:ti,ab OR Prenatal:ti,ab OR Antenatal:ti,ab OR Antepartum:ti,ab OR Intrapartum:ti,ab OR Postpartum:ti,ab OR Cesarean:ti,ab

AND

'guideline'/exp OR 'checklist'/exp OR 'consensus development'/exp OR 'evidence based practice'/exp OR 'practice guideline'/exp OR 'standards'/exp OR 'meta analysis'/exp OR 'systematic review'/exp OR 'scoping review'/exp OR Toolkit*:ti,ab OR Guideline*:ti,ab OR Recommend*:ti,ab OR Checklist*:ti,ab OR consensus:ti,ab OR Evidence-based:ti,ab OR 'Best practice*':ti,ab OR "Clinical management":ti,ab OR "Anesthetic management":ti,ab OR anesthesia:ti,ab OR anaesthesia:ti,ab OR Standards:ti,ab OR systematic:ti OR scoping:ti OR meta-analy*:ti

Interventions search

'obesity'/exp OR obesity:ti,ab OR superobesity:ti,ab

AND

'pregnancy'/exp OR 'pregnancy disorder'/de OR 'high risk pregnancy'/exp OR 'labor complication'/exp OR 'multiple pregnancy'/exp OR 'obstetric emergency'/exp OR 'placenta disorder'/exp OR 'pregnancy complication'/exp OR 'pregnancy disorders of endocrine origin'/exp OR 'pregnancy toxemia'/exp OR 'prolonged pregnancy'/exp OR 'puerperal disorder'/exp OR 'pregnant woman'/exp OR 'obstetric delivery'/exp OR 'perinatal period'/exp OR 'perinatal care'/exp OR Pregnancy:ti,ab OR Pregnancies:ti,ab OR Pregnant:ti,ab OR Parturition:ti,ab OR Parturient*:ti,ab OR Peripartum:ti,ab OR Perinatal:ti,ab OR Prenatal:ti,ab OR Antenatal:ti,ab OR Antepartum:ti,ab OR Intrapartum:ti,ab OR Postpartum:ti,ab OR Cesarean:ti,ab

AND

'guideline'/exp OR 'checklist'/exp OR 'consensus development'/exp OR 'practice guideline'/exp OR 'standards'/exp OR 'meta analysis'/exp OR 'systematic review'/exp OR 'scoping review'/exp OR toolkit*:ti,ab OR guideline*:ti,ab OR recommend*:ti,ab OR checklist*:ti,ab OR consensus:ti,ab OR 'evidence based':ti,ab OR 'best practice*':ti,ab OR 'clinical management':ti,ab OR 'anesthetic management':ti,ab OR standards:ti,ab OR 'intervention study'/exp OR 'patient education'/exp OR 'health education'/exp OR 'therapy'/exp OR intervention*:ti,ab OR therapy:ti,ab OR treatment:ti,ab

AND

'crossover procedure':de OR 'double-blind procedure':de OR 'randomized controlled trial':de OR 'single-blind procedure':de OR (random* OR factorial* OR crossover* OR cross NEXT/1 over* OR placebo* OR doubl* NEAR/1 blind* OR singl* NEAR/1 blind* OR assign* OR allocat* OR volunteer*):de,ab,ti OR 'clinical article'/exp OR 'controlled study'/exp OR 'major clinical study'/exp OR 'prospective study'/exp OR 'cohort analysis'/exp OR 'cohort':ti,ab OR 'compared':ti,ab OR 'groups':ti,ab OR 'case control':ti,ab OR 'multivariate':ti,ab

Filters:

https://guides.library.harvard.edu/c.php?g=309982&p=2079546

https://work.cochrane.org/embase

CENTRAL: Cochrane Register of Controlled Trials

Guidelines and intervention search

#1 MeSH descriptor: [Obesity] explode all trees

#2 (Obesity OR Obese OR Superobesity):ti,ab,kw

#3 #1 OR #2

#4 MeSH descriptor: [Pregnancy] explode all trees

#5 MeSH descriptor: [Pregnancy Complications] explode all trees

#6 MeSH descriptor: [Pregnant Women] explode all trees

#7 MeSH descriptor: [Delivery, Obstetric] explode all trees

#8 MeSH descriptor: [Peripartum Period] explode all trees

#9 MeSH descriptor: [Perinatal Care] explode all trees

#10 Pregnancy:ti,kw,ab OR Pregnancies:ti,kw,ab OR Pregnant:ti,kw,ab OR Parturition:ti,kw,ab OR Parturient*:ti,kw,ab OR Peripartum:ti,kw,ab OR Perinatal:ti,kw,ab OR Prenatal:ti,kw,ab OR Antenatal:ti,kw,ab OR Antepartum:ti,kw,ab OR Intrapartum:ti,kw,ab OR Postpartum:ti,kw,ab OR Cesarean:ti,kw,ab

#11 {OR #4-#10}

#12 Toolkit*:ti,kw,ab OR Guideline*:ti,kw,ab OR Recommend*:ti,kw,ab OR Checklist*:ti,kw,ab OR consensus:ti,kw,ab OR Evidence-based:ti,kw,ab OR Best practice*:ti,kw,ab OR “Clinical management”:ti,kw,ab OR “Anesthetic management”:ti,kw,ab OR anesthesia:ti,kw,ab OR anaesthesia:ti,kw,ab OR Standards:ti,kw,ab

#13 MeSH descriptor: [Practice Guidelines as Topic] explode all trees

#14 systematic:ti OR scoping:ti OR meta-analy*:ti

#15 #12 OR #13 OR #14

#16 #3 AND #11 AND #15

#17 MeSH descriptor: [Early Medical Intervention] explode all trees

#18 MeSH descriptor: [Patient Education as Topic] explode all trees

#19 MeSH descriptor: [Health Education] explode all trees

#20 MeSH descriptor: [Therapeutics] explode all trees

#21 intervention*:ti,kw,ab OR therapy:ti,kw,ab OR treatment:ti,kw,ab

#22 {OR #17-#21}

#23 #3 AND #11 AND #22

#24 #16 OR #23

CINAHL (EbscoHost)

Guidelines search

((MH "Obesity") OR (MH "Obesity, Morbid")) OR TI (Obesity OR Obese OR Superobesity) OR AB (Obesity OR Obese OR Superobesity)

AND

((MH "Pregnancy+") OR (MH "Pregnancy, Multiple+") OR (MH "Pregnancy Trimesters+") OR (MH "Pregnancy, Unplanned") OR (MH "Pregnancy, Unwanted") OR (MH "Expectant Mothers") OR (MH "Pregnancy Complications+") OR (MH "Obstetric Care+") OR (MH "Postnatal Care+") OR (MH "Postnatal Period+")) OR TI (Perinatal OR Pregnancy OR Pregnancies OR Pregnant OR Parturition OR Parturient* OR Peripartum OR Prenatal OR Antenatal OR Antepartum OR Intrapartum OR Postpartum OR Cesarean) OR AB (Perinatal OR Pregnancy OR Pregnancies OR Pregnant OR Parturition OR Parturient* OR Peripartum OR Prenatal OR Antenatal OR Antepartum OR Intrapartum OR Postpartum OR Cesarean)

AND

((MH "Practice Guidelines") OR (MH "Meta Analysis") OR (MH "Meta Synthesis")) OR TI (Toolkit* OR Guideline* OR Recommend* OR Checklist* OR consensus OR Evidence-based OR Best practice* OR “Clinical management” OR “Anesthetic management” OR anesthesia OR anaesthesia OR Standards) OR AB (Toolkit* OR Guideline* OR Recommend* OR Checklist* OR consensus OR Evidence-based OR Best practice* OR “Clinical management” OR “Anesthetic management” OR anesthesia OR anaesthesia OR Standards) OR TI (systematic OR scoping OR meta-analy*)

Interventions search

((MH "Early Intervention") OR (MH "Patient Education+") OR (MH "Health Education+") OR (MH "Pregnancy Outcomes") OR (MH "Treatment Outcomes+")) OR TI (Toolkit* OR Guideline* OR Recommend* OR Checklist* OR consensus OR Evidence-based OR Best practice* OR “Clinical management” OR “Anesthetic management” OR anesthesia OR anaesthesia OR Standards OR "Early Medical Intervention" OR "Patient Education as Topic" OR "Health Education" OR intervention* OR therapy OR treatment) OR AB (Toolkit* OR Guideline* OR Recommend* OR Checklist* OR consensus OR Evidence-based OR Best practice* OR “Clinical management” OR “Anesthetic management” OR anesthesia OR anaesthesia OR Standards OR "Early Medical Intervention" OR "Patient Education as Topic" OR "Health Education" OR intervention* OR therapy OR treatment)

AND

(MH "Prospective Studies") OR TI (cohort OR longitudinal OR prospective OR retrospective) OR AB (cohort OR longitudinal OR prospective OR retrospective) OR (((MH "Random Assignment") or (MH "Random Sample+") or (MH "Crossover Design") or (MH "Clinical Trials+") or (MH "Comparative Studies") or (MH "Control (Research)+") or (MH "Control Group") or (MH "Factorial Design") or (MH "Quasi-Experimental Studies+") or (MH "Placebos") or (MH "Meta Analysis") or (MH "Sample Size") or (MH "Research, Nursing") or (MH "Research Question") or (MH "Research Methodology+") or (MH "Evaluation Research+") or (MH "Concurrent Prospective Studies") or (MH "Prospective Studies") or (MH "Nursing Practice, Research-Based") or (MH "Solomon Four-Group Design") or (MH "One-Shot Case Study") or (MH "Pretest-Posttest Design+") or (MH "Static Group Comparison") or (MH "Study Design") or (MH "Clinical Research+")) or (clinical nursing research or random* or cross?over or placebo* or control* or factorial or sham* or meta?analy* or systematic review* or blind* or mask* or trial*))

Clinicaltrials.gov

Keyword searches included pregnancy and obesity.

Google searches

Recognizing that guidelines, toolkits, and checklists are often not published in the journal literature, we supplemented the guidelines search strategy with Google searches. To ensure more precision we limited the results to .org and .gov domains.

Searches were run in Google for “obesity pregnancy guideline” with the following limits:

1. Words in page title only
2. Words in URL only
3. .org domain
4. .gov domain
5. .gov.uk domain
6. .org.uk domain
7. .gov.au domain
8. .org.au domain

On the assumption that the Google search algorithm pushes the most relevant results to the top, one reviewer (MK) screened the first four pages of results for each search, looking for guidelines and checklists not already included in our previous search results. For the identified sites, the other authors (PT, AP, IC, JP) also voted to include or exclude the sites. The most recent search was conducted in April 2021.

Title	Year	Source or Site	Tool type	Content
Obesity in Pregnancy[1] [a]	8.2021	Department of Health in Queensland, AU Guideline: Obesity and pregnancy (including post bariatric surgery) (health.qld.gov.au)	Flow Chart	**Intrapartum** If BMI > 40 kg/m^2 Early assessment of IV access Recommend continuous fetal monitoring If prophylactic antibiotics, consider higher dosage Active third stage management Surveillance for shoulder dystocia/PPH **Postpartum** Surveillance for airway compromise Early mobilisation Assess risk of VTE and consider thromboprophylaxis Additional support for breastfeeding
Class 3 Obesity and Pregnancy [2]	7.2020	University of New Mexico Department of Obstetrics and Gynecology http://unmobgyn.pbworks.com/w/file/fetch/140915307/Class%203%20Obesity%20and%20Pregnancy.pdf	Standard operating procedure-guideline	**Intrapartum** No clear evidence for routine IOL solely for class 3 obesity Higher morbidity with TOLAC compared to repeat CD in this specific population Consider repeat CD in this population Alert team of increased risk of shoulder dystocia and PPH Anesthesia evaluation before admission, or early in admission Pneumatic compression stockings during labor Continuous fetal and uterine monitoring in labor Avoid use of wound vacs or drains **Postpartum** Low-molecular weight heparin for thromboprophylaxis for 5-6 days postpartum Weight based prophylaxis is better option Breast feeding encouraged due to higher risks of difficulties Lactation counseling Consider lactation consulting Incentive spirometry Early ambulation Avoid early hospital discharge
Obesity in Pregnancy [3]	4.2018	Alaska Native Medical Center https://anmc.org/wp-content/uploads/ClinicalGuidelinesMaster/Obesity.pdf	Guideline	**Intrapartum** Use appropriate sized blood pressure cuff Anticipate higher dose of oxytocin for induction or augmentation of labor Consider placement of prophylactic epidural catheter **If BMI > 40 kg/m^2** Consider early IUPC and FSE

				If BMI > 50 kg/m² Anesthesia consult on admission Consider additional use of IV famotidine and/or metoclopramide Anticipate higher rate of failed regional anesthesia Anticipate difficult airway (have videolaryngoscope available, have laryngeal mask airway available, have emergency cricothyroidotomy kit available) **If Cesarean delivery** Bariatric surgery should not be considered an indication for CD Anticipate greater time from incision to delivery Pfannenstiel incision carries less risk of infection and dehiscence than midline incision Consider retracting panniculus cephalad (or caudad) with tape or large "Ioban" drape Consider self-retaining retractor, extra-long instruments Close subcutaneous layer (34% decrease in wound disruption) Subcutaneous drains may be associated with a higher risk of infection Consider closure with polydioxanone (PDS) Consider Smead-Jones "mass closure" If staples used for skin closure, do not remove until 7-10 days postoperatively for a vertical incision and 5 days for a Pfannenstiel Increase dose of prophylactic cefazolin to 3 g IV before incision if BMI > 40 kg/m² Panniculectomy at the time of CD increases complications Early ambulation Intermittent pneumatic compression devices Consider using bariatric bed with frame and trapeze for mobility postoperatively Anticoagulation if 1 major or 2 minor ACCP risk factors for VTE Enoxaparin 40mg every 12 hours for BMI < 50 kg/m², 60 mg every 12 hours for BMI > 50 kg/m² or weight based dosing (e.g., enoxaparin 0.5 mg/kg every 12 hours)
Obesity in Pregnancy Guideline [4]	9.2020	National Health System Northern Devon Healthcare United Kingdom https://www.northdevo	Care Pathway	**Intrapartum** All blood pressure measurements should be taken using the appropriate size arm cuff. Complete a manual handling risk assessment to ensure the correct equipment is available and used.

		nhealth.nhs.uk/wp-content/uploads/2018/06/Obesity-in-Pregnancy-Guideline.pdf		Measure and fit TED anti-embolism stockings. Consider calf compression device for all women with BMI ≥ 40. Assess pressure areas and maintain skin integrity. Consider ultrasound scan to confirm fetal presentation. Be alert to increased risk of shoulder dystocia. The duty anaesthetist and duty obstetric registrar should be informed when a woman with a BMI ≥ 40 is admitted to labour ward. Women with a BMI ≥ 40 should have IV access early in labour with "FBC and group and save taken". For women with a BMI ≥ 40, prophylactic omeprazole should be administered as per prescription. Raised BMI alone is not an indication for continuous fetal monitoring in labour. **Postpartum** All women with a BMI ≥ 35 should be recommended to have active management of the third stage of labour Women with a BMI ≥ 30 should be encouraged to mobilise as early as practicable following childbirth to reduce the risk of thromboembolism. TED stockings or calf compression devices to be worn throughout hospital stay regardless of mode of delivery for women with BMI ≥ 35. Assess wound and observe for signs of dehiscence.
Obesity in Pregnancy, Labour and Puerperium [5]	2019	University Hospitals of Leicester NHS Trust United Kingdom Microsoft Word - Obesity in Pregnancy Labour 18 7 19 (leicestershospitals.nhs.uk)	Guideline	**Intrapartum:** Assessment of tissue viability by completing "Waterlow Risk Assessment Form"; if value > 10 then inspect skin daily via "BEST SHOT" guidance (also postpartum) Notify OR staff on admission if weight is > 140 kg **Postpartum:** Early mobilization Use compression stocking if ≥ 2 risk factors VTE prophylaxis for 7 days if ≥ 1 risk factors **If BMI ≥ 40:** Early IV access Consider early epidural Experienced obstetrician (≥ ST6) to perform CD or "rotational instrumental delivery" Active management of 3rd stage Consider IV syntocinon instead of IM route

				VTE prophylaxis regardless of delivery route Consider increased dose of antibiotic prophylaxis
Obesity Medicine Management of obesity in women's health care. Chapter 19: Checklists for Care: Care Maps for Pregnancy in the Obese Gravida [6]	2017	United States	CareMap	**Intrapartum** Obtain clear fetal heart tracing and uterine contraction assessment Place SCD Early consultation with anesthesia Confirm adequate equipment for anesthesia, labor and delivery, and operating room Discuss/plan for the following: delivery route, skin cleansing/preparation, antibiotic dosing for CD (consider 3g cefazolin if weight > 120 kg), postpartum VTE prophylaxis (SCD, LMWH), early ambulation, perineal laceration or incision care, address medical comorbidities, medication adjustments **Immediate postpartum** VTE prophylaxis Early ambulation Anticoagulation (if indicated) Lactation referral
Supporting a Plus-Size Pregnancy: A Checklist for Healthcare Providers [7]	2019	United States NIH/NICHD, National Child and Maternal Health Education Program NIH Pub.Number: 19-HD-8100 https://www.nichd.nih.gov/sites/default/files/2019-11/Healthcare_Provider_Checklist.pdf	Checklist	Ensure availability of appropriate birthing beds and monitoring/other equipment to care for plus-size patients (e.g., large chairs and wheelchairs, larger blood pressure cuffs). Assess appropriateness of gurneys and staffing plans and revise as needed (e.g., get motorized lifts for gurneys, increase staff to assist with moving the patient). Consider consulting with an anesthesia service, especially for patients with obstructive sleep apnea, in case the need for a surgical delivery arises. Consider early epidural catheter placement, and discuss the risks and benefits with the patient. Consider allowing a longer first stage of labor before performing cesarean delivery for labor arrest. Work with your patient to create a birthing plan, including pain management methods. Work with your patient to create a breastfeeding plan and help her get lactation support/consultation, if needed.
Antenatal Management of Obesity [8]	2018	Spectrum Health Medical Group Michigan, United States	Protocol	Anesthesia consult if BMI > 60 Prophylactic antibiotics "Azithro + Ancef (3g if >120kg)" Delivery timing 39-40 weeks

		www.spectrumhealth.org>mfm>protocol-obesity		Consider wound vac placement post op if Class III obesity with risk factors (DM, chorio) or BMI > 60 Postop prophylactic lovenox while inpatient for class I and II obesity with risk factors, >/= class III regardless of risk factors

Appendix B: Title, year of publication, source of recommendations, and content topic for tools for the peripartum management of obesity identified from searches of Google Scholar.

[a] During original Google scholar search on 4.1.21, the Queensland Clinical Guideline for "Obesity in pregnancy" was published in 2015. When the manuscript was updated for publication, a new version of the guideline was published in 8.2021 and therefore the most recent guideline was used for this manuscript since the prior link was no longer available.

IOL induction of labor

CD or CS cesarean delivery

IV intravenous

BMI body mass index

PPH postpartum hemorrhage

VTE venous thromboembolism

TOLAC trial of labor after cesarean

IUPC intrauterine pressure catheter

FSE fetal scalp electrode

PDS polydioxanone

ACCP American College of Chest Physicians

TED thrombo-embolus deterrent

OR operating room

NIBP non-invasive blood pressure

BP blood pressure

NB neuraxial blockade

LMWH low molecular weight heparin

DM diabetes

Reference List for Appendix B

1. Queensland Clinical Guidelines. Obesity and pregnancy (including post bariatric surgery). Guideline No. MN21.14-V6-R26. Queensland Health. 2021. Available from: http://www.health.qld.gov.au/qcg Accessed 9/24/21.

2. Gynecology UoNMSoMDoOa. Standard operating procedure-guideline class 3 obesity and pregnancy http://unmobgyn.pbworks.com/w/file/fetch/140915307/Class%203%20Obesity%20and%20Pregnancy.pdf 2020 [

3. Obesity in pregnancy - ANMC guideline Alaska Native Medical Center [Available from: https://anmc.org/wp-content/uploads/ClinicalGuidelinesMaster/Obesity.pdf

4. Obesity in pregancy guideline National Health System Northern Devon Healthcare2020 [Available from: https://www.northdevonhealth.nhs.uk/wp-content/uploads/2018/06/Obesity-in-Pregnancy-Guideline.pdf.

5. Obesity in pregnancy, labour and the puerperium University Hospitals of Leicester NHS Trust2019 [Available from: Microsoft Word - Obesity in Pregnancy Labour 18 7 19 (leicestershospitals.nhs.uk).

6. RK S. Obesity Medicine: Management of Obesity in Women's Health Care 1ed: McGraw-Hill Education; 2017.

7. Supporting a plus-size pregnancy: a checklist for healthcare providers NIH Pub.Number: 19-HD-8100: Eunice Kennedy Shriver National Institute of Child Health and Human Development; 2019 [Available from: https://www.nichd.nih.gov/sites/default/files/2019-11/Healthcare_Provider_Checklist.pdf.

8. Antenatal management of obesity: Spectrum Health The Medical Group Maternal Fetal Medicine; 2018 [Available from: www.spectrumhealth.org>mfm>protocol-obesity.

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	3
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	3
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	Cover letter
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	4
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	4, Appendix A
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Appendix A
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	4
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	5
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	5
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	5

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	5
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	5, figure 1
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	6, Table 1,2,Appendix B
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	Not applicable
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	6-7
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	6-7
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	8
Limitations	20	Discuss the limitations of the scoping review process.	10
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	9, Table 3
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	Title page

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMAScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850.

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Title Page

Peripartum care of persons with obesity: A scoping review of recommendations and practical tools for implementation

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Abstract

Objective: Despite the growing prevalence of obesity among reproductive aged persons in the U.S., evidence-based guidelines for peripartum care are lacking. The objective of this scoping review is to identify obesity-related recommendations for peripartum care, evaluate grades of evidence for each recommendation, and identify practical tools (e.g., checklists, toolkits, care pathways, bundles) to support their implementation in clinical practice.

Data sources: We searched MEDLINE, EMBASE, CINAHL, the Cochrane Central Register of Controlled Trials, and clinicaltrials.gov from inception to December 2020 for eligible studies addressing peripartum care in persons with obesity.

Study eligibility criteria: Inclusion criteria were published evidence-rated recommendations and practical tools for peripartum care of persons with obesity.

Study appraisal and synthesis methods: Pairs of independent reviewers extracted data (source, publication year, content and number of recommendations, level and grade of evidence, description of tool) and identified similarities and differences among the articles.

Results: Of 18,315 screened articles, 18 were included including 7 articles with evidence-rated recommendations and 11 practical tools (3 checklists, 3 guidelines, 1 care bundle, 1 flowchart, 1 care pathway, 1 care map, 1 protocol). Thirteen of 39 evidence-rated recommendations were based on expert opinion. Recommendations related to surgical antibiotic prophylaxis and subcutaneous tissue closure at cesarean delivery received the highest-grade of evidence. Some of the practical tools included a

checklist from the United States regarding anticoagulation after cesarean delivery (evidence supported recommendation), a bundle for surgical site infections after cesarean delivery in Australia (evidence did not support recommendation), and a checklist with content for several aspects of peripartum care from Canada (evidence supported seven of nine definitive recommendations).

Conclusion: The recommendations for peripartum care for persons with obesity are based on limited evidence and few practical tools for implementation exist. Future work should focus on developing practical tools based on high quality studies.

Strengths and limitations of this study:

- We may not have identified all articles with evidence-rated recommendations, though our search of available published literature was thorough including a search of appropriate web sites.
- Sites may have practical implementation tools that they use in the short- or long-term, but they may not be published or available in a more public domain.
- Although topics such as contraception and postpartum weight management are important in the postpartum care of persons with obesity, they were not specifically addressed in this review, which pertained to peripartum care in the immediate postpartum period.
- Obesity was typically defined according to a BMI ≥ 30.0 kg/m^2, but in many instances the timing of the BMI was not provided (e.g., pre-pregnancy vs. at delivery).

- We did not include recommendations that were intended for patient education only in this review.

Keywords: obesity, peripartum care, pregnancy, tools

INTRODUCTION

Obesity has reached epidemic proportions in the United States.[1] In 2015-2016, non-Hispanic Black (54.8%) and Hispanic (50.6%) women had the highest prevalence of obesity and 36.5% of reproductive age women (20-39 years) had obesity (BMI ≥ 30.0 kg/m^2), translating to a high percentage of persons with obesity during future pregnancies and race-ethnicity health disparities.[2] Of further concern, over 50% of persons with obesity exceed guidelines for weight gain during pregnancy, thus compounding their risks for adverse outcomes.[3-5] Adverse peripartum outcomes associated with obesity include cesarean delivery, infection, hemorrhage, thromboembolism (VTE), and anesthesia-related complications, such as failure of regional anesthesia and respiratory depression.[6] These adverse outcomes are amplified in persons with a BMI ≥ 50 kg/m^2.[7] Furthermore, obesity is cited as a contributing factor in over 50% of maternal deaths.[8]

Adaptations to prenatal care for persons with obesity include early screening for diabetes and limiting weight gain to 11-20 pounds.[9] However, more evidence-based studies for peripartum care of persons with obesity, where the risk for adverse outcomes is a significant concern, are needed. For example, the National Institute for Health and Care Excellence (NICE) performed evidence-based reviews for the intrapartum management of obesity in 2019 and found no clinical evidence to suggest that the management of fetal monitoring or maternal positioning in labor should be altered.[10] Even fewer studies and evidence-based recommendations are available for those with a BMI ≥ 50 kg/m^2, who are at even higher risk for adverse outcomes.

Strategies that have reduced adverse outcomes in obstetrics include the development of checklists or toolkits after identifying patient, provider, and systems factors for improvement in the care pathway.[11] Given the increasing incidence of obesity and obesity-related complications, it is critical to identify opportunities to improve the safe delivery of peripartum care.

Objectives

The objective of this scoping review is to identify obesity-related recommendations for peripartum care, evaluate levels or grades of evidence for each recommendation, and identify practical tools such as checklists, toolkits, or other comprehensive care pathways to support their implementation in clinical practice. In this scoping review, we were specifically interested in recommendations that pertained to actionable items such as a treatment or decision option or a specialized consultation.

METHODS

Eligibility criteria, information sources, search strategy

The PRISMA extension for scoping reviews (PRISMA-ScR) checklist was used in developing and reporting this scoping review.[12] The inclusion criteria were: (1) published (in print or online) recommendations along with levels or grades of evidence for the peripartum care of persons with obesity (BMI ≥ 30.0 kg/m^2), and if possible, specifically for persons with a BMI ≥ 50 kg/m^2; or (2) published (in print or online) description of a tool such as a checklist, toolkit, or comprehensive care pathway for the peripartum care of obesity. We defined peripartum care to refer to care immediately before, during and after delivery, approximately 24 hours before and after delivery. To be included in the review, the identified recommendations needed to focus on

actionable items or management strategies, as opposed to being a listing of comorbidities or risks that are associated with obesity in pregnancy. Actionable items might include giving or withholding a particular medication or device. Recommendations that exclusively related to “patient counseling” or imparting of knowledge to the patient were not included as the interpretation of counseling can have different meanings depending on the clinical setting (e.g., location of clinical practice, provider type). The recommendations could have been abstracted from articles pertaining to obesity alone, or other articles that specified recommendations pertaining to obesity (e.g., antibiotic use in pregnancy with a specific adaptation for persons with obesity). Because recommendations could be published from varying health care systems and there were no restrictions placed on country of origin (e.g., national guidelines from United States vs. United Kingdom), variances in evidence grading were identified and abstracted according to the health care system’s grading method.

We searched PubMed MEDLINE, Embase (embase.com), Cochrane Central Register of Controlled Trials (Wiley), CINAHL (EbscoHost), and clinicaltrials.gov from inception through December 2020, with no date or language restrictions. The search for eligible studies involved controlled vocabulary (MeSH headings and thesauri of relevant databases) and the keywords of obesity, morbid obesity, super morbid obesity, guidelines, recommendations, checklist, toolkit, maternal care pathway, peripartum care, and pregnancy. The bibliographies of relevant reviews were hand-searched, as well as key websites including Google Scholar. A full list of the sources and search strategies is outlined in Appendix A.

Patient and Public Involvement

Patients were not directly involved in the design of this study.

Study Selection

The questions for this scoping review were: (1) What are the recommendations for peripartum care of persons with obesity published by either individual authors, national societies, or other government departments that provide levels or grades of evidence to support the recommendation? (2) What are the published tools for practical implementation of recommendations, either in the form of checklists, toolkits, or other comprehensive care pathways?

The primary outcomes were the number of recommendations per article, topic of recommendation, level or grade of evidence to support recommendations, and similarities and differences between the recommendations across articles. For the identified checklists, toolkits, or other comprehensive care pathways for the peripartum management of obesity, their details were summarized and crosschecked with the aforementioned recommendations.

Data extraction

Four reviewers independently screened all citations using the Covidence review management software.[13] Initially, the reviewers were trained on a sample of 20 articles using the Covidence software to verify clarity and consistency regarding inclusion and exclusion criteria. A separate, 5th reviewer resolved all conflicts. Once agreement was obtained on articles meeting criteria for final inclusion, two reviewers independently extracted the following data from each article using a form that was tested and modified by the reviewers, as applicable: (1) source of recommendations (e.g., individual authors, national societies, etc.), (2) year of publication, (3) content and

total number of recommendations, (4) level and grade of evidence for each of the recommendations, (4) system used to determine levels of evidence or classification of recommendations, (5) description of checklist, toolkit, comprehensive care pathway or other format used for implementation in the peripartum care of obesity. If articles were in abstract form only, we contacted the authors for updates on the status of the final publication.

Data synthesis

The data were summarized and abstracted into table format, noting key similarities and differences among the articles in terms of content and level and grade of evidence. For the identified checklists, toolkits, etc. similarities and differences among the content were highlighted. For this scoping review, we did not assess the effectiveness of the findings or evaluate bias. The scoping review protocol is published at https://doi.org/10.18131/g3-gyms-ww23.

RESULTS

Study selection

After removal of duplicates, 18,328 articles were screened, resulting in 203 articles for full-text review. Figure 1 shows the flow diagram for study selection. A total of 7 evidence-rated articles and 11 tools met inclusion criteria for this review. The majority (n=8) of the tools were selected from the results of Google Scholar searches.

Study characteristics

Table 1 displays the title, year of publication, source of recommendations, and references for evidence levels and grades for seven articles identified from the search of all databases. The publication years ranged from 2015-2020 representing three

countries (US, UK, Canada) and one international guideline. Publication topics included thromboembolism, antibiotics prophylaxis, as well as the broad-spectrum of peripartum care. For these articles, the content was either exclusively focused on the management of obesity or the content was about a high-risk condition during pregnancy and addressed obesity among other issues. Table 2 displays the topic, content of the recommendation, and evidence levels and grades for each recommendation from the seven articles in Table 1. For the tools, Table 3 displays the title, year of publication, source of recommendations, and content topic for the peripartum management of obesity identified from searches of PubMed MEDLINE, Embase, Cochrane Central Register of Controlled Trials, and CINAHL (n=3). Appendix B displays the same information identified from a search of key websites and Google Scholar for tools (n=8). We found a wide range of tools including checklists, bundles, flow charts, guidelines, protocols, care pathways, and care maps from practices in the United States, Canada, and the United Kingdom.

Table 1. Source of recommendations, year of publication, title, evidence grading system and levels and grades for 7 articles related to peripartum management of obesity

Author/Source	Date	Title	Evidence Grading System Examples of grade and level ranges
McAuliffe et al International Federation of Gynecology and Obstetrics	2020	Management of prepregnancy, pregnancy, and postpartum obesity[14]	GRADE[15] Grade strong or weak Evidence low, moderate, high or best practice
Society for Maternal-Fetal Medicine (United States); 1/6 recommendations pertain to obesity	2020	SMFM Consult Series #51: Thromboembolism prophylaxis for cesarean delivery[16]	GRADE[15] Grade strong or weak Evidence low, moderate, high or best practice
J van Schalkwyk, N Van Eyk Society of Obstetricians and Gynaecologists of Canada (Canada); 1/7 recommendations pertain to obesity	2017	Guideline No. 247-Antibiotic prophylaxis in obstetric procedures[17]	Canadian Task Force on Preventive Health Care [18] Levels I-III Classifications A-I

Maxwell C, et al. Society of Obstetricians and Gynaecologists of Canada (Canada)	2019, 2020 correction	Guideline No. 392-Pregnancy and maternal obesity Part 2: Team planning for delivery and postpartum care[19]	Canadian Task Force on Preventive Health Care [18] Levels I-III Classifications A-E,I
Denison FC, et al. Royal College of Obstetricians and Gynaecologists (United Kingdom)	2018	Care of women with obesity in pregnancy Green-top Guideline #72[20]	Clinical Governance Advice No.1 Development of RCOG Green-Top Guidelines [21] Grades A-D, and “checkmark” Levels 1++ to 4
Royal College of Obstetricians and Gynaecologists (United Kingdom)	2015	Reducing the risk of venous thromboembolism during pregnancy and the puerperium Green-top Guideline No.37a[22]	Clinical Governance Advice No.1 Development of RCOG Green-Top Guidelines [21] Grades A-D, and “checkmark” Levels 1++ to 4
American College of Obstetricians and Gynecologists Practice Bulletin (United States)	2015	Practice Bulletin #156 Obesity in pregnancy[9]	U.S. Preventive Services Task Force [23] Grade A-C Levels I-III

GRADE Grading of Recommendations Assessment, Development and Evaluation

SMFM Society for Maternal-Fetal Medicine

RCOG Royal College of Obstetricians and Gynaecologists

Table 2. Topics, recommendations, and level or grade of evidence among 7 articles related to peripartum management of obesity.

Topic	Recommendation	Level or grade of evidence
Route of delivery	The decision for a woman with maternal obesity to give birth by planned caesarean section should involve a multidisciplinary approach, taking into consideration the individual woman's comorbidities, antenatal complications and wishes.[20]	Level 2-, C
Labor induction	Induction of labor is recommended at 41+0 weeks of gestation for women with a BMI ≥ 35 owing to their increased risk of intrauterine death.[14]	Strong + + +
	Elective induction of labour at term in obese women may reduce the chance of caesarean birth without increasing the risk of adverse outcomes.[20]	Level 2+, B
	Where macrosomia is suspected, induction of labour may be considered. Parents should have a discussion about the options of induction of labour and expectant management.[20]	Level 1+, B
Fetal monitoring	Electronic fetal monitoring is recommended for women in active labor with a BMI ≥ 35. Intrauterine pressure catheters and fetal scalp electrodes may help.[14]	Conditional +
	(a) Electronic fetal monitoring can be considered for women in active labour with a body mass index > 35 kg/m^2. (b) Intrauterine pressure catheters may assist in assessment of labour contractions. (c) Fetal scalp electrodes may be helpful to ensure continuous fetal monitoring when indicated.[19]	III-B
Labor management	Allowing a longer first stage of labor before performing cesarean delivery for labor arrest should be considered in obese women.[9]	B, Level II-2,3
Blood pressure monitoring	Where available, an appropriately sized blood pressure cuff should be used for measurements. The cuff size used at the earliest time point should be documented in the medical records.[14]	Conditional ++
IV access	Establish venous access in early labor for women with a BMI ≥40 and consider a second cannula.[14]	Conditional +
	Women with a BMI 40 kg/m^2 or greater should have venous access established early in labour and consideration should be given to the siting of a second cannula.[20]	Checkmark
Regional anesthesia	In the case of vaginal delivery for women with a BMI ≥ 40, early placement of an epidural catheter is advisable in the case of an emergency cesarean delivery.[14]	Conditional + +
Antibiotic prophylaxis for cesarean delivery	Women with a BMI ≥ 30 having a cesarean delivery are at increased risk of wound infection and should receive prophylactic antibiotics at the time of surgery. Women with obesity may benefit from higher doses.[14]	Strong + + + +
	In patients with morbid obesity (BMI > 35), doubling the antibiotic dose may be considered.[17]	III-B
	Women with obesity may benefit from higher dosage of preoperative antibiotics for caesarean birth.[19]	I-A
	Women with class 1 obesity or greater having a caesarean section are at increased risk of wound infection and should receive prophylactic antibiotics at the time of surgery.[20]	Level 1++, A
Incision type, skin closure for cesarean delivery	There is a paucity of high-quality evidence to support the use of one surgical approach over another. Surgical approaches should therefore follow NICE CG132 but clinicians may decide alternative approaches are merited depending on individual circumstances.[20]	Checkmark
Subcutaneous tissue closure	It is recommended to reapproximate the subcutaneous tissue layers at the time of caesarean birth to reduce wound complications.[19]	II-2A
	Women undergoing caesarean section who have more than 2 cm subcutaneous fat should have suturing of the subcutaneous tissue space in order to reduce the risk of wound infection and wound separation.[20]	Level 1++, A

Topic	Recommendation	Level or grade of evidence
	Subcutaneous drains increase the risk of postpartum cesarean wound complications and should not be used routinely.[9]	Grade A, Level 1
	There is a lack of good-quality evidence to recommend the routine use of negative pressure dressing therapy, barrier retractors and insertion of subcutaneous drains to reduce the risk of wound infection in obese women requiring caesarean sections.[20]	Level 2- to 1+, B
Hemorrhage	Active management of the third stage should be recommended to reduce the risk of postpartum hemorrhage.[14]	Strong + + +
	Although active management of the third stage of labour is advised for all women, the increased risk of PPH in those with a BMI greater than 30 kg/m^2 makes this even more important.[20]	Level 2++, A or Level 1++, B [a]
VTE prophylaxis	Postoperative pharmacologic thromboprophylaxis should be prescribed based on maternal weight.[14]	Conditional + +
	Mechanical thromboprophylaxis is recommended before and after cesarean delivery. Where available, women with a BMI ≥ 35 should be given graduated compression stockings, or other interventions such as sequential compression devices, after cesarean delivery until mobilization, which should be encouraged early.[14]	Conditional + +
	When pharmacologic thromboprophylaxis is needed in pregnant women with class III obesity, we suggest the use of intermediate doses of enoxaparin [for cesarean delivery].[16]	2C
	Postoperative thromboprophylaxis is recommended, at appropriate dosing for the given body mass index, due to the greater risk of venous thromboembolism following caesarean birth with women with obesity.[19]	II-3 A
	All women with class 3 obesity (BMI greater than or equal to 40 kg/m^2) should be considered for prophylactic LMWH in doses appropriate for their weight for 10 days after delivery.[22]	D
	Women with two or more persisting risk factors listed in Table 1 should be considered for LMWH in prophylactic doses appropriate for their weight for 10 days after delivery. One risk factor = BMI ≥ 30kg/m^2.[22]	B
	Mechanical thromboprophylaxis is recommended before cesarean delivery, if possible, as well as after cesarean delivery.[9]	B, Level II-3
	Weight-based dosage for venous thromboembolism thromboprophylaxis may be more effective than BMI-stratified dosage strategies in class III obese women after cesarean delivery.[9]	B, Level II-3
Breastfeeding	Obesity is associated with low breastfeeding initiation and maintenance. Women with obesity in early pregnancy should receive specialist advice on the benefits of breastfeeding and appropriate antenatal and postnatal support for breastfeeding initiation and maintenance.[14]	Conditional + +
	Women with obesity should be offered lactation support in the postpartum period.[19]	III C
	Obesity is associated with low breastfeeding initiation and maintenance rates. Women with a booking BMI ≥30 kg/m^2 or greater should receive appropriate specialist advice and support antenatally and postnatally regarding the benefits, initiation and maintenance of breastfeeding.[20]	Checkmark, Level 1+
Anesthesiology consult	Antenatal assessment with obstetric anaesthesia may assist in planning for safer birth for women with obesity.[19]	III-A
	The on-duty anaesthetist covering the labour ward should be informed of all women with class III obesity admitted to the labour ward for birth. This communication should be documented by the attending midwife in the notes.[20]	Checkmark
Systems	Where possible, healthcare facilities should have clearly defined pathways for the management of pregnant women with obesity. The adequacy of resources and equipment available should be considered when making decisions around care, especially for women with a BMI ≥ 40.[14]	Conditional +
	Obstetric team planning may be helpful for women with obesity to navigate the steps in antenatal, labour and delivery, and postnatal care.[19]	III-3 A [b]

Topic	Recommendation	Level or grade of evidence
	Consultation with anesthesia service should be considered for obese pregnant women with OSA because they are at an increased risk of hypoxemia, hypercapnia, and sudden death.[9]	C

[a] The recommendation is reports as “Level 2++, A” on page 26 of the document and also reported as “Level 1++, B” on pages 8 and 30 of the document.

[b] The recommendation is reported as “III-3 A”, though this level and grade of evidence is not defined in the Society of Obstetricians and Gynaecologists of Canada document.

BMI body mass index

NICE CG National Institute for Health and Care Excellence Clinical Guidelines

VTE venous thromboembolism

PPH postpartum hemorrhage

IV intravenous

LMWH low molecular weight heparin

OSA obstructive sleep apnea

Table 3: Title, year of publication, source of recommendations, content topic, and evidence to support recommendations among 3 tools related to the peripartum management of obesity

Title	Year	Source or Site	Tool type	Content	Evidence to support content when a definitive recommendation was made in the tool
Society for Maternal-Fetal Medicine Special Statement: Checklist for thromboembolism prophylaxis after cesarean delivery[24]	2020	Society for Maternal-Fetal Medicine	Checklist	**VTE prophylaxis (after cesarean delivery)** For women with body mass index (BMI) 40 kg/m^2 or greater (class 3 obesity) who have thrombophilia or history of deep venous thrombosis or pulmonary embolism, intermediate-dose low-molecular-weight heparin (e.g., enoxaparin 40 mg SC every 12 hours); continue for 6 weeks postoperatively	SMFM[16] Level 2C
Reducing surgical site infections post-cesarean section in an Australian hospital, using a bundled care approach[25]	2020	NSW Local Health District, Australia	Bundle	**Subcutaneous tissue closure** Negative pressure wound therapy BMI>35 (PICO) BMI > 40 (Prevena) applied in operating suite at the time of incision closure and left in-situ for 7 days	RCOG[20] Level 2- to 1+, B does NOT support recommendation
Team Planning in Obstetrical Care for Women with Obesity[26]	2019	Mount Sinai Hospital in Toronto, Ontario Canada	Checklist	**General admission for delivery** PICC line recommended (checkbox) **Intrapartum** Type of delivery (spontaneous or induced labor or Cesarean delivery) (checkbox) Appropriate size [blood pressure] cuff Appropriate size gown, long monitoring belts Notify OB, Anesthesia, Respiratory therapist, Neonatology May need cross and type IUPC use (checkbox) Encourage ambulation **Cesarean delivery**	FIGO[14] Conditional ++ for BP cuff size RCOG[20] "Checkmark" for notify anesthesia

				Incision location Method of [incision] closure Use of negative pressure wound system (checkbox). Plan for prolonged length of stay if OSA/CPAP (checkbox) Additional medication for gastric emptying/GERD and possible additional antibiotics Equipment (OR table with side bars and pads, OR tray, hover mat, epidural/spinal needle and portable ultrasound, Troop pillow, need for difficult airway try, Mobius retractor and Sturgeon, Traxi Panniculus retractor, negative pressure wound system) Need for increased length of stay due to anesthesia (checkbox) (e.g., CPAP for sleep apnea). **Postpartum** Bariatric bed required for a weight > 500 lbs. (check box) Delay in suture or staple removal with the postoperative day entered for removal as an outpatient. Prophylactic anticoagulation, early ambulation encouraged Pain management plan with dosage changes Breastfeeding, lactation consultant Dietician follow-up	SOGC[17, 19] Level 1-A and Level III-B for additional antibiotics FIGO[14] Conditional 1+ for resources an equipment FIGO[14] Conditional 1+ for resources an equipment None SMFM[16] Level 2C, FIGO Conditional ++[14], SOGC[19] II-3 B, RCOG[20] Grade B or D, ACOG[9] Grade B Level 2-3 None FIGO[14] Conditional ++, RCOG[20] “checkmark”, Level 1+

SMFM Society for Maternal-Fetal Medicine

BMI body mass index

SC subcutaneous

NSW North South Wales

RCOG Royal College of Obstetricians and Gynecologists

PICC peripherally inserted central catheter

BP blood pressure

OB obstetrics

IUPC intrauterine pressure catheter

OSA obstructive sleep apnea

CPAP continuous positive airway pressure

FIGO International Federation of Gynecology and Obstetrics

SOCG Society of Obstetricians and Gynaecologists of Canada

OR operating room

VTE venous thromboembolism

ACOG American College of Obstetricians and Gynecologists

Synthesis of Results

The evidence-rated recommendations covered topics such as labor induction (e.g., indication and timing), intravenous access, fetal monitoring (e.g., scalp electrodes, intrauterine pressure catheters), management of the 1st and 3rd stages of labor, breastfeeding, and system-related preparedness. Several recommendations were specific to cesarean delivery (e.g., incision type, antibiotic prophylaxis and dose, subcutaneous tissue closure, negative pressure dressings, and VTE prophylaxis) and anesthesia (e.g., consultation, early placement of an epidural catheter). In several instances, recommendations for persons with obesity did not differ from recommendations for persons without obesity (e.g., antibiotic prophylaxis for cesarean delivery).[20] Three articles had one recommendation [16, 17, 22] and the highest number of recommendations was 11 in a single article.[14] The FIGO (International Federation of Gynecology and Obstetrics) Pregnancy and Non-Communicable Disease Committee published guidelines for the management of pre-pregnancy, pregnancy, and postpartum obesity. Their recommendations for peripartum management (n=11) were included in this analysis, but it should be noted that the recommendations were not unique to the article, but instead they were abstracted from previously published international articles.[14]

The recommendations that were of the highest grade (Strong, Level 1, or Grade A) were antibiotic prophylaxis for cesarean delivery,[14, 20] higher dosage of preoperative antibiotics for cesarean delivery,[17, 19] and subcutaneous tissue closure.[9, 20] We noted that 13 recommendations were based on expert opinion or the lowest level of evidence. We noted that topics such as antibiotic prophylaxis (n=4

recommendations),[14, 17, 19] subcutaneous skin closure (n=4 recommendations),[9, 19, 20] and VTE prophylaxis (n=8 recommendations)[9, 14, 16, 19] were most commonly addressed. There were two instances where a particular intervention was not recommended (e.g., subcutaneous drains, negative pressure dressing therapy).[9, 20] We did not find any recommendations that directly opposed one other, but there were differences in the specifics of the recommendations. For example, the American College of Obstetricians and Gynecologists (ACOG) recommends an anesthesiology consult for persons with both obesity and obstructive sleep apnea whereas RCOG recommends that the anesthetist "be informed of all women with class III obesity".[9, 20] In one guideline from the Society of Obstetricians and Gynaecologists of Canada (SOGC), the recommendation is for a "higher" dose [19] and another recommendation from the SOGC is for a "double dose" [17] of antibiotic prophylaxis. Regarding specific recommendations for persons with different classes of obesity, we only found recommendations for weight-based VTE prophylaxis dosing [9, 16, 22] and anesthesiology consultations.[20]

Regarding the practical tools for implementation (Table 3), the style varied. In a checklist and bundle, there were specific recommendations including "40 mg of enoxaparin subcutaneously twice daily for VTE prophylaxis after cesarean delivery" [24] and "negative pressure wound therapy…applied in operating suite at the time of incision closure and left-in-situ for 7 days", respectively.[25] Another checklist had several recommendations for intrapartum and postpartum care with check boxes (e.g., intrauterine pressure catheter use, incision type, negative pressure dressing therapy), ultimately leaving the decision to perform the intervention or not up to the individual

provider.[26] Common terms found in the tools from Google Scholar searches included "consider" a certain treatment option or "anticipate" a particular complication (Appendix B). We noted differences in these tools for continuous fetal monitoring, where two tools recommend continuous fetal monitoring,[27, 28] but one did not.[29] In addition, two tools [25, 30] recommended negative pressure dressing therapy for certain circumstances (e.g., BMI > 35 kg/m^2 or > 40 kg/m^2) whereas another tool stated "avoid the use of wound vacs."[27]

We then evaluated the similarities and differences between the evidence-rated recommendations in Table 2 and any of the published tools in Table 3. The evidence to support or not support the content in the tools from Table 2 was provided in the last column of Table 3. Some of the differences noted are as follows. The one recommendation in the checklist from the Society for Maternal-Fetal Medicine was supported from its own clinical series article.[16, 24] The recommendation from the bundle for prophylactic negative pressure wound therapy to reduce surgical site infection at a hospital in New South Wales, Australia was not supported by any recommendations in Table 2.[25] We observed that evidence-rated recommendations supported the majority of the content in the checklist from Abdelmalek et al. These included to notify anesthesiology providers, have resources available to accommodate increased weight (e.g., operating room equipment, blood pressure cuffs), give prophylactic anticoagulation (though dose adjustments not specified), and have a lactation consultation.[26] However, content such as delay in staple removal or adjustments in postpartum pain management were not found in other evidence-rated recommendations in Table 2.

DISCUSSION

Principal Findings

In our scoping review of the peripartum management of obesity, we found seven articles with evidence-rated recommendations. The articles included national guidelines from the FIGO (n=11 recommendations), United States (n=6 recommendations), United Kingdom (n=13 recommendations), and Canada (n=9 recommendations). The majority of the levels of evidence were second or third tier (Level 2 from GRADE, Level II or III from Canadian Task Force on Preventive Health Care, or Grade B or C from US Preventive Services Task Force). The recommendation that was of the highest grade (Strong, Level 1 or Grade A) was antibiotic prophylaxis for cesarean delivery,[14, 20] yet these recommendations apply to persons of all weights. A higher dosage of preoperative antibiotics for cesarean delivery also had the highest grade in one article[19] as well as subcutaneous tissue closure.[9, 20] We noted that 13 recommendations were based on expert opinion, or the lowest level of evidence. We noted that the majority of these recommendations would be considered “low-risk” interventions such as lactation and anesthesia consults and developing a system or clinical care pathway for persons with obesity. Other expert opinion recommendations might be considered in the labor management for all persons depending on the clinical situation (e.g., intravenous access, fetal heart rate monitoring, IUPC use).

Although we did not find directly opposing recommendations, there were subtle differences in some of the recommendations including criteria for anesthesia consults and antibiotic dosing. There is considerable debate over appropriate prophylactic dosing of antibiotics for cesarean delivery in persons with obesity given that pharmacokinetic

studies suggest improved or similar tissue concentrations with adjusted dosing,[31-34] whereas a study comparing clinical outcomes such as surgical site infections did not demonstrate significant differences when comparing standard vs. higher doses of antibiotics.[35] The variations in recommendations may reflect the uncertainty of whether to reach a physiological target vs. a clinical outcome.

We found that the recommendation for prophylactic negative pressure therapy in one tool contradicted the Royal College of Obstetricians and Gynaecologists' recommendation regarding this practice ("There is a lack of good-quality evidence to recommend the routine use of negative pressure dressing therapy…").[20] We acknowledge the content in the tools may be unique to a site depending on available resources at the time of peripartum care as well as historical practice patterns, cost, ease of use, and risk/benefit ratio to maternal and fetal health. In the tools we reviewed, language such as "consider" or "anticipate" suggests that a concrete recommendation is not available and care needs to be individualized.

Strengths and limitations in relation to other studies

Other authors have published summaries of clinical guidelines, similar to the ones we identified. For example, a systematic review of guidelines available worldwide for the management of obesity in pregnancy found 32 clinical practice guidelines covering the domains of preconception care, care during pregnancy, diet and exercise during pregnancy, care immediately before, during and after delivery, and postpartum care.[36] For delivery and postpartum care, those authors identified the following recommendations: (1) obesity alone not an indication for induction of labor, (2) early establishment of venous access during labor for women with a BMI > 40 kg/m^2, (3)

allowing for a longer 1st stage of labor before performing a cesarean delivery for labor arrest, and (4) active management of the 3rd stage of labor. Recommendations pertaining to cesarean delivery included: (1) obesity alone not an indication for elective cesarean delivery, (2) need for adequate staffing and equipment for maternal weight > 120 kg, (3) suturing subcutaneous tissue if > 2 cm of depth, (4) use of mechanical thromboprophylaxis before and after cesarean delivery, and (5) weight-based dosing of medication used to prevent VTE. Lastly, they also identified recommendations for breastfeeding support and lactation consultants. These recommendations were similar to the ones we identified from national guidelines in our scoping review.[9, 19, 20]

Several of the evidence-rated recommendations in Table 2 supported the content in the 11 tools we identified. However, we also found content not supported by evidence-rated recommendations such as a peripherally inserted catheter for difficult intravenous access and delayed staple removal. We identified a randomized controlled non-inferiority trial of early (post-operative day 3) or delayed (between post-operative days 7 and 10) staple removal for transverse skin incisions in persons with a BMI ≥ 30 kg/m^2.[37] Although the study was stopped prior to reaching the targeted sample size, the occurrence of superficial wound dehiscence was 15.2% in the early and 11.5% in the delayed group (RR 1.3, 95% CI 0.7-2.4) and there were no other differences in the secondary outcomes of seroma, hematoma, surgical site infection, or pain scores among the two groups. Since the available evidence regarding timing of staple removal is limited, other clinical and non-clinical characteristics such as provider and patient preference likely contribute to decisions about staple removal timing.

Strengths and limitations of this study

We acknowledge several limitations to our study. We may not have identified all articles with evidence-rated recommendations, especially since our search ended in December 2020 and more recent articles were not identified. However, our search of available published literature was thorough including a search of appropriate web sites. Sites may have practical implementation tools that they use in the short- or long-term, but they may not be published or available in a more public domain. We identified clinical guidelines from other countries including Ireland and Australia,[38, 39] but they were not included in this review because they were not accompanied by evidence-rated recommendations. Although topics such as contraception and postpartum weight management are important in the postpartum care of persons with obesity, they were not specifically addressed in this review, which pertained to peripartum care in the immediate postpartum period. Obesity was typically defined according to a BMI ≥ 30.0 kg/m^2, but in many instances the timing of the BMI was not provided (e.g., pre-pregnancy vs. at delivery). Some recommendations were specific to a particular BMI cut-off, but others pertained to obesity, in general, without specifying a BMI. Lastly, we did not include recommendations that were intended for patient education only in this review.

Meaning of the study

Based on this scoping review, we propose the following key content for a peripartum checklist or toolkit in Table 4. This content is based on evidence ratings and ease of implementation. In summary, persons with obesity are at high risk for morbidity and mortality, with an abundance of risk occurring during the peripartum period. Few guidelines exist for the care of these persons and the evidence to support care is

limited. Thus, there is a need for high quality studies encompassing peripartum interventions.

Table 4: Proposed key content for a peripartum checklist or toolkit for persons with obesity

Content	Examples
Provider discussion on labor induction, delivery route, and labor management	Allow for longer labor Difficulties in fetal heart rate monitoring
Expert consultations	Anesthesiologists Lactation consultants
Prophylaxis for cesarean delivery	Mechanical devices for VTE prophylaxis Higher dose of antibiotic before delivery depending on BMI Higher dose of anticoagulant after delivery depending on BMI
Wound management	Close subcutaneous tissue without drains or wound therapy

Conclusion

The recommendations for peripartum care for persons with obesity are based on limited evidence and few practical tools for implementation exist. Future work should focus on developing practical tools based on high quality studies.

Contributorship statement

MK designed the study protocol. LCO completed the database search of potential articles. MK, IC, JMP, AP, and PT reviewed abstracts, decided on inclusion and exclusion criteria, and reviewed the full-text of included articles. All authors contributed to the synthesis of results. All authors acknowledged approval of the final version for publication.

Competing interests

The authors have no competing interests to report.

Ethics approval statement

Ethics approval was not required since the study was a review of previously published articles.

Funding

There are no financial support resources to report.

Data sharing

The protocol is available for review at https://doi.org/10.18131/g3-gyms-ww23. A full list of the sources and search strategies is outlined in Appendix A.

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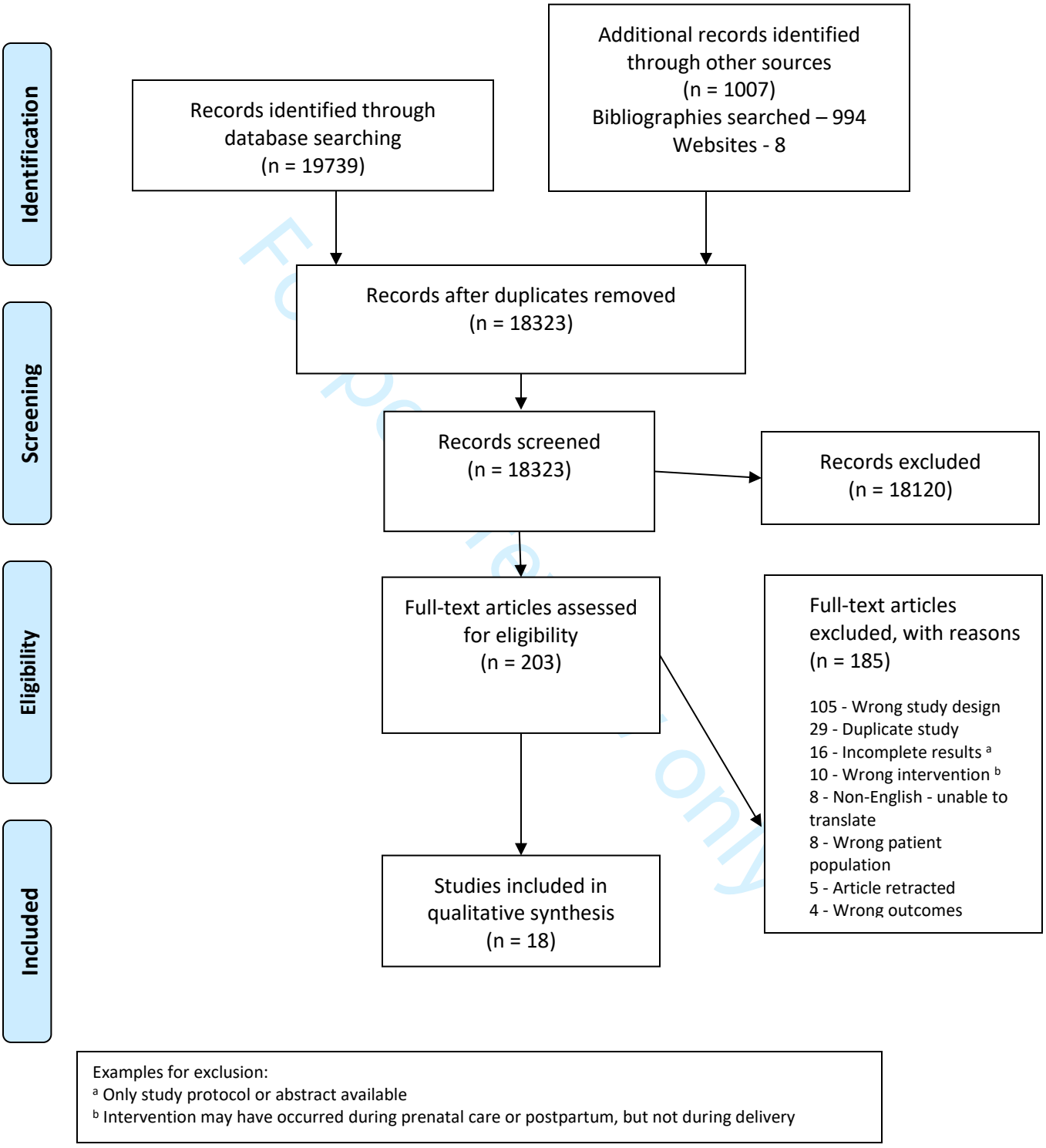
Figure 1: PRISMA flow diagram for study selection.

PRISMA Flow Diagram



Examples for exclusion:
[a] Only study protocol or abstract available
[b] Intervention may have occurred during prenatal care or postpartum, but not during delivery

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). *P*referred *R*eporting *I*tems for *S*ystematic Reviews and *M*eta-*A*nalyses: The PRISMA Statement. PLoS Med 6(6): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit www.prisma-statement.org.

Appendix A Search Strategy

PubMed MEDLINE

Guidelines search

("Obesity"[Mesh] OR Obesity[tiab] OR Obese[tiab] OR Superobesity[tiab]) AND ("Pregnancy"[Mesh] OR "Pregnancy Complications"[Mesh] OR "Pregnant Women"[Mesh] OR "Delivery, Obstetric"[Mesh] OR "Peripartum Period"[Mesh] OR "Perinatal Care"[Mesh] OR Pregnancy[tiab] OR Pregnancies[tiab] OR Pregnant[tiab] OR Parturition[tiab] OR Parturient[tiab] OR Parturients[tiab] OR Peripartum[tiab] OR Perinatal[tiab] OR Prenatal[tiab] OR Antenatal[tiab] OR Antepartum[tiab] OR Intrapartum[tiab] OR Postpartum[tiab] OR Cesarean[tiab]) AND (Toolkit[tiab] OR toolkits[tiab] OR Guideline[tiab] OR guidelines[tiab] OR Recommend*[tiab] OR Checklist[tiab] OR checklists[tiab] OR consensus[tiab] OR Evidence-based[tiab] OR “Best practice*”[tiab] OR “Clinical management” [tiab] OR “Anesthetic management”[tiab] OR anesthesia[tiab] OR anaesthesia[tiab] OR Standards[tiab] OR "Guideline" [Publication Type] OR "Practice Guidelines as Topic"[Mesh] OR "Practice Guideline" [Publication Type] OR "Meta-Analysis" [Publication Type] OR "Meta-Analysis as Topic"[Mesh] OR "Network Meta-Analysis"[Mesh] OR systematic[ti] OR scoping[ti] OR meta-analy*[ti])

Interventions search

("Obesity"[Mesh] OR Obesity[tiab] OR Obese[tiab] OR Superobesity[tiab]) AND ("Pregnancy"[Mesh] OR "Pregnancy Complications"[Mesh] OR "Pregnant Women"[Mesh] OR "Delivery, Obstetric"[Mesh] OR "Peripartum Period"[Mesh] OR "Perinatal Care"[Mesh] OR Pregnancy[tiab] OR Pregnancies[tiab] OR Pregnant[tiab] OR Parturition[tiab] OR Parturient*[tiab] OR Peripartum[tiab] OR Perinatal[tiab] OR Prenatal[tiab] OR Antenatal[tiab] OR Antepartum[tiab] OR Intrapartum[tiab] OR Postpartum[tiab] OR Cesarean[tiab])

AND (Toolkit*[tiab] OR Guideline*[tiab] OR Recommend*[tiab] OR Checklist*[tiab] OR consensus[tiab] OR Evidence-based[tiab] OR Best practice*[tiab] OR “Clinical management” [tiab] OR “Anesthetic management”[tiab] OR anesthesia[tiab] OR anaesthesia[tiab] OR Standards[tiab] OR "Guideline" [Publication Type] OR "Practice Guidelines as Topic"[Mesh] OR "Practice Guideline" [Publication Type] OR "Early Medical Intervention"[Mesh] OR "Patient Education as Topic"[Mesh] OR "Health Education"[Mesh] OR intervention*[tiab] OR therapy[subheading] OR therapy[tiab] OR treatment[tiab])

AND

(“Case-Control Studies”[Mesh:noexp] OR "retrospective studies"[mesh:noexp] OR “Control Groups”[Mesh:noexp] OR (case[TIAB] AND control[TIAB]) OR (cases[TIAB] AND controls[TIAB]) OR (cases[TIAB] AND controlled[TIAB]) OR (case[TIAB] AND comparison*[TIAB]) OR (cases[TIAB] AND comparison*[TIAB]) OR “control

group"[TIAB] OR "control groups"[TIAB] OR cohort studies[mesh:noexp] OR longitudinal studies[mesh:noexp] OR follow-up studies[mesh:noexp] OR prospective studies[mesh:noexp] OR retrospective studies[mesh:noexp] OR cohort[TIAB] OR longitudinal[TIAB] OR prospective[TIAB] OR retrospective[TIAB] OR randomized controlled trial[pt] OR controlled clinical trial[pt] OR randomized[tiab] OR placebo[tiab] OR clinical trials as topic[mesh:noexp] OR randomly[tiab] OR trial[ti] NOT (animals[mh] NOT humans [mh]))

Filters used for the interventions search:

http://libguides.sph.uth.tmc.edu/search_filters/pubmed_filters

https://work.cochrane.org/pubmed

Embase (embase.com)

Guidelines search

'obesity'/exp OR obesity:ti,ab OR superobesity:ti,ab

AND

'pregnancy'/exp OR 'pregnancy disorder'/de OR 'high risk pregnancy'/exp OR 'labor complication'/exp OR 'multiple pregnancy'/exp OR 'obstetric emergency'/exp OR 'placenta disorder'/exp OR 'pregnancy complication'/exp OR 'pregnancy disorders of endocrine origin'/exp OR 'pregnancy toxemia'/exp OR 'prolonged pregnancy'/exp OR 'puerperal disorder'/exp OR 'pregnant woman'/exp OR 'obstetric delivery'/exp OR 'perinatal period'/exp OR 'perinatal care'/exp OR Pregnancy:ti,ab OR Pregnancies:ti,ab OR Pregnant:ti,ab OR Parturition:ti,ab OR Parturient*:ti,ab OR Peripartum:ti,ab OR Perinatal:ti,ab OR Prenatal:ti,ab OR Antenatal:ti,ab OR Antepartum:ti,ab OR Intrapartum:ti,ab OR Postpartum:ti,ab OR Cesarean:ti,ab

AND

'guideline'/exp OR 'checklist'/exp OR 'consensus development'/exp OR 'evidence based practice'/exp OR 'practice guideline'/exp OR 'standards'/exp OR 'meta analysis'/exp OR 'systematic review'/exp OR 'scoping review'/exp OR Toolkit*:ti,ab OR Guideline*:ti,ab OR Recommend*:ti,ab OR Checklist*:ti,ab OR consensus:ti,ab OR Evidence-based:ti,ab OR 'Best practice*':ti,ab OR "Clinical management":ti,ab OR "Anesthetic management":ti,ab OR anesthesia:ti,ab OR anaesthesia:ti,ab OR Standards:ti,ab OR systematic:ti OR scoping:ti OR meta-analy*:ti

Interventions search

'obesity'/exp OR obesity:ti,ab OR superobesity:ti,ab

AND

'pregnancy'/exp OR 'pregnancy disorder'/de OR 'high risk pregnancy'/exp OR 'labor complication'/exp OR 'multiple pregnancy'/exp OR 'obstetric emergency'/exp OR 'placenta disorder'/exp OR 'pregnancy complication'/exp OR 'pregnancy disorders of endocrine origin'/exp OR 'pregnancy toxemia'/exp OR 'prolonged pregnancy'/exp OR 'puerperal disorder'/exp OR 'pregnant woman'/exp OR 'obstetric delivery'/exp OR 'perinatal period'/exp OR 'perinatal care'/exp OR Pregnancy:ti,ab OR Pregnancies:ti,ab OR Pregnant:ti,ab OR Parturition:ti,ab OR Parturient*:ti,ab OR Peripartum:ti,ab OR Perinatal:ti,ab OR Prenatal:ti,ab OR Antenatal:ti,ab OR Antepartum:ti,ab OR Intrapartum:ti,ab OR Postpartum:ti,ab OR Cesarean:ti,ab

AND

'guideline'/exp OR 'checklist'/exp OR 'consensus development'/exp OR 'practice guideline'/exp OR 'standards'/exp OR 'meta analysis'/exp OR 'systematic review'/exp OR 'scoping review'/exp OR toolkit*:ti,ab OR guideline*:ti,ab OR recommend*:ti,ab OR checklist*:ti,ab OR consensus:ti,ab OR 'evidence based':ti,ab OR 'best practice*':ti,ab OR 'clinical management':ti,ab OR 'anesthetic management':ti,ab OR standards:ti,ab OR 'intervention study'/exp OR 'patient education'/exp OR 'health education'/exp OR 'therapy'/exp OR intervention*:ti,ab OR therapy:ti,ab OR treatment:ti,ab

AND

'crossover procedure':de OR 'double-blind procedure':de OR 'randomized controlled trial':de OR 'single-blind procedure':de OR (random* OR factorial* OR crossover* OR cross NEXT/1 over* OR placebo* OR doubl* NEAR/1 blind* OR singl* NEAR/1 blind* OR assign* OR allocat* OR volunteer*):de,ab,ti OR 'clinical article'/exp OR 'controlled study'/exp OR 'major clinical study'/exp OR 'prospective study'/exp OR 'cohort analysis'/exp OR 'cohort':ti,ab OR 'compared':ti,ab OR 'groups':ti,ab OR 'case control':ti,ab OR 'multivariate':ti,ab

Filters:

https://guides.library.harvard.edu/c.php?g=309982&p=2079546

https://work.cochrane.org/embase

CENTRAL: Cochrane Register of Controlled Trials

Guidelines and intervention search

#1 MeSH descriptor: [Obesity] explode all trees

#2 (Obesity OR Obese OR Superobesity):ti,ab,kw

#3 #1 OR #2

#4 MeSH descriptor: [Pregnancy] explode all trees

#5 MeSH descriptor: [Pregnancy Complications] explode all trees

#6 MeSH descriptor: [Pregnant Women] explode all trees

#7 MeSH descriptor: [Delivery, Obstetric] explode all trees

#8 MeSH descriptor: [Peripartum Period] explode all trees

#9 MeSH descriptor: [Perinatal Care] explode all trees

#10 Pregnancy:ti,kw,ab OR Pregnancies:ti,kw,ab OR Pregnant:ti,kw,ab OR Parturition:ti,kw,ab OR Parturient*:ti,kw,ab OR Peripartum:ti,kw,ab OR Perinatal:ti,kw,ab OR Prenatal:ti,kw,ab OR Antenatal:ti,kw,ab OR Antepartum:ti,kw,ab OR Intrapartum:ti,kw,ab OR Postpartum:ti,kw,ab OR Cesarean:ti,kw,ab

#11 {OR #4-#10}

#12 Toolkit*:ti,kw,ab OR Guideline*:ti,kw,ab OR Recommend*:ti,kw,ab OR Checklist*:ti,kw,ab OR consensus:ti,kw,ab OR Evidence-based:ti,kw,ab OR Best practice*:ti,kw,ab OR “Clinical management”:ti,kw,ab OR “Anesthetic management”:ti,kw,ab OR anesthesia:ti,kw,ab OR anaesthesia:ti,kw,ab OR Standards:ti,kw,ab

#13 MeSH descriptor: [Practice Guidelines as Topic] explode all trees

#14 systematic:ti OR scoping:ti OR meta-analy*:ti

#15 #12 OR #13 OR #14

#16 #3 AND #11 AND #15

#17 MeSH descriptor: [Early Medical Intervention] explode all trees

#18 MeSH descriptor: [Patient Education as Topic] explode all trees

#19 MeSH descriptor: [Health Education] explode all trees

#20 MeSH descriptor: [Therapeutics] explode all trees

#21 intervention*:ti,kw,ab OR therapy:ti,kw,ab OR treatment:ti,kw,ab

#22 {OR #17-#21}

#23 #3 AND #11 AND #22

#24 #16 OR #23

CINAHL (EbscoHost)

Guidelines search

((MH "Obesity") OR (MH "Obesity, Morbid")) OR TI (Obesity OR Obese OR Superobesity) OR AB (Obesity OR Obese OR Superobesity)

AND

((MH "Pregnancy+") OR (MH "Pregnancy, Multiple+") OR (MH "Pregnancy Trimesters+") OR (MH "Pregnancy, Unplanned") OR (MH "Pregnancy, Unwanted") OR (MH "Expectant Mothers") OR (MH "Pregnancy Complications+") OR (MH "Obstetric Care+") OR (MH "Postnatal Care+") OR (MH "Postnatal Period+")) OR TI (Perinatal OR Pregnancy OR Pregnancies OR Pregnant OR Parturition OR Parturient* OR Peripartum OR Prenatal OR Antenatal OR Antepartum OR Intrapartum OR Postpartum OR Cesarean) OR AB (Perinatal OR Pregnancy OR Pregnancies OR Pregnant OR Parturition OR Parturient* OR Peripartum OR Prenatal OR Antenatal OR Antepartum OR Intrapartum OR Postpartum OR Cesarean)

AND

((MH "Practice Guidelines") OR (MH "Meta Analysis") OR (MH "Meta Synthesis")) OR TI (Toolkit* OR Guideline* OR Recommend* OR Checklist* OR consensus OR Evidence-based OR Best practice* OR “Clinical management” OR “Anesthetic management” OR anesthesia OR anaesthesia OR Standards) OR AB (Toolkit* OR Guideline* OR Recommend* OR Checklist* OR consensus OR Evidence-based OR Best practice* OR “Clinical management” OR “Anesthetic management” OR anesthesia OR anaesthesia OR Standards) OR TI (systematic OR scoping OR meta-analy*)

Interventions search

((MH "Early Intervention") OR (MH "Patient Education+") OR (MH "Health Education+") OR (MH "Pregnancy Outcomes") OR (MH "Treatment Outcomes+")) OR TI (Toolkit* OR Guideline* OR Recommend* OR Checklist* OR consensus OR Evidence-based OR Best practice* OR “Clinical management” OR “Anesthetic management” OR anesthesia OR anaesthesia OR Standards OR "Early Medical Intervention" OR "Patient Education as Topic" OR "Health Education" OR intervention* OR therapy OR treatment) OR AB (Toolkit* OR Guideline* OR Recommend* OR Checklist* OR consensus OR Evidence-based OR Best practice* OR “Clinical management” OR “Anesthetic management” OR anesthesia OR anaesthesia OR Standards OR "Early Medical Intervention" OR "Patient Education as Topic" OR "Health Education" OR intervention* OR therapy OR treatment)

AND

(MH "Prospective Studies") OR TI (cohort OR longitudinal OR prospective OR retrospective) OR AB (cohort OR longitudinal OR prospective OR retrospective) OR (((MH "Random Assignment") or (MH "Random Sample+") or (MH "Crossover Design") or (MH "Clinical Trials+") or (MH "Comparative Studies") or (MH "Control (Research)+") or (MH "Control Group") or (MH "Factorial Design") or (MH "Quasi-Experimental Studies+") or (MH "Placebos") or (MH "Meta Analysis") or (MH "Sample Size") or (MH "Research, Nursing") or (MH "Research Question") or (MH "Research Methodology+") or (MH "Evaluation Research+") or (MH "Concurrent Prospective Studies") or (MH "Prospective Studies") or (MH "Nursing Practice, Research-Based") or (MH "Solomon Four-Group Design") or (MH "One-Shot Case Study") or (MH "Pretest-Posttest Design+") or (MH "Static Group Comparison") or (MH "Study Design") or (MH "Clinical Research+")) or (clinical nursing research or random* or cross?over or placebo* or control* or factorial or sham* or meta?analy* or systematic review* or blind* or mask* or trial*))

Clinicaltrials.gov

Keyword searches included pregnancy and obesity.

Google searches

Recognizing that guidelines, toolkits, and checklists are often not published in the journal literature, we supplemented the guidelines search strategy with Google searches. To ensure more precision we limited the results to .org and .gov domains.

Searches were run in Google for “obesity pregnancy guideline” with the following limits:

1. Words in page title only
2. Words in URL only
3. .org domain
4. .gov domain
5. .gov.uk domain
6. .org.uk domain
7. .gov.au domain
8. .org.au domain

On the assumption that the Google search algorithm pushes the most relevant results to the top, one reviewer (MK) screened the first four pages of results for each search, looking for guidelines and checklists not already included in our previous search results. For the identified sites, the other authors (PT, AP, IC, JP) also voted to include or exclude the sites. The most recent search was conducted in April 2021.

Title	Year	Source or Site	Tool type	Content
Obesity in Pregnancy [1] [a]	8.2021	Department of Health in Queensland, AU Guideline: Obesity and pregnancy (including post bariatric surgery) (health.qld.gov.au)	Flow Chart	**Intrapartum** If BMI > 40 kg/m^2 Early assessment of IV access Recommend continuous fetal monitoring If prophylactic antibiotics, consider higher dosage Active third stage management Surveillance for shoulder dystocia/PPH **Postpartum** Surveillance for airway compromise Early mobilisation Assess risk of VTE and consider thromboprophylaxis Additional support for breastfeeding
Class 3 Obesity and Pregnancy [2]	7.2020	University of New Mexico Department of Obstetrics and Gynecology http://unmobgyn.pbworks.com/w/file/fetch/140915307/Class%203%20Obesity%20and%20Pregnancy.pdf	Standard operating procedure-guideline	**Intrapartum** No clear evidence for routine IOL solely for class 3 obesity Higher morbidity with TOLAC compared to repeat CD in this specific population Consider repeat CD in this population Alert team of increased risk of shoulder dystocia and PPH Anesthesia evaluation before admission, or early in admission Pneumatic compression stockings during labor Continuous fetal and uterine monitoring in labor Avoid use of wound vacs or drains **Postpartum** Low-molecular weight heparin for thromboprophylaxis for 5-6 days postpartum Weight based prophylaxis is better option Breast feeding encouraged due to higher risks of difficulties Lactation counseling Consider lactation consulting Incentive spirometry Early ambulation Avoid early hospital discharge
Obesity in Pregnancy [3]	4.2018	Alaska Native Medical Center https://anmc.org/wp-content/uploads/ClinicalGuidelinesMaster/Obesity.pdf	Guideline	**Intrapartum** Use appropriate sized blood pressure cuff Anticipate higher dose of oxytocin for induction or augmentation of labor Consider placement of prophylactic epidural catheter **If BMI > 40 kg/m^2** Consider early IUPC and FSE

				If BMI > 50 kg/m² Anesthesia consult on admission Consider additional use of IV famotidine and/or metoclopramide Anticipate higher rate of failed regional anesthesia Anticipate difficult airway (have videolaryngoscope available, have laryngeal mask airway available, have emergency cricothyroidotomy kit available) **If Cesarean delivery** Bariatric surgery should not be considered an indication for CD Anticipate greater time from incision to delivery Pfannenstiel incision carries less risk of infection and dehiscence than midline incision Consider retracting panniculus cephalad (or caudad) with tape or large "Ioban" drape Consider self-retaining retractor, extra-long instruments Close subcutaneous layer (34% decrease in wound disruption) Subcutaneous drains may be associated with a higher risk of infection Consider closure with polydioxanone (PDS) Consider Smead-Jones "mass closure" If staples used for skin closure, do not remove until 7-10 days postoperatively for a vertical incision and 5 days for a Pfannenstiel Increase dose of prophylactic cefazolin to 3 g IV before incision if BMI > 40 kg/m² Panniculectomy at the time of CD increases complications Early ambulation Intermittent pneumatic compression devices Consider using bariatric bed with frame and trapeze for mobility postoperatively Anticoagulation if 1 major or 2 minor ACCP risk factors for VTE Enoxaparin 40mg every 12 hours for BMI < 50 kg/m², 60 mg every 12 hours for BMI > 50 kg/m² or weight based dosing (e.g., enoxaparin 0.5 mg/kg every 12 hours)
Obesity in Pregnancy Guideline [4]	9.2020	National Health System Northern Devon Healthcare United Kingdom https://www.northdevo	Care Pathway	**Intrapartum** All blood pressure measurements should be taken using the appropriate size arm cuff. Complete a manual handling risk assessment to ensure the correct equipment is available and used.

		nhealth.nhs.uk/wp-content/uploads/2018/06/Obesity-in-Pregnancy-Guideline.pdf		Measure and fit TED anti-embolism stockings. Consider calf compression device for all women with BMI ≥ 40. Assess pressure areas and maintain skin integrity. Consider ultrasound scan to confirm fetal presentation. Be alert to increased risk of shoulder dystocia. The duty anaesthetist and duty obstetric registrar should be informed when a woman with a BMI ≥ 40 is admitted to labour ward. Women with a BMI ≥ 40 should have IV access early in labour with "FBC and group and save taken". For women with a BMI ≥ 40, prophylactic omeprazole should be administered as per prescription. Raised BMI alone is not an indication for continuous fetal monitoring in labour. **Postpartum** All women with a BMI ≥ 35 should be recommended to have active management of the third stage of labour Women with a BMI ≥ 30 should be encouraged to mobilise as early as practicable following childbirth to reduce the risk of thromboembolism. TED stockings or calf compression devices to be worn throughout hospital stay regardless of mode of delivery for women with BMI ≥ 35. Assess wound and observe for signs of dehiscence.
Obesity in Pregnancy, Labour and Puerperium [5]	2019	University Hospitals of Leicester NHS Trust United Kingdom Microsoft Word - Obesity in Pregnancy Labour 18 7 19 (leicestershospitals.nhs.uk)	Guideline	**Intrapartum:** Assessment of tissue viability by completing "Waterlow Risk Assessment Form"; if value > 10 then inspect skin daily via "BEST SHOT" guidance (also postpartum) Notify OR staff on admission if weight is > 140 kg **Postpartum:** Early mobilization Use compression stocking if ≥ 2 risk factors VTE prophylaxis for 7 days if ≥ 1 risk factors **If BMI ≥ 40:** Early IV access Consider early epidural Experienced obstetrician (≥ ST6) to perform CD or "rotational instrumental delivery" Active management of 3rd stage Consider IV syntocinon instead of IM route

				VTE prophylaxis regardless of delivery route Consider increased dose of antibiotic prophylaxis
Obesity Medicine Management of obesity in women's health care. Chapter 19: Checklists for Care: Care Maps for Pregnancy in the Obese Gravida [6]	2017	United States	CareMap	**Intrapartum** Obtain clear fetal heart tracing and uterine contraction assessment Place SCD Early consultation with anesthesia Confirm adequate equipment for anesthesia, labor and delivery, and operating room Discuss/plan for the following: delivery route, skin cleansing/preparation, antibiotic dosing for CD (consider 3g cefazolin if weight > 120 kg), postpartum VTE prophylaxis (SCD, LMWH), early ambulation, perineal laceration or incision care, address medical comorbidities, medication adjustments **Immediate postpartum** VTE prophylaxis Early ambulation Anticoagulation (if indicated) Lactation referral
Supporting a Plus-Size Pregnancy: A Checklist for Healthcare Providers [7]	2019	United States NIH/NICHD, National Child and Maternal Health Education Program NIH Pub.Number: 19-HD-8100 https://www.nichd.nih.gov/sites/default/files/2019-11/Healthcare_Provider_Checklist.pdf	Checklist	Ensure availability of appropriate birthing beds and monitoring/other equipment to care for plus-size patients (e.g., large chairs and wheelchairs, larger blood pressure cuffs). Assess appropriateness of gurneys and staffing plans and revise as needed (e.g., get motorized lifts for gurneys, increase staff to assist with moving the patient). Consider consulting with an anesthesia service, especially for patients with obstructive sleep apnea, in case the need for a surgical delivery arises. Consider early epidural catheter placement, and discuss the risks and benefits with the patient. Consider allowing a longer first stage of labor before performing cesarean delivery for labor arrest. Work with your patient to create a birthing plan, including pain management methods. Work with your patient to create a breastfeeding plan and help her get lactation support/consultation, if needed.
Antenatal Management of Obesity [8]	2018	Spectrum Health Medical Group Michigan, United States	Protocol	Anesthesia consult if BMI > 60 Prophylactic antibiotics "Azithro + Ancef (3g if >120kg)" Delivery timing 39-40 weeks

		www.spectrumhealth.org>mfm>protocol-obesity		Consider wound vac placement post op if Class III obesity with risk factors (DM, chorio) or BMI > 60 Postop prophylactic lovenox while inpatient for class I and II obesity with risk factors, >/= class III regardless of risk factors

Appendix B: Title, year of publication, source of recommendations, and content topic for tools for the peripartum management of obesity identified from searches of Google Scholar.

[a] During original Google scholar search on 4.1.21, the Queensland Clinical Guideline for "Obesity in pregnancy" was published in 2015. When the manuscript was updated for publication, a new version of the guideline was published in 8.2021 and therefore the most recent guideline was used for this manuscript since the prior link was no longer available.

IOL induction of labor

CD or CS cesarean delivery

IV intravenous

BMI body mass index

PPH postpartum hemorrhage

VTE venous thromboembolism

TOLAC trial of labor after cesarean

IUPC intrauterine pressure catheter

FSE fetal scalp electrode

PDS polydioxanone

ACCP American College of Chest Physicians

TED thrombo-embolus deterrent

OR operating room

NIBP non-invasive blood pressure

BP blood pressure

NB neuraxial blockade

LMWH low molecular weight heparin

DM diabetes

References:

[1] Queensland Clinical Guidelines. Obesity and pregnancy (including post bariatric surgery). Guideline No. MN21.14-V6-R26. Queensland Health. 2021. Available from: http://www.health.qld.gov.au/qcg. Accessed 9/24/21.

[2] University of New Mexico School of Medicine. Standard operating procedure-guideline class 3 obesity and pregnancy. 2020. Available from: http://unmobgyn.pbworks.com/w/file/fetch/140915307/Class%203%20Obesity%20and%20Pregnancy.pdf. Accessed 4/1/21.

[3] Obesity in pregnancy - ANMC guideline Alaska Native Medical Center. Available from: https://anmc.org/wp-content/uploads/ClinicalGuidelinesMaster/Obesity.pdf. Accessed 4/1/21.

[4] Obesity in pregnancy guidelines. 2020. Available from: https://www.northdevonhealth.nhs.uk/wp-content/uploads/2018/06/Obesity-in-Pregnancy-Guideline.pdf. Accessed 4/1/21.

[5] Obesity in pregnancy, labour and the puerperium. University Hospitals of Leicester NHS Trust 2019. Available from: Microsoft Word - Obesity in Pregnancy Labour 18 7 19 (leicestershospitals.nhs.uk). Accessed 4/1/21.

[6] Silverman RK. Obesity Medicine: Management of Obesity in Women's Health Care 1ed: McGraw-Hill Education; 2017.

[7] Supporting a plus-size pregnancy: a checklist for healthcare providers NIH Pub.Number: 19-HD-8100: Eunice Kennedy Shriver National Institute of Child Health and Human Development; 2019. Available from: https://www.nichd.nih.gov/sites/default/files/2019-11/Healthcare_Provider_Checklist.pdf. Accessed 4/1/21.

[8] Antenatal management of obesity. 2018 Available from: www.spectrumhealth.org>mfm>protocol-obesity. Accessed 4/1/21.

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	3
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	3
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	Cover letter
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	4
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	4, Appendix A
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Appendix A
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	4
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	5
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	5
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	5

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	5
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	5, figure 1
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	6, Table 1,2,Appendix B
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	Not applicable
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	6-7
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	6-7
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	8
Limitations	20	Discuss the limitations of the scoping review process.	10
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	9, Table 3
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	Title page

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMAScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850.