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Care of Women with Obesity in Pregnancy

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Care of Women with Obesity in Pregnancy

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This is the second edition of this guideline. The first edition was published in 2010 as a joint guideline with the Centre of Maternal and Child Enquiries under the title 'Management of Women with Obesity in Pregnancy'.

Executive summary

Prepregnancy care

What care should be provided in the primary care setting to women of childbearing age with obesity who wish to become pregnant?

Primary care services should ensure that all women of childbearing age have the opportunity to optimise their weight before pregnancy. Advice on weight and lifestyle should be given during preconception counselling or contraceptive consultations. Weight and BMI should be measured to encourage women to optimise their weight before pregnancy. ✓

Women of childbearing age with a BMI 30 kg/m^2 or greater should receive information and advice about the risks of obesity during pregnancy and childbirth, and be supported to lose weight before conception and between pregnancies in line with National Institute for Health and Care Excellence (NICE) Clinical guideline (CG) 189. D

Women should be informed that weight loss between pregnancies reduces the risk of stillbirth, hypertensive complications and fetal macrosomia. Weight loss increases the chances of successful vaginal birth after caesarean (VBAC) section. B

What nutritional supplements should be recommended to women with obesity who wish to become pregnant?

Women with a BMI 30 kg/m^2 or greater wishing to become pregnant should be advised to take 5 mg folic acid supplementation daily, starting at least 1 month before conception and continuing during the first trimester of pregnancy. D

Obese women are at high risk of vitamin D deficiency. However, although vitamin D supplementation may ensure that women are vitamin D replete, the evidence on whether routine vitamin D should be given to improve maternal and offspring outcomes remains uncertain. B

Provision of antenatal care

How and where should antenatal care be provided?

Care of women with obesity in pregnancy can be integrated into all antenatal clinics, with clear local policies and guidelines for care available. D

What are the facilities, equipment, and personnel required?

All maternity units should have a documented environmental risk assessment regarding the availability of facilities to care for pregnant women with a booking BMI 30 kg/m^2 or greater. This risk assessment should address the following issues: ✓

- **circulation space**
- **accessibility, including doorway widths and thresholds**
- **safe working loads of equipment and floors**
- **appropriate theatre gowns**
- **equipment storage**
- **transportation**
- **staffing levels**
- **availability of, and procurement process for, specific equipment, including large blood pressure cuffs, appropriately sized compression stockings and pneumatic compression devices, sit-on weighing scale, large chairs without arms, large wheelchairs, ultrasound scan couches, ward and delivery beds, mattresses, theatre trolleys, operating theatre tables and lifting and lateral transfer equipment.**

Maternity units should have a central list of all facilities and equipment required to provide safe care to pregnant women with a booking BMI 30 kg/m^2 or greater. The list should include details of safe working loads, product dimensions, as well as where specific equipment is located and how to access it. ✓

Women with a booking BMI 40 kg/m^2 for whom moving and handling are likely to prove unusually difficult should have a moving and handling risk assessment carried out in the third trimester of pregnancy to determine any requirements for labour and birth. Clear communication of manual handling requirements should occur between the labour and theatre suites when women are in early labour. D

Some women with a booking BMI less than 40 kg/m^2 or greater may also benefit from assessment of moving and handling requirements in the third trimester. This should be decided on an individual basis. ✓

Measuring weight, height and BMI

When and how often should maternal weight, height and BMI be measured?

All pregnant women should have their weight and height measured using appropriate equipment, and their BMI calculated at the antenatal booking visit. Measurements should be recorded in the handheld notes and electronic patient information system. D

For women with obesity in pregnancy, consideration should be given to reweighing women during the third trimester to allow appropriate plans to be made for equipment and personnel required during labour and birth. ✓

What is the acceptable gestational weight gain in obese women?

There is a lack of consensus on optimal gestational weight gain. Until further evidence is available, a focus on a healthy diet may be more applicable than prescribed weight gain targets. ✓

Information giving during pregnancy

What are the clinical risks of maternal obesity to maternal and fetal health in pregnancy?

All pregnant women with a booking BMI 30 kg/m^2 or greater should be provided with accurate and accessible information about the risks associated with obesity in pregnancy and how they may be minimised. Women should be given the opportunity to discuss this information. D

What dietetic and exercise advice should be offered in pregnancy?

Dietetic advice by an appropriately trained professional should be provided early in the pregnancy where possible in line with NICE Public Health Guideline 27. ✓

What is the role of anti-obesity drugs in pregnancy?

Anti-obesity or weight loss drugs are not recommended for use in pregnancy. C

Risk assessment during pregnancy in women with obesity

What specific risk assessments are required for anaesthetics?

Pregnant women with a booking BMI 40 kg/m^2 or greater should be referred to an obstetric anaesthetist for consideration of antenatal assessment. D

Difficulties with venous access and regional and general anaesthesia should be assessed. In addition, an anaesthetic management plan for labour and birth should be discussed and documented. Multidisciplinary discussion and planning should occur where significant potential difficulties are identified. D

What specific risk assessments are required for prevention of pressure sores?

Women with a booking BMI 40 kg/m^2 or greater should have a documented risk assessment in the third trimester of pregnancy by an appropriately qualified professional to consider tissue viability issues. This should involve the use of a validated scale to support clinical judgement. D

Special considerations for screening, diagnosis and management of maternal disease in women with obesity

What special considerations are recommended for screening, diagnosis and management of gestational diabetes in women with obesity?

All pregnant women with a booking BMI 30 kg/m^2 or greater should be screened for gestational diabetes according to NICE or Scottish Intercollegiate Guidelines Network guidelines. B

What special considerations are recommended for screening, diagnosis and management of hypertensive complications of pregnancy in women with obesity?

An appropriate size of cuff should be used for blood pressure measurements taken at the booking visit and all subsequent antenatal consultations. The cuff size used should be documented in the medical records. C

Clinicians should be aware that women with class II obesity and greater have an increased risk of pre-eclampsia compared with those with a normal BMI. B

Women with more than one moderate risk factor (BMI of 35 kg/m^2 or greater, first pregnancy, maternal age of more than 40 years, family history of pre-eclampsia and multiple pregnancy) may benefit from taking 150 mg aspirin daily from 12 weeks of gestation until birth of the baby. B

Women who develop hypertensive complications should be managed according to the NICE CG107. ✓

What special considerations are recommended for prevention, screening, diagnosis and management of venous thromboembolism in women with obesity?

Clinicians should be aware that women with a BMI 30 kg/m^2 or greater, prepregnancy or at booking, have a pre-existing risk factor for developing venous thromboembolism (VTE) during pregnancy. B

Risk assessment should be individually discussed, assessed and documented at the first antenatal visit, during pregnancy (if admitted or develop intercurrent problems), intrapartum and postpartum. Antenatal and post-birth thromboprophylaxis should be considered in accordance with the RCOG GTG No. 37a. D

Acute VTE in pregnant women with obesity should be treated according to RCOG GTG No. 37b. ✓

What special considerations are recommended for screening, diagnosis and management of mental health problems in women with obesity?

Women with BMI 30 kg/m^2 or greater are at increased risk of mental health problems and should therefore be screened for these in pregnancy. D

There is insufficient evidence to recommend a specific lifestyle intervention to prevent depression and anxiety in obese pregnant women. ✓

Antenatal screening

What special considerations does maternal obesity have for screening for chromosomal anomalies during pregnancy?

All women should be offered antenatal screening for chromosomal anomalies. Women should be counselled, however, that some forms of screening for chromosomal anomalies are slightly less effective with a raised BMI. B

Consider the use of transvaginal ultrasound in women in whom it is difficult to obtain nuchal translucency measurements transabdominally. ✓

What special considerations does maternal obesity have for screening for structural anomalies during pregnancy?

Screening and diagnostic tests for structural anomalies, despite their limitations in the obese population, should be offered. However, women should be counselled that all forms of screening for structural anomalies are more limited in obese pregnant women. C

Fetal surveillance

How and when should the fetus be monitored antenatally?

As recommended by RCOG GTG No. 31, serial measurement of symphysis fundal height (SFH) is recommended at each antenatal appointment from 24 weeks of gestation as this improves the prediction of a small-for-gestational-age fetus. B

Women with a BMI greater than 35 kg/m^2 are more likely to have inaccurate SFH measurements and should be referred for serial assessment of fetal size using ultrasound. ✓

Where external palpation is technically difficult or impossible to assess fetal presentation, ultrasound can be considered as an alternative or complementary method. ✓

How and when should the fetus be monitored during labour?

In the absence of good-quality evidence, intrapartum fetal monitoring for obese women in labour should be provided in accordance with NICE CG190 recommendations. ✓

How and when should the fetus be monitored post dates in women with obesity?

There is a lack of definitive data to recommend routine monitoring of post dates pregnancy. However, obese pregnant women should be made aware that they are at increased risk of stillbirth. D

Planning labour and birth

What should be discussed with women with maternal obesity regarding labour and birth?

Women with maternal obesity should have an informed discussion with their obstetrician and anaesthetist (if clinically indicated) about a plan for labour and birth which should be documented in their antenatal notes. ✓

Women who are multiparous and otherwise low risk can be offered choice of setting for planning their birth in midwifery-led units (MLUs), with clear referral pathways for early recourse to consultant-led units (CLUs) if complications arise. C

Active management of the third stage should be recommended to reduce the risk of postpartum haemorrhage (PPH). A

Is maternal obesity an indication for induction of labour?

Elective induction of labour at term in obese women may reduce the chance of caesarean birth without increasing the risk of adverse outcomes; the option of induction should be discussed with each woman on an individual basis. B

Is maternal obesity an indication for caesarean section?

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. C

Is macrosomia and maternal obesity an indication for induction of labour and/or caesarean section?

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. B

What care should women with obesity and a previous caesarean section receive?

Women with a booking BMI 30 kg/m^2 or greater should have an individualised decision for VBAC following informed discussion and consideration of all relevant clinical factors. ✓

Care during childbirth

Where should obese women give birth?

Class I and II maternal obesity is not a reason in itself for advising birth within a CLU, but indicates that further consideration of birth setting may be required. D

The additional intrapartum risks of maternal obesity and the additional care that can be provided in a CLU should be discussed with the woman so that she can make an informed choice about planned place of birth. ✓

What lines of communication are required during labour and birth in women with maternal obesity?

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. ✓

What midwifery support should be available during labour to obese women?

Women with class III obesity who are in established labour should receive continuous midwifery care, with consideration of additional measures to prevent pressure sores and monitor the fetal condition. ✓

What specific interventions may be required during labour and birth for women with maternal obesity?

In the absence of current evidence, intrapartum care should be provided in accordance with NICE CG190. ✓

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. ✓

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. B

What specific surgical techniques are recommended for performing caesarean section on the obese woman (including incision, closure)?

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. ✓

What postoperative wound care is recommended following caesarean section in women with obesity?

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. A

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. A

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. B

Postnatal care and follow-up after pregnancy

How can the initiation and maintenance of breastfeeding in women with maternal obesity be optimised?

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. ✓

What ongoing care, including postnatal contraception advice, should be provided to women with maternal obesity following pregnancy?

Maternal obesity should be considered when making the decision regarding the most appropriate form of postnatal contraception. ✓

What information should be given postnatally to obese women about their long-term health risks and those of their children?

Refer to NICE CG189. Women with class I obesity or greater at booking should continue to be offered nutritional advice following childbirth from an appropriately trained professional, with a view to weight reduction in line with NICE Public Health Guideline 27. D

Women who have been diagnosed with gestational diabetes should have postnatal follow-up in line with NICE Guideline 3. D

What support can be given in the community to ensure minimal interpregnancy weight gain or to minimise risks of a future pregnancy?

Women should be supported to lose weight postpartum and offered referral to weight management services where these are available. ✓

Management of pregnancy following bariatric surgery

What are the clinical risks of previous bariatric surgery to maternal and fetal health during pregnancy?

A minimum waiting period of 12–18 months after bariatric surgery is recommended before attempting pregnancy to allow stabilisation of body weight and to allow the correct identification and treatment of any possible nutritional deficiencies that may not be evident during the first months. D

How should women with previous bariatric surgery be cared for during pregnancy?

Women with previous bariatric surgery have high-risk pregnancies and should have consultant-led antenatal care. ✓

Women with previous bariatric surgery should have nutritional surveillance and screening for deficiencies during pregnancy. D

Woman with previous bariatric surgery should be referred to a dietician for advice with regard to their specialised nutritional needs. D

1. Purpose and scope

Obesity is becoming increasingly prevalent in the UK population and has become one of the most commonly occurring risk factors in obstetric practice, with 21.3% of the antenatal population being obese and fewer than one-half of pregnant women (47.3%) having a body mass index (BMI) within the normal range.[1] According to World Health Organization criteria,[2] adults can be classified according to BMI as shown below in Table 1.

Table 1. Classification of adults according to BMI

Classification	BMI (kg/m^2)
Underweight	< 18.50
Normal range	18.50–24.99
Overweight	≥ 25.00
Preobese	25.00–29.99
Obese class I	30.00–34.99
Obese class II	35.00–39.99
Obese class III	≥ 40.00

While the majority of the recommendations within this guideline pertain to women with a BMI 30 kg/m^2 or greater, some recommendations are specific to women in the higher classes of obesity only. Obese women with a BMI below a specified threshold may also benefit from recommendations in a higher BMI group, depending on individual circumstances. However, the chosen BMI cut-offs reflect careful consideration given to the balance of medical intervention versus risk, differences in local prevalence of maternal obesity and resource implications for local healthcare organisations.

The recommendations cover interventions prior to conception, and during and after pregnancy.

2. Introduction and background epidemiology

The prevalence of obesity in the general population in the UK has increased markedly since the early 1990s. The prevalence of obesity in pregnancy has also been seen to increase, rising from 9–10% in the early 1990s to 16–19% in the 2000s.[3,4]

Pregnant women who are obese are at greater risk of a variety of pregnancy-related complications compared with women of normal BMI, including pre-eclampsia and gestational diabetes. Pregnant women who are obese are also at increased risk of caesarean birth. Maternal size can make the assessment of fetal size, presentation and external monitoring of fetal heart tracing more challenging during pregnancy. Initiation and maintenance of breastfeeding are also more difficult in the women with obesity.[1,5–17] High prepregnancy BMI is associated with a small but statistically significant increase in severe maternal morbidity or mortality, with the adjusted rate difference per 10 000 women compared with normal BMI being 24.9 (95% CI 15.7–34.6) for women with class I obesity, 35.8 (95% CI 23.1–49.5) for women with class II obesity and 61.1 (95% CI 44.8–78.9) for women with class III obesity.[18] These US data are supported by the 2015 MBRRACE-UK (Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK) review into maternal deaths, which reported that 30% of women who died were obese and 22% were overweight.[19] In recognition of the excess in deaths and additional risks, the Confidential Enquiry on Maternal and Child Health (CEMACH 2003–5) recommended that women with a BMI 30 kg/m^2 or more should be seen for prepregnancy counselling.

3. Identification and assessment of evidence

This guideline was developed using standard methodology for developing RCOG Green-top Guidelines (GTGs). The Cochrane Library (including the Cochrane Database of Systematic Reviews, the Database of Abstracts of Reviews of Effects [DARE] and the Cochrane Central Register of Controlled Trials [CENTRAL]), EMBASE, MEDLINE, and Trip were searched for relevant papers. The search was inclusive of all relevant articles published until May 2016. A top-up literature search was performed in January 2018. The databases were searched using the relevant Medical Subject Headings (MeSH) terms, including all subheadings and synonyms, and this was combined with a keyword search. Search terms included 'obesity', 'bariatric surgery', 'anti-obesity agents', and '(prepregnancy or pre-pregnancy or preconception* or pre-conception* or pregestation* or pre-gestation*) adj3 (obes* or weight or bmi)'. The search was limited to studies on humans and papers in the English language. Relevant guidelines were also searched for using the same criteria in the National Guideline Clearinghouse and the National Institute for Health and Care Excellence (NICE) Evidence Search.

Where possible, recommendations are based on available evidence. Areas lacking evidence are highlighted and annotated as 'good practice points'. Further information about the assessment of evidence and the grading of recommendations can be found in Appendix I.

4. Prepregnancy care

4.1 *What care should be provided in the primary care setting to women of childbearing age with obesity who wish to become pregnant?*

Primary care services should ensure that all women of childbearing age have the opportunity to optimise their weight before pregnancy. Advice on weight and lifestyle should be given during preconception counselling or contraceptive consultations. Weight and BMI should be measured to encourage women to optimise their weight before pregnancy. ✓

Women of childbearing age with a BMI 30 kg/m^2 or greater should receive information and advice about the risks of obesity during pregnancy and childbirth, and be supported to lose weight before conception and between pregnancies in line with NICE Clinical guideline (CG) 189. D

Women should be informed that weight loss between pregnancies reduces the risk of stillbirth, hypertensive complications and fetal macrosomia. Weight loss increases the chances of successful vaginal birth after caesarean (VBAC) section. B

Compared with women of a healthy prepregnancy BMI, pregnant women with obesity are at increased risk of miscarriage,[20] gestational diabetes,[16] pre-eclampsia,[21] venous thromboembolism (VTE),[22,23] induced labour,[24] dysfunctional or prolonged labour,[25] caesarean section,[26] anaesthetic complications,[27–31] postpartum haemorrhage (PPH),[32] wound infections[15] and mortality.[33] Women over their ideal weight are less likely to initiate and maintain breastfeeding than women of normal weight.[34] Evidence level 2– to 2++

Infants of obese mothers are at increased risk of congenital anomalies,[35] stillbirth,[12,36] prematurity,[8] macrosomia[9,15] and neonatal death.[9,36] Intrauterine exposure to maternal obesity is also associated with an increased risk of developing obesity and metabolic disorders in childhood.[37] Women should be supported to lose weight before conception and between pregnancies in line with NICE CG189.[38] Please see Appendix II for further information on risks. Evidence level 2++

There is evidence that in women with obesity, weight loss between pregnancies reduces the risk of stillbirth,[39–42] hypertensive complications[40] and macrosomia. Weight loss also increases the chances of successful VBAC[43] in a linear manner. Evidence level 2++

4.2 *What nutritional supplements should be recommended to women with obesity who wish to become pregnant?*

Women with a BMI 30 kg/m^2 or greater wishing to become pregnant should be advised to take 5 mg folic acid supplementation daily, starting at least 1 month before conception and continuing during the first trimester of pregnancy. D

Obese women are at high risk of vitamin D deficiency. However, although vitamin D supplementation may ensure that women are vitamin D replete, the evidence on whether routine vitamin D should be given to improve maternal and offspring outcomes remains uncertain. **B**

In the general maternity population, a systematic review of five trials, including 7391 pregnancies (2033 with a history of a pregnancy affected by a neural tube defect [NTD] and 5358 with no history of NTDs), demonstrated that daily folic acid supplementation in doses ranging from 0.36 mg (360 micrograms) to 4 mg (4000 micrograms) a day, with and without other vitamins and minerals, before conception and up to 12 weeks of gestation, prevents the recurrence of these defects. However, there is insufficient evidence to determine whether folic acid reduces the risk of other birth defects.[44] Evidence level 1++

Women with a raised BMI are at increased risk of NTDs, with a meta-analysis of 12 observational cohort studies reporting an OR of 1.70 (95% CI 1.34–2.15) and 3.11 (95% CI 1.75–5.46) for women defined as obese and severely obese, respectively, compared with women of healthy weight.[35] Evidence level 2++

Evidence from cross-sectional data shows that compared with women with a BMI less than 27 kg/m^2, women with a BMI 27 kg/m^2 or greater are less likely to use nutritional supplements and less likely to receive folate through their diet. In addition, they had lower serum folate levels even after controlling for folate intake.[45] Evidence level 2+

The findings from the studies above suggest that obese women should receive higher doses of folate supplementation in order to minimise the increased risk of fetal NTDs. Although there have been some studies which have suggested a link between high-dose folic acid supplementation and longer term outcomes, including asthma in the offspring[46,47] and maternal malignancy, causality has not been established and the consensus is that high-dose folic acid is safe.[48] However, there is uncertainty about whether 5 mg is the appropriate dose,[49] and whether supplementation reduces the risk of NTDs to the same extent in the obese as it does in the non-obese pregnant population. Evidence level 2–

Prepregnancy BMI is inversely associated with serum vitamin D concentrations among pregnant women. Women with obesity (BMI 30 kg/m^2 or greater) are at increased risk of vitamin D deficiency compared with women of a healthy weight (BMI less than 25 kg/m^2). Cord serum vitamin D levels in infants of obese women have also been found to be lower than infants born to non-obese women.[50] Evidence level 2+

The main source of vitamin D is synthesis on exposure of the skin to sunlight. However, in the UK there is limited sunlight of the appropriate wavelength, particularly during winter. A survey in the UK showed that approximately one-quarter of UK women aged between 19 and 24 years, and one-sixth of those aged between 25 and 34 years, are at risk of vitamin D deficiency.[51] Maternal skin exposure alone may not always be enough to achieve the optimal vitamin D status needed for pregnancy, and the recommended oral intake of 10 micrograms vitamin D daily for all pregnant and breastfeeding women cannot usually be met from diet alone.

A Cochrane review concluded that supplementing pregnant women with vitamin D in a single or continued dose increases serum 25-hydroxyvitamin D at term and may reduce the risk of low birthweight, preterm birth and pre-eclampsia. However, when calcium and vitamin D are combined, the risk of preterm birth is increased. The clinical significance of the increased serum 25-hydroxyvitamin D concentrations therefore remains unclear.[52] Evidence level 1+

A multicentre trial randomised 569 pregnant women to receive placebo and 565 to receive cholecalciferol 1000 iu/day (25 micrograms/day). A total of 370 (65%) neonates in the placebo group and 367 (65%) neonates in the cholecalciferol group had a usable dual energy X-ray absorptiometry scan and were analysed for the primary endpoint. The neonatal whole-body bone mineral content of infants born to mothers assigned to cholecalciferol 1000 iu/day did not significantly differ from that of infants born to mothers assigned to placebo (61.6 g [95% CI 60.3–62.8] versus 60.5 g [95% CI 59.3–61.7], respectively; $P = 0.21$). However, supplementation of women with cholecalciferol 1000 iu/day during pregnancy did demonstrate that this dosage was sufficient to ensure that most pregnant women were vitamin D replete and it was safe.[53]

Evidence level 1++

5. Provision of antenatal care

5.1 How and where should antenatal care be provided?

Care of women with obesity in pregnancy can be integrated into all antenatal clinics, with clear local policies and guidelines for care available.

D

The Clinical Negligence Scheme for Trusts (CNST) Maternity Risk Management Standards[54] recommend that maternity services must develop and implement robust processes to manage the risks associated with obesity, and consistently provide sensitive, comprehensive, and appropriate multidisciplinary care. Specific recommendations include a requirement for all women with a BMI 30 kg/m^2 or greater to have multidisciplinary care, a documented antenatal consultation about the intrapartum risks and to be advised to deliver in a consultant-led unit (CLU) for those with a BMI of 35 kg/m^2 or greater. This may not be feasible in areas of high prevalence due to capacity and resources. It is therefore important that all health professionals providing maternity care are aware of the maternal and fetal risks, and the specific interventions required to minimise these.[55] Provision of care should be organised depending on the local need and available services.

Evidence level 4

5.2 What are the facilities, equipment and personnel required?

All maternity units should have a documented environmental risk assessment regarding the availability of facilities to care for pregnant women with a booking BMI 30 kg/m^2 or greater. This risk assessment should address the following issues:

✓

- **circulation space**
- **accessibility, including doorway widths and thresholds**
- **safe working loads of equipment and floors**
- **appropriate theatre gowns**
- **equipment storage**
- **transportation**
- **staffing levels**
- **availability of, and procurement process for, specific equipment, including large blood pressure cuffs, appropriately sized compression stockings and pneumatic compression devices, sit-on weighing scale, large chairs without arms, large wheelchairs, ultrasound scan couches, ward and delivery beds, mattresses, theatre trolleys, operating theatre tables, and lifting and lateral transfer equipment.**

Maternity units should have a central list of all facilities and equipment required to provide safe care to pregnant women with a booking BMI 30 kg/m^2 or greater. The list should include details of safe working loads, product dimensions, as well as where specific equipment is located and how to access it. ✓

Women with a booking BMI 40 kg/m^2 for whom moving and handling is likely to prove unusually difficult should have a moving and handling risk assessment carried out in the third trimester of pregnancy to determine any requirements for labour and birth. Clear communication of manual handling requirements should occur between the labour and theatre suites when women are in early labour. D

Some women with a booking BMI less than 40 kg/m^2 or greater may also benefit from assessment of moving and handling requirements in the third trimester. This should be decided on an individual basis. ✓

A minimum requirement for maternity services within the NHS Litigation Authority's CNST Maternity Risk Management Standards is the availability of suitable equipment for women with a high BMI. It is recommended that units should have a documented process to assess this on a regular basis.[54] It is also recognised as good practice for maternity units to have an ultrasound machine, and extra-long spinal and epidural needles available at all times on the labour ward.

Five areas have been identified in the risk assessment of the bariatric patient journey: patient factors; equipment; communication; building space; and organisational and staff issues.[56] Available moving and handling equipment should be listed along with its weight limit and storage location.[57] This will include chairs, beds, theatre operating tables and transfer equipment, such as hoists and lateral transfer equipment. Moving and handling courses and updates should be mandatory and include the management of class III obesity.[57]

Evidence level 4

6. Measuring weight, height and BMI

6.1 *When and how often should maternal weight, height and BMI be measured?*

All pregnant women should have their weight and height measured using appropriate equipment, and their BMI calculated at the antenatal booking visit. Measurements should be recorded in the handheld notes and electronic patient information system. D

For women with obesity in pregnancy, consideration should be given to reweighing women during the third trimester to allow appropriate plans to be made for equipment and personnel required during labour and birth. ✓

Appropriate care of women with maternal obesity can only be possible with consistent identification of those women who are at risk. NICE CG62 *Antenatal care for uncomplicated pregnancies*[58] recommends that maternal height and weight is measured at the booking appointment (ideally by 10 weeks of gestation) and the woman's BMI is calculated. Semi-structured interviews of health professionals in the North East Government Office Region of England suggested that self-reported rather than measured height and weight are used at some community booking visits due to lack of availability of appropriate equipment.[3] A

Evidence level 2+

systematic review, including 62 studies, found women under-reported their prepregnancy (–2.94 kg to –0.29 kg) and birth (–1.28 kg to –0.07 kg) weights, and over-reported gestational weight gain (0.33–3 kg). However, the magnitude of error was small and did not largely bias associations between pregnancy-related weight and birth outcomes. The review concluded that although measured weight is preferable, self-reporting is a cost-effective and practical measurement approach.[59]

Mandatory height and weight data fields in electronic patient information systems, and functionality allowing the automatic calculation of BMI, may be useful to enable local organisations to achieve 100% compliance with this standard.

6.2 *What is the acceptable gestational weight gain in obese women?*

There is a lack of consensus on optimal gestational weight gain. Until further evidence is available, a focus on a healthy diet may be more applicable than prescribed weight gain targets. ✓

There is a lack of consensus on optimal gestational weight gain.[60] The Institute of Medicine (IoM) guidelines (USA) recommend different ranges of weight gain for normal weight, overweight and obese women.[61] These guidelines are the most widely used but are not adopted routinely in clinical practice.[60,62,63] The original recommendations were focussed on strong evidence supporting the need for adequate maternal gestational weight gain to prevent fetal growth restriction. The guidelines were later extended to include advice for overweight and obese pregnant women. However, due to a lack of controlled trials, the recommended ranges of weight gain for each BMI category were devised using available evidence from observational studies considering prevention of small- and large-for-gestational-age infants, reduction in caesarean section rates and reducing postpartum weight retention. Notably, there was insufficient evidence for the IoM to include gestational diabetes and pre-eclampsia, common adverse outcomes in obese pregnant women, when preparing these guidelines. Studies have suggested that the IoM guidelines should be modified according to obesity class.[64] Until further evidence is available, a focus on a healthy diet may be more applicable than prescribed weight gain targets.

Evidence level 2+ to 2++

7. Information giving during pregnancy

7.1 *What are the clinical risks of maternal obesity to maternal and fetal health in pregnancy?*

All pregnant women with a booking BMI 30 kg/m^2 or greater should be provided with accurate and accessible information about the risks associated with obesity in pregnancy and how they may be minimised. Women should be given the opportunity to discuss this information. D

Preconception counselling provides a unique opportunity to inform obese women who are planning a pregnancy about the potential benefits of achieving a healthy weight prepregnancy and of the increased risk associated with maternal obesity. Although preconception advice and care is the ideal scenario, many women present for the first time during pregnancy. These women should be given an early opportunity to discuss potential risks and management options with a healthcare professional. The aim is to provide appropriate information sensitively, which empowers the woman to actively engage with health professionals and the services available to her. Relevant information will include the increased risk of

Evidence level 4

gestational diabetes, pre-eclampsia and fetal macrosomia, requiring: an increased level of maternal and fetal monitoring; the potential for poor ultrasound visualisation of the baby and consequent difficulties in fetal surveillance and screening for anomalies; the potential for difficulty with intrapartum fetal monitoring, anaesthesia and caesarean section, which would require senior obstetric and anaesthetic involvement as well as an antenatal anaesthetic assessment; and the need to prioritise the safety of the mother at all times. Preconception counselling should therefore be given where possible.[65,66]

7.2 *What dietetic and exercise advice should be offered in pregnancy?*

Dietetic advice by an appropriately trained professional should be provided early in the pregnancy where possible in line with NICE Public Health Guideline 27. ✓

Many women and their partners have pre-existing social and cultural beliefs about pregnancy diet and weight gain.[67] These views should be considered when discussing the importance of healthy eating and appropriate exercise during pregnancy to prevent excessive weight gain and gestational diabetes.[63]

7.3 *What is the role of anti-obesity drugs in pregnancy?*

Anti-obesity or weight loss drugs are not recommended for use in pregnancy. C

Anti-obesity or weight loss drugs are used for the management of obesity in women of reproductive age. Currently, there is a paucity of information about the effect of anti-obesity drugs on the fetus and access to most anti-obesity drugs (with the exception of orlistat) is limited.

Orlistat is a lipase inhibitor that acts by inhibiting the absorption of dietary fats. Although data are limited, using the Swedish Medical Birth Register, during the years 1998–2011 and among 392 126 infants born, 248 were exposed to orlistat in early pregnancy and no increase in major malformation risk was seen (relative risk [RR] 0.42, 95% CI 0.11–1.07).[68] Evidence level 2+

Phentermine/topiramate promotes appetite reduction and decreases food consumption. The exact mechanism of action of topiramate on weight loss is not known but may be related to appetite suppression and increased satiety.[69] Use of topiramate in pregnancy is linked to oral clefts. A meta-analysis of all studies reporting on women exposed to topiramate during pregnancy included 3420 patients and 1 204 981 controls. The odds ratio of oral cleft following first trimester exposure to topiramate was 6.26 (95% CI 3.13–12.51; $P = 0.00001$).[69] Evidence level 2++

Topiramate and phentermine are also individually excreted in breast milk and, therefore, the combination of phentermine/topiramate may also be present in breast milk. Treatment with either medication is therefore not recommended during lactation due to unknown risks on the infant.

Lorcaserin hydrochloride is a serotonin receptor agonist that is highly selective for the specific serotonin receptor, 5-HT_{2C}, which is involved in the regulation of appetite.[70] It is believed that lorcaserin promotes satiety and results in weight loss from decreased overall food consumption. There are no data on the safety of lorcaserin in human pregnancy. In animal studies, although exposure to lorcaserin during embryogenesis has not demonstrated teratogenicity or embryolethality, exposure in late pregnancy did result in lower birthweight of offspring, which persisted to adulthood. Lorcaserin is therefore contraindicated in pregnancy.[71,72]

Evidence level 4

8. Risk assessment during pregnancy in women with obesity

8.1 What specific risk assessments are required for anaesthetics?

Pregnant women with a booking BMI 40 kg/m^2 or greater should be referred to an obstetric anaesthetist for consideration of antenatal assessment.

D

Difficulties with venous access, and regional and general anaesthesia should be assessed. In addition, an anaesthetic management plan for labour and birth should be discussed and documented. Multidisciplinary discussion and planning should occur where significant potential difficulties are identified.

D

The Obstetric Anaesthetists' Association and Association of Anaesthetists of Great Britain and Ireland guideline on obstetric anaesthetic services[66] recommends that antenatal assessment for all pregnant women with a booking BMI 40 kg/m^2 or greater should be made by an obstetric anaesthetist.

Evidence level 4

Obesity is a risk factor for many anaesthetic-related complications and has been identified as a significant risk factor for anaesthesia-related maternal mortality. A study of UK Obstetric Surveillance System data showed that one-quarter of maternal cardiac arrests were related to anaesthesia. Of this number, 75% of the women were obese.[27] Epidural resite rate in the women with class III obesity (greater than 136 kg in weight) was 17% in a cohort study compared with 3% in the control group (less than 113 kg in weight).[31] Obesity in pregnancy is associated with an increased risk of difficulties with airway management, including difficult bag mask ventilation[73] and failed intubation,[28,29] a higher risk of desaturation when difficulty is encountered[28] and postoperative atelectasis. Guidelines from the Difficult Airway Society and Obstetric Anaesthetists' Association highlight the importance of thoughtful formation of both primary and secondary airway plans.[74,75] Obesity is also associated with a significantly higher gastric volume in labouring parturients.[76] The increased difficulties associated with the provision of general and regional anaesthesia in the obese can lead to an increased decision-to-delivery time in women who require a category 1 or 2 caesarean section.[30] Women with class III obesity will be at highest risk and it is recommended that anaesthetic resources locally are focused on this group of women. Maternity services may decide to use a lower BMI threshold, taking into consideration the local prevalence of maternal obesity. Each woman should be given advice on labour analgesia after individual risk assessment.

Evidence level 2–

8.2 *What specific risk assessments are required for prevention of pressure sores?*

Women with a booking BMI 40 kg/m^2 or greater should have a documented risk assessment in the third trimester of pregnancy by an appropriately qualified professional to consider tissue viability issues. This should involve the use of a validated scale to support clinical judgement. **D**

A BMI greater than 40 kg/m^2 is a risk factor for developing pressure sores.[77,78] Immobility is also a risk factor.[79] A documented assessment of pressure ulcer risk should be performed, using a validated scale to support clinical judgement as per NICE guidance.[80] Reassessment of risk should occur if there is a change in clinical status. Those assessed as being at risk should have plans for skin assessment, skin care, repositioning frequency and pressure redistributing devices put in place.[80]

Evidence level 4

9. Special considerations for screening, diagnosis and management of maternal disease in women with obesity

9.1 *What special considerations are recommended for screening, diagnosis and management of gestational diabetes in women with obesity?*

All pregnant women with a booking BMI 30 kg/m^2 or greater should be screened for gestational diabetes according to NICE or Scottish Intercollegiate Guidelines Network (SIGN) guidelines. **B**

National guidelines, including NICE Guideline 3 *Diabetes in pregnancy: management from preconception to the postnatal period*,[81] and SIGN guidelines,[82] recommend that all pregnant women with a booking BMI 30 kg/m^2 or greater be screened for gestational diabetes.

based on evidence level 2– to 2++ studies

Maternal obesity is known to be an important risk factor for gestational diabetes with a number of large cohort studies reporting a three-fold increased risk compared with women of a healthy weight.[6,8,15,16,83] A large prospective cohort has found that obese women with gestational diabetes have a three-fold increased risk of congenital anomalies.[84] Moreover, secondary analysis of the Hyperglycaemia and Adverse Pregnancy Outcomes study showed that maternal gestational diabetes and obesity were independently associated with adverse pregnancy outcomes, with an even greater impact in combination.[85]

Evidence level 2++

9.2 *What special considerations are recommended for screening, diagnosis and management of hypertensive complications of pregnancy in women with obesity?*

An appropriate size of cuff should be used for blood pressure measurements taken at the booking visit and all subsequent antenatal consultations. The cuff size used should be documented in the medical records. **C**

Clinicians should be aware that women with class II obesity and greater have an increased risk of pre-eclampsia compared with those with a normal BMI. **B**

Women with more than one moderate risk factor (BMI of 35 kg/m^2 or greater, first pregnancy, maternal age of more than 40 years, family history of pre-eclampsia and multiple pregnancy) may benefit from taking 150 mg aspirin daily from 12 weeks of gestation until birth of the baby. B

Women who develop hypertensive complications should be managed according to the NICE CG107. ✓

The effects of three different cuff sizes (standard, 12 × 23 cm; large, 15 × 33 cm; and thigh, 18 × 36 cm) on blood pressure measurement (84 000 measurements) were evaluated in 1240 adults. The differences in readings among the three cuffs were smallest in non-obese subjects and became progressively greater with increasing arm circumference in the obese population. Less error was introduced by using too large a cuff than by too small a cuff.[86] Evidence level 2+

A systematic review and meta-analysis of 29 prospective cohort studies involving a total of 1 980 761 participants found that when compared with women with a BMI of between 18.5 kg/m^2 and 24.9 kg/m^2, risk ratios for pre-eclampsia of overweight, obese and severely obese women were 1.70 (95% CI 1.60–1.81; $P < 0.001$), 2.93 (95% CI 2.58–3.33; $P < 0.001$) and 4.14 (95% CI 3.61–4.75; $P < 0.001$), respectively.[87] Evidence level 2++

Moderate risk factors for the development of pre-eclampsia include a BMI of 35 kg/m^2 or greater, first pregnancy, maternal age of more than 40 years, family history of pre-eclampsia and multiple pregnancy. It is the considered opinion of the NICE Guideline Development Group[88] that women with more than one moderate risk factor may benefit from taking 75 mg aspirin daily from 12 weeks of gestation until the birth of the baby.[88,89] Evidence level 2+

More recent evidence from a multicentre randomised placebo-controlled trial and a systematic review and meta-analysis suggests that women at high risk of pre-eclampsia may benefit from taking 150 mg aspirin daily from 12 weeks of gestation.[90,91] Evidence level 1+

One randomised trial[92] has found this benefit may be enhanced if aspirin is taken at night, rather than during the day. Evidence level 1–

NICE CG107[88] also recommends that women who have had pre-eclampsia should be advised to achieve and keep a BMI within the healthy range (18.5–24.9 kg/m^2; as per NICE CG43 *Obesity Prevention*) before their next pregnancy. One retrospective cohort study showed that the risk of recurrence of pre-eclampsia in women who had it in their first pregnancy increases linearly with increasing BMI.[93] Evidence level 2–

9.3 *What special considerations are recommended for prevention, screening, diagnosis and management of venous thromboembolism in women with obesity?*

Clinicians should be aware that women with a BMI 30 kg/m^2 or greater, prepregnancy or at booking, have a pre-existing risk factor for developing VTE during pregnancy. B

Risk assessment should be individually discussed, assessed and documented at the first antenatal visit, during pregnancy (if admitted or develop intercurrent problems), intrapartum and postpartum. Antenatal and postbirth thromboprophylaxis should be considered in accordance with the RCOG GTG No. 37a.

D

Acute VTE in pregnant women with obesity should be treated according to RCOG GTG No. 37b.

✓

Obesity is a risk factor for VTE[22,23,94–97] with the risk of pulmonary emboli (adjusted OR [aOR] 14.9, 95% CI 3.0–74.8) being greater than for deep vein thrombosis (aOR 4.4, 95% CI 1.6–11.9). Risk assessment and use of thromboprophylaxis in obesity should be guided as per RCOG GTG No. 37a[98] and treated as per RCOG GTG No. 37b.[99]

Evidence level 2+

The RCOG recommends routine measurement of peak anti-Xa activity for women weighing 90 kg or more on therapeutic doses of low-molecular-weight heparin (LMWH).[99]

Evidence level 4

Two studies, one prospective cohort (n = 85) and one case–control (n = 40), investigated weight-based dosing of prophylactic LMWH and subsequent anti-Xa levels in women with class III obesity. Both studies found that weight-based dosing of LWMH was superior to fixed dosing in reversing the increased thrombotic tendency in class III obesity.[100,101]

Evidence level 2–

9.4 *What special considerations are recommended for screening, diagnosis and management of mental health problems in women with obesity?*

Women with BMI 30 kg/m^2 or greater are at increased risk of mental health problems and should therefore be screened for these in pregnancy.

D

There is insufficient evidence to recommend a specific lifestyle intervention to prevent depression and anxiety in obese pregnant women.

✓

A systematic review and meta-analysis showed that obese pregnant women are at increased risk of mental health problems in pregnancy.[102] Obese and overweight women had a significantly higher prevalence of depression symptoms than women of normal weight and higher median prevalence estimates. This was found during pregnancy (obese, 33.0%; overweight, 28.6%; normal weight 22.6%) and postpartum (obese, 13.0%; overweight, 11.8%; normal weight, 9.9%). Obese women also had higher odds of antenatal anxiety (OR 1.41; 95% CI 1.10–1.80). The few studies identified for postpartum anxiety,[103–105] eating disorders[106,107] or antenatal serious mental illness[103,108] also suggested increased risk among obese women.

Evidence 2++

Three randomised controlled trials have investigated the effect of lifestyle intervention, including advice on dietary intake and physical activity, in obese pregnant women and although they have demonstrated a reduction in gestational weight gain, they have had conflicting results on depression and anxiety levels.[109–111]

Evidence 2+

According to recommendations from NICE CG192,[112] women with a BMI 30 kg/m^2 or greater should be screened for mental health problems.

Evidence level 4

10. Antenatal screening

In the UK, pregnant women are offered antenatal screening for fetal aneuploidy, including trisomy 21 (Down syndrome), using either first trimester combined screening or second trimester biochemical screening. In addition, women are offered a fetal anomaly scan between 18^{+0} and 20^{+6} weeks of gestation to detect structural abnormalities.

A comprehensive meta-analysis by Stothard et al.[113] has shown that obese pregnant women (BMI 30 kg/m^2 or greater) are at increased risk of a range of structural anomalies (Table 2). Data from the Consortium on Safe Labour study has further divided obese pregnant women into two groups (those with gestational diabetes and those without) and have shown that even in the absence of gestational diabetes, obese pregnant women remain at risk of developing congenital cardiac defects (OR 1.18, 95% CI 1.02–1.36).[7]

Evidence level 2++

10.1. What special considerations does maternal obesity have for screening for chromosomal anomalies during pregnancy?

All women should be offered antenatal screening for chromosomal anomalies. Women should be counselled, however, that some forms of screening for chromosomal anomalies are slightly less effective with a raised BMI.

B

Consider the use of transvaginal ultrasound in women in whom it is difficult to obtain nuchal translucency (NT) measurements transabdominally.

✓

Obese pregnant women should be offered diagnostic testing using invasive methods if found to be high risk with screening tests.

Table 2. Risk of fetal structural anomalies for obese pregnant women

Structural anomaly	OR	95% CI
Neural tube defects	1.80	1.62–2.15
Spina bifida	2.24	1.86–2.69
Cardiovascular anomalies	1.30	1.12–1.51
Septal anomalies	1.20	1.09–1.31
Cleft palate	1.23	1.03–1.47
Cleft lip and palate	1.20	1.03–1.40
Anorectal atresia	1.48	1.12–1.97
Hydrocephaly	1.68	1.19–2.36
Limb reduction anomalies	1.34	1.03–1.73

The First and Second Trimester Evaluation of Risk trial[114] has demonstrated that maternal BMI has a significant impact on the success of obtaining accurate NT measurements. Other studies[115,116] have supported this finding and have shown that additional time is required to obtain measurements, and even then, these women have a higher chance of unsuccessful attempts at NT measurements requiring repeat visits.

Evidence level 2++

A retrospective cohort study by Tsai et al.[117] has shown that the proportion of pregnant women who completed first trimester screening is inversely proportional to their BMI (64% of women with BMI 18–24.9 kg/m^2 versus 61% of women with BMI greater than 30 kg/m^2 and 47% if BMI greater than 40 kg/m^2; $P < 0.001$). However, further analyses of those who completed screening with specific ultrasonographic soft markers did not show any difference in detection rates between the groups (47% for normal or overweight women versus 17% for obese women; $P = 0.20$).

Evidence level 2+

Those with unsuccessful first trimester screening should be offered second trimester screening with serum markers.

Noninvasive prenatal testing (NIPT) involves detecting free fetal DNA fractions in the maternal serum for results. These have been shown to decrease with increasing maternal weight. Obesity-specific tests are not available and women should be informed of the limitations of these tests.[118,119] Results of screening for trisomies with NIPT may therefore be less effective for obese pregnant women.

Evidence 2+

Diagnostic testing may be offered, considering the limitations of screening tests in obese women, after full counselling. A retrospective cohort study concluded that women with a BMI between 30 and 40 kg/m^2 do not have increased risk of fetal loss associated with chorionic villus sampling or amniocentesis. Higher loss rates were observed for women with class III obesity following amniocentesis (aOR 2.2, 95% CI 1.2–3.9).[120]

Evidence level 2+

10.2 *What special considerations does maternal obesity have for screening for structural anomalies during pregnancy?*

Screening and diagnostic tests for structural anomalies, despite their limitations in the obese population, should be offered. However, women should be counselled that all forms of screening for structural anomalies are more limited in obese pregnant women.

C

Maternal obesity is a limiting factor in screening for structural anomalies during pregnancy due to difficulty in accurate visualisation of fetal structures with increasing BMI.[121] The increased echogenicity of adipose tissue and increased absorption of the ultrasonic sound beam by abdominal fat results in reduced image clarity and poor image quality. This leads to fewer anomalies being detected at the midtrimester fetal anomaly scan in obese pregnant women, with an increased risk of missed antenatal diagnoses of fetal anomalies (aOR 0.7, 95% CI 0.7–0.9; $P = 0.001$).[114,122] Data from the FaSTER trial has shown a lower sensitivity and higher false-negative rate of detection of multiple aneuploidy markers (BMI less than 25 kg/m^2, 32% sensitivity and 68% false-negative rate versus BMI greater than 30 mg/m^2, 22% sensitivity and 78% false-negative rate).

Evidence level 2++

This may result in the need for extra time for fetal anomaly scans. Repeat scans, including consideration of the transvaginal approach, may also be required to complete the screening process. A case–control study by Hendler et al.[123] looking at repeat examination of cardiac structures in obese versus non-obese pregnant women found that repeat ultrasound visualisation at a later gestation can improve identification of cardiac structural abnormalities. However, rates of suboptimal views remained significantly higher in the obese group.

Evidence level 2–

11. Fetal surveillance

11.1 How and when should the fetus be monitored antenatally?

As recommended by RCOG GTG No. 31, serial measurement of symphysis fundal height (SFH) is recommended at each antenatal appointment from 24 weeks of gestation as this improves the prediction of a small-for-gestational-age fetus.

B

Women with a BMI greater than 35 kg/m^2 are more likely to have inaccurate SFH measurements and should be referred for serial assessment of fetal size using ultrasound.

✓

Where external palpation is technically difficult or impossible to assess fetal presentation, ultrasound can be considered as an alternative or complementary method.

✓

The following methods of estimating fetal growth have been assessed in the NICE CG62 *Antenatal care for uncomplicated pregnancies*[58] and RCOG GTG No. 31 *Investigation and Management of the Small-for-Gestational-Age Fetus*:[124]

- SFH with or without the use of customised SFH measurements.[125,126]
- Ultrasound scanning with or without the use of customised charts.
- Clinical judgement and abdominal palpation.

In women with obesity, all of these methods are technically more difficult, increasing the risk of false-negative results. This is particularly the case for women with class III obesity.

In the absence of good-quality evidence, it is advised that NICE CG62[58] and RCOG GTG No. 31[124] recommendations are followed for women with obesity to ensure safe and standard provision of care.

Evidence level 4

11.2 How and when should the fetus be monitored during labour?

In the absence of good-quality evidence, intrapartum fetal monitoring for obese women in labour should be provided in accordance with NICE CG190 recommendations.

✓

There is no evidence to support continuous fetal monitoring during labour in the absence of other comorbidities, or medical or obstetric complications. NICE CG190 *Intrapartum care for healthy women and babies*[127] recommends that intermittent fetal heart monitoring should be offered to low-risk women in labour using the Pinard stethoscope or Doppler ultrasound.

Evidence level 4

11.3 *How and when should the fetus be monitored post dates in women with obesity?*

There is a lack of definitive data to recommend routine monitoring of post dates pregnancy. However, obese pregnant women should be made aware that they are at increased risk of stillbirth. D

Perinatal mortality and fetal compromise increase progressively beyond 37 weeks of gestation[128] and women with obesity are at increased risk of stillbirth (BMI greater than 35 kg/m^2 versus 20–25 kg/m^2; OR 3.9, 95% CI 2.44–6.22).[12] Women with obesity are also at increased risk of prolonged pregnancy.[12] A retrospective cohort study of 29 224 women concluded that women with higher BMIs had increased risk of prolonged pregnancy and induction of labour with aOR 1.24 (95% CI 1.14–1.34) for overweight women, aOR 1.52 (95% CI 1.37–1.10) for class I obesity, aOR 1.75 (95% CI 1.48–2.07) for class II obesity and aOR 2.27 (95% CI 1.78–2.89) for class III obesity. Approximately 60% of obese primiparous women and 90% of obese multiparous women achieved vaginal birth following induction of labour.[129] Evidence level 2+

Definitive recommendations for fetal surveillance are hampered by the lack of randomised controlled trials demonstrating that antepartum fetal surveillance decreases perinatal morbidity or mortality in late-term and post-term gestations. The American College of Obstetrics and Gynecology suggests that based on epidemiological data linking advancing gestational age to stillbirth, antepartum fetal surveillance at or beyond 41 weeks of gestation should be indicated.[130] There are no definitive studies determining the optimal type or frequency of such testing and no evidence specific for women with obesity. Evidence level 4

12. Planning labour and birth

Planning for labour and birth is a dynamic process, which requires ongoing review of the woman's antenatal progress and development of complications during the antenatal period. When discussing labour with the woman, it is important to consider maternal comorbidities, fetal complications, and access to services for emergency birth and neonatal resuscitation if required.

This requires a multidisciplinary, individualised approach, with consideration of the woman's and her partner's views, and may involve the obstetrician, midwife and anaesthetist, and early anticipation of potential maternal and fetal complications that may arise during the intrapartum period.[125] Evidence level 4

12.1 *What should be discussed with women with maternal obesity regarding labour and birth?*

Women with maternal obesity should have an informed discussion with their obstetrician and anaesthetist (if clinically indicated) about a plan for labour and birth which should be documented in their antenatal notes. ✓

Women who are multiparous and otherwise low risk can be offered choice of setting for planning their birth in MLUs with clear referral pathways for early recourse to CLUs if complications arise. C

Active management of the third stage should be recommended to reduce the risk of PPH. **A**

Maternal obesity is associated with an increased incidence of induction of labour (OR 1.70, 95% CI 1.64–1.76),[15] augmentation of labour (aOR 1.26, 95% CI 1.16–1.37)[14] and intrapartum caesarean section (aOR 1.52, 95% CI 1.30–1.79).[14] In addition, this group of women are also at increased risk of complications, including shoulder dystocia (OR 2.9, 95% CI 1.4–5.8),[24] and have a higher prevalence of requesting additional analgesia in labour (aOR of requesting for epidural 1.20, 95% CI 1.18–1.23).[9]

The Birthplace in England national prospective cohort study[131] reported that low-risk women should be offered a choice of birthplace, including CLUs and MLUs. The risk of adverse events is uncommon and interventions are low. Planned birth in midwifery-led units is supported by NHS trained midwives working with referral pathways to CLUs in case complications arise, liaising with a comprehensive network of ambulance services. Evidence level 2+

A secondary analysis of the Birthplace study looking at the impact of maternal obesity on intrapartum outcomes in otherwise low-risk women concluded that the intrapartum risks may be lower than previously anticipated (adjusted RR 1.12, 95% CI 1.02–1.23 for BMI greater than 35 kg/m^2 relative to low-risk women of normal weight).[14]

NICE CG190[127] recommends that women with a booking BMI greater than 35 kg/m^2 have planned labour and birth in an obstetric unit. Those who have a BMI of between 30 kg/m^2 and 35 kg/m^2 at booking should have individualised assessment of place of birth. Evidence level 1– to 2++

NICE CG62[58] recommends that healthcare providers should discuss labour and birth with pregnant women before 36 weeks of gestation. This discussion should include the labour plan, pain management and management of prolonged pregnancy.

Women with maternal obesity should be made aware of potential intrapartum complications when discussing labour and birth. Issues that should be discussed include potential anaesthetic and obstetric complications, availability of senior obstetrician and anaesthetist, immediate access to theatre and neonatal resuscitation facilities. However, in recognition of the secondary analysis of the Birthplace study looking at the intrapartum risks of maternal obesity, parity should be taken into account when assessing place of birth and risk for giving birth in MLUs. Evidence level 4

Sebire et al.[15] have shown that obese pregnant women are at increased risk of PPH (OR 1.39, 95% CI 1.32–1.46) even after correcting for mode of birth. Active management of the third stage of labour should be recommended to women with maternal obesity. The use of prophylactic uterotonics for the management of the third stage of labour has been shown to reduce the risk of PPH.[132] Evidence level 2++

12.2 *Is maternal obesity an indication for induction of labour?*

Elective induction of labour at term in obese women may reduce the chance of caesarean birth without increasing the risk of adverse outcomes; the option of induction should be discussed with each woman on an individual basis. **B**

A retrospective cohort study of 74 725 obese women compared the perinatal outcomes of elective induction of labour at 37 weeks of gestation and expectant management. The odds of caesarean birth were lower among nulliparous women with elective induction of labour at 37 weeks of gestation (OR 0.55, 95% CI 0.34–0.90) and 39 weeks of gestation (OR 0.77, 95% CI 0.63–0.95) compared with expectant management. Among multiparous women with a prior vaginal birth, elective induction of labour at 37 (OR 0.39, 95% CI 0.24–0.64), 38 (OR 0.65, 95% CI 0.51–0.82) and 39 (OR 0.67, 95% CI 0.56–0.81) weeks of gestation was associated with lower odds of caesarean section. Additionally, elective induction of labour at 38, 39 and 40 weeks of gestation was associated with lower odds of macrosomia. There were no differences in the odds of operative vaginal birth, lacerations, brachial plexus injury or respiratory distress syndrome. This study concluded that elective induction of labour of obese women at term may reduce the risk of caesarean birth, without increasing the risks of adverse outcomes.[133] Evidence level 2+

A systematic review and meta-analysis of prospective, retrospective, cohort and case–control studies, including 1 443 449 pregnant women in upper and middle income countries, concluded that maternal obesity is associated with fetal overgrowth and macrosomia, with an overall, unadjusted OR 2.42 (95% CI 2.16–2.72) for large-for-gestational-age infants more than the 90th centile; OR 2.17 (95% CI 1.92–2.45) for birthweight more than 4000 g; and OR 2.77 (95% CI 2.22–3.45) for birthweight more than 4500 g.[134] Evidence level 2++

A 2016 Cochrane database systematic review of randomised trials for induction of labour for suspected fetal macrosomia concluded that elective induction of labour did not reduce the risk of brachial plexus injury. However, induction of labour results in lower mean birthweight, and fewer fractures and cases of shoulder dystocia. The authors concluded that while further trials are needed to identify the optimal gestation for induction and diagnosis of macrosomia, induction of labour may be considered where macrosomia can be identified confidently and options of induction and expectant management should be discussed.[135] Evidence level 1+

12.3 *Is maternal obesity an indication for caesarean section?*

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. **C**

Pregnant women with a higher BMI have an increased risk of caesarean birth. A systematic review and meta-analyses of 11 cohort studies[136] concluded that the risk of caesarean section increased by 50% in overweight women and more than doubled in obese women (pooled OR in overweight women 1.53, 95% CI 1.48–1.58; obese women 2.26, 95% CI 2.04–2.51; class III obesity 3.38, 95% CI 2.49–4.57). However, the decision regarding mode of birth should be individualised and consider the woman's comorbidities, circumstances and wishes. A multidisciplinary approach is recommended and a discussion between the consultant obstetrician, anaesthetist, midwife and woman during the antenatal period is encouraged. Assessment of cervical favourability should be taken into account, as it has been shown that nulliparous obese pregnant women with an unfavourable cervix are more likely to have a failed induction, resulting in caesarean section.[137] However, a retrospective cohort study by Subramaniam et al.[138] showed that planned caesarean section in women with class III obesity is not associated with reduced morbidity compared with induction of labour.

Evidence level 2–

Women with maternal obesity who require birth by emergency caesarean section are at increased risk of significant morbidity and mortality. This should be taken into consideration when planning labour and mode of birth. Those with class III obesity may require additional specialist equipment. A detailed plan for obstetric and anaesthetic management should be put in place antenatally and documented in the woman's notes.

12.4 *Is macrosomia and maternal obesity an indication for induction of labour and/or caesarean section?*

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. **B**

A Cochrane review[135] of evidence on near-term or term induction of labour for fetal macrosomia has shown a reduction in the risk of shoulder dystocia and fetal fractures, irrespective of maternal BMI. The findings also showed no change in the risk of caesarean section. In order to prevent one fracture, it would be necessary to induce 60 women.

Evidence level 2+

This finding was supported by a randomised controlled trial by Boulvain et al.[139] which studied obese pregnant women. This trial compared induction of labour between 37^{+0} and 38^{+6} weeks of gestation versus expectant management of large-for-dates fetuses which was defined by an estimated fetal weight greater than the 95th centile. This trial has shown a decreased incidence of shoulder dystocia in the induction of labour group (OR 0.47, 95% CI 0.26–0.86), but there were no reported cases of brachial plexus injuries or intracranial haemorrhage in either group.

Evidence level 1+

A meta-analysis by Magro-Malosso et al.[140] of nondiabetic women did not show that induction of labour at term for fetal macrosomia, as diagnosed using antenatal ultrasonographic-estimated fetal weight, prevents shoulder dystocia (OR 0.57, 95% CI 0.30–1.08). It did, however, show a reduced risk of fetal fractures (OR 0.17, 95% CI 0.03–0.79).

Boulvain et al.[139] and Magro-Malosso et al.[140] did show that fetuses from the induction of labour group were at increased risk of raised bilirubin of more than 250 mmol/l (9% in induction group versus 3% in expectant group; $P = 0.0004$; OR 3.03, 95% CI 1.60–5.74) and phototherapy (11% in induction group versus 7% in expectant group; $P = 0.03$; OR 1.68, 95% CI 1.07–2.66).

Evidence level 1++

12.5 *What care should women with obesity and a previous caesarean section receive?*

Women with a booking BMI 30 kg/m^2 or greater should have an individualised decision for VBAC following informed discussion and consideration of all relevant clinical factors. ✓

The risks and benefits of VBAC are outlined in RCOG GTG No. 45 *Birth after Previous Caesarean Birth*.[141]

Evidence level 4

Compared with non-obese pregnant women, obese pregnant women have additional risks which need to be considered during decision making. Obesity is a risk factor for unsuccessful VBAC. A retrospective cohort study by Durnwald et al.[142] showed that only 54.6% of obese pregnant women had successful VBAC compared with 70.5% of those with a normal BMI ($P = 0.003$). Notably, those who had a normal BMI at booking but subsequently had an obese BMI at birth also had reduced VBAC success compared with those who maintained a normal BMI during pregnancy (56.6% versus 74.2%; $P = 0.006$). This finding has been replicated by several other studies.[143,144]

Class III obesity is associated with increased rates of uterine rupture during trial of labour[143–145] and neonatal injury. Emergency caesarean section in women with obesity is associated with an increased risk of serious maternal morbidity because anaesthetic[146] and operative difficulties are more prevalent in these women than in women with a healthy BMI. This should also be taken into account when discussing the risks and benefits of VBAC.

Evidence level 2–

13. Care during childbirth

13.1 *Where should obese women give birth?*

Class I and II maternal obesity is not a reason in itself for advising birth within a CLU, but indicates that further consideration of birth setting may be required. D

The additional intrapartum risks of maternal obesity and the additional care that can be provided in a CLU should be discussed with the woman so that she can make an informed choice about planned place of birth. ✓

Women with obesity are at significantly higher risk of shoulder dystocia, emergency caesarean section and atonic PPH after vaginal but not caesarean birth.[147] Immediate obstetric intervention is vital in these situations. In addition, babies born to mothers with obesity are up to 1.5 times more likely to be admitted to a neonatal intensive care unit than babies born to mothers of a healthy weight.[10–12,15,16,24,137,148]

Evidence level 2++

13.2 *What lines of communication are required during labour and birth in women with maternal obesity?*

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. ✓

An opportunity for early assessment will allow the on-duty anaesthetist to review documentation of the antenatal anaesthetic consultation, identify potential difficulties with regional and/or general anaesthesia, and alert senior colleagues if necessary. An early epidural may be advisable, depending on the clinical scenario.

13.3 *What midwifery support should be available during labour to obese women?*

Women with class III obesity who are in established labour should receive continuous midwifery care, with consideration of additional measures to prevent pressure sores and monitor the fetal condition. ✓

Continuous midwifery care is recommended for all women in established labour as per NICE CG190.[127] Women with class III obesity need extra vigilance regarding care of pressure areas and ensuring normal labour progress. Fetal heart rate monitoring can be a challenge and close surveillance is required with recourse to fetal scalp electrode or ultrasound assessment of the fetal heart if necessary.

Evidence level 4

13.4 *What specific interventions may be required during labour and birth for women with maternal obesity?*

In the absence of current evidence, intrapartum care should be provided in accordance with NICE CG190. ✓

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. ✓

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. B

A systematic review of eight studies[149] including 364 771 women concluded that healthy nulliparous women with obesity are subject to increased interventions during labour and birth compared with normal-weight women. Interventions included early hospitalisation, artificial rupture of membranes, epidural analgesia, induction of labour and augmentation of labour. Future studies are needed to evaluate maternal and neonatal outcomes with and without the use of interventions. Intrapartum care should be provided in accordance with NICE CG190.[127]

Evidence level 2+

Establishing venous access in women with class III obesity is more likely to be difficult than in women with class I and II obesity. It is important that this is not attempted for the first time in an emergency situation when urgent venous access is required for intravenous medication or for resuscitation.

Women with obesity are at increased risk of PPH. There is strong evidence from the general maternity population that active management of the third stage of labour reduces the risk of PPH, postpartum anaemia and the need for blood transfusion.[150] Active management in all women is associated with a reduced incidence of prolonged third stage of labour and with a reduction in the use of therapeutic oxytocic drugs.

Evidence level 1++

13.5 *What specific surgical techniques are recommended for performing caesarean section on the obese woman (including incision, closure)?*

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. ✓

Surgical access to the uterus can be very challenging in some women with obesity due to the presence of a large panniculus. It is important that an additional experienced assistant is present during the surgical procedure. Several different surgical approaches have been described in obese women, including vertical and transverse suprapannus skin incisions, to avoid pannus retraction.[151–157] Compared with transverse infrapanniculus incisions, vertical suprapanniculus incisions are associated with increased operative morbidity, including bleeding and classical hysterotomy,[144] and prolonged postoperative hypoxaemia and respiratory compromise.[158,159] Evidence is conflicting about whether the risk of surgical site infections is increased,[151,157,160,161] decreased[155] or unchanged[154,162–164] with vertical suprapanniculus incisions. The alternative suprapanniculus approach is to use a transverse as opposed to a vertical skin incision[165] but there is a paucity of evidence on clinical outcomes following this approach.

13.6 *What postoperative wound care is recommended following caesarean section in women with obesity?*

Women with class I obesity or greater having a caesarean section are at increased risk of wound infection and should receive prophylactic antibiotics at the time of surgery. A

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. A

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. B

A retrospective observational study of 287 213 singleton pregnancies[15] reported an aOR of 2.24 (99% CI, 1.91–2.64) for wound infection in obese women compared with healthy weight women. In the general maternity population, a systematic review of randomised trials in women undergoing elective or nonelective caesarean sections[166] showed that the incidence of wound infections was significantly reduced with antibiotic prophylaxis compared with no prophylaxis. Compared with placebo or no treatment, the use of prophylactic antibiotics in women undergoing caesarean section reduced the incidence of wound infection (RR 0.40, 95% CI 0.35–0.46; 82 studies; 14 407 women), endometritis (RR 0.38, 95% CI 0.34–0.42; 83 studies; 13 548 women) and maternal serious infectious complications (RR 0.31, 95% CI 0.20–0.49; 32 studies; 6159 women). Suturing of the subcutaneous tissue space should be performed as recommended by NICE CG13 *Caesarean section*.[167]

Evidence level 1++

Two controlled trials[168,169] randomised 76 and 91 women, respectively, who had at least 2 cm subcutaneous fat to closure or nonclosure of the subcutaneous tissue space. Meta-analysis[167] of these randomised controlled trials showed that closure of the subcutaneous space decreased the incidence of wound complications (RR 0.42, 95% CI 0.22–0.81).

A systematic review and meta-analysis in the nonobstetric population,[170] including nine randomised controlled trials and 15 observational studies, concluded that the use of negative pressure wound therapy significantly reduced surgical site infections in randomised controlled trials (OR 0.56, 95% CI 0.32–0.96; $P = 0.04$) and observational studies (OR 0.30, 95% CI 0.32–0.42; $P < 0.00001$). These results were found to be consistent in clean and clean-contaminated surgery with different types of procedures, but not in orthopaedic or trauma surgery.

Evidence level 2++

However, there is insufficient evidence for negative pressure dressings in the obese obstetric population,[156,157] other practices to reduce surgical site infections, including insertion of subcutaneous drains,[171,172] and use of barrier retractors,[173,174] with more data awaited from ongoing trials.

Evidence level 2– to 1+

14. Postnatal care and follow-up after pregnancy

14.1 *How can the initiation and maintenance of breastfeeding in women with maternal obesity be optimised?*

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. ✓

Maternal obesity is associated with a physiological delay in lactogenesis, lower rates of breastfeeding initiation, earlier cessation of breastfeeding and earlier introduction of solids.[40,175,176]

Evidence level 2++

This is likely to be multifactorial in origin and may be due to women's perceptions of breastfeeding, difficulty with correct positioning of the baby and the possibility of an impaired prolactin response to suckling.[177]

Evidence level 3

Evidence derived from randomised controlled trials[178,179] in the general maternity population shows that breastfeeding education and support is associated with higher breastfeeding initiation rates and, in some instances, longer durations of breastfeeding.

Evidence level 1+

Dedicated breastfeeding support during the postnatal period is needed as the onset of breastfeeding is likely to be more complicated than for other women. Extra help is needed to ensure frequent and effective milk removal to stimulate lactogenesis, and assistance with physical difficulties attaching the newborn infant to large breasts.[180–182]

14.2 *What ongoing care, including postnatal contraception advice, should be provided to women with maternal obesity following pregnancy?*

Maternal obesity should be considered when making the decision regarding the most appropriate form of postnatal contraception. ✓

Postnatal contraception advice should be given according to the Faculty of Sexual and Reproductive Healthcare guidelines[183,184] which recognise that women with obesity are at increased risk of VTE if they take the hormonal contraceptive pill.

Evidence level 2– to 2++

14.3 *What information should be given postnatally to obese women about their long-term health risks and those of their children?*

Refer to NICE CG189. Women with class I obesity or greater at booking should continue to be offered nutritional advice following childbirth from an appropriately trained professional, with a view to weight reduction in line with NICE Public health guideline 27. D

Women who have been diagnosed with gestational diabetes should have postnatal follow-up in line with NICE Guideline 3. D

Clinicians should refer to NICE CG189.[38] A small number of randomised controlled trials[185–187] have assessed the effect of postnatal lifestyle interventions on weight reduction. Modification of dietary and physical activity behaviours are associated with a significant reduction in body weight compared with no lifestyle intervention. Maternity services need to identify what services are available locally to provide this follow-up.

Evidence level 1–

A systematic review and meta-analysis[188] found that women with gestational diabetes mellitus had an increased risk of developing type II diabetes compared with those who had a normoglycaemic pregnancy (RR 7.43, 95% CI 4.79–11.51).

In an earlier systematic review,[189] there was a steep increase in incidence of type II diabetes within the first 5 years following a pregnancy with gestational diabetes. However, after 5 years, the conversion of gestational diabetes to type II diabetes appeared to plateau.

Evidence level 1+

Data from an observational cohort study of 330 Danish women with diet-treated gestational diabetes showed that 41% of these women developed diabetes during a median of 10 years follow-up.[80] This reflected a doubling of the risk compared with an earlier cohort of 241 women with gestational diabetes followed by the same research group 10 years previously. Being overweight (aOR 2.0, 95% CI 1.1–3.4) or obese (aOR 2.6, 95% CI 1.5–4.5) prepregnancy was found to be a significant risk factor for the development of type II diabetes in these women.

Evidence level 2+

14.4 What support can be given in the community to ensure minimal interpregnancy weight gain or to minimise risks of a future pregnancy?

Women should be supported to lose weight postpartum and offered referral to weight management services where these are available. ✓

Even modest postpartum weight retention is associated with a heightened risk of adverse outcomes in subsequent pregnancies, including hypertensive disease, diabetes and stillbirth.[190] Greater attention should be paid to interventions to help women reduce their weight following pregnancy to achieve a healthy BMI.

Evidence level 4

15. Management of pregnancy following bariatric surgery

15.1 What are the clinical risks of previous bariatric surgery to maternal and fetal health during pregnancy?

A minimum waiting period of 12–18 months after bariatric surgery is recommended before attempting pregnancy to allow stabilisation of body weight and to allow the correct identification and treatment of any possible nutritional deficiencies that may not be evident during the first months. D

A meta-analysis of 11 cohort studies[191] compared obese women who had undergone bariatric surgery with obese women who had not undergone bariatric surgery. The analysis concluded that women who had undergone bariatric surgery had lower odds of gestational diabetes (OR 0.31, 95% CI 0.15–0.65), hypertensive disorders (OR 0.42, 95% CI 0.23–0.78) and macrosomia (OR 0.40, 95% CI 0.24–0.67). However, the odds for small-for-gestational-age newborns was increased (OR 2.16, 95% CI 1.38–2.66).

Evidence level 2+

Another systematic review and meta-analysis of 17 nonrandomised cohort and case–control studies[192] concluded that obese women who had bariatric surgery had a lower incidence of pre-eclampsia (OR 0.45, 95% CI 0.25–0.80; $P = 0.007$), gestational diabetes (OR 0.47, 95% CI 0.40–0.56; $P < 0.001$) and large-for-gestational-age neonates (OR 0.46, 95% CI 0.34–0.62; $P < 0.001$), while a higher incidence of small-for-gestational-age neonates (OR 1.93, 95% CI 1.52–2.44; $P < 0.001$), preterm birth (OR 1.31, 95% CI 1.08–1.58; $P = 0.006$), admission for neonatal intensive care (OR 1.33, 95% CI 1.02–1.72; $P = 0.03$) and maternal anaemia (OR 3.41, 95% CI 1.56–7.44; $P = 0.002$) was identified.

Evidence level 2++

A review of the current evidence[193] concluded that there is a better overall obstetric outcome after bariatric surgery compared with women with class III obesity who are managed conservatively. A reduction in the prevalence of gestational diabetes mellitus, pregnancy-associated hypertensive disorders, macrosomia and congenital defects were observed. However, the risk of potential maternal nutritional deficiencies and newborn small for gestational age cannot be overlooked. Results concerning the incidence of preterm birth and the number of caesarean sections are less consistent.

Evidence level 2++

15.2 How should women with previous bariatric surgery be cared for during pregnancy?

Women with previous bariatric surgery have high-risk pregnancies and should have consultant-led antenatal care. ✓

Women with previous bariatric surgery should have nutritional surveillance and screening for deficiencies during pregnancy. D

Woman with previous bariatric surgery should be referred to a dietician for advice with regard to their specialised nutritional needs. D

Pregnancy can exacerbate nutritional deficiencies that predate pregnancy. Women, particularly those with malabsorptive procedures involving anatomical changes in the gastrointestinal tract, are at high risk of micronutritional deficiencies (including vitamin B12, iron, folate and fat-soluble vitamins) and macronutritional deficiencies (mainly fat and protein).

A few studies[194–197] have evaluated the nutritional state of women during pregnancy following bariatric surgery. Although these are limited by small sample sizes and lack of appropriate controls, these women are at increased risk of anaemia and low B12 levels. Relevant information should be requested from the parent bariatric surgery team. Women who have undergone previous gastric band insertion should have consideration of deflation for the duration of pregnancy dependent upon the circumstances of the woman. Hyperemesis may be pathological and related to an internal hernia or gastric band slip. Certain procedures are associated with an increased risk of reflux and aspiration–gastric band and sleeve gastrectomy. The major thrust of care will be vitamin and mineral supplementation during pregnancy, which requires specialist dietetic support.[198] Based on this evidence, joint guidelines generated by the American Association of Clinical Endocrinology, The Obesity Society, and American Society for Metabolic and Bariatric Surgery recommend that women with previous surgery have nutritional surveillance and screening every trimester.[199] However, although supplementation may partially correct nutritional deficiencies,[200] there is a paucity of evidence about what the optimal basal supplementation should be in clinical practice.

Evidence level 4

16. Recommendations for future research

- **Studies to evaluate a normal partogram for women who are obese.**
- **Studies to evaluate the safety and role of anti-obesity drugs during pregnancy.**
- **Methods to improve antenatal fetal surveillance in women who are obese.**

- **Studies to evaluate surgical techniques at caesarean birth in women who are obese.**
- **Methods to reduce postsurgical site infection.**
- **Methods to improve the safety of mode of birth in women who are obese after caesarean section.**
- **Studies to evaluate the risk of adverse health outcomes in the offspring of women who are obese.**
- **Studies to evaluate the psychological needs of pregnant women who are obese.**
- **Studies to assess the impact of increased risks associated with obesity on maternal emotional and psychological wellbeing.**

17. Auditable topics

- **Proportion of women with class I obesity or greater at booking who commenced 5 mg folic acid supplementation daily prior to conception (100%).**
- **Proportion of pregnant women who have a record of maternal height, weight and BMI in their maternity records (100%).**
- **Proportion of maternity healthcare professionals who have had training in moving and handling techniques and the use of specialist bariatric equipment within the previous year (100%).**
- **Proportion of women with class III obesity who had an antenatal anaesthetic review (100%).**
- **Proportion of women with class I obesity or greater at booking, plus two other risk factors for VTE, as outlined in RCOG GTG No. 37a, who had pharmacological thromboprophylaxis prescribed antenatally (100%).**
- **Proportion of women with class III obesity at booking who had pharmacological thromboprophylaxis prescribed postnatally (100%).**
- **Proportion of women with class I obesity or greater at booking who had a glucose tolerance test during pregnancy (100%).**
- **Proportion of women with class I obesity or greater at booking who had active management of the third stage of labour (100%).**
- **Proportion of operative vaginal births and caesarean sections in women with class III obesity at booking, which were attended by an obstetrician and anaesthetist at specialty trainee level 6 or above (100%).**

18. Useful links and support groups

- **Royal College of Obstetricians and Gynaecologists. *Why your weight matters during pregnancy and after birth. Information for you.* London: RCOG; 2018.**
- **NHS Choices. *Overweight and pregnant* [http://www.nhs.uk/conditions/pregnancy-and-baby/pages/overweight-pregnant.aspx].**
- **Obesity in pregnancy [http://www.maternal-and-early-years.org.uk/obesity-in-pregnancy].**

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Appendix I: Explanation of guidelines and evidence levels

Clinical guidelines are: 'systematically developed statements which assist clinicians and patients in making decisions about appropriate treatment for specific conditions'. Each guideline is systematically developed using a standardised methodology. Exact details of this process can be found in Clinical Governance Advice No.1 *Development of RCOG Green-top Guidelines* (available on the RCOG website at http://www.rcog.org.uk/green-top-development). These recommendations are not intended to dictate an exclusive course of management or treatment. They must be evaluated with reference to individual patient needs, resources and limitations unique to the institution and variations in local populations. It is hoped that this process of local ownership will help to incorporate these guidelines into routine practice. Attention is drawn to areas of clinical uncertainty where further research may be indicated.

The evidence used in this guideline was graded using the scheme below and the recommendations formulated in a similar fashion with a standardised grading scheme.

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+

Good practice points

✓	Recommended best practice based on the clinical experience of the guideline development group

Appendix II: Risks of maternal obesity

Risk	Study	n	OR (95% CI)[a]
Gestational diabetes	NW Thames 1989–97[15] Aberdeen 1976–2005[24]	287 213 24 241	3.6 (3.3–4.0)[b] 2.4 (2.2–2.7)
Hypertensive disorders	NW Thames 1989–97[15] Aberdeen 1976–2005[24]	287 213 24 241	2.1 (1.9–2.5)[b] 3.3 (2.7–3.9)
Venous thromboembolism	Denmark 1980–2001[23]	71 729	9.7 (3.1–30.8)
Slower labour progress 4–10 cm	USA 1995–2002[201]	612	7.0 versus 5.4 hours[c] $P < 0.001$
Caesarean section	Meta-analysis of 33 studies[26]	1 391 654	2.1 (1.9–2.3)
Emergency caesarean section	NW Thames 1989–97[15] Cardiff 1990–99[24]	287 213 8350	1.8 (1.7–1.9) 2.0 (1.2–3.5)
Postpartum haemorrhage	NW Thames 1989–97[15] Aberdeen 1976–2005[24]	287 213 24 241	1.4 (1.2–1.6)[b] 2.3 (2.1–2.6)
Wound infection	NW Thames 1989–97[15]	287 213	2.24 (1.91–2.64)[b]
Birth defects	Australia 1998–2002[9]	11 252	1.6 (1.0–2.5)
Prematurity	Aberdeen 1976–2005[24] Australia 1998–2002[9]	24 241 11 252	1.2 (1.1–1.4) 1.2 (0.8–1.7)
Macrosomia	NW Thames 1989–97[15] Sweden 1992–2001[26]	287 213 805 275	2.4 (2.2–2.5)[b] 3.1 (3.0–3.3)[d]
Shoulder dystocia	Sweden 1992–2001[26] Cardiff 1990–99[24]	805 275 8350	3.14 (1.86–5.31)[d] 2.9 (1.4–5.8)
Admission to neonatal intensive care unit	NW Thames 1989–97[15] Cardiff 1990–99[24]	287 213 8350	1.3 (1.3–1.4)[b] 1.5 (1.1–2.3)
Stillbirth	Meta-analysis of 9 studies[202]	1 031 804	2.1 (1.5–2.7)
Neonatal death	Denmark 1989–96[36]	24 505	2.6 (1.2–5.8)
Depression	Meta-analysis of 62 studies[102]	75 108	33.0%[e]

[a]Unless otherwise stated.
[b]99% CI.
[c]Median class I obesity or greater compared with normal weight.
[d]OR for class III obesity.
[e]Median prevalence in obese women.

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The final version is the responsibility of the Guidelines Committee of the RCOG.

The guideline will be considered for update 3 years after publication, with an intermediate assessment of the need to update 2 years after publication.

