Queensland Clinical Guidelines

Translating evidence into best clinical practice

Maternity and Neonatal **Clinical Guideline**

Obesity and pregnancy (including post bariatric surgery)

Queensland Government

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Cultural acknowledgement

We acknowledge the Traditional Custodians of the land on which we work and pay our respect to the Aboriginal and Torres Strait Islander Elders past, present and emerging.

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This guideline does not address all elements of standard practice and accepts that individual clinicians are responsible for:

- Providing care within the context of locally available resources, expertise, and scope of practice
- Supporting consumer rights and informed decision making, including the right to decline intervention or ongoing management
- Advising consumers of their choices in an environment that is culturally appropriate and which enables comfortable and confidential discussion. This includes the use of interpreter services where necessary
- Ensuring informed consent is obtained prior to delivering care
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- Applying standard precautions, and additional precautions as necessary, when delivering care
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Flowchart: Obesity and pregnancy (including post bariatric surgery)

Principles of care

- Sensitive language to reduce weight stigma
- Sufficient resources (human and equipment)
- Local criteria for safe care provision
- Audit care

BMI classification (kg/m^2)

- Underweight < 18.5
- Normal 18.5–24.9*
- Overweight 25.0–29.9*
- Obese I 30.0–34.9*
- Obese II 35.0–39.9
- Obese III > 40

*Variations for Asian background

GWG

Trimester 1 kg
- All women 0.5–2.0

Trimester 2+3 kg/week
- Underweight 0.5
- Normal 0.4
- Overweight 0.3
- Obese 0.2

Total GWG

Singleton kg
- Normal 11.5–16
- Overweight 7–11.5
- Obese 5–9

Twin/triplet kg
- Normal 17–25
- Overweight 14–23
- Obese 11–19

Pre and inter-conception

- Comprehensive health assessment
- Discuss health impacts and options
- Consider referral to dietitian
- Aim to normalise weight
- Higher dose folic acid daily
- Personalised approach to weight concern and lifestyle
- Post BS: micronutrient supplements and monitoring
- Identify/optimise comorbidities (e.g. diabetes mellitus)

Antenatal

Assessment
- Comprehensive history (including past BS)
- Early antenatal booking-in
- Measure BMI pre-pregnancy and at 36 weeks
- Use correctly sized BP cuff
- If BS: micronutrient supplements/monitoring

Discuss
- Lifestyle options, healthy eating and physical activity
- GWG and consider weight gain chart use
- Implications for care (e.g. transfer of care)
- Greater inaccuracy early pregnancy screening

Refer as required
- Psychosocial wellbeing
- Mental health

Consider risk of
- Pre-eclampsia – low dose aspirin
- VTE and need for thromboprophylaxis

Elements | BMI (kg/m^2)	25–29.9	30–34.9	35–39.9	> 40	BS
Higher dose folic acid		✓	✓	✓	✓
Multidisciplinary	✓	✓	✓	✓	✓
Additional bloods		✓	✓	✓	✓
Early GDM screen		✓	✓	✓	✓ caution:OGTT
Additional USS			✓	✓	✓
Referrals					
Dietitian	✓	✓	✓	✓	✓
Obstetrician			Consult	✓	✓
Anaesthetic				✓	✓
Obstetric medicine					✓

Labour and birth

- If BMI > 40 kg/m^2
  - Early assessment of IV access
  - Recommend CFM
- If prophylactic antibiotics, consider higher dosage
- Surveillance for shoulder dystocia/PPH
- Active third stage management

Postpartum

- Surveillance for airway compromise
- Early mobilisation
- Assess risk of VTE and consider thromboprophylaxis
- Additional support for breastfeeding
- Referral for ongoing healthy lifestyle support

BMI: body mass index, BP: blood pressure, BS: bariatric surgery, CFM: continuous fetal monitoring, GDM: gestational diabetes mellitus, GWG: gestational weight gain, IV intravenous, OGTT: oral glucose tolerance test, PPH: postpartum haemorrhage, USS: ultrasound scan, VTE: venous thromboembolism, > greater than, < less than

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Abbreviations

BMI	Body mass index
BS	Bariatric surgery
CFM	Continuous fetal monitoring
CS	Caesarean section
EDD	Estimated due date
FGR	Fetal growth restriction
GDM	Gestational diabetes mellitus
GP	General practitioner
GWG	Gestational weight gain
ICU	Intensive care unit
IOL	Induction of labour
IV	Intravenous
LGA	Large for gestational age
n	Number of people in a study
NTD	Neural tube defect
OSA	Obstructive sleep apnoea
SGA	Small for gestational age
PPH	Primary postpartum haemorrhage
USS	Ultrasound scan
VTE	Venous thromboembolism

Definitions

Bariatric equipment	Equipment intended for use with patients exceeding a particular weight or size (e.g. 120 kg or BMI greater than 35)
Healthcare team	Membership of the healthcare team is influenced by the needs of the woman and her baby, availability of staff, and other local resourcing issues. The health care team may include a range of multidisciplinary professional including, but not limited to, midwife, midwifery navigator, nurse, nurse practitioner, obstetrician, neonatologist/paediatrician, other specialist practitioners (e.g. maternal fetal medicine specialist), general practitioner, social worker/counsellor and dietitian).
Macronutrients	Nutrients that the body requires in large quantities (e.g. energy, protein, fatty acids).
Micronutrients	Nutrients that the body requires in smaller quantities (e.g. folate, other vitamins).
Weight stigma	Discrimination and prejudice specific to body size and appearance.

1 Introduction

The prevalence of obesity is increasing worldwide[1] and is the leading risk factor associated with disease in Australia.[2] A significant proportion of pregnant women in Queensland have a raised body mass index (BMI)[3] and they are more likely to experience pregnancy complications, including stillbirth.[4,5] A BMI greater than 25 kg/m^2 or excessive GWG is implicated in up to 30% of pregnancy complications[6] (e.g. pre-eclampsia, gestational diabetes mellitus (GDM), preterm birth and a baby who is large for gestational age (LGA).[5]

Healthy lifestyle interventions across the childbearing continuum are thought to provide an opportunity for health improvement and renewed efforts are recommended to encourage all women of reproductive age to adopt healthy lifestyle choices.[4,7,8] Whilst lifestyle interventions remain an important facet of health care,[8,9] sensitive and respectful partnerships is the critical foundation for women living with a raised BMI, who often experience significant weight stigma when accessing maternity services.[10] A holistic approach is imperative with referral to specialists according to the woman's individual needs and choices.

When discussing lifestyle interventions, consider the multifaceted issues that may contribute to increased weight (e.g. epigenetics, childhood adverse experiences, mental ill-health, socio-economic status) to avoid escalating challenging feelings some women may feel (e.g. shame, guilt).[5,11] Bariatric surgery (BS) is one option for women of reproductive age to reach a healthy weight, and there are now greater demands to provide specialty pregnancy care for women with past BS.[12]

Expansive literature is available addressing the endemic and complex nature of obesity and the impact on pregnancy.[5,13,14] This guideline summarises findings and makes consensus recommendations relating to women with a raised BMI or who have had BS and become pregnant or are planning a pregnancy.

1.1 Prevalence

- 46% of pregnant women in Queensland have a BMI above the normal range[3], aligning with Australian data[15]
- Women experiencing obesity are more likely to be single, smoke and experience a greater level of social disadvantage[16]
- There is a dose response relationship between pre-pregnancy BMI and a lower quality diet, supporting the concept that obesity is a form of sub-optimal nutrition[17]
- 31% of pregnant Aboriginal and/or Torres Strait Islander women have a BMI 30 kg/m^2 or above, versus 21% of non-Aboriginal and/or Torres Strait Islander women[3]
    - Refer to Table 1. Queensland mothers by BMI and Aboriginal and Torres Strait Islander status 2019

Table 1. Queensland mothers by BMI and Aboriginal and Torres Strait Islander status 2019

BMI (kg/m^2)	**Aboriginal and/or Torres Strait Islander women** (n=4436) %	**Non-Aboriginal and/or Torres Strait Islander women** (n=55089) %	**Total %**
Underweight (18 or less)	10	7	7
Normal (19–24)	34	47	46
Overweight (25–29)	23	24	24
Obese class I (30–34)	16	12	13
Obese class II (35–39)	9	6	6
Obese class III (40–49)	5	3	3
BMI 50 or above	0.7	0.3	0.4
Not stated	3	0.9	1
Total	100	100	100

Source: Queensland Health Perinatal data collection: extracted May 2021[3]

2 Clinical standards

A holistic approach designed around the woman's clinical circumstances, comorbidities and informed choices will provide excellence in health care for the woman living with a raised BMI when planning or experiencing pregnancy.[18]

2.1 Language

There is no single term universally acceptable[19] to women who are living with a BMI greater than 25 kg/m^2. In this guideline, the clinical terms overweight, obese or BMI (as defined by the Institute of Medicine) are used. Other terms may be equally appropriate or preferred according to a woman's individual values and preferences.

2.2 Minimising weight stigma

Table 2. Weight stigma in healthcare

Aspect	Consideration
Context	• Weight stigma occurs when people feel that they have been treated differently due to their body weight[20] • Obesity is a multifaceted health condition and is often associated with: o Sub-optimal nutrition,[21] childhood adverse experiences,[22,23] mental health disorders,[24] eating disorders[25] o Metabolic alterations impacting hormonal pathways and function[14] • Beliefs based on myths[26] and misperceptions may underpin unfair treatment—intentionally or subconsciously, leading to weight stigma[27] • Negative societal stereotypes perpetuate stigmatisation[27] • Impaired psychological functioning resulting from weight stigma, challenges associated factors (e.g. low self-esteem, poor body image)[27] • Pregnant women accessing maternity services have reported feeling stigmatised[11]
Language recommendations	• Be respectful and maintain an awareness that language is an important contributor to weight stigma[11,28] o Avoid words such as 'super obese' and 'morbidly obese' o Use 'people first' language (e.g. 'the woman experiencing obesity' rather than 'the obese woman')[29] • Discuss and document the woman's language preferences and encourage use by all team members
Clinician support	• Support the healthcare team to develop communication skills that enable positive and non-judgemental discussions about weight[11,28,30] • Offer training and resources to support o Knowledge translation and participatory engagement with women[30,31] o Understanding of the broad impacts of obesity on clinical care • Health professionals can enhance their own communication skills by engaging in self-reflection about perceptions and attitudes to obesity[28]

2.3 Clinical care

Table 3. Clinical care

Aspect	Clinical practice points
Standard care	• Refer to the Queensland Clinical Guideline: *Standard care* for healthcare concepts considered routine or 'standard' including: o Woman-centred care o Continuity of care models o Consent, privacy and respectful communication o Informed decision making o Culturally safe and appropriate care
Weight related care	• Individualise general information about weight and pregnancy to the woman's circumstances (e.g. family history or existing comorbidities)[32] • When taking measurements, promote privacy, modesty, comfort and accuracy (e.g. scales in a private area[33])[11,28] • If weight exceeds 120 kg or BMI over 35 kg/m^2 —bariatric equipment • Refer to Appendix B: Retrieval Services Queensland—transport weights • Refer to Appendix B: Retrieval Services Queensland—transport weights
Model of care	• If BMI more than 30 kg/m^2 or previous BS, early booking in[9,34] • Care within a continuity of carer model recommended due to:[35] o Increased risk of associated psychosocial issues[30] o Risk of fragmentation of care particularly when BMI is above 40 kg/m^2 [36] • Consider tailored programs[37] (e.g. healthy lifestyle, peer support groups, specialised clinics, midwife navigator) o Preconception clinics for women living with obesity[38] • Link to local community groups promoting health lifestyle activities[38] • Encourage ongoing care with general practitioner (GP) to enhance long term health enhancing behaviours[39]
Transfer of care	• Develop local protocols for transfer aligned to service capabilities and logistics (e.g. available afterhours clinical expertise and ancillary support and resources)[40,41] • Discuss options for care with the woman early in pregnancy, considering: o Risks associated with birthing away from family, community, country o Family impacts (e.g. accommodation, transport, childcare) • Consider if consultation with a higher level facility (as opposed to transfer) may offer a safe model of care • When transfer of care is agreed, discuss with the receiving facility as soon as possible, ideally prior to the onset of labour • Consider restrictions on weight capacity of the various modes of transport • Refer to Appendix B: Retrieval Services Queensland—transport weights

2.4 Referral pathways

Table 4. Referral pathways

Aspect	Consideration
Context	• Consider use of telehealth services • Consider Australian College of Midwives—National Midwifery Guidelines for Consultation and Referral[42]
Dietitian	• If BMI greater than 25 kg/m^2 [43,44] • If previous BS[41]
Obstetrician	• If previous BS • If BMI is greater than 35 kg/m^2 in the first trimester—Consult[42] • If BMI is greater than 40 kg/m^2 in the first trimester—Refer[42]
Anaesthetic	• If BMI is greater than 40 kg/m^2 refer for third trimester review for[44]: o Anaesthetic pre-assessment o Development of anaesthetic management plan
Allied health	• Refer as indicated (e.g. to social work, physiotherapist, exercise physiologist, occupational therapist, pharmacist)
Mental health	• Refer as indicated to psychologist, perinatal mental health, mental health services[41]

3 Promoting a healthy lifestyle

Pregnant women living with a raised BMI require a multifaceted and holistic approach to clinical care. This approach is best provided by a healthcare team experienced in the management of maternal obesity.[7]

3.1 Psychosocial support

Table 5. Psychosocial support and health care engagement

Aspect	Consideration
Information	• Women living with a raised BMI may experience issues that impact on their psychological wellbeing during pregnancy (e.g. body image changes)[24] o Maintain a low threshold for referral to mental health services • Health care engagement may improve health literacy, lifestyle choices and contribute to improved health for future generations[21] • Sharing information about lifestyle changes using a sensitive and practical approach can support women to feel more in control[10] • Maintaining engagement with health care providers is a major challenge, particularly during lifestyle and behavioural changes[21,45]
Enablers to health care engagement	• Focus on promoting healthy lifestyle rather than on body weight alone[13] • Build a positive therapeutic relationship using sensitive communication strategies[21,45] • Promote peer and family support and involvement when behavioural changes are being undertaken[21] • Promote participatory communication (e.g. the 5A's–Ask, Assess, Advise, Agree, Assist) for more effective counselling and better engagement[46] o Tailor information according to individual needs and values for greater meaning[31] o Target topics raised by the woman to align healthy behaviours that may improve the woman's wellness (e.g. nausea may be reduced by non-fatty food choices; fatigue can be reduced by exercising)[32,46] o Dispel myths (e.g. 'eating for two') by explaining physical changes in pregnancy (e.g. excessive food intake may increase maternal size)[32] • Schedule adequate time for discussions[47] • Consider increasing the frequency of contact through face to face, telehealth, or SMS messaging[7,48]
Barriers to health care engagement	• Women may avoid healthcare due to feelings of weight stigma[11] • Avoiding or limiting discussions about size by health care provider[31] o May be perceived by the woman as a lack of interest or that the clinician sees her as unmotivated[11] o Denies the woman a normal experience of being coached regarding lifestyle choices in pregnancy[10] • Unbalanced amounts of appointment time allocated to lifestyle changes leaving limited time to focus on pregnancy care[10] • Discussions based on fear arousal (e.g. risks of obesity) without offering protective actions have the potential to prompt defensive behaviours[49] • Clinical practice gaps (e.g. knowledge, skills, capability, resources)[50]

3.2 Healthy lifestyle, eating and movement

Table 6. Healthy lifestyle, eating and movement

Aspect	Consideration
Healthy lifestyle	• Implementing a lifestyle intervention of healthy diet or exercise, or both (versus 'routine' care and information sharing) reported reduced rates of: o Excessive GWG[44] o GDM[9,51] o LGA infants[44] (15%[9]–65%[52]) o Caesarean section (CS) [44,51] • Limited quality evidence exists for prescribing a specific lifestyle intervention, duration, frequency, or delivery style[53,54] • Considered discussion about interventions that impact positively is imperative when the woman is motivated to implement change[53] o Refer to Section 2.2: Minimising weight stigma
Healthy eating	• Consider cultural food practices and preferences • Support realistic goal setting, aligned with a balanced eating plan[13] • Discuss challenging situations and possible solutions to promote self-efficacy (e.g. think about what you might do when you go out to eat)[49] • Follow the Australian Dietary Guidelines and share information about[7]: o Using a food diary o Eating a variety of foods focussing on number of serves of core food groups o Preferencing foods that are nutrient dense[44] and have a low glycaemic index[9] o Increasing intake of fruits and vegetables and eating less foods with high fat and sugar content[55] • Advise about impact of eating patterns using simple relevant examples[9] o Undernutrition is associated with an increased risk of a small for gestational age (SGA) baby, and overnutrition risks an LGA baby o Healthy GWG results in a lower risk of CS and baby complications such as respiratory distress • Encourage iron rich foods[44] due to risk of postpartum haemorrhage (PPH)
Physical activity	• Assess levels of current movement and physical activity o If minimal, encourage incidental movement (any form of movement is a benefit, minimise sitting time, take the stairs[44]) o Aim to build to regular moderate intensity exercise recommended for all pregnant women (e.g. walking, low impact dance or aerobic classes,[9] swimming, muscle strengthening activities)[44] • Encourage activities that are enjoyable and that offer community connection[38] • Recommend realistic goal setting and other measures such as pedometer, exercise diaries or journals[7] • Offer information about exercise benefits specific to obesity in pregnancy o Decreased risk of GDM[56] o Exercise especially in the second and third trimesters—increases the rate of spontaneous vaginal birth (SVB)[57] • Discuss general precautions around physical activity and pregnancy particularly when comorbidities exist (e.g. cease and seek advice if dyspnoea, dizziness, faintness, chest pain)[44]

4 Maternal size and pregnancy

Weight classification offers guidance about additional health risks associated with being pregnant and outside a normal weight range. It does not however, account for other variations that impact health (e.g. age, body composition, family history).

4.1 Weight status calculation and classification

The World Health Organisation (WHO) recommends the classification of weight in order to provide population comparisons and to identify individuals with additional health risks[1].

Table 7. Tools to calculate weight status

Aspect	Considerations
BMI	• A practical, inexpensive population level measurement of weight status used to estimate the relative risk of disease related to obesity[1,44] • Each 3 kg equates to approximately 1 unit (1 kg/m^2) of BMI • Increased total body fluid during pregnancy makes it less robust[58] • Percentile charts are used for women up to 19 years to identify their weight classification[59,60]
Ethnic diversity	• No broad consensus for using a specific tool according to a woman's ethnicity[44,61] except for the Asian population o Range of BMI levels associated with increased health risk is lower in Asian populations, therefore adjust GWG accordingly[44,62,63] o Refer to Table 9. Recommended gestational weight gain
Recommendation	• Pre-pregnancy use BMI[39] o Waist circumference is used in some settings to predict level of visceral fat and refine disease risk (e.g. cardiovascular disease, diabetes)[59,64] • During pregnancy use pre-pregnancy BMI[44] • Recalculate BMI in the last trimester at approximately 36 weeks gestation • Use clinical judgement to individualise the findings and health risks[59] (e.g. clinical judgement would consider an athlete's greater muscle mass as an impact on BMI)

4.1.1 Weight classification and risk of disease

Table 8. Weight classifications and risk of disease

Group	BMI (kg/m^2)	Risk of disease/comorbidities
Underweight	Less than 18.5	Low
Normal weight	18.5–24.9	Average
Overweight/pre obese	25–29.9	Increased
Obesity class I	30–34.9	Moderate
Obese class II	35–39.9	Severe
Obese class III	40 or more	Very severe
Group (15–19 years)	**BMI (standard deviations above mean)**	
Overweight	+1	Increased
Obesity	+2	Increased
Group (pre-pregnancy)	**Waist circumference (cm)**	
Overweight/obese	More than 80 cm	Increased
	More than 88 cm	High

Source: World Health Organization. Obesity: preventing and managing the global epidemic. 2000[1]

4.2 Gestational weight gain

GWG recommendations are based on those of the Institute of Medicine[41,65] with BMI range variations included for women of Asian ethnicity.[44]

Table 9. Recommended gestational weight gain

Pre-pregnancy BMI (kg/m^2)	**Singleton pregnancy weight gain**		
Non-Asian background	**1st trimester total weight gain** (kg)	**2nd and 3rd trimester** (kg/week)	**Total** (kg)
Less than 18.5	0.5–2 kg	0.5	12.5–18
18.5 to 24.9		0.4	11.5–16
25.0 to 29.9		0.3	7–11.5
Greater than or equal to 30.0		0.2	5–9
Asian background			
Less than 18.5	0.5–2 kg	0.5	12.5–18
18.5 to **22.9**		0.4	11.5–16
23.0 to **27.5**		0.3	7–11.5
Greater than **27.5**			7
Twin and triplet pregnancy	**Twin or triplet pregnancy weight gain**		
18.5 to 24.9	–		17–25
25.0 to 29.9			14–23
Greater than or equal to 30.0			11–19

4.2.1 Monitoring gestational weight gain

Table 10. Monitoring gestational weight gain

Aspect	**Considerations**
Context	• Women living with obesity often exceed the recommended GWG[66] • An Australian study identified that pregnant women: o Have divergent views and misperceptions about GWG[67] o Often underestimate own weight and overestimate optimal GWG[67]
Reduced GWG	• Studies examining reduced GWG by balancing dietary intake with nutrient and energy requirements are underpowered with inconsistent findings[66,68] • Weight loss during pregnancy when compared to recommended GWG is associated with SGA[69,70] • Weight loss is not recommended for women during pregnancy[70]
Health benefits of recommended GWG	• Less pregnancy related impacts (e.g. pre-eclampsia,[71] CS;[44,71] LGA[44]) • Reduced risk of postpartum weight retention and future obesity[33,72] • Health outcomes are optimised when: o GWG is steady and within the recommended range[14,65] o Structured interventions (diet and regular exercise) support women to gain appropriate weight in pregnancy[9]
Measuring GWG	• Use standard procedures to ensure consistency of serial weights[65] • Plot weight against gestation to identify trends[65] o Offer the use of a validated weight gain monitoring chart[73] (e.g. Pregnancy weight gain chart for BMI 25 kg/m^2 or over[74]) • Review weight and discuss the pattern of GWG at each visit[44,73]
Recommendation	• Record pre-pregnancy weight and BMI at initial visit[44] o If no pre-pregnancy weight, use weight at first antenatal appointment to calculate BMI • Check weight at each antenatal visit[75] • If weight could impact transfer of care or birth decisions, recalculate BMI earlier than at 36+0 weeks gestation (e.g. at 32 weeks)

5 Health impacts of obesity on pregnancy

Maternal and fetal morbidity and mortality increase incrementally with increasing BMI. Both pre-pregnancy BMI and high GWG are attributable to increases in risk.[6]

5.1 Impacts on the woman

Table 11. Pregnancy health impacts of obesity on the woman

Aspect	Increased incidence
Conception and pregnancy loss	• Longer time taken to conceive[76] • Infertility[77] (additional risk if the male is also obese[78]) • Adverse outcomes associated with assisted conception[77] • Miscarriage, stillbirth, neonatal death, perinatal death[77]
Pregnancy complications	• GDM[6] • Hypertension in pregnancy and pre-eclampsia[6] • Thromboembolic disease[76] • Depression and anxiety[24,79] o Antenatal depression 6–10% greater incidence[24] • Eating disorders (binge eating disorder, bulimia nervosa) and serious mental illness[24,25] • Prolonged pregnancy[80]
Intrapartum challenges	• Preterm birth[6] • Achieving epidural analgesia during labour[81] • Induction of labour (IOL)[76] o CS following IOL[47] • Instrumental and complicated vaginal birth[5] • Shoulder dystocia[47]
Caesarean section	• Increased CS rate (elective and emergency) compared to women within normal weight range o 1.58 times more likely if the woman is overweight[82] o 2.75 to 4 times more likely if the woman is obese[82,83] • As BMI increases by 1 kg/m^2 the risk of having a CS increases by 10%[59] • Incrementally higher rate of CS complications, surgical time[84] and next birth also being CS[85] • Increased CS relating to vaginal birth after caesarean (VBAC)[86]
Anaesthetic risks	• Length of anaesthetic time and complexity of anaesthesia incrementally increases with rising BMI[84] • Death related to anaesthetic[81] • Difficult intubation[81] • Intensive care unit (ICU) admission[84] • Obstructive sleep apnoea (OSA) and associated complications (e.g. ICU admission)[87]
Postnatal risks	• Postpartum haemorrhage[76] • Thromboembolic disease[76] • Wound infection[88] • Breastfeeding challenges with initiation and duration of feeding[5,47,76] o 13% decreased rate of initiation and 20% decreased likelihood of any breastfeeding at 6 months[89] • Length of hospital stay[76] • Postnatal depression 2–3% greater incidence[24]

5.2 Impacts on the baby

Table 12. Impacts of obesity on the fetus/baby

Aspect	Increased incidence
During pregnancy	• Congenital malformations (e.g. neural tube defect (NTD))[5] • Difficulties with fetal surveillance[90] o Suboptimal ultrasonography o Difficulty detecting SGA o Inaccuracy of fetal heart rate measurement and cardiotocograph (CTG) • Macrosomia/LGA[6,47,76] • Stillbirth[91]
Postnatal	• LGA and associated birth injury • Preterm birth[5] • Jaundice[16] • Hypoglycaemia[16] • Admission to neonatal unit[47] • Respiratory distress[16] • Neonatal and infant death[91]
Longer term	• Childhood obesity, metabolic syndrome including diabetes, generational obesity[14,92] • Neurodevelopmental differences[93] (e.g. developmental, attention) • Language delay[93]

5.3 Incremental increase of risk

The frequency of adverse outcome increases with increasing BMI, for example, greater association with hypertension in pregnancy as BMI rises.[16]

Table 13. Association between clinical outcomes and BMI

Outcome	BMI (kg/m^2)					
	Less than 18.5	18.5–25	25–30	30–35	35–40	40 or more
Maternal %						
Hypertension in pregnancy	1	2	3	5	7	10
GDM	1	1	2	3	5	7
Diabetes (Type 1 or 2)	0.2	0.5	0.3	2	3	4
Spontaneous vaginal birth	61	54	50	47	47	44
Assisted birth	13	13	10	8	6	5
CS	26	33	34	45	47	52
Neonatal %						
Perinatal death	0.5	0.7	1	1	2	2
Stillbirth	0.2	0.4	0.5	0.7	0.8	0.7
Neonatal death	0.3	0.3	0.5	0.5	0.7	1
Macrosomia	5	11	16	19	20	21
SGA	12	11	12	13	16	19
LGA	11	11	12	13	14	16
Preterm birth	9	7	8	9	10	11
Respiratory distress syndrome	4	4	5	6	6	7
Mechanical ventilation	6	5	6	7	9	10
Jaundice	6	5	5	6	8	9
Hypoglycaemia	1	0.9	1	2	3	3

Source: Mater Mothers Hospital Brisbane 1998-2009; n=75432)[16]

6 Preconception and inter-pregnancy care

Table 14. Preconception and inter-pregnancy care

Aspect	Consideration
Preconception	• Many women planning to conceive are unaware of the impact of obesity on pregnancy[13] [refer to Table 11. Pregnancy health impacts of obesity and Table 12. Impacts of obesity on the fetus/baby] • Preconception weight loss (e.g. 3–5% of body weight) and a period of weight stabilisation (e.g. three months) may reduce o Blood glucose and triglycerides[13,61] o Exposure of the feto-placental unit to an adverse metabolic environment[14,94] o Short and long term impact of obesity on both the woman and her baby[4,14,71] • Stabilising weight loss prior to conception (e.g. six months) may reduce pregnancy related complications[95]
Interpregnancy	• Inter-pregnancy weight loss reduces the impact of weight retention after pregnancy that often results in a higher BMI in subsequent pregnancies[96] • Women gaining one to two BMI units from one pregnancy to the next increase their risk of gestational hypertension, GDM or LGA by 20–40%[96] • Weight retention after pregnancy increases the risk of lifetime obesity[7,97]
Interventions and weight loss	• Consider weight loss pharmacotherapy prior to planning pregnancy o Cease prior to planning pregnancy—due to unknown side effects[98] • BS [refer to Section 10 Bariatric surgery and pregnancy
Clinical surveillance	• Calculate BMI and measure waist circumference • Complete family history and discuss any congenital anomalies, heritable conditions and known risks associated with obesity to baby [refer to Table 12. Impacts of obesity on the fetus/baby] • Conduct a health assessment to identify, and optimise any comorbidities (e.g. diabetes, hypertension) o Screen for sleep disorders and refer as indicated[99] [refer to Table 16. Antenatal surveillance] • Assess psychosocial wellbeing and screen for associated risks (e.g. depression, socioeconomic status, food insecurity, family violence)[22-24] • Discuss and assess dietary patterns whilst observing for symptoms related to an eating disorder[100] [refer to Table 6. Healthy lifestyle, eating and movement] • Consider screening to identify nutritional deficiencies [refer to Table 15. Pregnancy care additions—overweight and obesity] o Vitamin B_{12} screening prior to commencing folate supplements may increase accuracy of results[101] • Refer according to the woman's needs o Refer to Table 4. Referral pathways
Nutritional supplements	• Commence folic acid at least one month (or up to three months[98]) prior to conception[102] o Refer to Table 15. Pregnancy care additions—overweight and obesity • If deficiencies detected, additional nutritional supplements maybe required • If previous BS, assess adherence to prescribed nutritional supplements and recommend continuation o Refer to Section 10 Bariatric surgery and pregnancy
Specialty clinics	• Consider specialty preconception clinics for women a raised BMI[38]

7 Antenatal care

Additional antenatal care is indicated for women a raised BMI, depending on their clinical circumstances including the presence of comorbidities.

7.1 Pregnancy care additions—overweight and obesity

Table 15. Pregnancy care additions—overweight and obesity

Aspect	Consideration
History taking	• If previous BS, refer to Section 10 Bariatric surgery and pregnancy • Detail menstrual history and dates o Greater inaccuracy of ultrasound scan (USS) dating[103] • Document potential contributors to body size (e.g. food insecurity, poor dietary patterns, lifestyle choices and changes[104])
Baseline screening	• If BMI is equal to or greater than 30 kg/m^2 · baseline blood and urine screening including:[90] o Renal and liver function tests o Protein creatinine ratio, or urine dipstick testing o Early GDM screen [refer to Queensland Clinical Guideline: *Gestational diabetes mellitus*[105]] • Screening for fetal abnormalities [refer to 7.3 Fetal surveillance]
Screening for nutritional deficiencies	• Consider screening for nutritional deficiencies[21,98] o Especially ferritin, vitamin B_{12},[101] folate, vitamin D,[101,106] magnesium and potassium[106] • If vitamin D levels are lower than 50 nmol/L recommend daily vitamin D according to level of deficiency • Cautious interpretation of micronutrient test accuracy in the presence of systemic inflammation[107]
Folic acid supplementation	• Women experiencing obesity have a higher incidence of folate deficiency and increased risk of NTD[108] • There is limited and conflicting evidence and wide variation in recommendations about the optimal dose of folic acid supplementation during pregnancy for women experiencing obesity[41,90,109] • There is some evidence of negative impact on child cognitive development at age 4–5 years where high dose folic acid (5 mg daily) is continued after 12 weeks gestation[110] <u>Consensus recommendation</u> • If BMI is 30 mg/kg^2 or more: o Recommend folic acid 2.5–5 mg daily, ideally three months prior to conception and continue until 12 weeks gestation o Recommend the total daily dose of folic acid does not exceed 5 mg (consider folic acid contained in other pregnancy supplements the woman may be taking)
Breastfeeding preparation	• Offer opportunity for the woman to share feelings about her own body, breast shape and breastfeeding[89] • Build self-confidence[111] by discussing: o Breast feeding expectations (e.g. milk often comes later) o If the woman has large breasts, initial support may be required for positioning and attachment[111,112] o Benefits of 'skin to skin' contact, hand expressing and frequent feeding to stimulate supply[113] • Discuss expressing from 37 weeks gestation especially if GDM[105] • Refer to Queensland Clinical Guidelines: *Establishing breastfeeding*[113]

7.2 Surveillance for co-morbidities

Table 16. Antenatal surveillance

Aspect	Consideration	
GDM	• If early screening is normal, repeat at 24–28 weeks gestation • Refer to Queensland Clinical Guideline: *Gestational diabetes mellitus*[105]	
Hypertension	• Document the appropriately sized blood pressure cuff • If pre-existing hypertension, consider cardiac evaluation (e.g. electrocardiogram), especially if smoking • Refer to Queensland Clinical Guideline: *Hypertension and pregnancy*[114]	
Pre-eclampsia	• Assess for clinical risk factors and consider prophylaxis (e.g. aspirin) • Refer to Queensland Clinical Guideline: *Hypertension and pregnancy*[114]	
Venous thromboembolism (VTE):	• BMI greater than 30 kg/m^2 is a risk factor for VTE • Refer to Queensland Clinical Guideline *Venous thromboembolism prophylaxis in pregnancy and the puerperium*[115]	
Obstructive Sleep Apnoea (OSA)	• OSA in women experiencing obesity (compared to women experiencing obesity without OSA) results in[99]: o Higher rates of medical and surgical complications o Longer hospital stays o Higher rates of admission to ICU • Greater sensitivity to adverse effects of opioids (e.g. respiratory depression)[81] • If frequent snoring reported, offer screening[87] • The Australian Sleep Association recommend screening by using the STOP Questionnaire o If the answer is yes to two or more of the following questions, refer to a physician/sleep specialist	
	S	Do you **s**nore loudly (louder than talking or loud enough to be heard through closed doors)?
	T	Do you often feel **t**ired, fatigued or sleepy during daytime?
	O	Has anyone **o**bserved you stop breathing during your sleep?
	P	Do you have or are you being treated for high blood **p**ressure?
Depression and anxiety	• If concerns are identified, perform additional psychosocial assessment, and/or refer as required[44] • Recommend thorough routine and baseline investigations (e.g. to exclude hypothyroidism)	
Eating disorders	• Increased risk of adverse maternal and neonatal outcomes[116] • Maintain awareness of history or symptoms suggestive of an eating disorder[25,100] (e.g. binge or purge eating, laxative overuse) • Refer to perinatal mental health/mental health services as required	

7.3 Fetal surveillance

Table 17. Fetal surveillance

Aspect	Consideration
Fetal abnormality screening	• Additional counselling relating to routine options for screening includes: o If combined first trimester screening (cFTS), greater rate of inaccuracy relating to difficulties with USS[44] and alterations in maternal serum markers (e.g. PaPP-A)[117] o Non-invasive prenatal screening (NIPS) or cell free DNA (cfDNA) has increased inaccuracy and test failure; consider timing (e.g. 10 weeks[118]) o If a failed test or 'no call' occurs, further testing is recommended (e.g. invasive testing) prior to any definitive management decisions[117,118] • Include BMI or weight classification[117] on request forms
Measuring symphysis-fundal height	• Recommended as baseline screening tool[119] o May increase identification of LGA and SGA o Incremental increase of inaccuracy with increase of BMI o Not recommended over for women with a BMI over 40 kg/m^2 [120]
Fetal movements	• Women with obesity and altered fetal movements are at greater risk of fetal growth restriction (FGR) and stillbirth[90] • Perception of fetal movements is similar if a woman is obese or not[121] • Investigate reports of altered fetal movements irrespective of BMI[121] • Refer to Queensland Clinical Guideline: *Fetal movements*[122]
USS	• USS accuracy for dating, anatomical assessment and weight estimation is reduced with increased maternal adiposity[90,103] • Dating scans: o Greater accuracy is expected via a transvaginal scan using crown-rump measurement between 7–14 weeks[90] o USS at 11–14 weeks gestation are less reliable and more likely to postpone the estimated due date (EDD)[103] • Transabdominal USS in the third trimester remains the best estimate of fetal weight despite variation in accuracy[123,124] • Quality evidence is limited for the following recommendations: o If BMI greater than 30 kg/m^2, consider morphology at 20–22 weeks[90]—balance sub-optimal USS visualisation with delayed diagnosis of abnormalities[44] o If BMI greater than 35 kg/m^2, recommend USS at 28–32 weeks gestation to assess fetal growth, with follow up scans as indicated (e.g. four weekly)[125]
SGA	• Among women experiencing obesity, a fetus identified as SGA is associated with higher rates (five-fold) of fetal mortality[126] • Consider IOL to reduce the risk of stillbirth, balanced with risks of prematurity and IOL[126] o Refer to Queensland Clinical Guideline: *Induction of labour*[127]
LGA	• Excessive GWG increases the risk of macrosomia[90] • Detection rate of 10–38% by USS in the general pregnancy population[128] • Fetal biometry in the third trimester with a focus on the abdominal circumference growth velocity (ACGV) increases LGA detection rates[128] • Consider IOL to reduce risks of related morbidity[123]Refer to Queensland Clinical Guideline*: Induction of labour*[127]
Stillbirth	• Stillbirth rate increases incrementally with rising BMI[91,129] • Gaining three or more BMI units between pregnancies combined with obesity increases stillbirth risk[96] • Refer to Queensland Clinical Guideline: *Stillbirth care*[130]

8 Intrapartum care

Table 18. Intrapartum assessment and management

Aspect	Consideration
Communication	• If weight exceeds 120 kg notify anaesthetist and operating theatre on admission[41]
Positioning and equipment	• Promoting active birth within a framework of managing increased risk may improve the woman's birthing experience without compromising clinical care[131] [refer to Queensland Clinical Guideline: *Normal Birth*[132]] • Encourage to remain mobile with adequate rest periods (moving requires extra effort and difficulty may cause embarrassment)[131] • Actively observe skin integrity, especially if an epidural is sited • If BMI greater than 35 kg/m^2, water immersion is not recommended o Refer to Queensland Clinical Guideline: *Normal Birth*[132]
Fetal monitoring	• USS (e.g. portable) may be required to accurately determine fetal presentation and position[41] • If BMI greater than 40 kg/m^2 recommend continuous fetal monitoring (CFM)[41] o Wireless/beltless monitoring may enhance the woman's comfort and mobility [133] • If a satisfactory trace or recording cannot be obtained, consider: o Internal fetal monitoring with a fetal scalp electrode (FSE) o Intrauterine pressure catheter (if available) • Refer to Queensland Clinical Guideline: *Intrapartum fetal surveillance*[134]
Analgesia/ anaesthesia	• If BMI greater than 40 kg/m^2, recommend early insertion of cannula for intravenous access due to higher risk of complications[41,44] o Refer to Table 11. Pregnancy health impacts of obesity on the woman • Discuss option of early insertion of epidural analgesia as may[135]: o Allow greater time for effective placement o Offer advantage in the event of an emergency CS • Portable USS assists in identifying landmarks, reduces procedure time and improves accuracy of epidural catheter placement[135] • Consider oral H_2-receptor antagonists prescribed every 6 hours for antacid prophylaxis in labour[81]
Shoulder dystocia	• Maintain awareness of the increased risk of shoulder dystocia, particularly if macrosomia suspected or during an instrumental vaginal birth[136] • Have an experienced clinician in attendance for birth[136] • Notify obstetric team of impending birth according to local protocols[136]
Third stage prevention and management	• Consider group and hold on admission[137] • Maintain awareness of the increased risk of PPH • Recommend active management of third stage[137] o Consider factors which impact on the effectiveness of uterotonic drugs, including the site of administration and the length of the needle used • Refer to Queensland Clinical Guidelines: *Normal birth*[132] and *Primary postpartum haemorrhage*[137]

8.1 Induction of labour

Table 19. Induction of labour

Aspect	Consideration
Context	• Obesity alone is not an indication for IOL[41] • The evidence is unclear about clinical outcomes associated with IOL: o IOL prior to EDD for women with a BMI greater than 30 kg/m^2 and existing comorbidities, resulted in decreased CS rates (retrospective cohort, n=4128)[138] o Women experiencing obesity (n=1543) were more likely to have a low Bishops score (less than five) at time of IOL and an increased rate of failed IOL and CS[83,139]
Methods	• IOL using a balloon catheter is a suitable option[140] • More likely to require multiple IOL methods[139] • Oxytocin more likely required to induce contractions[139]
Recommendation	• Assess each woman individually for overall risks associated with IOL and discuss the benefits of IOL specific to obesity[98] • Inform women that compared to women with a BMI of a healthy range[141]: o Post term pregnancy is more common o Spontaneous labour is less likely o IOL is more frequent,[15,47] and is likely to take longer[139,141] o Stillbirth rate is increased, particularly if SGA suspected[126] • Refer to Queensland Clinical Guideline: *Induction of labour*[127]

8.2 Caesarean section

Table 20. Caesarean section

Aspect	Considerations
Procedure	• If BMI 40 kg/m^2 or more, CS is technically more difficult and takes longer[84] • Additional staffing and equipment for women greater than 120 kg[41] • Improved surgical access may be achieved by elevating panniculus (e.g. Alexis Retractor, panniculus taping procedures) or alternative surgical incision (e.g. high Pfannenstiel)[142] • If more than 2 cm subcutaneous fat, suturing the subcutaneous tissue space reduces the risk of wound infection and wound separation[143] • Consult with wound care teams for dressing recommendations[143]
Anaesthesia	• Pre-operative o H_2 receptor antagonist to reduce aspiration risk during extubation[144] o Consider likelihood of OSA o Invasive arterial monitoring may be required • Intraoperative o Neuraxial anaesthesia with continuous technique (epidural or combined spinal-epidural) for obesity class III recommended—additional time and skill may be required[81,144] o Utilise supplemental oxygenation according to oxygen saturations[81] • If general anaesthetic o Optimise pre oxygenation[144] o Extra resources for intubation (e.g. video laryngoscope) • Postoperative o An opioid-sparing multimodal analgesic technique is recommended including use of local and/or regional analgesia[144] o If OSA diagnosed or likely[144]consider high dependency care
Antibiotics	• Consider adjusting prophylactic antibiotic regimes according to BMI o If BMI is below 30 kg/m^2 cefazolin 2 gm IV as a single dose o If BMI greater than 30 kg/m^2 cefazolin 3 gm IV a single dose[143,145] o If skin closure has not occurred within two hours of antibiotic administration and BMI is above 35 kg/m^2 consider repeating dose[146] • If history of penicillin or cephalosporin hypersensitivity refer to *eTG complete—Surgical antibiotic prophylaxis for specific procedures* or locally endorsed antibiotic guidelines if available[147]

9 Postpartum care

9.1 Clinical surveillance

Table 21. Postpartum clinical surveillance

Aspect	Consideration
Clinical observations	• Locate bed to facilitate close clinical surveillance • Escalate clinical concerns early to minimise deterioration related to risks of obesity[81] • Monitor oxygen saturations and respiratory rate particularly following narcotic or sedative medications and known OSA[144] • Monitor temperature to identify early signs of infection • Monitor vaginal loss to detect PPH
Mobility	• Encourage early mobilisation o Review and update mobility assessment as required o Consider regular physiotherapy to encourage mobilisation • Complete skin integrity checks and consider pressure area care
VTE prophylaxis	• Actively assess the requirement for postpartum thromboprophylaxis • Refer to Queensland Clinical Guideline: *Venous thromboembolism (VTE) prophylaxis in pregnancy and the puerperium*[115]
Rh D immunoglobulin	• Testing and dosage recommendations not altered by BMI[148] • Consider site of administration and the length of the needle used[148]

9.2 Breastfeeding

Table 22. Breastfeeding support

Aspect	Consideration
Initial support	• To encourage self-confidence o Provide information to support realistic expectations o Support active decision making (e.g. some women perceive lack of control in decision making after a high risk pregnancy and birth)[111,112] • Allocate additional time to support effective positioning and attachment particularly if movement is limited (e.g. following CS)[149] • Mitigate mechanical challenges relating to large breasts through comfortable positioning, different baby holds, props and pillows[111] • Refer early to lactation support services[111] • Refer to Queensland Clinical Guideline: *Establishing breastfeeding*[113]
Ongoing support	• If delay in secretory activation (lactogenesis II), consider extended home visiting until community service provision is in place • Discuss strategies and positioning in social environments to overcome practical barriers associated with breastfeeding and weight stigma[112] • Offer information for breastfeeding support groups o Women experiencing obesity have reported these groups as helpful for breastfeeding support and developing social supports[111,112]

9.3 Discharge and postpartum weight retention

Table 23. Discharge

Aspect	Consideration
Discharge	• Consider co-morbidities in assessing readiness for discharge • Discuss inter-pregnancy interval and contraception plans to promote health optimisation prior to future pregnancy[150] • If hormonal methods of contraception are requested, conduct a risk assessment for VTE • Recommend ongoing professional supports (e.g. GP, dietitian, Community Child Health)[13] o Additional allied health support through GP referral (e.g. practice incentive programs)
Postnatal weight loss	• Discuss benefits of postpartum weight loss in reducing overall risk of long term obesity[72] • Recommend ongoing lifestyle support and weight monitoring following pregnancy for up to 12–18 months[7] o A return to pre-pregnancy weight by six months postpartum reduces obesity risk[151] o Additional support with healthy behaviours and associated weight loss may also occur opportunistically through more frequent contact with health professionals during early parenting[13] o Provides links to community programs supporting healthy lifestyle activities[38]

10 Bariatric surgery and pregnancy

Consider women's previous history of obesity when planning clinical care for women who have had bariatric surgery.

10.1 Impact of previous bariatric surgery on pregnancy

Table 24. Pregnancy outcomes following previous bariatric surgery

Aspect		Impact
Woman	Risk	• Increased rates of nutritional deficiencies and malabsorption issues[152] • Increased risk of unplanned pregnancy
	Benefit	• Reduced rates of: o GDM[153] o Hypertensive disorders[153] o Post term pregnancy[152] o IOL[154] o Epidural use[154] o Labour dystocia[154] o Obstetric anal sphincter injury[154] o PPH[153,154] o CS[153], and CS following previous CS[154]
Baby	Risk	• Increased rates of: o FGR[153] o SGA infants[152,153] o Preterm birth[152,153] o Stillbirth[152] o Congenital abnormalities[152] o Neonatal unit admission[152]
	Benefit	• Reduced rates of: o Neonatal resuscitation[154] o LGA infants[152,153]

10.2 Bariatric procedures

Table 25. Bariatric procedures

Aspect	Consideration
Context	• In Queensland between 2014–2019, 0.5% (n=1472) of women birthing babies had pre-pregnancy BS[155] • Bariatric procedures are not recommended when imminently planning pregnancy[156]
Types of bariatric surgery	• There is no clear evidence to guide the most appropriate type of surgery for women of childbearing age[157] • The most common types are sleeve gastrectomy (46%) and Roux en Y gastric bypass (38.2%); Australian cases mostly sleeve gastrectomies[158] o Clinical outcomes at one year post sleeve gastrectomy/Roux en Y surgery demonstrate an average weight loss of 30% total body weight o Less common procedures include gastric banding • Newer endoscopic techniques (e.g. endoscopic intragastric balloon) are emerging[156,159] o Risk profiles are potentially lower with a less invasive approach o Less expensive compared to BS o Evidence based outcomes of these procedures are limited
Surgery to pregnancy interval	• Recommend delaying conception to stabilise weight loss, achieve a varied nutritious diet[156] and reduce associated health impacts[160,161] o Limited evidence on short and long term effects of rapid weight loss and changes in micronutrient absorption[162] o Fertility may increase as weight is lost and hormonal imbalances resolve and unplanned pregnancy may occur[162] • Recommend contraception to avoid unplanned pregnancy (long acting reversible contraception more effective than oral contraception)[94,157,162] • Evidence limited for optimal surgery to conception interval[34,152,162] o Recommend minimum of one year before pregnancy[157] with a broad guide of 12–18 months[156] o Consider personal health and individual needs rather than adherence to arbitrary timeframe[34]
Recommendation for referral	• Prior to a planned pregnancy, consult with a specialist in the management of pregnancy after BS[157] • Dietitian for preconception, pregnancy and postnatal nutritional support[152] • Specialist referral (bariatric surgeon, obstetric medicine) for all pregnant women post BS[34,162] • If acute abdominal pain, persistent nausea and vomiting, inability to eat, symptoms of malabsorption (e.g. steatorrhoea),or ‘dumping syndrome’ (postprandial syndrome) occur, refer to specialist[159,162] • If concern for fetal development because of other risk factors (e.g. unplanned pregnancy during rapid weight loss) consider specialist referral • If pregnancy occurs whilst receiving pharmacological management for mental illness consider medication review

10.3 Nutrition and screening if post bariatric surgery

Table 26. Nutrition and screening if post bariatric surgery

Aspect	Consideration
Context	• Risk of not achieving all dietary requirements for pregnancy up to five years post BS requiring individualised dietary advice[163] • Dietitians and other trained health professionals utilise nutrient reference values and dietary modelling to assist in individualising advice[164] • Micronutrient levels are unpredictable during pregnancy and post BS[157] • Generally pregnancy results in a physiological decrease of 25–30% in serum albumin, haemoglobin, ferritin, parathyroid hormone (PTH), calcium, magnesium, selenium, zinc, and vitamins A, B_6, B_{12}, and D[157]
Nutrition	• Monitor food intake and provide ongoing nutritional counselling[162] • Maintain nutritional intake with small frequent meals

Screening	• There is limited high level evidence to inform optimal screening regimen for pregnant populations post BS[94]
	• Recommend screening to guide individualised supplementation and identify and treat nutritional deficiencies[94,157,162]
	  o Consider type of BS, previous history of deficiency, adherence to supplementation and dietary intake
	  o Use clinical judgement to individualise screening requirements
	  o If deficiencies identified, consult experienced multidisciplinary team and consider repeat screening following treatment (e.g. 2–4 weeks post treatment)[162]
	  o If re-testing clinically indicated within 3 months, include requirement for 'override retest' on pathology form
	• Refer to Appendix C: Suggested pregnancy nutrient and biochemical screening post bariatric surgery

10.4 Supplements if post bariatric surgery

Additional supplementation is recommended for all women post BS to prevent deficiencies.[94] Refer to Appendix D: Recommendations for routine micronutrient supplementation post bariatric surgery for further guidance.

Table 27. Post bariatric surgery preconception and pregnancy supplements

Supplement	Dosage
Multivitamin	• Two (2) adult multivitamin and multi-mineral tablets orally daily that provide iron, iodine, folic acid, thiamine, vitamin A, E, K, zinc, copper, selenium • Avoid exceeding upper limit of 10000 international units Vitamin A from retinol sources[165,166]
Folic acid	• Supplied by multivitamin +/- additional supplementation to achieve a total of 5 mg/day[94]
Iron	• Supplied by multivitamin +/- additional supplementation to achieve total of 45–80 mg/day[94,157] • Separate from calcium supplement and acid reducing medications
Calcium	• Supplied by multivitamin +/- additional supplementation to achieve 1200–1500 mg/day[94] • May be in a combined supplement with vitamin D
Vitamin D	• Regular dose dependent on serum levels[156] • If deficient, 3000 IU/day, titrated until serum levels of 25-OH Vitamin D are greater than or equal to 50 nmols/litre[156] • This may be in a combined supplement with calcium
Vitamin B_{12}	• Adjust dose to normalise serum levels[94] • Dose dependent on frequency and route of administration • Recommend sublingual, subcutaneous or intramuscular unless efficacy of oral supplemental has been demonstrated and prescribed by specialist • Folic acid supplements may mask underlying vitamin B_{12} deficiency and complications (e.g. subacute combined degeneration of the spinal cord)[101]

10.5 Pregnancy care additions if post bariatric surgery

Table 28. Pregnancy care additions post BS

Context	Considerations
Schedule of visits	• Develop a schedule of antenatal visits following individualised assessment with obstetric review[162] • This may be every 4–6 weeks depending on the woman's clinical history for weight and blood pressure monitoring, psychosocial support
History taking	• Document the date and type of bariatric procedure(s) and contact details of bariatric surgeon (where applicable) • Record symptoms relating to common conditions where there are acute nutritional deficiencies including[34] o Anaemia (iron, vitamin B_{12}) o Night blindness (vitamin A) o Urinary tract infections (vitamins A, D)
GDM screening	• Type of BS influences time and method[105] • Oral glucose tolerance test (OGTT) may be unsuitable due to risk of dumping syndrome[105] • Refer to Queensland Clinical Guideline: *Gestational diabetes mellitus*[105]
Acute abdominal pain	• If a woman post BS complains of abdominal pain during pregnancy, maintain a high index of suspicion[159] o The risk of complications (e.g. bowel obstruction, internal hernia) is increased by pregnancy o Common pregnancy discomforts (e.g. nausea, vomiting, increased intraabdominal pressure) may mask a surgical complication o Refer to Table 25. Bariatric procedures
Monitoring GWG	• Refer women to a dietitian for an individualised weight management plan and monitoring to avoid excessive GWG[163] • Some women post BS may not achieve sufficient GWG (associated with greater rates of SGA babies and preterm birth)[163] • Refer to Section 4.2.1. Monitoring gestational weight gain
Fetal surveillance	• Active fetal surveillance due to increased risk of stillbirth[91,167] • If EDD uncertain or menstrual cycles irregular, recommend early dating USS to assist with accurate fetal growth monitoring[157] • Monitor fetal growth (every 4–6 weeks from 24+0 weeks gestation[94,162]) o Monthly fundal height measurements[157] o Regular growth USS (growing curve, umbilical doppler, amniotic fluid index)[159] • Manage altered fetal movements as for general pregnancy[121] • If SGA is identified, use CFM in labour and notify paediatric team of impending birth of baby[157]

10.6 Postnatal care additions if post bariatric surgery

Table 29. Postnatal care additions post BS

Aspect	Clinical practice points
Postpartum	• Avoid administration of non-steroidal anti-inflammatory medications to reduce risk of gastric ulceration[157] • Consider long active reversible contraception rather than oral forms of contraception[94,162] • Continue postnatal nutritional and healthy lifestyle support by the dietitian to reduce the risk of postnatal weight retention and weight regain[168]
Breastfeeding	• Recommend breastfeeding as benefits outweigh any risk of micronutrient deficiency occurring as a result of BS[89,159] • Recommend ongoing monitoring of micronutrients and supplementation t as part of the discharge summary o Refer to Table 26. Nutrition and screening • Refer to Appendix D: Recommendations for routine micronutrient supplementation post bariatric surgery • Refer to Table 22. Breastfeeding

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Appendix A: Resource considerations

Aspect	Consideration
Service capability*#	• Industry facility development documents offer detailed guidance for the development of Hospital and Health Service management plans that outline the facility's response to the planned or unplanned admission of women with obesity • Consider the physical and service delivery capabilities of the facility in determining appropriate care, referral or transfer of women with obesity, including (but not limited to): o Facility design (e.g. width of access doors and pathways, turning circles for bariatric equipment, availability of suitable accommodation) o Availability of bariatric equipment with appropriate safe working loads (SWL) and widths o Workforce capabilities (e.g. access to a range and number of appropriately skilled health care professionals) o Capability to manage the potential risks and complications of obesity
Equipment#	• Bariatric equipment is required when weight exceeds 150 kgs • Bariatric bedrooms with ensuite in an acute hospital setting are designed for patients up to 250 kg • Super bariatric rooms for a patient up to 450 kg • Calibrated bariatric scales • Range of large sized blood pressure cuffs • Bariatric equipment that has sufficient SWL and appropriate size/width to accommodate patient girth is required (e.g. hoists, beds, shower chairs, lateral transfer devices, wheelchairs, bedside chairs, clinical waiting areas) • Bariatric equipment is clearly labelled with SWL
Workforce+	• Additional workforce may be required to care for women with obesity • Access to a range of allied health staff is recommended • Provide task specific training, including safe handling procedures and the use of bariatric equipment to all staff involved in the care of women with obesity

*Queensland Health. Clinical Services Capability Framework for Public and Licensed Private health Facilities v3.2. [Internet]. 2014 [cited 22/8/2020]. Available from: https://www.health.qld.gov.au

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Appendix B: Retrieval Services Queensland—transport weights

Mode of transport	Maximum weight (kg)	Comments
QAS road ambulance	160	Manual Stryker
	200	Power lifter Stryker
QAS bariatric ambulance	500	Two vehicles in Brisbane (Nathan &Chermside) One vehicle in Townsville
Fixed wing RFDS B200	180	Width restriction of 80cm for B200
RFDS B350/TAS	250	
Fixed wing Lifeflight	130 on stretcher 200 walking	Width restriction of 70cm for Challenger
Rotary Helo 139	160	No width restriction for aircraft door
Rotary Bell 412-RK and MK All other Bell 412	190 160	No width restriction for aircraft door

Source: Retrieval Services Queensland Communique

Appendix C: Suggested pregnancy nutrient and biochemical screening post bariatric surgery

Laboratory test		Pre conception	First trimester	2nd and 3rd trimester	Lactation (3 monthly)	Additional measurements/notes
Full blood count		✓	✓	✓	✓	
CHEM20*	Electrolytes Sodium, Potassium, Chloride, Creatinine, Chem Panel	✓	✓	✓		Order individual tests or if all required complete as part of a *CHEM20
	Albumin	✓	✓	✓	✓	
	Calcium	✓	✓	✓	✓	
	Magnesium	✓	✓	✓	✓	
	Phosphate	✓	✓	✓	✓	
	Liver function tests	✓	✓	✓	✓	
	Renal Panel	✓	✓	✓	✓	
Thyroid function—thyroid stimulating hormone (TSH)		✓	✓			At physicians' discretion Add on free thyroxine (FT4) if TSH abnormal
C Reactive Protein		✓	✓		✓	Baseline screen, then at physician's discretion. If systemic inflammation, risk of inaccurate plasma nutrient levels (e.g. vitamins A, B^6, C, D, selenium, zinc). Repeat after resolves
Iron studies		✓	✓	✓	✓	Includes ferritin and transferrin saturation
Vitamin D—25 OH		✓	✓	✓	✓	
Vitamin B_{12} (Cobalamin)		✓	✓	✓	✓	Folic acid supplementation may mask deficiency
Methylmalonic acid (MMA)		✓	✓	✓	✓	Sensitive index of vitamin B_{12} status At physicians' discretion
Folate (Serum)		✓	✓	✓	✓	
Zinc protoporphyrin		✓	✓	✓		
Vitamin A		✓	✓	✓	✓	
Retinol Binding Protein		✓	✓	✓	✓	
Vitamin B_1 (Thiamine diphosphate whole blood—THIAM)		✓				If repeated vomiting
Serum copper and ceruloplasmin			✓			Ceruloplasmin: copper carrying protein
Selenium			✓			
Vitamin E—Alpha-tocopherol (VITE)		If symptomatic anaemia or steatorrhea				
Vitamin B_6 (Pyridoxine)		If multiple or severe deficiencies				
Vitamin C		If deficiency suspected				

Source: Shawe J, et al. Pregnancy after bariatric surgery: Consensus recommendations for periconception, antenatal and postnatal care. Obesity Reviews 2019;20(11):1507-22; Ciangura C, et al. Clinical Practice Guidelines for Childbearing Female Candidates for Bariatric Surgery, Pregnancy, and Post-partum Management After Bariatric Surgery. Obesity surgery 2019;29(11):3722-34; Mechanick JI, et al. Clinical Practice Guidelines for the perioperative nutrition, metabolic and nonsurgical support of patients undergoing bariatric procedures – 2019 Update. Endocrine Practice 2019;25(Supplement 2):1-75; Pathology Queensland communique, January 2021. O'Kane M, Parretti HM, Pinkney J, Welbourn R, Hughes CA, Mok J, et al. British Obesity and Metabolic Surgery Society Guidelines on perioperative and postoperative biochemical monitoring and micronutrient replacement for patients undergoing bariatric surgery—2020 update. Obesity Reviews 2020;21(11):e13087.

Appendix D: Recommendations for routine micronutrient supplementation post bariatric surgery

Nutrient	Daily supplements after bariatric surgery		Daily upper limit in pregnancy and lactation		Notes
	Preconception	Pregnancy and lactation	14 to 18 years	19 to 50 years	
Folic acid	5 mg	5 mg	800 micrograms	1,000 micrograms	One month prior to pregnancy and up to 12 weeks gestation
Iodine	150 micrograms	150 micrograms	900 micrograms	1,100 micrograms	
Calcium	1,200–1,500 mg	1,200–1,500 mg	2,500 mg	2,500 mg	Adjusted for dietary calcium intake. May be combined in vitamin D supplement Avoid taking with iron
Iron	45–60 mg	50–80 mg	45 mg	45 mg	Take separate from calcium supplement and acid reducing medications
Vitamin A	5,000 IU	5,000 IU	9,300 IU	10,000 IU	Avoid exceeding an upper limit of 10,000 IU Vitamin A from retinol sources
Vitamin B_1	≥ 12mg	≥ 12mg	Not specified	Not specified	
Vitamin B_{12}	1 mg	1 mg	Not specified	Not specified	Dose dependent on frequency and route of administration
Vitamin D	≥ 1,000 IU	≥ 1,000 IU	3000 IU	3000 IU	Titrate dosage until serum levels of 25-hydroxyvitamin D >50nmol/L (30 ng/mL), accounting for cumulative content within other supplements
Vitamin E	15 mg	15 mg	300 mg/day (α-tocopherol equivs)	300 mg/day (α-tocopherol equivs)	Caution required in pregnancy
Vitamin K	90–120 micrograms	90–120 micrograms	Not specified	Not specified	Caution required in pregnancy
Copper	2 mg	2 mg	8 mg	10 mg	
Zinc	8–15 mg per 1 mg of copper	8–15 mg per 1 mg of copper	35 mg	40 mg	
Selenium	50 micrograms	50 micrograms	400 micrograms	400 micrograms	

Source: Shawe J,et al. Pregnancy after bariatric surgery: Consensus recommendations for periconception, antenatal and postnatal care. Obesity Reviews 2019;20(11):1507-22; Ciangura C, et al. Clinical Practice Guidelines for Childbearing Female Candidates for Bariatric Surgery, Pregnancy, and Post-partum Management After Bariatric Surgery. Obesity surgery 2019;29(11):3722-34; Mechanick JI, et al. Clinical Practice Guidelines for the perioperative nutrition, metabolic and nonsurgical support of patients undergoing bariatric procedures – 2019 Update. Endocrine Practice 2019;25(Supplement 2):1-75; NHMRC. Nutrient Reference Values for Australia and New Zealand. 2006; Australian Government. Clinical Practice Guidelines: Pregnancy Care. 2018.

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