

# CLINICAL PRACTICE **12** GUIDELINE



## The Management of High or Low **Body Mass Index** during Pregnancy 2019 Update



Association of  
Ontario **Midwives**  
*Delivering what matters.*

# CLINICAL PRACTICE GUIDELINE NO.12

## The Management of High or Low Body Mass Index during Pregnancy

### 2019 Update

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#### AUTHORS (2019)

Natalie Hope, MPH  
Tasha MacDonald, RM, MHSc

#### CONTRIBUTORS (2019)

##### Clinical Practice Guideline Committee

Megan Bowen, RM  
Elizabeth Cates, RM, PhD  
Shelley Clarke-Dolby, RM  
Meagan Furnivall, RM  
Genia Stephen (Chair), RM, IBCLC  
Dana Wilson-Li, RM

##### AOM Staff

Alexa Minichiello, MSc

##### Quality Insurance and Risk Management Committee

Remi Ejiwunmi, RM, MSc  
Abigail Corbin, RM  
Ali McCallum, RM  
Kim Coultier Holtz, RM

#### AUTHORS (2010)

Elissa Press, RM  
Suzannah Bennett, MHSc

#### CONTRIBUTORS (2010)

##### Clinical Practice Guideline Subcommittee

Elizabeth Darling (Chair), RM, MSc  
Cherylee Bourgeois, RM  
Corinne Hare, RM  
Jenni Huntly, RM  
Paula Salehi, RM  
Lynlee Spencer, RM  
Rhea Wilson, RM

##### Insurance and Risk Management Program Steering Committee

Remi Ejiwunmi (Chair), RM  
Abigail Corbin, RM  
Elana Johnston, RM  
Carolynn Prior van Fraassen, RM  
Lisa M. Weston, RM

##### AOM Staff

Cindy Hutchinson, MSc  
Tasha MacDonald, RM, MHSc  
Bobbi Soderstrom, RM

#### ACKNOWLEDGEMENTS

Kristen Dennis, RM

Ontario Ministry of Health and Long-Term Care  
Ryerson University Midwifery Education Program

The Association of Ontario Midwives respectfully acknowledges the financial support of the Ministry of Health and Long-Term Care in the development of this guideline.

The views expressed in this guideline are strictly those of the Association of Ontario Midwives. No official endorsement by the Ministry of Health and Long-Term Care is intended or should be inferred.

**The AOM is committed, through our statement on Gender Inclusivity and Human Rights, to reflect and include trans, genderqueer and intersex communities in all aspects of our work.**

This document contains references to sources that use gendered language to refer to populations of pregnant and birthing people. To represent these sources accurately, we may maintain gendered language.

We support research and knowledge translation that engages and reflects the entire childbearing population.

This guideline reflects information consistent with the best evidence available as of the date issued and is subject to change. The information in this guideline is not intended to dictate a course of action, but to inform clinical decision-making. Local standards may cause practices to diverge from the suggestions within this guideline. If practice groups develop protocols that depart from a guideline, it is advisable to document the rationale for the departure.

Midwives recognize that client expectations, preferences and interests are an essential component in clinical decision-making. Clients may choose a course of action that differs from the recommendations in this guideline, within the context of informed choice. When clients choose a course of action that diverges from a clinical practice guideline and/or practice group protocol, this should be well documented in their charts.

## Abbreviations

<b>BMI</b>	Body mass index (kg/m <sup>2</sup> )
<b>GDM</b>	Gestational diabetes mellitus
<b>GWG</b>	Gestational weight gain
<b>IOM</b>	Institute of Medicine
<b>IUGR</b>	Intrauterine growth restriction
<b>LBW</b>	Low birth weight
<b>LGA</b>	Large for gestational age
<b>NTD</b>	Neural tube defect
<b>SGA</b>	Small for gestational age

*This document replaces AOM Clinical Practice Guideline No. 12: The Management of Women with a Low or High Body Mass Index, published in 2010.*

## Statement of purpose

The goal of this clinical practice guideline (CPG) is to provide evidence-based recommendations that are consistent with the midwifery philosophy of care. Midwives are encouraged to use this CPG as a tool in clinical decision-making.

## Objectives

The objective of this CPG is to provide a critical review of the research literature on the management of

uncomplicated pregnancy in clients who have a pre-pregnancy body mass index (BMI) less than (<) 18.5 kg/m<sup>2</sup> or greater than or equal (≥) to 30 kg/m<sup>2</sup>.

## Topics of interest:

- Risk factors
- Prevention of poor outcomes
- Associated complications (antenatal/intrapartum, postpartum, fetal/neonatal)

## Outcomes of interest

### Critical:

- Neonatal mortality
- Maternal mortality

### Important:

- Potential harms associated with assessment or monitoring (pain and injury, separation of neonate and parent, stigmatization)

## Methods

In 2009, a search of the MEDLINE database (Medical Literature Analysis and Retrieval System Online) and the Cochrane Library from 1994 to 2009 was conducted using the following keywords: pregnancy, body mass index, BMI, weight gain, birth weight, postpartum weight, maternal health, preterm delivery, obesity, overweight. Vaginal birth after caesarean section (VBAC) was excluded and is addressed in the AOM's

CPG No. 14: Vaginal Birth after Previous Low-Segment Caesarean Section. Additional search terms were used to provide more detail on individual topics as they relate to pre-pregnancy BMI. Older studies were accessed in cases of commonly cited statistics or significant impact on clinical practice.

In 2019, this CPG was partially updated to include more recent literature published from 2010 to 2018. Based on consultation with the AOM's Clinical Practice Guideline Committee and a preliminary review of emerging research, specific sections of the guideline were selected for updating, and new systematic searches were performed to address these updates. Keywords were similar to those used in the original 2009 search. For each search, two screeners examined the search results and selected research that met specific inclusion criteria and fell within the scope of the original guideline. Changes in evidence have been made to the current edition of this guideline to reflect this new research.

Throughout the CPG, minor updates were made to statistics, and to include information from updated versions of previously referenced literature. Some sections were reorganized or combined to enhance clarity and readability.

Recommendations and summary statements in updated CPGs will now be marked with one of the following labels: [new 2019], [2019] or [2010]. These labels will appear at the end of recommendations or summary statements. See the table below (Key to Partial Update Labelling for Recommendations and Summary Statements) for an explanation of these labels.

Table 1 in the Appendix provides a detailed list of the updated recommendations and summary statements (i.e., [new 2019] statements) in this guideline, along with an explanation for these changes.

Key to partial update labelling for recommendations and summary statements	
Recommendation or summary statement label	Meaning of label
[new 2019]	<p>New recommendation or summary statement as of 2019</p> <ul style="list-style-type: none"> <li>Indicates that the recommendation or summary statement is new as of 2019. New evidence has prompted a change to or the addition of a recommendation or summary statement.</li> <li>An explanation of this change is provided in the Appendix.</li> </ul>
[2019]	<p>Reaffirmed recommendation or summary statement as of 2019</p> <ul style="list-style-type: none"> <li>Indicates that the recommendation or summary statement is consistent with new evidence as of 2019. New evidence has not prompted a change to the original statement.</li> <li>Small changes may have been made to the wording of this statement, but they do not affect the meaning.</li> </ul>
[2010]	<p>Unchanged recommendation or summary statement from 2010</p> <ul style="list-style-type: none"> <li>Indicates that the recommendation or summary statement has not been updated since 2010. New evidence has not been reviewed.</li> <li>Small changes may have been made to the wording of this statement, but they do not affect the meaning.</li> </ul>

## Review

The original 2010 CPG was reviewed using a modified version of the AGREE instrument (1) and the Values-based Approach to CPG Development (2), as well as consensus of the CPG Committee, the Insurance and Risk Management Program and the AOM Board of Directors. The original CPG critically appraised the available evidence based on the Canadian Task Force on Preventive Health Care. See the table below, Key to

evidence statements and grading of recommendations, from the Canadian Task Force on Preventive Health Care).

The updated (current) version of this CPG was reviewed by the CPG Subcommittee and the Insurance and Risk Management Program, and approved by the Board of Directors.

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

Source: (3)

\*The evidence in this guideline was originally appraised using the Canadian Task Force on Preventive Health Care (CTFPHC) key to evidence statements and grading of recommendations. (3) The CTFPHC has since adopted the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach to grading the quality of evidence and strength of recommendations. In light of the partial nature of this CPG update, we have not amended our appraisal protocol at this time.

## INTRODUCTION

This CPG reviews the body of research related to the antenatal, intrapartum and postpartum clinical management of clients with a BMI < 18.5 kg/m<sup>2</sup> or ≥ to 30 kg/m<sup>2</sup>. Available evidence on this topic is predominantly observational: primarily retrospective or prospective cohorts, chart reviews or large database analyses. Available randomized controlled trials (RCTs) were limited to nutritional or exercise-based interventions. While many of the studies reviewed lacked a high level of rigour and suffered from methodological limitations, they often demonstrated a significant association between high or low BMI and risk of pregnancy-related complications.

Most important, while this CPG deals with discrete categorizations, BMI is a continuous variable. Not all individuals with high or low BMI are at equal risk for developing pregnancy-related complications. Midwives are encouraged to use this guideline in the context of clinical judgment and midwifery values.

### Defining Body Mass Index

BMI is a numerical value that relates weight to height. It is calculated as follows:

Metric formula:	Non-metric formula:
BMI = (weight in kilograms) / (height in metres) <sup>2</sup>	BMI = (weight in pounds x 703) / (height in inches) <sup>2</sup>

While BMI is used as an indicator of adiposity, it is only an estimate and cannot measure adiposity directly. Other methods used to classify underweight and obesity categorizations include waist circumference, waist-to-hip ratio and specific body weights (e.g., > 90 kg for obesity). (4) Since 2009, the Institute of Medicine (IOM) has used the World Health Organization (WHO) categorization for BMI, a popular and widely accepted standard (Table 1), and it has developed recommendations for gestational weight gain (GWG) based on pre-pregnancy BMI (Table 2). Due to insufficient evidence, the IOM was unable to develop more specific recommendations for gestational weight gain (GWG) among those within obesity classes II and III. (5)

BMI is limited by its distinct categorization of

underweight, “normal” weight, overweight, and obesity (which is further separated into obesity classes; see Table 1). The sharp boundaries that separate BMI measurement categories from one another imply that one decimal point can change the recommended course of care for a client, and that healthy individuals can only exist within the “normal” BMI parameters. This contributes to harmful, society-wide stigmatization, particularly for individuals with a high-BMI, who are often perceived as not invested in their health. Furthermore, research demonstrates that BMI alone cannot be relied upon to dictate health status. An analysis of data from the National Health and Nutrition Examination Survey in the United States has found that approximately 29% of individuals who are categorized as obese according to BMI are cardiometabolically healthy, while 30% of “normal”-BMI individuals are cardiometabolically unhealthy. (6)

BMI is further limited in its ability to account for and describe body composition or the distribution of body fat. Accurate measurement of fat distribution is an important factor, as excess abdominal fat is associated with increased health risks compared with fat distribution elsewhere. (7) Furthermore, individuals who are naturally very lean or muscular, or those belonging to certain ethnic or racial groups, are particularly vulnerable to being inappropriately classified using the BMI parameters. (8,9) Midwives should apply BMI in practice with the understanding of its negligible consideration of socio-economic and ethnic differences between individuals.

Currently, BMI is the most widely used variable to examine the health impacts associated with very low or very high levels of adiposity. To make recommendations that are consistent with the available evidence base, this CPG refers specifically to BMI and the WHO’s BMI categorization. In an effort to reduce the connotation that a body with a “normal” BMI (18.5-24.9 kg/m<sup>2</sup>) equals a healthy body, this CPG will instead use the terminology “recommended BMI.”

Midwives should keep in mind the limitations of BMI categorization and weight gain recommendations when reading this CPG, and when recording BMI and establishing individualized management plans with their clients.

**Table 1: Obesity and underweight classes as defined by the World Health Organization (10)**

Obesity classes	BMI (kg/m <sup>2</sup> )	Underweight classes	BMI
Obesity Class I	30-34.9	Severe thinness	< 16
Obesity Class II	35-39.9	Moderate thinness	16-16.99
Obesity Class III	≥ 40	Mild thinness	17-18.49

**Table 2: Institute of Medicine recommendations for total and rate of weight gain during pregnancy, by pre-pregnancy BMI (5)**

Pre-pregnancy BMI	BMI (WHO) (kg/m <sup>2</sup> )	Total weight gain range (lbs)	Rate of weight gain* in second and third trimester (mean range in lbs/wk)
Underweight	< 18.5	28-40	1 (1-1.3)
Recommended weight	18.5-24.9	25-35	1 (0.8-1)
Overweight	25.0-29.9	15-25	0.6 (0.5-0.7)
Obese (all classes)	≥ 30.0	11-20	0.5 (0.4-0.6)

\* Calculations assume a 1.1-4.4 lb weight gain in the first trimester (Siga-Ritz, 1994, quoted in (5))

## RISK FACTORS FOR DEVELOPING HIGH OR LOW BMI

While genetic and biological factors play a role in the potential for having a high or low BMI, there are several other important contributing factors that differ between populations and among individuals. In particular, research demonstrates that the dramatic rise in obesity in North America can be linked to complex interactions between changes to the social, political and environmental structure over the past couple of decades. (11) For example, a limited investment in accessible infrastructure that promotes healthy practices, coupled with a societal view that idealizes particular bodies, has an influence on population health and behaviours. (11) These issues are heightened for marginalized individuals, demonstrating the importance of social determinants in contributing to health inequities.

The development of equitable policy and infrastructure is required to make significant changes in the rising rates of obesity at the population level. To support clients, midwives may become familiar with and build relationships with community programs and

agencies that directly address issues of poverty and marginalization.

## Disordered Eating

Eating disorders such as anorexia nervosa, bulimia and binge eating disproportionately affect people of childbearing age compared with the general population. These disorders are often associated with high or low BMI, and they increase the risks of morbidity and mortality. (12) A 2002 survey showed that 1.5% of Canadian women aged 15 to 24 years had an eating disorder (13), and that approximately 3% of women will be affected by an eating disorder in their lifetime. (14) A review of the literature focused on, and limited to, identifying and monitoring eating disorders and the most effective treatment interventions from a midwifery perspective is available (see [Eating Disorders and Women's Health: An Update](#) (15)). However, an in-depth discussion and critical appraisal of the evidence is beyond the scope of this guideline.

## RECOMMENDATION

1. Offer referral to the most appropriate and available mental health services for clients who have or are suspected of having an eating disorder. [III-C] [2010]

## PREVENTION OF POOR OUTCOMES

The information presented below is a summary of prevention or intervention strategies that reduce the risks in pregnancy due to an elevated or decreased BMI. Ultimately, midwives should discuss individualized care plans with clients, tailored to their specific needs, while accounting for individual, social and environmental realities that may affect their clients' ability to achieve and maintain their goals.

### Optimizing Gestational Weight Gain

A 2017 systematic review and meta-analysis of 23 cohort studies and 1 309 136 participants found that individuals who gain weight within the recommended ranges outlined in Table 2 have better pregnancy outcomes than those who do not. This suggests that complications related to obesity or underweight can be reduced or prevented through the careful management of weight gain during pregnancy. Compared with those who gained weight within the guidelines, regardless of BMI category pre-pregnancy, GWG below the guidelines was associated with an increased risk for small for gestational age (SGA) (OR 1.53 95% CI 1.44-1.64) and preterm birth (OR 1.70 95% CI 1.32-2.20), with the greatest risk among participants who were underweight pre-pregnancy. In contrast, gaining weight above the guidelines, regardless of BMI category pre-pregnancy, increases the risk for large for gestational age (LGA) (> 90th percentile; OR 1.85 95% CI 1.76-1.95), macrosomia (> 4500 g; OR 1.95 95% CI 1.79-2.11) and caesarean delivery (OR 1.30 95% CI 1.25-1.35). (16) Although the IOM recommendations may provide a general reference for GWG, this research is largely based on observational data. There is also insufficient evidence to report on other adverse outcomes, including preeclampsia and gestational diabetes, which are more common in pregnant people with a high BMI. Until more evidence is available, clients should not rely on specific weight gain targets, but rather focus on optimizing GWG by maintaining a healthy diet and physical activity.

Midwives can mitigate and support BMI-related health complications by engaging in thoughtful, informative conversations with clients about developing and maintaining healthy practices. They can also support clients by connecting them with community health services where appropriate. By using a respectful, informed approach, midwives can identify and contribute to clients' efforts to make positive behavioural changes while remaining mindful that the causes of high or low BMI often extend beyond an individual's control. Midwives should reflect on their own beliefs about individuals with a high- or low-BMI, and they should take care not to perpetuate harmful assumptions about clients' health, eating habits, lifestyle choices or physical ability.

## RECOMMENDATION

2. Discuss the benefits of optimizing GWG in pregnancy for clients with a BMI < 18.5 kg/m<sup>2</sup> or ≥ 30 kg/m<sup>2</sup>. [II-2-B] [new 2019]

## SUMMARY STATEMENT

For clients with a BMI ≥ 30 kg/m<sup>2</sup>, consider discussing the benefits of achieving a recommended BMI prior to the next conception. [new 2019]

### Charting Weight Gain on Antenatal Records

The IOM recommends documenting preconception BMI as well as subsequent weight gain throughout pregnancy and sharing these results with clients so they are aware of their progress toward their weight gain goals. (5) Midwives who choose to chart weight gain may be able to help their clients address excessive or inadequate GWG during pregnancy. Research from a longitudinal birth cohort study demonstrates that participants who inaccurately estimated their pre-pregnancy body weight were more likely to gain excessive gestational weight, with the greatest likelihood of excessive gain among individuals who were overweight/obese and who underestimated their true pre-pregnancy weight (OR 7.6 95% CI 3.4-17.0). (17)

When discussing weight charting and management, in particular with high-BMI individuals, research shows that careful wording is important to developing a healthy, respectful relationship between client and clinician. Midwives should avoid such negative terms

as “fat,” “fatness,” “large size,” “heaviness” and “obesity” with high-BMI clients, as these may be interpreted as offensive or distressing and could prevent further discussion on this topic. (18) Rather, “weight,” “excess weight” and “BMI” are more likely to be interpreted as neutral or desirable. (18) Midwives should encourage open discussion and questioning, and they should respect the wishes of clients who have specific preferences about the language they prefer their provider to use. Clients should also be given the opportunity to discuss any challenges with weight management, and midwives should respond with appropriate assistance.

In some cases, midwives or clients may choose not to routinely measure or document weight gain. Midwives can offer to have an informed choice discussion about the benefits and risks of charting weight gain for clients with a BMI < 18.5 kg/m<sup>2</sup> or ≥ 30 kg/m<sup>2</sup>.

The risks and benefits of charting GWG for clients in the recommended BMI category are outside the scope of this guideline.

## RECOMMENDATION

3. Midwives may consider calculating and documenting pre-pregnancy BMI on the first antenatal record. If pre-pregnancy weight is unknown, midwives may consider documenting BMI at the intake visit. [III-B] [new 2019]

## Nutrition and Physical Activity in Pregnancy

Clients may be offered services for counselling related to nutrition and physical activity to help them achieve their GWG goals. These behavioural interventions can improve long-term health, optimize infant birth weight and help reduce childhood obesity. (5) However, there is a lack of good evidence to guide clinical practice on how to support clients to meet their weight gain goals during pregnancy, specifically which interventions are the most effective. (5) Unfortunately, the ideal format and intensity of methods to limit GWG for high-BMI pregnant people has not been established. (5, 19-21)

A 2018 systematic review and meta-analysis on attenuating pregnancy weight gain discovered that dietary interventions have demonstrated effectiveness in reducing excessive weight gain during pregnancy.

However, the researchers could not describe the “optimal” pregnancy diet based on their results. (22) This is consistent with research that failed to find significant associations between particular foods and excessive GWG or inadequate weight gain across all participants. (23) Although most clients will likely benefit from the general dietary advice in Canada’s Food Guide, midwives may also refer clients to nutritionists for specific, individualized direction. A systematic review on this topic suggests that social support, knowledge about healthy foods, the skills to prepare meals and the ability to eat at home enabled healthy habits during pregnancy. Cravings, nausea and schedule demands have been observed as barriers to healthy eating. (24) Therefore, the appropriate diet for each client should take into account individual preferences and experiences during pregnancy, time and budget constraints, cultural practices, and food knowledge and preparation skills. (22)

According to the 2018 Canadian Guideline for Physical Activity throughout Pregnancy, developed by the Society of Obstetricians and Gynaecologists (SOGC), exercise during pregnancy is associated with improved cardiovascular function and a reduction of the occurrence of excess weight gain. (19,25) The 2018 SOGC guideline recommends that pregnant people should try to do physical activity at least three days a week, and they should incorporate a variety of exercises, including aerobic exercise, resistance training, gentle stretching and pelvic floor training. (26) Low-risk, previously active individuals can continue their exercise routines. (26) Research demonstrates that a sedentary lifestyle during pregnancy may be associated with adverse outcomes, including loss of muscular and cardiovascular fitness, excessive GWG, higher risk of gestational diabetes or hypertensive disorders of pregnancy, varicose veins and deep vein thrombosis, a higher incidence of complaints for conditions such as dyspnea or lower back pain, and poor psychological adjustment to the physical changes of pregnancy. (26)

Despite the important benefits of physical activity during pregnancy, midwives should be aware that vigorous activity (30 minutes/day) is a significant predictor of inadequate weight gain during pregnancy for clients with a low-BMI (OR 0.76, 95% CI 0.60-0.96, p = 0.005) (27).

Most available research on weight management describes interventions designed for the general population, but the best practices identified are transferable to encourage healthy behaviour changes in pregnant people. Research demonstrates that participants achieve greater improvements in health outcomes when the weight management approach is multifaceted. (28) Thus, an individualized plan that incorporates both diet and physical activity while taking into account individual experiences and knowledge, social support, resource constraints, medical contraindications and referrals to appropriate health care providers will more likely result in optimal GWG.

## RECOMMENDATIONS

4. All clients should be counselled about the importance of good nutrition and physical activity during pregnancy. Canada’s Food Guide is an example of a nutrition guideline that includes dietary advice for individuals who are pregnant or nursing. [II-2-B] [2010]
5. For clients with a BMI < 18.5 kg/m<sup>2</sup> or ≥ 30 kg/m<sup>2</sup>, midwives should identify and offer referrals to the most appropriate health care providers available in clients’ communities to discuss nutrition, healthy eating and other good habits. [II-2-B] [2010]

## HIGH BMI

The worldwide prevalence of obesity has risen dramatically in the past few decades. In 2017, self-reported weight and height data from Statistics Canada observed an obesity rate (BMI ≥ 30 kg/m<sup>2</sup>) of 26.9% for Canadians aged 18 and over. (3) More specifically, the percentage of people aged 18 to 34 who were considered obese increased from 17.3% in 2015 to 19.7% in 2017. (30) As the prevalence of obesity increases,

midwives will care for more individuals with a high BMI. Midwives should possess the knowledge and skills to manage the clinical outcomes associated with a high BMI, and be aware that clients with a high BMI often experience stigmatization and weight bias from medical professionals. Thus, midwives should make every effort to adapt their care to promote a helpful, healing environment and support a normal birth experience. Such accommodations should include the use of appropriately sized medical equipment, barrier-free washrooms in midwifery clinics, and any necessary consultation or collaboration with other medical and health care professionals. (31)

## ANTENATAL AND INTRAPARTUM COMPLICATIONS: HIGH BMI

High BMI is associated with possible complications throughout pregnancy, as described in Tables 4a, 4b, 4c, 5a, 5b, and 5c. The values listed are an accumulation of the available research contained in meta-analyses and/or systematic reviews from 2010 to 2018. The reported ORs and RRs are subject to error, as researchers often fail to adjust for the limitations of BMI, GWG, underlying comorbidities and social/environmental characteristics across studies. This raises the likelihood of confounding and potentially overestimating the independent risks of high BMI during pregnancy. Studies with high-BMI populations may also use different sample selection and analysis techniques that may not be generalizable for Ontario. The following research into risk factors should therefore be interpreted with caution.

**Table 3: Strength of OR/RR values**

OR/RR	Strength of risk factor
≤ 2.99	Mild
3.00-5.99	Moderate
≥ 6.00	Strong

**Table 4a: Antenatal/intrapartum complications: BMI ≥ 30 kg/m<sup>2</sup> compared with a BMI of 18.5-24.9 kg/m<sup>2</sup>**

Complication(s)	OR/OR range
<b>Mild risk factor</b>	
Miscarriage	1.26-1.31 (33,34)
Antenatal anxiety	1.41 (34)
Antenatal depression	1.43 (34)
Caesarean section	2.01-2.05 (34,35)
<b>Moderate risk factor</b>	
Preeclampsia	3.15 (36)
Gestational diabetes	3.34-3.76 (34)

**Table 5a: Antenatal/intrapartum complications: BMI ≥ 40 kg/m<sup>2</sup> compared with a BMI of 18.5-24.9 kg/m<sup>2</sup>**

Complication(s)	OR/RR range
<b>Moderate risk factor</b>	
Induction of labour	3.66 (35,37)
Preeclampsia	3.80 (37)
Gestational diabetes	5.20 (37)

Research consistently demonstrates that the risk for antepartum and intrapartum health complications increases as BMI increases. In particular, numerous systematic reviews and observational studies have demonstrated a step-wise increase in the risks for hypertensive conditions and preeclampsia (5,38–49) and gestational diabetes mellitus (GDM). (34,37,50) National guidelines on obesity and pregnancy have acknowledged these increased risks, and they recommend that clients be well informed and monitored closely, particularly if they have other risk factors. (51)

### Preeclampsia and Hypertension

A recent meta-analysis of approximately 1.4 million people found a moderately increased risk of preeclampsia in pregnant individuals with a BMI ≥ 30 kg/m<sup>2</sup> compared with individuals within the recommended BMI range (OR 3.15, 95% CI 2.96-3.35). (36) A separate meta-analysis found that the risk of preeclampsia for those with a BMI ≥ 40 kg/m<sup>2</sup> was moderate (OR 3.80, 95% CI 3.07-4.68), even when potentially confounding risk factors were controlled for. (37)

When assessing and monitoring clients' blood pressure, it is critical that midwives utilize the appropriately sized blood pressure cuff. Blood pressure in high-BMI individuals may be overestimated when cuff sizes are too small, leading to over-diagnosis of hypertension. (52)

The use of low-dose acetylsalicylic acid (ASA) (optimal dosage is unknown but may be between 60 and 150 g) (53) during pregnancy has been shown to provide some preventive benefit for multiple adverse pregnancy outcomes, including preeclampsia and hypertension. (54) Some guideline groups have recommended low-dose ASA for clients with a high-BMI, but only for those with at least one other moderate risk factor for preeclampsia. (51,54) Other moderate risk factors include age > 40 years, family history of preeclampsia and current multiple pregnancy. (51) To learn more about the management of preeclampsia with low-dose ASA, and for further discussion on the relationship between hypertensive disorders during pregnancy and high BMI, refer to the AOM's [CPG No. 15: Hypertensive Disorders of Pregnancy](#). (55)

## RECOMMENDATION

6. Obtain and document a baseline blood pressure, using the appropriate cuff size for clients with a BMI  $\geq 30$  kg/m<sup>2</sup>. [II-2-B] [2019]

## Gestational Diabetes

The link between GDM and high BMI was demonstrated in a recent overview of systematic reviews, in which a moderately increased risk of developing GDM was found in two meta-analyses among those with a BMI  $\geq 30$  kg/m<sup>2</sup>, compared with individuals within the recommended BMI range (see Table 7a). (34) Despite the known association between obesity and GDM, an updated Cochrane review reported insufficient evidence to support the use of GDM screening based on risk factors (e.g., BMI  $\geq 30$  kg/m<sup>2</sup>) over universal screening. (56) This is consistent with the AOM's 2016 literature review on GDM, which concludes that there remains significant uncertainty and disagreement as to whether all clients should be screened for GDM, or only select clients with specific risk factors. (57) Although the AOM does not outline a specific screening approach, it provides an overview of the current evidence and recommendations from several other guideline development groups, all of which identify BMI  $\geq 30$  kg/m<sup>2</sup> as a risk factor for GDM. (57)

Research suggests that the risks for adverse perinatal outcomes associated with GDM are likely due to hyperglycemia and the pregnant person's coexisting environment, rather than high BMI, and that well-controlled glucose levels of the pregnant person appear to decrease the occurrence of adverse outcomes. (57) Midwives may refer to the AOM's literature review on GDM for more information on this topic.

## RECOMMENDATION

7. For clients with a BMI  $\geq 30$  kg/m<sup>2</sup>, midwives should discuss the higher risk of preeclampsia and GDM, along with the risks and benefits of GDM screening. [II-2-A] [new 2019]

## Thromboembolism

Although thromboembolism is reported by other clinical guideline development groups as a serious health risk during high-BMI pregnancies, there is

limited systematic research on this association. While a 2016 meta-analysis determined that there is a mild risk for postpartum venous thromboembolism among those with a BMI  $\geq 30$  kg/m<sup>2</sup> (OR 2.5, 95% CI 1.8-3.5) (see Table 4b) and a moderate risk among individuals with a BMI  $\geq 40$  kg/m<sup>2</sup> (OR 4.6, 95% CI 3.0-7.2) (see Table 5b) (58), a 2014 systematic review identified three studies with varied results on the risk of antepartum venous thromboembolism in the BMI  $\geq 30$  kg/m<sup>2</sup> population (59). Of these three studies, one found a strong risk (OR 9.7) for antepartum venous thromboembolism among individuals with a BMI  $\geq 30$  kg/m<sup>2</sup>, while the other two studies found no significant risk for those with a BMI  $\geq 30$  kg/m<sup>2</sup>. (59) Despite this variation, clinical practice guidelines on obesity and pregnancy – including those developed by SOGC 2010 and the American College of Obstetricians and Gynecologists (ACOG) 2015 – acknowledge the increased risk of venous thromboembolism throughout and after pregnancy, particularly if other risk factors are present. (51) The Royal College of Obstetricians and Gynecologists (RCOG) reports several risk factors for venous thromboembolism that should be accounted for when considering thromboprophylaxis, including BMI  $\geq 30$  kg/m<sup>2</sup>, planned caesarean section, age  $> 35$  years and medical comorbidities. (60) Moreover, the RCOG recommends offering postnatal thromboprophylaxis to all pregnant people with a BMI  $\geq 40$  kg/m<sup>2</sup>, regardless of their mode of delivery. (61) However, given the paucity of high-quality evidence on when and in what form thromboprophylaxis should be considered with high-BMI clients (62), the necessity of this treatment should be individually assessed, taking into account the full clinical picture. This is consistent with current guidance from the SOGC. (62)

## RECOMMENDATION

8. Midwives should individually evaluate each client's need for thromboprophylaxis. They may consider suggesting an antepartum consultation with a physician for clients with a BMI  $\geq 40$  kg/m<sup>2</sup>, or for clients with a BMI  $\geq 30$  kg/m<sup>2</sup> and other known risk factors for thromboembolism. [III-C] [new 2019]

## Fetal Monitoring

Excessive abdominal adiposity may affect midwives' ability to monitor fetal development during pregnancy

through ultrasound and abdominal palpation. (45) A review of 11 019 pregnancies found that the rate of suboptimal visualization of fetal cardiac structures through ultrasound increased 49.8% and craniofacial structures increased 31% in individuals with a BMI  $\geq$  30 kg/m<sup>2</sup> compared with those having a BMI < 30 kg/m<sup>2</sup>. (63) Midwives may also find abdominal palpation and symphysis-fundal measurements more difficult to interpret in clients with high BMI, as growth charts may not be accurate for this group. (64)

Although fetal heart rate (FHR) monitoring with a Pinard stethoscope or a Doppler ultrasound may be challenging with high-BMI clients, there is no evidence to support the necessity of continuous FHR monitoring during labour on the basis of high BMI alone. (65) Research from 2014 reported no detrimental

effect on the accuracy or reliability of abdominal fetal electrocardiograms during labour for pregnant participants with high BMI; therefore, midwives may consider this method when fetal heart rate is difficult to detect. (66)

## RECOMMENDATIONS

9. For second-trimester ultrasounds indicating suboptimal visualization, discuss limitations of ultrasound with client and consider offering repeat ultrasound if needed. [III-B] [2019]
10. When abdominal palpation proves challenging and/or symphysis-fundal measurements are unreliable, midwives should discuss the risks and benefits of a third-trimester ultrasound and offer as necessary to address any information gaps. [II-2-B] [2019]

## Bariatric Surgery and Pregnancy

Bariatric surgery is performed on people who have a very high BMI. Weight loss is usually achieved with a medical device (gastric banding) or gastric bypass. The majority of bariatric surgery patients are people of childbearing age. (124) In 2007, 1313 surgeries were performed in Canada, with 6783 patients on waiting lists. (125) The most popular surgeries are laparoscopic adjustable gastric band (LAGB) and Roux-en-Y gastric bypass (RYGB), which reduce the size of the stomach. Surgeries that bypass all or part of the small intestine result in food restriction and malabsorption and increase the risk of nutritional deficiencies. (126,127) Evidence on pregnancy outcomes after bariatric surgery is growing but limited, and includes case reports, case-control and cohort studies.

For pregnant individuals who have had gastric bypass, folate, iron and B12 malabsorption and deficiencies may occur. (128) Close monitoring may be particularly important with respect to their nutritional status. (127) GDM testing may require alternate methods, as use of standard glucose solutions can cause rapid gastric emptying. Sugar consumption may cause cramping, diarrhea, hypotension, nausea or tachycardia. Midwives may consider measuring fasting serum glucose periodically, or a referral to a physician for a three-day continuous glucose sensor. While these methods do not supersede traditional oral glucose screening, they might be better tolerated by those who have had bariatric surgery. (128) People whose weight has stabilized and who maintain good nutritional balance throughout their pregnancies may experience less morbidity and mortality than they would have with obesity. Small studies have shown that individuals who have had bariatric surgery have lower risks of preeclampsia, LGA infants, GDM, fetal macrosomia and hypertension disorders. (126,129) In a retrospective study of 808 participants who had surgery before and after delivery, the surgery was independently associated with a reduced risk of diabetes, hypertensive disorders and fetal macrosomia. (130)

Individuals who have had bariatric surgery may be at increased risk of abdominal hernias, gallstones, changes in metabolism (including metabolism of medications), organ displacement as the uterus enlarges, and possible increased risk of intrauterine growth restriction (IUGR). (127) Clients should be encouraged to breast- or chest-feed postpartum. It is important to note, however, that there are limited case reports of nutritional deficiency in the infants of parents who have had gastric bypass, even if the parent is asymptomatic. (131) More research is needed to compare pregnancy complications by the type of surgery. (132)

## SUMMARY STATEMENT

Midwives may consider offering continuous fetal heart rate monitoring to clients with a high-BMI in whom fetal heart rate is difficult to detect using intermittent auscultation. [new 2019]

## Anesthesia

There are reports in the literature of increased difficulties with placing epidural or spinal catheters and with intubation among individuals with high BMI. (39,67,68) As well, the risk of dural puncture may be greater for individuals with high BMI. However, BMI is a poor predictor of distance to the epidural space, and standard

epidural needles can generally be used. (68) If pain relief is requested or necessary for clients with high BMI, it would be ideal to discuss potential complications with them prior to labour.

## RECOMMENDATION

**11.** Midwives should consider offering an antepartum anesthesiology consultation for clients who plan to have an epidural, or for those who wish to have a more detailed discussion about potential anesthesia complications related to BMI  $\geq 30$  kg/m<sup>2</sup>. [III-C] [2019]

## POSTPARTUM CONSIDERATIONS: HIGH BMI

**Table 4b: Postpartum complications: BMI  $\geq 30$  kg/m<sup>2</sup> compared with a BMI of 18.5-24.9 kg/m<sup>2</sup>**

Complication(s)	OR/OR range
<b>Mild risk factor</b>	
Postpartum depression	1.30 (34)
Surgical or caesarean wound infection	1.00-2.10 (34)
Postpartum venous thromboembolism	2.5 (58)
Postpartum hemorrhage	1.2* (69)
<b>Mild to moderate risk factor</b>	
Not initiating breast or chest feeding	1.19-3.65 (34)

**Table 5b: Postpartum complications: BMI  $\geq 40$  kg/m<sup>2</sup> compared with a BMI of 18.5-24.9 kg/m<sup>2</sup>**

Complication(s)	OR/RR
<b>Mild risk factor</b>	
Postpartum hemorrhage	1.43* (69)
<b>Moderate risk factor</b>	
Postpartum venous thromboembolism	4.6 (58)
Surgical or caesarean wound infection	5.94 (37)

\*OR value was obtained from a meta-analysis published in 2008. No applicable meta-analyses or systematic reviews that examined risk of postpartum hemorrhage were published in 2010-2018.

## Weight Retention and Mental Health

Compared with individuals within the recommended BMI range, individuals with obesity are more likely to experience weight retention post-pregnancy. (5,70-71) Research suggests that excessive weight gain during and

after pregnancy may be linked to postpartum depression. (34) To better understand this association, qualitative studies speculate that stigma and judgment associated with obesity, criticisms from health care providers and lack of available social supports may all contribute to

the increased risk of poor mental health for postpartum parents with high BMI. (73) However, these findings cannot be used to determine a direction of association, since those with poor mental health may also struggle with weight management. (34)

### Caesarean Wound Infection

There appears to be a moderate risk for surgical or caesarean wound infection among postpartum parents with a BMI  $\geq 40$  kg/m<sup>2</sup>, even when other risk factors are controlled for (AdjRR 5.94, 95% CI 2.98-11.77). (37) However, research on the risk for surgical or caesarean wound infection among those with a BMI  $\geq 30$  kg/m<sup>2</sup> is inconclusive, with some studies reporting a mild risk and others reporting none. (34) Research in this area comes to little consensus on the factors that contribute to surgical site infection, but factors may include length of surgery, use of prophylactic antibiotics, skin closure technique and comorbidities such as diabetes. (74) Moreover, inconclusive results among those with a BMI  $\geq 30$  kg/m<sup>2</sup> may be related to limitations of the BMI value, which does not provide an exact measure of excess fat or fat distribution. Indeed, not all individuals with a BMI  $\geq 30$  kg/m<sup>2</sup> have high levels of excess fat around their abdomen, but those with excess abdominal fat may be more likely to experience friction, sweat and bacteria buildup around the surgical site, thus increasing their risk for infection.

### Lactation

Those with a BMI  $\geq 30$  kg/m<sup>2</sup> are less likely to initiate human milk feeding and they have been shown to have a shorter duration of nursing (both exclusive and any), regardless of GWG. (34,75–79) The precise reason for this association is unclear, but it may be due to a decreased prolactin response to suckling (which would in turn reduce milk production), a delay in lactogenesis, or large breasts that may increase the difficulty of latching. (34,75)

Midwives can play a vital role in encouraging chest/ breastfeeding by discussing the numerous benefits for both parent and newborn and by providing lactation support. Midwives should also address any concerns of clients who choose not to nurse.

### RECOMMENDATION

- Midwives are well suited to help clients with a BMI  $\geq 30$  kg/m<sup>2</sup> who may experience difficulties with nursing to establish good positioning, latch and milk supply. When appropriate, midwives should refer clients to a lactation consultant or other specialist for lactation support. [III-B] [2019]

## FETAL AND NEONATAL COMPLICATIONS: HIGH BMI

Table 4c: Fetal and neonatal complications: BMI $\geq 30$ kg/m <sup>2</sup> compared with recommended BMI 18.5-24.9 kg/m <sup>2</sup>	
Complication(s)	OR/OR range
<b>Negligible to mild risk factor</b>	
Preterm birth (< 37 weeks)	1.05-1.23 (34,80)
<b>Mild risk factor</b>	
Congenital heart defects	1.17 (81)
Orofacial clefts	1.18 (82)
Infant death ( $\leq$ 1 year old)	1.42 (83)
Preterm birth (> 32 weeks)	1.59 (34)
Stillbirth	1.63-2.07 (34,80)
Neural tube defects	1.68-1.87 (34,84)
NICU admission	1.91 (80)
Large for gestational age (> 90th percentile)	1.88-2.42 (80,85,86)

Macrosomia (> 4000 g)	2.00-2.92 (80,85,86)
<b>Mild to moderate risk factor</b>	
Macrosomia (> 4500 g)	2.77-3.23 (85,86)
<b>Moderate risk factor</b>	
Childhood obesity	3.06 (86)

**Table 5c: Fetal and neonatal complications: BMI ≥ 40 kg/m<sup>2</sup> compared with recommended BMI 18.5-24.9 kg/m<sup>2</sup>**

Complication(s)	OR/RR
<b>Mild risk factor</b>	
Congenital birth defects	1.46 (37)
Preterm birth (< 37 weeks)	1.50 (34)
Stillbirth	2.19 (34)
Preterm birth (< 32 weeks)	2.27 (34)
<b>Moderate risk factor</b>	
Large for gestational age (> 90th percentile)	3.14 (37)

### Large for Gestational Age and Macrosomia

LGA fetuses (> 90th percentile) and fetal macrosomia (> 4000 g or > 4500 g) are more common in pregnancies with individuals who have a BMI ≥ 30 kg/m<sup>2</sup> and a BMI ≥ 40 kg/m<sup>2</sup> (see Table 4c and 5c). (40,44,45,87–90) Macrosomia is associated with an increased risk of shoulder dystocia, birth injury and perinatal death, as well as an increased risk of caesarean delivery. (63) It is important to note that after adjusting for fetal macrosomia, obesity during pregnancy is not an independent risk factor for shoulder dystocia. (39,91,92)

### SUMMARY STATEMENT

Clients with a BMI ≥ 30 kg/m<sup>2</sup> would benefit from informed choice discussions about the increased risk for fetal macrosomia and LGA, and the associated complications this may have during labour and birth. [new 2019]

### Neural Tube Defects and Folate Intake

Since the introduction of mandatory folic acid fortification of flour in 1997, there has been a dramatic 46% decrease in neural tube defects (NTDs) in Canada. (93) However, evidence indicates that the risk for NTDs remains especially elevated among individuals with high BMI, even since fortification. (94) A 2016 systematic

review and meta-analysis of 22 studies found a pooled OR for NTDs of 1.68 (95% CI 1.51-1.87, p < 0.00001) among those with pre-pregnancy BMI ≥ 30 kg/m<sup>2</sup> compared with those within the recommended BMI range. (84)

The reasons that individuals with high BMI may be at increased risk for NTDs are not entirely clear. Researchers have suggested that lower fruit and vegetable consumption, overall increased energy intake, higher metabolic demands or a high-glycemic index diet may be more prevalent in this population, decreasing folate availability thereby increasing the risk of NTDs. (95) Recent pharmacokinetic research further elucidates the relationship between high BMI and NTDs. Evidence from one 2013 study demonstrated that women of childbearing age with high BMI versus recommended BMI had different pharmacokinetic responses to an equivalent dosage of folic acid administered after a period of fasting. (96) In this study, the maximum serum folate concentration was 34% lower in the high-BMI group compared with recommended BMI individuals, even though the rate of dietary folate absorption between the groups was the same, indicating that excess body fat may influence folate circulation into tissue. (96) This finding is consistent with a 2017 systematic review, which found that the negative association between

## Folic Acid and Folate

Folic acid is a stable synthetic form of folate that is routinely added to supplements, drugs and fortified foods. (133) Once ingested, folic acid must undergo several metabolic steps to be converted into a biologically active tetrahydrofolate (THF) form. (133) Supplementation of folic acid during pregnancy is widely considered safe, and doses up to 5.0 mg have not been known to have adverse effects on pregnant people or fetuses. (134) Some researchers have raised concerns about potential adverse effects of excessive folic acid consumption, but these results are largely inconsistent, and further research with high-BMI individuals is required. (135)

Folate may also be increased through diet, in the form of 5-methyltetrahydrofolate (5-MTHF), which naturally occurs in food and is the most abundant derivative of folate found in the blood. (136) Because 5-MTHF is already biologically active, it requires no further metabolism to be absorbed within the body. (133)

Although most individuals can properly convert folic acid into its active form, this process is disrupted for those with a MTHFR (methylenetetrahydrofolate reductase) genetic mutation. (136) A body of research studying participants within the recommended BMI finds that supplementation with 5-MTHF is equally or more effective when compared with folic acid for increasing folate concentration in the blood in individuals with and without the MTHFR mutation. (136–139) Supplemental forms of 5-MTHF may be safely used as an alternative to folic acid for people within the recommended BMI. However, this research has yet to be replicated among individuals with a high BMI, and thus the efficacy of 5-MTHF for this specific population is currently unknown.

serum folate concentration and BMI remained even after adjustment for folate intake. (97)

This evidence suggests that a proportion of the NTD risk associated with pre-pregnancy high-BMI status may be explained by a decreased concentration of serum folate in the blood. (96-98) Since nutrients for the developing embryo are derived from the pregnant person's serum and folate requirements are higher during pregnancy, limited folate availability may affect the development of the fetus. Individuals with high BMI may require a higher dosage of supplemental or dietary folate to achieve a serum folate concentration that provides protection against NTDs. (99)

One case-control study found that individuals within the recommended BMI range (18.5-24.9 kg/m<sup>2</sup>) who supplemented daily with 0.4 mg of folic acid in the periconceptional period (three months before conception and three months after conception), demonstrated a significantly reduced risk for NTDs in comparison to recommended BMI individuals who did not supplement with folic acid (aOR 0.21, 95% CI 0.11-0.40). The risk for NTDs was also reduced among high-BMI individuals who were supplemented with folic acid, but this reduction was not as large when compared with that of recommended BMI individuals (aOR 0.65, 95%

CI 0.22-0.89). Considering that high-BMI individuals exhibit lower serum folate levels than recommended BMI individuals, and that the metabolism of folate may differ with adiposity, it is possible that high-BMI participants in this sample were not administered adequate levels of folic acid to ensure a protective effect against NTDs. (99)

Research that has adjusted for the consumption of folate based on BMI has found reductions in NTDs comparable to those of recommended BMI individuals. (95,96,99) Evidence from one case-control study in 2013 assessed the impact of higher intake of dietary folate in individuals with high BMI. In the study, overweight (BMI 25.0-29.9 kg/m<sup>2</sup>) and obese (BMI ≥ 30 kg/m<sup>2</sup>) participants who consumed 0.45-3.12 mg of dietary folate daily during the periconceptional period significantly reduced their risk of NTD-affected pregnancies (aOR 0.28 95% CI 0.10-0.76). (95) This research suggests that the NTD risk in individuals with high BMI may be attenuated to some degree with a folate-rich diet. Foods rich in naturally occurring folate include asparagus, broccoli, spinach, lentils, beans and liver. (100)

Currently, there is no clear consensus in available literature and among clinical guideline groups on the specific recommended dosage of folate or folic acid for

pregnant clients with a BMI  $\geq 30$  kg/m<sup>2</sup>. Consistent with the above literature, the RCOG 2010 and the Royal Australian and New Zealand College of Obstetricians and Gynecologists (RANZCOG) 2013 recommend a high dose folate supplement of 5 mg/day for clients with a BMI  $\geq 30$  kg/m<sup>2</sup>; ideally given before pregnancy and with continuance through the antenatal period. (61,101) Health Canada guidance from 2010 recommends that all pregnant people supplement with 0.4 mg of folic acid regardless of BMI, but after considering the above research it remains unclear if this dosage is high enough to provide a protective effect for individuals with obesity. (99,102) Although a folate/folic acid dosage ranging from 0.4 mg to 5 mg is likely to provide some preventive benefit for high-BMI clients, more research is needed to recommend a specific dosage that provides the most optimal preventive effect against the development of NTDs for high-BMI clients.

## RECOMMENDATION

**13.** For clients with a BMI  $\geq 30$  kg/m<sup>2</sup>, midwives should discuss the benefits of a diet high in nutrient-dense, folate-containing foods before and during pregnancy to reduce the risk of NTDs. For clients who cannot maintain a high-folate diet, midwives may also discuss the risks and benefits of administering a supplement with 0.4 mg to 5 mg of folic acid. [II-2-B] [new 2019]

## MIDWIFERY-SPECIFIC CONSIDERATIONS: HIGH BMI

### Establishing IV Access

Visualization and palpation of a suitable vein for IV cannulation may be more challenging in clients with a BMI  $\geq 30$  kg/m<sup>2</sup>. This is due to thicker subcutaneous adipose tissue, which can result in smaller, more superficial veins that often have more valves and bifurcations. (103) In the event of an emergency, midwives may find establishing an IV line in the high-BMI client difficult. Therefore, midwives may consider placing an IV during labour, particularly for a planned home birth.

## RECOMMENDATION

**14.** Midwives should ensure that they feel competent to perform venipuncture and gain IV access in clients with a BMI  $\geq 30$  kg/m<sup>2</sup>, and they may consider establishing IV access during labour in clients who choose home birth. [III-C] [2010]

### Choice of Birthplace

A 2013 analysis of data from the Birthplace in England national prospective cohort study examined the risk of adverse outcomes among pregnant individuals with high BMI who planned to give birth at home, in a Freestanding Midwifery Unit (FMU) or in an Alongside Midwifery Unit (AMU). (104) The participants selected for this analysis were considered “otherwise healthy,” meaning that before the onset of labour they were not known to have any medical or obstetric history risk factors, according to the National Institute for Health and Care Excellence (NICE) intrapartum care guideline, other than BMI  $> 35$  kg/m<sup>2</sup>. Risk factors as identified by NICE include various chronic diseases as well as a history of previous pregnancy-related complications, such as caesarean section, uterine rupture and eclampsia (for a detailed list of risk factors, see Tables 2 and 3 in the Appendix). (105) The results of this study determined that when birth occurred at home, those with a BMI of 30-35 kg/m<sup>2</sup> (obese) and those with a BMI  $\geq 40$  kg/m<sup>2</sup> (very obese) did not significantly differ from participants within the recommended BMI range (18.5-24.9 kg/m<sup>2</sup>) in their risks for neonatal unit admission or intrapartum stillbirth/early neonatal death (AdjRR 1.36, 95% CI 0.80-2.29 for obese; AdjRR 1.17, 95% CI 0.49-2.81 for very obese), or in their risks for obstetric interventions and adverse maternal outcomes (AdjRR 1.04, 95% CI 0.89-1.22 for obese; AdjRR 0.95, 95% CI 0.59-1.52 for very obese). As with those who gave birth at home, no significant differences in risk were found between high-BMI and recommended-BMI participants who opted for a birth in an FMU or an AMU. (104)

Similar results were found in a 2018 national prospective cohort study, which examined the risks for adverse intrapartum and neonatal complications among individuals with a BMI of 35.1-40 kg/m<sup>2</sup> in comparison with recommended-BMI individuals (18.5-24.9 kg/m<sup>2</sup>) who were admitted to give birth in an AMU. As with the last study, all participant data was adjusted for confounding risk factors as identified by NICE (see

Tables 2 and 3 in the Appendix), and “otherwise healthy” participants were isolated for sensitivity analysis. The results determined that otherwise healthy nulliparous and multiparous participants with a BMI of 35.1-40 kg/m<sup>2</sup> were not at a significantly greater risk of adverse maternal outcomes that would require obstetric care – although the researchers did indicate that their sample size might have been too small to detect a difference between the groups. Participants with a BMI of 35.1-40 kg/m<sup>2</sup> were also not at a significantly greater risk for adverse neonatal outcomes (including Apgar < 7 at five minutes and neonatal unit admission); and there were no significant differences between these groups for other outcomes examined, including transfer to obstetric care, shoulder dystocia, general anesthesia, vaginal birth, perineal trauma and maternal blood transfusion. Furthermore, 88.3% of those with a BMI of 35.1-40 kg/m<sup>2</sup> had an uncomplicated vaginal birth without third- or fourth-degree perineal trauma, instrumental assistance or blood transfusion, which is comparable to the proportion of recommended-BMI participants in this sample with similar birth experiences (82.7%). However, those with a BMI of 35.1-40 kg/m<sup>2</sup> had a slightly greater risk of caesarean section (AdjRR 1.62, 95% CI 1.02-2.57), and the risk for an urgent caesarean section was higher for nulliparous participants specifically (AdjRR 1.80, 95% CI 1.05-3.08). Nulliparous participants with a BMI of 35.1-40 kg/m<sup>2</sup> also had a significantly higher risk for postpartum hemorrhage (AdjRR 3.01, 95% CI 1.24-7.31). These findings highlight the importance of parity in evaluating the risks for pregnancy complications among those with a BMI of 35.1-40 kg/m<sup>2</sup>. (106)

Taken together, this evidence suggests that high BMI on its own is not an indication for hospital birth, and that adverse intrapartum and neonatal risks are low for otherwise healthy pregnant people with high BMI, particularly for those who have given birth before. Midwives should support normal birth and choice of birthplace for pregnant individuals with high BMI while taking into account the client’s full clinical picture, values and preferences. Informed choice discussions with clients should not only address the potential risks for intrapartum complications, but should also include information on the potential benefits of giving birth at home or in a birth centre, such as greater comfort and reduced risks for medical intervention. (107)

## RECOMMENDATION

15. BMI  $\geq$  30 kg/m<sup>2</sup> alone is not an indicator for hospital birth. Midwives should support choice of birthplace for clients with a BMI  $\geq$  30 kg/m<sup>2</sup>. [II-2-B] [new 2019]

## LOW-BMI PREGNANCY

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### Background

In 2008, Statistics Canada estimated the prevalence of BMI < 18.5 kg/m<sup>2</sup> as 2% for individuals aged 18 years and older. (108) While many studies examine the health impacts of obesity, fewer studies have examined the health consequences of those who are underweight, with the exception of those that examine the health of individuals with eating disorders such as anorexia nervosa and bulimia. In general, depending on the BMI categorization used to define underweight and the contributing factors that lead to being underweight (e.g., disease, malnutrition, genetically lean body type), expert opinion varies on the actual health consequences of low BMI. In Canada, the health of underweight individuals has not been found to differ substantially from the reference group (BMI 18.5-24.9 kg/m<sup>2</sup>). (109) This may be particularly true for individuals who are well nourished but maintain a low BMI due to a genetically lean body type. These clients will not likely require specialized care that differs from that received by clients within the recommended BMI range, especially if they have no other risk factors during pregnancy. However, when malnutrition or disordered eating are the cause of low BMI, maternal morbidity and mortality may result from micronutrient deficiency, infections and anemia. (110,111)

### Associated Complications

Low BMI is associated with decreased rates of preeclampsia, gestational hypertension, induction of labour, caesarean delivery and fetal macrosomia when compared with other BMI categories. (112,113) Moreover, pregnant individuals with low BMI exhibit similar rates of chest/breastfeeding initiation and exclusive chest/breastfeeding (114), stillbirth (80), preterm birth < 32 weeks (115) and congenital heart defects (81,116) as pregnant people within the recommended BMI (see Table 6). However, individuals with low BMI at the point of conception have been shown to be at an increased risk for the complications listed under Mild Risk Factors in Table 6. Similar to Tables 4 (a, b and

c) and 5 (a, b and c), Table 6 includes the available risk information from current meta-analyses and systematic reviews published in 2010-2018. This research is also subject to the same limitations mentioned previously in the risk factor section for high-BMI pregnancies

(Complications of High BMI), and it should be interpreted with caution. In particular with low-BMI, research in this area is also limited by a failure to determine how the factors that have contributed to low-BMI (e.g., nutrition, poverty, genetics) may influence health outcomes.

**Table 6: Risk factors for low BMI < 18.5 kg/m<sup>2</sup> compared with recommended BMI 18.5-24.9 kg/m<sup>2</sup>**

Complication(s)	OR/RR/OR range
<b>Negligible risk factors*</b>	
Congenital heart defects	0.99-1.02 (81,116)
Stillbirth	1.11** (80)
Preterm birth < 32 weeks	1.13*** (115)
<b>Mild risk factors</b>	
Miscarriage	1.08 (33)
Preterm birth 32-36 weeks	1.25 (115)
Preterm birth < 37 weeks	1.29-1.32 (80,115,117)
Low birth weight (< 2500 g)	1.47-1.64 (86,115)
Intrauterine growth restriction	1.54 (115)
Low birth weight (< 2000 g)	1.67 (80)
Small for gestational age	1.64-1.81 (80,86,117)

\*The statistical analysis determined that the risk for these outcomes did not significantly differ from the recommended BMI comparison group; thus risk is considered negligible.

\*\*Non-significant confidence interval: 95% CI (0.96-1.29)

\*\*\*Non-significant confidence interval: 95% CI (0.92-1.38)

### Malnutrition and Other Comorbidities

Nutrition before conception and during pregnancy plays a vital role in the health of a growing fetus. (118) Individuals with low BMI are more likely to suffer from poor nutritional status or malnourishment, which if left unaddressed can have important health consequences for the pregnant parent and the infant. The association between low BMI and low birth weight (LBW), SGA, preterm birth and intrauterine growth restriction (IUGR) are thought to be linked to a lack of nutrients delivered from pregnant parent to developing fetus, thereby stunting fetal growth. (115,118,119) Infants with a birth weight at or below the third percentile (equivalent to two standard deviations below the mean birth weight for their gestational age) are at

significant risk for morbidities, including seizures, respiratory distress and hyperbilirubinemia. (87) Long-term outcomes for infants below the third percentile include metabolic disorders in adulthood, insulin resistance and type 2 diabetes, hypertension, obesity and cardiovascular disease. (87,120) In an effort to prevent morbidity and ensure optimal fetal growth in utero, midwives may support low-BMI clients who wish to learn more about their nutritional needs through education and/or by referring clients to a nutritionist if necessary or when requested. Underweight clients may also be closely monitored for appropriate fetal growth throughout pregnancy via ultrasound or serial growth studies as needed.

Aside from malnutrition, the presence of disordered eating and/or over-exercising behaviours, drug use or underlying medical conditions may be common among low-BMI individuals in developed countries. (115) Although the independent impact of low BMI on the risk of health complications is rather mild (as can be seen in Table 6), the presence of other comorbid conditions such as anorexia or prolonged nicotine use severely increases the risks for serious health consequences such as intrauterine growth restriction. (121)

## RECOMMENDATION

16. Clients with a BMI < 18.5 kg/m<sup>2</sup> are at higher risk of IUGR, SGA and LBW. If poor fetal growth is suspected, offer third-trimester ultrasound or serial growth studies as necessary to rule out IUGR. [II-2-B] [2019]

## Fertility

Low BMI can contribute to menstrual irregularities and infertility problems, which may increase the difficulty of calculating an estimated due date by menstrual history alone, compared with people who have regular cycles. (122) Individuals with low BMI are also at a slightly increased risk for miscarriage compared with recommended-BMI individuals (RR 1.08 95% CI 1.05-1.11,  $p < 0.0001$ ). (33)

## RECOMMENDATION

17. Midwives should perform a thorough menstrual history with every client. For those who report menstrual irregularities, discuss the risks and benefits of a dating ultrasound, preferably prior to 14 weeks' gestation. [I-A] [2019]

## CONCLUSION

This clinical practice guideline highlights some of the health complications that individuals with high or low BMI may face during and after pregnancy. It is important to note that not all individuals within a particular BMI category have an equal likelihood of experiencing complications. The possible consequences of labelling individuals high risk before any complications actually occur also need to be taken into account. High or low

BMI on its own, without complications, is not cause to automatically categorize a client as high risk. When careful assessment of term-underweight pregnant people rules out SGA, IUGR and LBW infants, there is no increased risk compared with the risk for those within the recommended BMI. Likewise, among pregnant people who have a high BMI but do not exhibit any of the comorbidities discussed, and in whom the index of suspicion for an LGA or macrosomic infant is low, complications such as postpartum hemorrhage and caesarean section may not prove problematic.

Midwives should take particular care in discussions with high-BMI clients, as qualitative research demonstrates that these individuals often experience labelling, stereotyping and discrimination from health care professionals during their pregnancies. Participants in this research have reported that health care providers often avoid discussions about obesity, make assumptions about the participants' lack of physical ability, and focus specifically on the health of the fetus, disregarding the pregnant parent's feelings or experience. These findings emphasize how the perception of high-BMI clients as high risk for medical intervention is disempowering, and may result in poor care, over-treatment or over-diagnosis within this population. (123)

Although discussion about BMI can be challenging, midwives can still provide thoughtful support and positive reinforcement throughout pregnancy and postpartum for clients with high or low BMI. When appropriate, comments regarding weight should involve the sensitive use of language and should be clear and carefully explained within the context of the client's unique clinical picture.

Each client deserves to be given an individualized care plan, which may or may not include issues related to BMI. An appropriate approach is to offer a realistic discussion about the risks associated with high or low BMI, the significance of complications should they develop, and an assessment of the midwife's ability to respond to them.

## SUMMARY OF RECOMMENDATIONS

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1. Offer referral to the most appropriate and available mental health services for clients who have or are suspected of having an eating disorder. [III-C] [2010]
2. Discuss the benefits of optimizing GWG in pregnancy for clients with a BMI  $< 18.5 \text{ kg/m}^2$  or  $\geq 30 \text{ kg/m}^2$ . [II-2-B] [new 2019]
3. Midwives may consider calculating and documenting pre-pregnancy BMI on the first antenatal record. If pre-pregnancy weight is unknown, midwives may consider documenting BMI at the intake visit. [III-B] [new 2019]
4. All clients should be counselled about the importance of good nutrition and physical activity during pregnancy. Canada's Food Guide is an example of a nutrition guideline that includes dietary advice for individuals who are pregnant or nursing. [II-2-B] [2010]
5. For clients with a BMI  $< 18.5 \text{ kg/m}^2$  or  $\geq 30 \text{ kg/m}^2$ , midwives should identify and offer referrals to the most appropriate health care providers available in clients' communities to discuss nutrition, healthy eating and other good habits. [II-2-B] [2010]

### High BMI

6. Obtain and document a baseline blood pressure, using the appropriate cuff size for clients with a BMI  $\geq 30 \text{ kg/m}^2$ . [II-2-B] [2019]
7. For clients with a BMI  $\geq 30 \text{ kg/m}^2$ , midwives should discuss the higher risk of preeclampsia and GDM, along with the risks and benefits of GDM screening. [II-2-A] [new 2019]
8. Midwives should individually evaluate each client's need for thromboprophylaxis. They may consider offering an antepartum consultation with a physician for clients with a BMI  $\geq 40 \text{ kg/m}^2$ , or for clients with a BMI  $\geq 30 \text{ kg/m}^2$  and other known risk factors for thromboembolism. [III-C] [new 2019]
9. For second-trimester ultrasounds reporting suboptimal visualization, discuss limitations of ultrasound with client and consider offering repeat ultrasound if needed. [III-B] [2019]
10. When abdominal palpation proves challenging and/or symphysis-fundal measurements are unreliable, midwives should discuss risks and benefits of a third-trimester ultrasound and offer as necessary to address any information gaps. [II-2-B] [2019]
11. Midwives should consider offering an antepartum anesthesiology consultation for clients who plan an epidural, or for those who wish to have a more detailed discussion about potential anesthesia complications related to BMI  $\geq 30 \text{ kg/m}^2$ . [III-C] [2019]
12. Midwives are well suited to help clients with a BMI  $\geq 30 \text{ kg/m}^2$  who may experience difficulties with nursing to establish good positioning, latch and milk supply. When appropriate, midwives should refer clients to a lactation consultant or other specialist for lactation support. [III-B] [2019]

13. For clients with a BMI  $\geq 30$  kg/m<sup>2</sup>, midwives should discuss the benefits of a diet high in nutrient-dense, folate-containing foods before and during pregnancy to reduce the risk of NTDs. For clients who cannot maintain a high-folate diet, midwives may also discuss the risks and benefits of administering a supplement with 0.4 mg to 5 mg of folic acid. [II-2-B] [new 2019]
14. Midwives should ensure that they feel competent to perform venipuncture and gain IV access in clients with a BMI  $\geq 30$  kg/m<sup>2</sup>, and may consider establishing IV access during labour in clients who choose home birth. [III-C] [2010]
15. BMI  $\geq 30$  kg/m<sup>2</sup> alone is not an indicator for hospital birth. Midwives should support choice of birthplace for clients with a BMI  $\geq 30$  kg/m<sup>2</sup>. [II-2-B] [new 2019]

### Low BMI

16. Clients with a BMI  $< 18.5$  kg/m<sup>2</sup> are at higher risk of IUGR, SGA and LBW. If poor fetal growth is suspected, offer third-trimester ultrasound or serial growth studies as necessary to rule out IUGR. [II-2-B] [2019]
17. Midwives should perform a thorough menstrual history with every client. For clients who report menstrual irregularities, discuss the risks and benefits of a dating ultrasound, preferably prior to 14 weeks' gestation. [I-A] [2019]

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## APPENDIX

**Table 1: Updated 2019 Recommendations, Summary Statements and Explanation of Changes\***

Original Recommendation or Summary Statement from 2010	Updated Recommendation or Summary Statement [new 2019]	Explanation of Change(s)
<b>Prevention of Poor Outcomes</b>		
<p><b>Recommendation</b></p> <p>Midwives should discuss the risks of excessive GWG in pregnancy for women with BMI <math>\geq 30</math>. [II-2-B]</p>	<p><b>Recommendation</b></p> <p>Discuss the benefits of optimizing GWG in pregnancy for clients with a BMI <math>&lt; 18.5</math> kg/m<sup>2</sup> or <math>\geq 30</math> kg/m<sup>2</sup>. [II-2-B] [new 2019]</p>	<ul style="list-style-type: none"> <li>• New systematic evidence was found suggesting that obesity- and underweight-related complications can be reduced or prevented to some extent through the careful management of weight gain during pregnancy.</li> <li>• The language of the new recommendation now addresses both low- and high-BMI populations.</li> </ul>
<p><b>Recommendation</b></p> <p>For women with BMI <math>\geq 30</math>, discuss the benefits of achieving a normal BMI prior to the next conception. [II-2-B]</p>	<p><b>Summary Statement</b></p> <p>For clients with a BMI <math>\geq 30</math> kg/m<sup>2</sup>, consider discussing the benefits of achieving a normal BMI prior to the next conception.</p>	<ul style="list-style-type: none"> <li>• This statement was changed from a recommendation to a summary statement, and some language was adjusted to be less prescriptive.</li> <li>• These changes allow midwives to use their clinical discretion to determine which clients would benefit from a discussion about future weight loss.</li> </ul>
<p><b>Recommendation</b></p> <p>Calculate and document pre-pregnancy BMI on the first antenatal record. [II-2B] If pre-pregnancy weight is unknown, document BMI at the intake visit. [III-B]</p>	<p><b>Recommendation</b></p> <p>Midwives may consider calculating and documenting pre-pregnancy BMI on the first antenatal record. If pre-pregnancy weight is unknown, midwives may consider documenting BMI at the intake visit. [III-B] [new 2019]</p>	<ul style="list-style-type: none"> <li>• The language of the new recommendation was adjusted to be less prescriptive than the original.</li> <li>• The new recommendation recognizes that not all Ontario midwives will choose to document and calculate BMI based on client preferences.</li> </ul>
<b>Antenatal and Intrapartum Complications: High BMI</b>		
<p><b>Recommendation</b></p> <p>For women with BMI <math>\geq 30</math>, midwives should discuss the increased risk of gestational diabetes mellitus (GDM) along with the risks and benefits of GDM screening. [II-2-A]</p>	<p><b>Recommendation</b></p> <p>For clients with a BMI <math>\geq 30</math> kg/m<sup>2</sup>, midwives should discuss the higher risk of preeclampsia and GDM, along with the risks and benefits of GDM screening. [II-2-A] [new 2019]</p>	<ul style="list-style-type: none"> <li>• Preeclampsia and gestational diabetes mellitus were both found to be moderate risk factors for pregnant people with a high-BMI.</li> <li>• Preeclampsia was included in this recommendation to reflect that it is another moderate risk factor for pregnant people with a high-BMI.</li> </ul>
<p><b>Recommendation</b></p> <p>Obesity is a moderate risk factor for thromboembolism. Women with BMI <math>\geq 30</math> undergoing caesarean section should be encouraged to discuss options for thromboprophylaxis with their consulting obstetrician. [II-2-B]</p>	<p><b>Recommendation</b></p> <p>Midwives should individually evaluate each client's need for thromboprophylaxis. They may consider offering an antepartum consultation with a physician for clients with a BMI <math>\geq 40</math> kg/m<sup>2</sup>, or for clients with a BMI <math>\geq 30</math> kg/m<sup>2</sup> and other known risk factors for thromboembolism. [III-C] [new 2019]</p>	<ul style="list-style-type: none"> <li>• Available literature on thromboembolism was inconclusive on a specific course of action for all high-BMI individuals. However, the presence of a very high BMI and/or other risk factors for thromboembolism are likely to influence clinical decision-making.</li> <li>• Opinions of respected authorities (i.e., other clinical practice guideline development groups) were referred to in the absence of well-designed, systematic evidence.</li> <li>• Evaluation of the evidence and classification of the recommendation was adjusted to reflect these changes.</li> </ul>

**Table 1: Updated 2019 Recommendations, Summary Statements and Explanation of Changes\***

Original Recommendation or Summary Statement from 2010	Updated Recommendation or Summary Statement [new 2019]	Explanation of Change(s)
<p><b>Recommendation</b></p> <p>All women with BMI <math>\geq</math> 30 should have an informed choice discussion of increased risks during labour. The following should be included as part of the informed choice discussion:</p> <ul style="list-style-type: none"> <li>• Increased risk of fetal macrosomia [II-2-B]</li> <li>• Increased risk of postpartum hemorrhage[II-2-B]</li> <li>• Increased difficulty of auscultating the fetal heart [II-2-B] and the potential need for internal fetal heart rate monitoring [III-C]</li> <li>• Increased risk of having a missed abnormality on ultrasound (NTD) [II-2-B]</li> <li>• Increased risk of stillbirth [II-2-B]</li> </ul> <p>Midwives should support the choice of birthplace for women with BMI &gt; 30 once increased risks have been discussed.</p>	<p><b>Summary Statement</b></p> <p>Midwives may consider offering continuous fetal heart rate monitoring to clients with a high-BMI in whom fetal heart rate is difficult to detect using intermittent auscultation. [new 2019]</p>	<ul style="list-style-type: none"> <li>• This recommendation was separated into two new summary statements and a new recommendation. <i>[See the section Fetal and Neonatal Complications: High BMI in this table for another summary statement; and Midwifery-Specific Considerations: High BMI in this table for the new recommendation.]</i></li> <li>• This summary statement isolates the portion of the original recommendation pertaining to fetal heart rate monitoring, to improve clarity.</li> <li>• Discussion on fetal heart rate monitoring was changed from a recommendation to a summary statement due to a lack of evidence to support continuous FHR monitoring during labour for clients with high BMI.</li> <li>• There was a lack of evidence on the specific need for internal fetal heart rate monitoring with high-BMI clients.</li> <li>• The portion of the original recommendation pertaining to fetal macrosomia has been moved to the Fetal and Neonatal Complications: High BMI section of the BMI CPG. <i>[See the section Fetal and Neonatal Complications: High BMI in this table for an explanation on this change.]</i></li> <li>• The portion of the original recommendation pertaining to the increased risk for postpartum hemorrhage (PPH) was removed due to a lack of recent systematic evidence on PPH risk for high-BMI clients.             <ul style="list-style-type: none"> <li>• The most recent meta-analysis found a mild risk for PPH among high-BMI pregnancies.</li> <li>• The risk of PPH for high-BMI clients has been included in Table 4b of the CPG and is discussed in the Choice of Birthplace section of the CPG. However, a recommendation specific to this topic was deemed unnecessary.</li> </ul> </li> <li>• The portion of the original recommendation pertaining to missed NTD abnormality on ultrasound was removed due to a lack of available evidence on this topic and a mild risk for NTDs in high-BMI pregnancies.</li> <li>• The portion of the original recommendation pertaining to stillbirth was removed due to recent research that demonstrated a mild risk for this outcome in high-BMI individuals.</li> <li>• The portion of the original recommendation pertaining to home birth was separated into its own recommendation to increase clarity and readability. <i>[See the section Midwifery-Specific Considerations: High BMI in this table for an explanation of this change.]</i></li> </ul>

**Table 1: Updated 2019 Recommendations, Summary Statements and Explanation of Changes\***

Original Recommendation or Summary Statement from 2010	Updated Recommendation or Summary Statement [new 2019]	Explanation of Change(s)
<b>Fetal and Neonatal Complications: High BMI</b>		
<p><b>Recommendation</b></p> <p>All women with BMI <math>\geq</math> 30 should have an informed choice discussion of increased risks during labour. The following should be included as part of the informed choice discussion:</p> <ul style="list-style-type: none"> <li>• Increased risk of fetal macrosomia [II-2-B]</li> <li>• Increased risk of postpartum hemorrhage[II-2-B]</li> <li>• Increased difficulty of auscultating the fetal heart [II-2-B] and the potential need for internal fetal heart rate monitoring [III-C]</li> <li>• Increased risk of having a missed abnormality on ultrasound (NTD) [II-2-B]</li> <li>• Increased risk of stillbirth [II-2-B]</li> </ul> <p>Midwives should support the choice of birthplace for women with BMI &gt; 30 once increased risks have been discussed.</p>	<p><b>Summary Statement</b></p> <p>Clients with a BMI <math>\geq</math> 30 kg/m<sup>2</sup> would benefit from informed choice discussions about the increased risk for fetal macrosomia and LGA, and the associated complications this may have during labour and birth. [new 2019]</p>	<ul style="list-style-type: none"> <li>• This recommendation was separated into two new summary statements and a new recommendation. <i>[See the section Antenatal and Intrapartum Complications: High BMI in this table for another summary statement; and the Midwifery-Specific Considerations: High BMI in this table for the new recommendation.]</i></li> <li>• This new summary statement isolates the portion of the original recommendation pertaining to fetal macrosomia</li> <li>• This summary statement was necessary to include because of the mild-to-moderate risk for large fetuses and infants among high-BMI pregnant people, as demonstrated in recent systematic research.</li> <li>• <i>[See the section Antenatal and Intrapartum Complication: High BMI in this table for an explanation of all other changes to the original recommendation.]</i></li> </ul>

**Table 1: Updated 2019 Recommendations, Summary Statements and Explanation of Changes\***

Original Recommendation or Summary Statement from 2010	Updated Recommendation or Summary Statement [new 2019]	Explanation of Change(s)
<p><b>Summary Statement</b></p> <p>Women with BMI &gt; 35 are at increased risk of having a fetus with NTD. Research concerning folic acid supplementation for women with BMI &gt; 35 is conflicting. Research has not shown that increased intake of folic acid in overweight and obese women results in a similar drop in NTDs as compared to ideal BMI women. Folic acid is considered safe in pregnancy for both mother and fetus. It is a water-soluble vitamin and excess is excreted through urine. The Compendium of Pharmaceuticals and Specialties states that after doses of about 2.5 to 5.0 mg, about half of a dose is excreted in urine. Folic acid supplementation may rarely cause allergic reactions including erythema, pruritus and/or urticaria. Doses of folic acid up to 5.0 mg have not been known to have adverse effects on pregnant women or their fetus.</p>	<p><b>Recommendation</b></p> <p>For clients with a BMI <math>\geq</math> 30 kg/m<sup>2</sup>, midwives should discuss the benefits of a diet high in nutrient-dense, folate-containing foods before and during pregnancy to reduce the risk of NTDs. For clients who cannot maintain a high-folate diet, midwives may also discuss the risks and benefits of administering a supplement with 0.4 mg to 5 mg of folic acid. [II-2-B] [new 2019]</p>	<ul style="list-style-type: none"><li>• This statement has been changed from a summary statement to a recommendation due to the availability of new research on the topic.</li><li>• The original summary statement did not provide clear guidance on folic acid supplementation due to conflicting evidence at the time</li><li>• New research on the benefits of folate intake and supplementation for high-BMI individuals was found, and current research consistently recommends folate supplementation for all BMI groups during pregnancy.</li><li>• There was no research to determine a specific dosage of folic acid for high-BMI clients, and thus a dosage range was included in this recommendation.</li></ul>

**Table 1: Updated 2019 Recommendations, Summary Statements and Explanation of Changes\***

Original Recommendation or Summary Statement from 2010	Updated Recommendation or Summary Statement [new 2019]	Explanation of Change(s)
<b>Midwifery-Specific Considerations: High BMI</b>		
<p><b>Recommendation</b></p> <p>All women with BMI <math>\geq</math> 30 should have an informed choice discussion of increased risks during labour. The following should be included as part of the informed choice discussion:</p> <ul style="list-style-type: none"> <li>• Increased risk of fetal macrosomia [II-2-B]</li> <li>• Increased risk of postpartum hemorrhage[II-2-B]</li> <li>• Increased difficulty of auscultating the fetal heart [II-2-B] and the potential need for internal fetal heart rate monitoring [III-C]</li> <li>• Increased risk of having a missed abnormality on ultrasound (NTD) [II-2-B]</li> <li>• Increased risk of stillbirth [II-2-B]</li> </ul> <p>Midwives should support the choice of birthplace for women with BMI &gt; 30 once increased risks have been discussed.</p>	<p><b>Recommendation</b></p> <p>BMI <math>\geq</math> 30 kg/m<sup>2</sup> alone is not an indicator for hospital birth. Midwives should support choice of birthplace for clients with a BMI <math>\geq</math> 30 kg/m<sup>2</sup>. [II-2-B] [new 2019]</p>	<ul style="list-style-type: none"> <li>• This recommendation was separated into two new summary statements and a new recommendation. <i>[See the section Antenatal and Intrapartum Complications: High BMI in this table for one summary statement; and the section Fetal and Neonatal Complications: High BMI of this table for the other new summary statement.]</i></li> <li>• New evidence on choice of birthplace for high-BMI pregnancies was found and included in the updated CPG; therefore, a new recommendation and classification were created based on this evidence.</li> <li>• <i>[See the section Antenatal and Intrapartum Complication: High BMI in this table for an explanation of all other changes to the original recommendation.]</i></li> </ul>

\*Section headings referred to in this table reflect those used in the updated 2019 version of this CPG.

**Table 2: Medical conditions indicating increased risk suggesting planned birth at an obstetric unit**

Disease area	Medical condition
Cardiovascular	<ul style="list-style-type: none"><li>• Confirmed cardiac disease</li><li>• Hypertensive disorders</li></ul>
Respiratory	<ul style="list-style-type: none"><li>• Asthma requiring an increase in treatment or hospital treatment</li><li>• Cystic fibrosis</li></ul>
Haematological	<ul style="list-style-type: none"><li>• Haemoglobinopathies – sickle-cell disease, beta-thalassaemia major</li><li>• History of thromboembolic disorders</li><li>• Immune thrombocytopenia purpura or other platelet disorder or platelet count below <math>100 \times 10^9</math>/litre</li><li>• Von Willebrand's disease</li><li>• Bleeding disorder in the woman or unborn baby</li><li>• Atypical antibodies which carry a risk of haemolytic disease of the newborn</li></ul>
Endocrine	<ul style="list-style-type: none"><li>• Hyperthyroidism</li><li>• Diabetes</li></ul>
Infective	<ul style="list-style-type: none"><li>• Risk factors associated with group B streptococcus whereby antibiotics in labour would be recommended</li><li>• Hepatitis B/C with abnormal liver function tests</li><li>• Carrier of/infected with HIV Toxoplasmosis – women receiving treatment</li><li>• Current active infection of chicken pox/rubella/genital herpes in the woman or baby</li><li>• Tuberculosis under treatment</li></ul>
Immune	<ul style="list-style-type: none"><li>• Systemic lupus erythematosus</li><li>• Scleroderma</li></ul>
Renal	<ul style="list-style-type: none"><li>• Abnormal renal function</li><li>• Renal disease requiring supervision by a renal specialist</li></ul>
Neurological	<ul style="list-style-type: none"><li>• Epilepsy</li><li>• Myasthenia gravis</li><li>• Previous cerebrovascular accident</li></ul>
Gastrointestinal	<ul style="list-style-type: none"><li>• Liver disease associated with current abnormal liver function tests</li></ul>
Psychiatric	<ul style="list-style-type: none"><li>• Psychiatric disorder requiring current inpatient care</li></ul>

**Table 3: Other factors indicating increased risk suggesting planned birth at an obstetric unit**

Factor	Additional information
Previous complications	<ul style="list-style-type: none"> <li>• Unexplained stillbirth/neonatal death, or previous death related to intrapartum difficulty</li> <li>• Previous baby with neonatal encephalopathy</li> <li>• Preeclampsia requiring preterm birth</li> <li>• Placental abruption with adverse outcome</li> <li>• Eclampsia</li> <li>• Uterine rupture</li> <li>• Primary postpartum haemorrhage requiring additional treatment or blood transfusion</li> <li>• Retained placenta requiring manual removal in theatre</li> <li>• Caesarean section</li> <li>• Shoulder dystocia</li> </ul>
Current pregnancy	<ul style="list-style-type: none"> <li>• Multiple birth</li> <li>• Placenta praevia</li> <li>• Preeclampsia or pregnancy-induced hypertension</li> <li>• Preterm labour or preterm prelabour rupture of membranes</li> <li>• Placental abruption</li> <li>• Anaemia – haemoglobin less than 85 g/litre at onset of labour</li> <li>• Confirmed intrauterine death</li> <li>• Induction of labour</li> <li>• Substance misuse</li> <li>• Alcohol dependency requiring assessment or treatment</li> <li>• Onset of gestational diabetes</li> <li>• Malpresentation – breech or transverse lie</li> <li>• BMI at booking of greater than 35 kg/m<sup>2</sup></li> <li>• Recurrent antepartum haemorrhage</li> <li>• Small for gestational age in this pregnancy (less than fifth centile or reduced growth velocity on ultrasound)</li> <li>• Abnormal fetal heart rate/doppler studies</li> <li>• Ultrasound diagnosis of oligo-/polyhydramnios</li> </ul>
Previous gynaecological history	<ul style="list-style-type: none"> <li>• Myomectomy</li> <li>• Hysterotomy</li> </ul>