

**WEIGHT GAIN COUNSELLING IN PRENATAL CARE:
ASSESSING AND IMPROVING PATIENT-HEALTHCARE
PROVIDER INTERACTIONS**

by

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ABSTRACT

Background: It is well accepted that gestational weight gain (GWG) outside of the Institute of Medicine recommendations is a modifiable risk factor for pregnancy complications, regardless of a woman's pre-pregnancy body mass index.

Objectives: Given that not all prenatal healthcare providers (HCPs) are aware of these guidelines nor discuss them with their patients, this thesis sought to examine counselling practices and evaluate a pilot knowledge translation tool for the improvement of such counselling.

Methods: 1) A literature review was conducted to assess current prenatal GWG counselling practices between patients and HCPs; 2) an electronic survey was conducted to determine patients' perceptions of GWG counselling and whether certain patient characteristics increase chances of counselling; 3) a quasi-experimental study was implemented to evaluate the Canadian Obesity Network's 5As of Healthy Pregnancy Weight Gain tool.

Results: GWG counselling was often infrequent and inaccurate. Women of higher socioeconomic status, older age, nulliparous, history of dieting, low physical activity and those categorized with overweight/obesity were more likely to receive GWG advice. The 5As of Healthy Pregnancy Weight Gain Tool is effective at initiating *Ask* and *Advise* components of HCP-mediated GWG counselling, but work is still needed to improve all other components of the 5As (*Assess, Agree, Assist*).

Conclusions: Weight gain counselling is an essential component of prenatal healthcare, but discussions between HCPs and patients is inconsistent. Future steps include the development of GWG knowledge translation tools and improving GWG education for HCPs.

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AUTHOR CONTRIBUTIONS

All the original research presented in this thesis was conducted by Ashley Weeks. Ashley was in charge of data collection, recruitment, ethics renewal/modification applications, and writing. As thesis supervisors, Dr. Kristi Adamo and Dr. Raywat Deonandan guided the overall process by providing methodological support, reviewing all work and providing input and suggestions. As such, they were co-authors on each of the following three manuscripts.

Dr. Zachary Ferraro and Dr. Rebecca Liu were additional co-authors on the narrative literature review (**Article 1**). Dr. Ferraro provided conceptual guidance in the project planning stages, and both he and Dr. Liu helped verify the included articles and provided an in-depth review of the final manuscript. Dr. Liu also helped with the procurement of information related to the geographical piece of the review.

Lyra Halili and Dr. Rebecca Liu were additional co-authors for the electronic survey paper (**Article 2**). They both helped to provide statistical and methodological support as well as provided an in-depth review of the final manuscript.

Dr. Zachary Ferraro and Alysha Harvey were additional co-authors for the 5As paper (**Article 3**). They each developed the initial project protocol, consent forms, and ethics applications as well as provided conceptual and methodological support throughout the project. Also, they will review the final manuscript before submission to the *Women's Health Issues* journal.

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LIST OF ABBREVIATIONS

5As	5As of Healthy Pregnancy Weight Gain tool: Ask, Asses, Advise, Agree, Assist
BMI	Body Mass Index
CHEO	Children’s Hospital of Eastern Ontario
CON	Canadian Obesity Network
DOHaD	Developmental Origins of Health and Disease
EMat	Electronic Maternal Health Survey
GWG	Gestational Weight Gain
HCP	Healthcare Provider
IOM	Institute of Medicine
kg	Kilograms
lbs	Pounds
MFM	Maternal-Fetal Medicine specialist
OB	Obstetrician
PA	Physical Activity
REB	Research Ethics Board
REDCap	Research Electronic Data Capture

PREFACE

This thesis consists of three original research manuscripts for which I am the primary author. Each of the research articles presented in the thesis is intended for dissemination targeted towards prenatal healthcare providers (obstetricians, family physicians, midwives, doulas, nurses) and policy-makers to have maximum clinical impact.

Chapter 2 Article:

Title: Inconsistent Weight Communication among Prenatal Healthcare Providers and Patients: A Narrative Review.

Description: The first article of my thesis is a narrative literature review that builds upon the introduction of my thesis by focusing on the evidence surrounding weight gain counselling among care providers in prenatal healthcare from both patient and provider perceptions.

Status: Published in *Obstetrical and Gynecological Survey* (August 2018).

Chapter 3 Article:

Title: Perceptions of Weight Gain in Pregnancy: Results of an Electronic Maternal Health Survey.

Description: The second article of my thesis consists of a secondary analysis of an electronic patient survey to determine trends in dietary and weight gain counselling in pregnancy.

Status: Submitted to *Women and Birth* (September 2018).

Chapter 4 Article

Title: A Pilot Study Evaluating the Effectiveness of the “5As of Healthy Pregnancy Weight Gain” Tool.

Description: The final article presented in this thesis contains the results of an evaluation of the 5As tool considering both patient and provider perceptions in Ottawa, Ontario.

Status: Submitted to *Women’s Health Issues* (December 2018).

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CHAPTER 1: INTRODUCTION

1.1 The Intrauterine Environment

Pregnancy has been considered one of the most significant periods of weight gain and physiological changes in a person's life – for both mom and baby (1,2). During this critical stage of growth and development, the intrauterine environment that a woman provides can have both immediate and long-term effects on the child. Dr. David Barker and colleagues were the first to observe associations between the pregnancy and postpartum stages and adulthood diseases. For example, they observed correlations between low birth weight and downstream heart disease (3), as well as *in utero* nutritional deprivation and downstream coronary artery disease, Type 2 Diabetes, overweight and obesity (1,2,4,5).

Today, expansion of Barker's original paradigm has been accepted by the International Society for Developmental Origins of Health and Disease (DOHaD), and current research focuses on understanding the mechanisms behind such fetal programming. The DOHaD concept acknowledges that certain environmental conditions alter the epigenetic markers of the fetal genome, which will consequently program certain metabolic traits that are only seen later in life (6). The DOHaD premise and its intricacies posit that prenatal exposures interplay with early childhood development to produce effects on long-term adult health. One such *in utero* exposure is gestational weight gain.

1.2 Gestational Weight Gain

Gestational weight gain (GWG) is an expected and important aspect of a healthy pregnancy (7). The Institute of Medicine (IOM) has developed an evidence-based guideline for appropriate and healthy GWG based on a woman's pre-pregnancy body mass index (BMI) (8).

As illustrated in Table 1, women of different BMI categories have varying target weight gain ranges; from five to 18 kilograms. Research strongly suggests that gaining too much or too little weight during pregnancy, commonly referred to as discordant GWG, will influence maternal-fetal health. Table 2 highlights the potential consequences of discordant GWG on both the mother and the developing baby.

Table 1. Institute of Medicine Guidelines for gestational weight gain, by pre-pregnancy BMI.

Pre-pregnancy BMI	Total Weight Gain lbs (kg)	Rate of Weight Gain in 2nd and 3rd Trimesters per week lbs/week (kg/week)
Underweight (<18.5 kg/m ²)	28-40 (12.5-18)	1-1.3 (0.44-0.58)
Normal Weight (19.5-24.9 kg/m ²)	25-35 (11.5-16)	0.8-1 (0.35-0.50)
Overweight (25.0-29.9 kg/m ²)	15-25 (7-11.5)	0.5-0.7 (0.23-0.33)
Obese , all categories (≥30 kg/m ²)	11-20 (5-9)	0.4-0.6 (0.17-0.27)

Table 2. Summary of the impacts discordant gestational weight gain can have on maternal and fetal health (2,6,7,9–13).

Maternal Effects		Fetal Effects
Inadequate weight gain		• Small-for-gestational-age • Preterm birth • Aberrant growth trajectories • Adulthood cardiovascular disease
Excessive weight gain	• Abnormal glucose metabolism • Gestational diabetes • Downstream type 2 diabetes • Hypertensive disorders • Preeclampsia • Caesarian section • Postpartum weight retention	• Large-for-gestational-age • Macrosomia • Caesarian section • Aberrant growth trajectories • Downstream childhood overweight or obesity

1.3 Trends in Overweight, Obesity and Excessive Weight Gain

Although the effects of inadequate GWG are of great importance clinically, excessive GWG is a greater public health issue due to the prevalence of both obesity (13,14) and women exceeding GWG guidelines (10). Indeed, a large systematic review and meta-analysis of over one million pregnancies found that almost half of pregnancies exceeded their weight gain recommendations (10). The National Institute of Health describes obesity as a body weight that is no longer healthy for the person's corresponding height (15). Obesity is associated with a plethora of negative health outcomes, notably hypertension, dyslipidemia, Type 2 diabetes, coronary heart disease, stroke, sleep apnea, respiratory problems, social discrimination and stigmatisation, and more (7,15,16). As documented by Statistics Canada, nearly 20% of all Canadians were classified as obese in 2014 (17). Overweight and obesity is also seen in childhood, with 26% of Canadians aged 2-18 being overweight or obese (18). Additionally, the percentage of overweight or obese Canadians continued to rise from 2003 to 2014, specifically between the ages of 18 and 54 which encompasses most women of the childbearing age (17). Because of the increasing rates of overweight and obesity, over two thirds (19) of women are entering pregnancy at a higher BMI than previously observed and contributing to the intergenerational cycle of obesity (6,9).

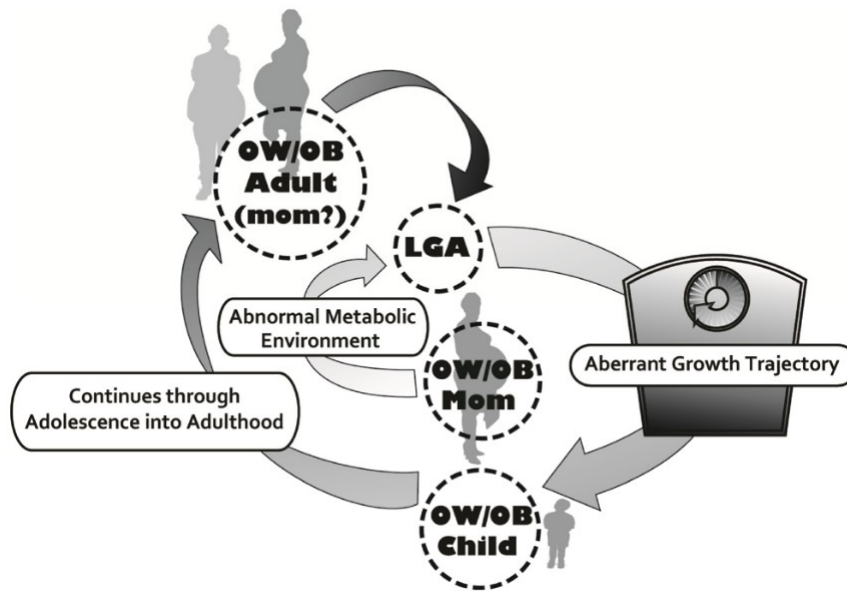


Figure 1. The intergenerational cycle of obesity (6). Obtained from Adamo KB, Ferraro ZM, Brett KE. Can We Modify the Intrauterine Environment to Halt the Intergenerational Cycle of Obesity? *International Journal of Environmental Research and Public Health*. 2012;9(4):1263-1307.

1.4 Modifying Gestational Weight Gain to Improve Medical Outcomes

While reflecting upon GWG, it is crucial to recognize that discordant GWG is both an *independent* and a *modifiable* risk factor for many pregnancy complications (20). In other words, the risks for discordant GWG exist regardless of a woman's pre-pregnancy BMI. For example, a healthy normal-weight woman with a low-risk pregnancy could put herself at higher risk for negative outcomes by gaining too much weight in pregnancy. GWG is modifiable because it can, fortunately, be mediated through conscious healthy lifestyle choices by the mother. For example, a woman with obesity who may already be at higher risk because of her current weight may reduce her risk of complications by gaining within the IOM Guidelines.

Table 3. Summary of lifestyle contributors to healthy gestational weight gain.

Contributor	Description
Diet	• In accordance with Canadian recommendations, pregnant women’s caloric requirements in pregnancy do <i>not</i> change at all in the first trimester. • Caloric requirements only increase by 350 and 450 calories in their second and third trimesters, respectively (21).
Physical Activity	• The American College of Obstetrics and Gynecology recommend 30 minutes of exercise on most, if not all, days of the week (22). • Physical activity provides benefits such as improved fitness, guideline-concordant weight gain, psychological wellbeing, improved fetal heart rate, improved placenta viability, and optimal lean body mass for offspring in early childhood (23).
Sleep	• Sleep deprivation has been associated with inadequate GWG (24). • Short sleep duration has been associated with impaired glycemia and obesity in non-pregnant subjects (25).
Other	• Interdisciplinary factors that are expected to contribute to healthy weight gain, but have yet to be scientifically investigated, may include further psychosocial aspects of health. • For example mental health, socioeconomic status and reducing sedentary activity.

A convincing amount of the literature regarding GWG shows that intervention during pregnancy, or even pre-pregnancy, can help to mediate maternal-fetal health risks (6,19,26–28). Therefore, it is essential that pregnant woman and women planning to become pregnant are aware of the IOM’s GWG recommendations. It is equally important that these women have access to weight management resources that are in agreement with their prenatal healthcare provider (HCP).

1.5 Prenatal Healthcare Provider Involvement

In general, behavioural change counselling from primary HCPs – largely defined as the statement of target pregnancy weight gain and weight management strategies – has been effective in helping patients improve self-management of a variety of conditions in non-pregnant

populations (29). Health belief models suggests that communication targeting self-efficacy, barriers, benefits, and risks are likely to lead to successful behavioural change (30). Behavioural interventions are particularly effective during pregnancy as it is a time in the lifespan when the mother is motivated to make healthy changes for the health of her baby (31,32).

It is especially important that pregnant patients receive advice that is from a reliable source, such as their HCP. Research has shown that GWG counselling by HCPs significantly improves weight gain outcomes (33–37). In addition, a recent analysis by our research group has shown that women are more likely to achieve appropriate GWG if they perceive that they are in control of their GWG, which a HCP may help them with (37). A woman's accurate knowledge of their specific GWG recommendation is positively associated with them achieving appropriate GWG (36), and women that believe they will gain too much weight are more likely to do so (38).

An in-depth review and analysis of current practices in HCP-directed GWG counselling is presented in **Chapter 2** of this thesis.

Objectives

The overall objectives of this thesis were to assess and improve provider-patient dialogue about healthy pregnancy weight gain.

More specifically:

1. To summarize the current literature assessing GWG discussions as they occur between patients and their HCPs in a clinical setting.
2. To survey pregnant women's perceptions of the occurrence of diet and weight management counselling in prenatal healthcare.
3. To evaluate the Canadian Obesity Network's 5As of Healthy Pregnancy Weight Gain Tool on patient-perceived weight counselling and determine HCP perceptions of the tool.

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CHAPTER 2: LITERATURE REVIEW

(Article 1)

Preamble

This chapter contains a detailed literature review to summarize the current evidence assessing GWG discussions as they occur between patients and their HCPs in a clinical setting (Objective 1). It builds upon the introduction of this thesis by focusing on current and historical research on weight gain counselling among care providers in prenatal healthcare from both patient and provider perceptions. The data are presented narratively but also contain some quantitative comparisons to help describe the nature and breadth of the existing data.

This literature review was published in the *Obstetrical and Gynecological Survey* (August 2018). This journal was chosen to allow for maximum dissemination to a clinical audience as it provides Continuing Medical Education credits to clinicians participating in the reading exercise.

Citation:

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CHIEF EDITOR'S NOTE: This article is part of a series of continuing education activities in this Journal through which a total of 36 *AMA PRA Category 1 Credits*[™] can be earned in 2018. Instructions for how CME credits can be earned appear on the last page of the Table of Contents.

Inconsistent Weight Communication Among Prenatal Healthcare Providers and Patients: A Narrative Review

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Importance: Gestational weight gain (GWG) is an independent and modifiable factor for a healthy pregnancy. Gestational weight gain above or below the Institute of Medicine Guidelines has been shown to impact both maternal and fetal health (eg, gestational diabetes, hypertension, downstream obesity). Healthcare providers (HCPs) have the potential to be reliable sources of evidence-based weight information and advice during pregnancy.

Objective: The aim of this study was to summarize the literature assessing GWG discussions between patients and their HCPs in a clinical setting to better understand the knowledge that is currently being exchanged.

Evidence Acquisition: A literature review was conducted by searching Ovid Medline, CINAHL, and Embase databases. All relevant primary research articles in English that assessed GWG discussions were included, whereas intervention studies were excluded.

Results: A total of 54 articles were included in this review. Although the overall prevalence and content of GWG counseling varied between studies, counseling was often infrequent and inaccurate. Healthcare providers tended to focus more on women experiencing obesity and excessive GWG, as opposed to the other body mass index categories or inadequate GWG. Women of higher socioeconomic status, older age, nulliparous, history of dieting, low physical activity, and those categorized as overweight/obese were more likely to receive GWG advice. Patients also reported receiving conflicting facts between different HCP disciplines.

Conclusions: The evidence regarding GWG counseling in prenatal care remains variable, with discrepancies between geographic regions, patient populations, and HCP disciplines.

Relevance: Healthcare providers should counsel their pregnant patients on GWG with advice that is concordant with the Institute of Medicine Guidelines.

Target Audience: Obstetricians and gynecologists, family physicians, midwives, and prenatal healthcare providers.

Learning Objectives: After completing this activity, the learner should be better able to critique the gaps in prenatal health education regarding GWG, assess the impact that various HCPs have on a patient's weight gain practices, and distinguish factors that contribute to useful and helpful GWG counseling.

Pregnancy is a critical period of growth and development.^{1,2} The intrauterine environment not only

contributes to long-term offspring health, but also the health of future generations.^{1,3-5} In fact, findings from

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a large epidemiological study by Barker and Osmond³ were the first to highlight the Fetal Origins of Health and Disease hypothesis. In 1986, Barker and Osmond³ observed a strong correlation between adult-onset ischemic heart disease and low birth weight. Subsequent studies conducted by Barker's group have provided support for the theory that nutritional deprivation in utero can alter fetal susceptibility to coronary artery disease, type 2 diabetes, overweight, and obesity later in life.^{2,6-9} Epidemiological⁶ and epigenetic⁷ studies beyond Barker's work have also linked fetal outcomes to in utero exposures. Environmental conditions have been shown to alter epigenetic markers of the fetus' DNA, which in turn predicts certain metabolic traits that become evident later in life.⁵ As a result of the research conducted around the Fetal Origins Hypothesis, this has given rise to the DOHaD concept (Developmental Origins of Health and Disease), which promotes research dedicated to understanding the mechanisms behind fetal programming.⁴ Together, the Fetal Origins Hypothesis and the more expansive DOHaD field effectively demonstrate the intricacy by which prenatal exposures impact early childhood development and disease trajectory. One such exposure that has seen tremendous growth in research focus is weight gain during pregnancy.

Weight gain during pregnancy, referred to as gestational weight gain (GWG), is an expected and important aspect of all pregnancies.¹⁰ The Institute of Medicine (IOM), first in 1990, and updated in 2009, provides an evidence-based guideline for appropriate and healthy GWG, which is based on a woman's prepregnancy body mass index (BMI) (Table 1).¹¹ Women on the lower end of the BMI scale have a far more liberal range of weight gain during pregnancy compared with those on the upper end of the BMI range. Researchers have found associations between gaining weight outside of the IOM recommendations and negative outcomes on both maternal and fetal health.^{5,10,11} For instance, inadequate weight gain has been associated with an increased risk of small-for-gestational-age babies and preterm birth.^{12,13} On the other side, excessive weight gain has been associated with an increased risk of large-for-gestational-age or macrosomic baby, as well as an increased risk of childhood obesity or

overweight, which propels the intergenerational cycle of obesity.^{5,13,14} For the mother, excessive weight gain during pregnancy has been associated with an increased risk of abnormal glucose metabolism, gestational or type 2 diabetes, hypertensive disorders, preeclampsia, and cesarean delivery.^{10,13}

Although the effects of inadequate GWG remain a priority clinically, more than half of today's pregnant women exceed GWG recommendations thereby contributing to the intergenerational cycle of obesity.^{5,13} In a recent systematic review and meta-analysis of 1,309,136 pregnant women, 23% of pregnancies gained below, and 47% of pregnancies gained above the recommended amount of weight.¹³ Currently, over two thirds of women are entering pregnancy at a higher BMI than previously observed,¹⁵ and globally the number of children and adolescents (aged 5–19 years) experiencing obesity has risen 10-fold in the past 4 decades.¹⁶ Based on current childhood obesity levels, trajectory models have demonstrated that the majority of today's youth will be obese at 35 years of age.¹⁷ Given the established relationship between discordant GWG and maternal-fetal health, a healthy weight gain trajectory in pregnancy has become a public health focus.

When considering GWG, it is crucial to recognize that discordant GWG is both an independent and a potentially modifiable risk factor for pregnancy complications.¹⁰ For motivated women, it is possible for GWG to be improved through conscious behavioral modifications by the mother, in consultation with a primary healthcare provider (HCP). Some examples of conscious behavioral changes include achieving adequate sleep,¹⁸ reducing sedentary activity, increasing physical activity (PA),¹⁹ and adjusting one's caloric intake appropriately based on pregnancy trimester to achieve a healthy lifestyle throughout pregnancy.²⁰ As discussed by Murphy et al,²¹ behavioral change counseling from primary HCPs has been effective in helping patients improve self-management of a variety of conditions. A meta-analysis on diet and PA counseling in pregnancy showed lower GWG in HCP intervention groups.²² Researchers have demonstrated the positive impact of behavior interventions

TABLE 1
Institute of Medicine Recommendations for Weight Gain in Pregnancy

Pre gravid Weight Category	Pre gravid BMI, kg/m ²	Recommended Rate of GWG in Second and Third Trimesters, Mean (Range), lb/wk	Recommended Total GWG, lb
Underweight	<18.5	1 (1–1.3)	28–40
Normal weight	18.5–24.9	1 (0.8–1)	25–35
Overweight	25–29.9	0.6 (0.5–0.7)	15–25
Obese (all classes)	>30	0.5 (0.4–0.6)	11–20

Adapted from the US Institute of Medicine and the US National Research Council Committee to Reexamine IOM Pregnancy Weight Guidelines. *Weight Gain During Pregnancy: Reexamining the Guidelines* (US National Academies Press, 2009).

in reducing GWG,^{22–24} which can help to mediate associated maternal-fetal health risks.^{5,25–28} A recent meta-analysis of 36 randomized controlled trials on diet and physical interventions in pregnancy showed a decrease in GWG and cesarean deliveries.²³ Similar results were also observed in previous meta-analyses.^{22,24} A woman's accurate knowledge of their specific GWG recommendation is positively associated with them achieving appropriate GWG,²⁹ and women that believe they will gain too much weight are in fact more likely to do so.³⁰ Specifically regarding HCP advice, there is evidence that GWG counseling may improve discordant weight gain.^{31–33} Results by Liu et al³¹ indicate that women being told to gain too much weight by their HCP are 2 times more likely to gain above the IOM guidelines, whereas women instructed to gain too little weight are 1.7 times more likely to gain below the guideline. This shows the magnitude of impact that an HCP may have on their patient's weight during pregnancy.

Still, it appears that women do not always receive accurate GWG information directly from their HCP. A study by Wilcox et al reported that women researching GWG information typically sought non-clinical and often non-evidence-based sources, such as the Internet (82.7%), books (55.4%), and friends (51.5%).³⁴ Similar results were reported in the study of Ferraro et al³⁵ about women's information channels for PA and dietary sources (DS) during pregnancy. Books and magazines (62.4% PA, 69.4% DS) and the Internet (43% PA, 53.7% DS) were the 2 most used sources among a list of options, which included a general practitioner, obstetrician/gynecologist, family, friend, registered nurse, personal trainer, or other. Although advice from HCPs would be expected to yield the most accurate and reliable information, a weak association between HCP advice and appropriate GWG exists,³⁶ suggesting a lack of consistent and clear guidance among HCPs or a lack of ability for patients to follow through on advice offered.

Pregnancy is a time point in the lifespan where women are in regular contact with the healthcare system, meaning that prenatal care providers have the potential to be reliable and valuable sources of evidenced-based information when counseling pregnant women about weight and its related behaviors. There is a need for better understanding of patient-provider dialogue to elucidate the knowledge that is being exchanged during these discussions. Thus, the purpose of this narrative review is to summarize the literature assessing GWG discussions as they occur during the prenatal period between patients and their HCPs in a clinical setting. Specifically, patient perceptions and HCP perceptions of GWG discussions will be explored, along with barriers and attitudes toward GWG communication.

METHODS

A comprehensive literature review was conducted by searching the Ovid Medline, CINAHL, and Embase databases for subject headings and key terms, such as combinations and iterations of “pregnancy,” “weight gain,” “counseling,” and “health professional” up to June 8, 2017, and updated on November 15, 2017 (the search was not limited to a start date, therefore all literature was catalogued). All primary research and English articles were included, as well as articles reporting on GWG discussions between patient and HCP in everyday clinical settings. There was no limitation on the prenatal HCP disciplines, and subsequently included obstetricians, family physicians, nurses, maternal-fetal medical (MFM) specialists, midwives, doulas, and any other trained and certified prenatal care provider. Clinical intervention study designs and conference abstracts were excluded. The lead author (A.W.) scanned the titles and abstracts of articles identified by the search strategy described previously and obtained full-text copies of all that potentially met the inclusion criteria. In addition, the search strategy was passively verified by another author (Z.M.F.) using the same combination of key search terms. The second author (R.H.L.) reviewed the full-text articles to be included to confirm the final selection.

RESULTS

Description of Articles

Study Characteristics

The literature search yielded a total of 724 articles, and 54 full-text articles were included after eligibility screening (Fig. 1). Of the studies assessing GWG communication between HCP and patient, 34 were quantitative, and 20 were of qualitative study design. The majority (85%) of quantitative studies were cross-sectional surveys, with sample sizes ranging from 42 to 9953 participants. Other quantitative study designs included one longitudinal cohort study, 2 prospective cohorts, and 2 retrospective cohorts. The qualitative studies had sample sizes ranging from 9 to 142 and consisted of focus groups, one-on-one interviews, and 1 analysis of observational audio recordings. For this narrative review, HCP disciplines included nurses, obstetricians, midwives, doulas, and family physicians. Definitions of “GWG discussion” varied or were absent in the included articles. Specifically, some authors defined weight gain discussions as providing information on a specific amount of weight to gain, whereas other authors stated terms such as “advice,” “counsel,” or “discuss” to define weight gain

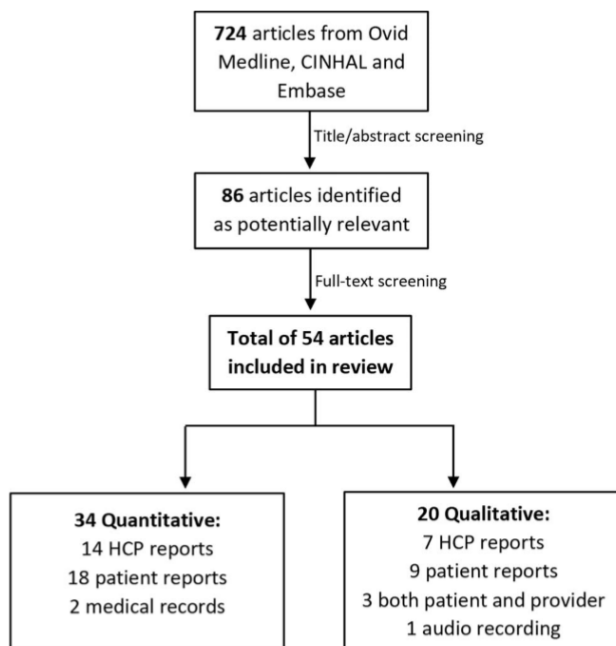


FIG. 1. Flowchart of included articles.

discussions between patients and HCPs. An executive summary of all findings can be found in Table 2. Summaries of the proportion of patients counseled on GWG can be found in Tables 3 and 4.

Historical Documentation

The first article identified assessing GWG conversations between prenatal patients and their HCP was published in 1986, which was the only study to analyze data from before the release of the first set of IOM guidelines related to GWG.³⁷ Most publications assessing GWG communication (84%) occurred after the release of the updated 2009 IOM guidelines.

Geographical Documentation

The majority of articles regarding GWG discussion between HCPs and patients were conducted in North America, with 22 from the United States and seven from Canada. Other studies were from Europe (seven studies from the United Kingdom and two from the Netherlands), Australia (eight from Australia and one from New Zealand), Asia (one from Japan and one from Sri Lanka), and one from Africa (Nigeria). Most studies (55.5%) followed the IOM guidelines for appropriate GWG, whereas others used country-specific guidelines or did not specify any guideline (see Supplementary Tables 1 and 2, Supplemental Digital Content, <http://links.lww.com/OBGYNSURV/A33>, <http://links.lww.com/OBGYNSURV/A34>).

Patient Perceptions (n = 30)

Among the included articles assessing patient perceptions of GWG advice, 18 were quantitative and 12 were qualitative studies. Key findings from articles examining patient perceptions are summarized below (Table 5).^{19,29–31,34,36–50,52–61}

Frequency of GWG Discussions Perceived by Patients

Patient reports of any GWG conversation varied considerably. The frequency of patients receiving GWG guidelines ranged from as low as 9.5%³⁴ to as high as 83%.⁴⁵ Most qualitative accounts reported that the majority of women did not receive any advice.^{38–43} Conversely, 2 qualitative studies reported that more than half (62%⁴⁶ and 63%⁴⁷) of women with overweight and obesity did, in fact, receive advice from their care provider. Few articles reported on the specific differences of approach or methods among different HCP disciplines; however, the articles that did discuss these differences were inconsistent. For instance, McDonald et al⁴⁴ reported that GWG communication was highest among midwives (64%) in a sample of 308 women, whereas Merckx et al¹⁹ reported only 13.4% of midwifery patients receiving any form of GWG advice in a sample of 455 women. In a focus group conducted by Tovar and colleagues,⁴² Hispanic women across all BMI groups reported receiving weight gain advice more frequently from a nutritionist or from the Women, Infants, and Children Program, than from their prenatal physician. In general, those who were significantly more likely to receive GWG advice were of higher socioeconomic status, older age, nulliparous, had a known history of dieting, had a lesser amount of PA in the first trimester, and were classified as overweight or obese.^{36,52,58} Overall, the frequency of GWG discussion shared from the patient point of view was often variable and inconsistent.

Content Themes and Accuracy Perceived by Patients

Along with conflicting patient perceptions of the frequency of GWG discussions, the patient-perceived content of the discussions also varied. For women receiving GWG advice, the two most common themes included being counseled on the risks associated with discordant GWG,^{44,45,50} and being given a specific amount of weight to gain.^{31,34,44,45,49,50,52,53} Most of the discussions related to the risks associated with discordant GWG focused on the risks of excessive weight gain, with fewer discussions about inadequate gain or weight loss during pregnancy. Of the articles reporting on specific weight gain ranges, the advice given by the HCP did not align with the IOM recommendations.^{52,53,58}

TABLE 2
Executive Summary of GWG Communication Between Prenatal Care Providers and Patients

Perception	Topic	Description of Theme
Patient	Prevalence of GWG discussion	Varied drastically among studies, but most prenatal patients do not receive GWG advice
	Patient characteristic	The following women were more likely to receive weight gain advice: • Higher socioeconomic status • Older age • Nulliparous • Known history of dieting • Low level of PA in the first trimester • Women with overweight or obesity
	Inconsistent advice	Patients reported receiving conflicting advice between different HCP disciplines. That is, midwife told them one thing and general practitioner told them another.
Prenatal HCP	Prevalence of GWG discussion	Varied drastically among studies, but most HCPs report discussing GWG more often than the patients perceived
	Patient characteristic	HCPs focused more on obesity and excessive GWG (as opposed to other BMI categories or inadequate weight gain).
	Weighing practices	Varied regarding frequency. Certain HCPs reported a reluctance to weigh their patients.
	Barriers	Commonly reported barriers include: • Lack of confidence • Lack of time • Lack of formal training • Assumption that counseling is ineffective • Concerns about the sensitivity of the topic (not wanting to offend) • Discrepancies regarding whose role it is to provide GWG advice
Agreed upon by both patients and HCPs	Content of GWG discussion	Primarily focused on the provision of a range of weight to gain and the risks associated with discordant GWG (specifically excessive weight gain). Lack details of behavioral modifications to achieve these goals.
	Accuracy of advice	Varied drastically among studies, but most patients were advised with low accuracy when compared with the IOM guidelines. Patients with overweight or obesity are more likely to be given incorrect weight ranges.
	Discipline of HCP	Varied, no agreement among the literature regarding which type of prenatal provider was most likely to give weight management advice.
Objective sources	Prevalence of GWG documentation	Very low frequency of documented GWG discussions in medical charts.

Multiple studies illustrated a lack of consistency with published guidelines and indicated that women who were overweight or obese were more likely to be told incorrect weight ranges.^{52,53,58} Interestingly, one study noted that women who were overweight or obese had an 18-fold higher likelihood of being told a recommendation that was more than the guidelines, when compared with women with normal weight.⁵² In another case, Tovar and colleagues⁴² noted drastic differences in target

weight recommendations among women of the same BMI category. In the focus group study performed by Tovar et al, normal weight, overweight, and obese women were each given inconsistent advice such that, some normal-weight women were told to not gain any weight and others were advised to gain up to 35 lb.

Variations within the content and the accuracy of advice among different BMI categories were apparent. This variation also extended to the type of HCP based

TABLE 3
Range of GWG Counseling and Accuracy in Studies Assessing Specific Populations

	Characteristic*	Number Assessing GWG Counseling	Given Any GWG Advice, %	Number Assessing Accuracy of Advice	Given Correct Advice,† %
Patient population	Hispanic	1	80	1	42
	Overweight/obese	16	15–100	3	0–29
	Black	3	50–66	0	—
	White	10	36–95	2	6–80
HCP population	Physician	12	28–98	3	0–10
	Midwife	4	13–43	1	16

*Defined as the majority of the population assessed in the study, >50%.

†With regards to IOM guidelines.

on patients' perceptions. In a qualitative study, one participant expressed that her doctors advised her not to gain any weight due to her overweight status. However, the participant's midwives subsequently told her that gaining over 22 pounds was normal.⁵⁵ The receipt of mixed messages regarding GWG was shared between studies. As an illustration, one participant in a study by Kominiarek and colleagues⁴⁷ highlighted, “one doctor tells you oh, you can gain 13 pounds, one doctor tells you oh, you can gain 25 pounds.” Similar mixed messages among different HCPs were also noted in an analysis of online parenting forums.⁵⁴ Overall, patients perceived receiving inconsistent GWG advice in content, accuracy, and from varying HCPs.

Specific GWG Counseling Advice Shared With Patients

Only two articles reported patients being counseled on how to gain within the guidelines.^{49,57} In a population-based study by Vinturache et al,⁵⁷ all patients reported receiving general advice about how to manage nutrition and exercise during pregnancy, yet identical advice about GWG was given, regardless of patients' prepregnancy BMI. Generally, women are interested in GWG discussions^{39,41,46,47,55}; however, they expressed not receiving enough information from their HCP.^{31,39,47,49,52} Participants noted feeling that their current discussions with HCPs were unclear or lacking in content such as how to gain an appropriate amount of weight during

pregnancy.^{31,39,47,49,52} As a result of the lack of clarity and specific weight counseling, patients noted feeling that HCPs were not concerned about their weight.^{45,48,49} Moreover, Nikolopoulos et al³⁹ mentioned that the lack of communication about weight and the confusion surrounding it lead some participants to question whether GWG was truly important to their HCP and for a healthy pregnancy. For example, one participant said.

“I thought that maybe the obstetrician didn't really care about the weight I'm gaining because she didn't tell me too much... Every time, just to go to the scale, she would look and tell me, ‘That's right’, every time. I don't know what's good or not.”

Likewise, Arden et al⁵⁴ found a similar theme in their analysis of parenting forums: “my midwife never weighs me, so I guess she's not too worried.” In some cases, women believed that prenatal patients would more commonly have to bring up weight gain to their HCPs themselves⁴³ or search the Internet on their own for weight advice during pregnancy.⁴⁰ Overall, patients perceived receiving unclear or a lack of tailored weight counseling advice from their HCPs, which lead them to question the importance of GWG during pregnancy.

Healthcare Provider Perceptions (n = 24)

Of the included articles related to HCP perceptions of GWG advice, 14 were quantitative and 10 were qualitative studies. There was great diversity in the types of HCP disciplines that were evaluated on GWG discussions. Studies included perceptions by the following types of HCPs: obstetricians, midwives, family physicians, nurses, MFM specialists, allied health staff, prenatal dietitians, practicing members of the American College of Obstetricians and Gynecologists (ACOG), or a mix of more than one of these specializations. Below are key findings from HCPs' perspectives along with barriers and perspectives of their role in giving pregnancy-related advice (Table 6).^{34,38,40,60,62–81}

TABLE 4
Differences in Range of GWG Counseling Between HCP and Patient Perspectives

	Given Any GWG Advice, %	Given Correct GWG Advice,* % (n)
HCP perspective (n = 12)	28–100	4–80 (5)
Patient perspective (n = 23)	0–87	0–85 (7)

*With regards to IOM guidelines.

TABLE 5
Patient Perceptions of Prevalence and Content of GWG Counseling

Prevalence of GWG Counseling	
<50% of patients counseled	>50% of patients counseled
• No advice given.³⁸⁻⁴³ • 9.5% given GWG guidelines.³⁴ • 13.4% of midwifery patients reported recalling any form of GWG advice.¹⁹ • 39% family physicians discussed GWG at all.⁴⁴ • 36% GWG among Obstetricians.⁴⁴ • 40.2% weight gain conversation among Nurses.⁴⁵	• 62% given advice.⁴⁶ • 63% given advice.⁴⁷ • 64% GWG communication among midwives.⁴⁴ • 75% weight gain conversation among physicians.³⁶ • 83% given GWG guidelines.⁴⁵ • 87% of patients recalling high frequency of GWG conversations and advice given.⁴⁸ • Weight gain advice more frequently from nutritionists or from Women, Infants, and Children Program than from prenatal physician.⁴²
Content and accuracy of the GWG discussion and HCP practices	
Content of GWG discussion	
• Patients given a specific amount of weight to gain.^{31,34,44,45,49-53} • Counseled on risks associated with excess GWG (less on inadequate weight gain).^{44,45,50} • Inconsistent weight suggestions.^{47,54,55}	
Aligns with IOM	
• 85% of pregnant women given advice within IOM.⁵² • 9% accuracy of advice given in line with IOM.⁴⁴	
Accuracy by HCP type	
• 16.3% midwives, 10% family physicians, and 9% obstetricians were accurate in prescribing GWG ranges.⁴⁴	
Advice on how to manage weight gain	
• 71.5% of HCPs rarely or never advised on how to manage weight in early pregnancy; 83.5% of HCPs rarely or never advised in late pregnancy.⁴⁶	

Frequency of GWG Discussions Perceived by HCPs

Although there was a wide range in frequency of GWG discussion, HCPs generally reported higher incidences of counseling than their patients perceived.^{64,65} The frequency of GWG discussions as perceived by HCPs ranged from 28% to 95.5%,^{70,71,75} yet the definitions of weight gain discussion differed throughout the studies. The qualitative reports about GWG advice frequency displayed greater variability. Select studies indicated very low frequencies of GWG discussion; one study⁶⁴ observed that only 33% of HCPs addressed GWG guidelines with their patients, and another study³⁸ indicated that less than 15% of obstetricians provided weight advice to each patient at every visit. In contrast, Oken and colleagues⁶⁵ reported that almost all clinicians provided advice during their first visit with the patient.

Work by our group, comparing self-reports of GWG discussions among different HCPs, found that the frequency of GWG conversations was highest among midwives (94%), followed closely by general practitioners (93%), obstetricians (84%), MFM specialists (73%), and nurses (60%).⁶⁸ Two studies showed minor variations in the frequency of GWG discussions by stage of pregnancy.^{43,65} For instance, Macleod et al⁶³ found that 39% of midwives reported offering verbal weight management advice at the patient's first prenatal appointment, but only 13% regularly offered this same advice later in pregnancy.

Overall, HCPs reported discussing GWG at a high frequency; however, this did not always occur at each prenatal visit across pregnancy and differed among HCP types.

Content Themes and Accuracy Perceived by HCPs

Similar to patient perceptions regarding the content of GWG discussions, HCP perceived that the content also varied. Of the HCPs that indicated providing GWG advice, the most common advice given was related to a specific target weight gain^{66,67,69,70,72,74,81} and the risks of discordant GWG.^{63,69,74} Despite a relatively high self-reported frequency of engaging in GWG conversation, HCPs did not always provide accurate GWG ranges in accordance with 2009 IOM guidelines. In one study of obstetricians and midwives, as little as 4% of HCPs correctly identified weight gain ranges for all prepregnancy BMI categories.⁷² Conversely, another article noted that the majority (80%) of a mix of HCP types counseled patients with the correct IOM recommendations.⁷⁰

There were also notable differences in the precision of GWG recommendations among higher and lower limits of individual prepregnancy weight categories.^{69,70,78} Findings from our group reported 69% of HCPs correctly identified the maximum IOM limit for women with obesity.⁶⁸ This same study noted that midwives tended to recommend 1.46 kg more weight

TABLE 6
HCP Perceptions of Prevalence and Content of GWG Counseling

Prevalence of GWG Counseling	
<50% of patients counseled	>50% of patients counseled
• 28% of HCPs discuss GWG.⁶² • 42% of HCPs reported discussing appropriate weight gain “frequently/always” with obese pregnant women.⁶³ • 33% of HCPs reported provided GWG guidelines.⁶⁴ • <15% OBs providing GWG advice at each visit.³⁸	• All clinicians reported providing advice during first prenatal visit.⁶⁵ • 95.5% of OBs and physicians discuss GWG.⁶⁶ • 65.5%–95% “always” or “often” discuss GWG.^{67–72}
Content and accuracy of the GWG discussion and HCP practices	
Frequency by profession	
• 94% midwives, 93% general practitioner, 84% OBs, 73% MFM specialists, 60% nurses.⁶⁸ • 90% nurses, 86% dieticians, 17% family physician, 50% midwives, 42% OB.⁷³	
Frequency by pregnancy stage	
• 39% midwives in the first visit but 13% at subsequent visits.⁶³ • 19% at first visit, 22% at subsequent visits.⁶²	
Content of advice	
• Provided advice about target weight gain or weight gain range.^{66,67,69,70,72} • Provided advice on the risks of discordant weight gain.^{63,69,74} • Japanese HCPs counseled patients to gain as little weight as possible.⁶⁰ • Behavioral advice for appropriate GWG (focus on PA and nutrition).^{67,69,74} • 83% OBs gave counsel on fruit and vegetable consumption, 73% discussed sugar-sweetened beverages, 94% discussed benefits of breastfeeding, 96% reported PA recommendations, 74% offering high fat and sugary foods advice.⁶⁷ • Midwives discussed PA and food requirements more frequently than all other disciplines.⁷⁴ • 15% midwives offered personalized advice on weight management based on current PA and diet levels.⁶³	
Accuracy of advice	
• 4% of HCPs correctly identified GWG range for all prepregnancy BMI categories.⁷² • 80% of HCPs correctly counseled based on IOM guidelines.⁷⁰	
Weighing practices	
• 19% of HCPs report frequent weighing.⁷² • 52% report frequent weighing.⁷⁵ • 92% general practitioners reported weighing, followed by OBs (88%), nurses (84%), and midwives (35%).⁷⁴ • There was reluctance from the HCP to weigh their patients.^{40,64,76,77}	
HCP perceptions on the importance of weight management	
• 62% HCPs believed GWG was not important and 69% of midwives ranked GWG as least important component of care.⁷⁵ • 100% of HCPs believe GWG was important for patients with obesity.⁷³	
OB indicates obstetrician.	

to gain for patients with obesity. In fact, midwives most commonly exceeded upper limit recommendations (60%), followed by nurses (50%), MFM specialists (32%), obstetricians (23%), and general practitioners (33%). Although the IOM guidelines use BMI as an indicator for GWG recommendations, it has been shown that obstetrician/gynecologists who completed their residency after 1996 were more likely to use their patient's BMI to screen for obesity during prenatal care than those completing residency before 1996.⁷¹

With regards to GWG-related content shared by HCPs, HCPs tended to focus more on obesity and excessive weight gain as opposed to inadequate weight gain.^{33,38,60} Interestingly in a study from Japan, the majority of HCPs counseled their patients to gain as little weight as possible to avoid excess weight.⁶⁰ Generally, there was a lack of consistency in the GWG content delivered by HCPs, either among HCPs or between care provider “types.”

Specific GWG Counseling Advice Provided by HCPs

A few studies reported details on the HCP's weighing practices and how they counseled their patients to gain weight within their recommendation.^{63,67,69,72–75} Weighing practices varied in terms of frequency^{40,44,70} and by HCP type.⁷⁰ Most prenatal patient weighing only occurred because of a known pregnancy complication, as opposed to routine weight gain surveillance.⁷² In fact, researchers noted that there was even a reluctance among some HCPs to weigh their patients.^{40,64,76,77} Knight-Agarwal et al⁷⁷ concluded that although once a popular occurrence, weighing women and advising about weight gain was no longer a standard practice among midwives. In an investigation by Olander and colleagues⁴⁰ assessing both patient and provider perceptions, HCPs believed or assumed that their patients did not want to be weighed, which may have contributed to discontinuing frequent weigh-ins. Moreover, the level of importance

on GWG during pregnancy varied by HCP type with some midwives (69%) ranking it as the least important component of care,⁴⁰ and another study noting that all HCPs (100%) believed that GWG was important for patients with obesity.⁷⁹

Regarding weight counseling, three studies reported on HCPs giving behavioral advice for appropriate GWG, and this advice focused on PA and nutrition.^{67,69,74} One study described HCPs' self-report on five weight-related actions during pregnancy including (1) giving counsel on fruit and vegetable consumption, (2) providing guidance on sugar-sweetened beverages, (3) giving counsel on breastfeeding, (4) giving counsel on PA, and (5) offering advice on high fat and sugary foods.⁶⁷ Morris and colleagues⁷⁴ reported that midwives discussed PA and food requirements more frequently than all other disciplines. Only a minority of midwives (15%) offered personalized advice on weight management based on the patient's current diet and PA levels.⁶³ One research group reported that the amount and consistency of the weight advice were determined by women's responses, women's motivation to change, and the midwives' self-perception as a role model.⁷⁹ It was also noted that certain midwives from the aforementioned study reported that their own body image and personal issues might have hindered their provision of weight advice. Generally, HCPs reported a high frequency of engaging in GWG discussions; however, there were inconsistent reports concerning the accuracy of GWG content and advice given during these conversations. In addition, HCP weighing practices and how they counseled their patients to gain weight within their recommendations were variable throughout the literature. At times, this variability and inconsistency of GWG counseling led patients to question the importance of GWG among their HCPs.

Barriers to Discussing GWG Perceived by HCPs

As highlighted in Table 2, commonly reported barriers to discussing weight gain included lack of confidence, lack of time, lack of training, the perception that it was not part of their job, the assumption that counseling is ineffective, and concerns about the sensitivity of the topic or not wanting to offend patients.^{33,63,78} In the article by Stotland et al on HCPs' knowledge, attitudes, and practices regarding excessive GWG,³⁸ HCPs stated their uneasiness in the effectiveness of counseling and could not agree on an effective approach that was sensitive to the issues patients faced related to GWG. This often resulted in HCPs avoiding or delaying any weight gain counseling.³⁸ Physicians particularly identified their lack of knowledge and

formal training as a weakness in addressing weight management issues. Stotland et al also suggested that many of the different HCPs required additional evidenced-based behavioral counseling training to adequately address weight management issues.³⁸

A common theme that emerged among barriers to HCPs included discrepancies about whether GWG advice should or should not be the role of the primary prenatal HCP. In a study by Macleod et al,⁶³ certain midwives were unsure if it was their role to provide advice, and one participant even stated that "midwives cannot be a jack of all trades. They will end up a master of none." However, other researchers described that the majority of HCPs believed that it was, in fact, their role to provide GWG advice.^{68,78}

Objective Sources of Data (n = 3)

Most of the studies included on GWG discussions were from patient and HCP self-reports. Only a few studies have used objective sources of data, such as medical chart data and audio recording data to describe GWG discussions. Two studies identified in our search investigated the documentation of GWG conversations in medical charts.^{51,82} One review of 477 medical charts from prenatal patients with overweight and obesity noted that 15% of physicians documented a GWG discussion and only 10% documented giving the patient a specific weight gain goal.⁸² In this study, the resident physicians were more likely to document the occurrence of a GWG discussion, but the faculty physicians were more likely to document the patient's specific GWG goal. In one case, a patient received different GWG goals from a nurse and a physician. Another study using medical chart review examined 300 records and noted similarly low GWG documentation.⁵¹ Only 14% of prenatal patients had documentation of GWG recommendations in their medical chart. In particular, 14% of the documentation was observed in normal weight population, 9% in women who are overweight, and 17% in women who are obese. Despite low reports of documented GWG conversations, a total of 92% of the women studied were weighed at each of their antenatal visits. With regards to medical record documentation, it should be noted that it was unclear whether GWG counseling truly occurred and it went undocumented, or whether there was lack of counseling that occurred, concurrent with a lack of documentation.^{51,82,83}

Along with objective medical chart data, one study used audio-taped recordings to assess the occurrence and content of GWG conversations, another objective source.⁸³ Washington Cole et al tested the use of the 5As (*ask, assess, advise, agree, assist*) theoretical

framework during prenatal care conversations around GWG. These conversations were documented using audio recordings from obstetrician clinics. Approximately half (55%) of the prenatal visits included some variation of weight-related behavioral counseling. Among the visits that included discussions about weight, counseling usually involved the *ask* (49%) or *advise* (85%) steps of the 5As framework. Thus, it was more common to *ask* for permission to discuss weight and to *advise* prenatal patients on discordant weight gain risk and management options. Less frequent were *assessing* the causes of discordant weight gain, *agreeing* on a behavioral plan to manage weight, and *assisting* women with potential barriers and education follow-up. There were no prenatal sessions that incorporated all 5As. Overall, the studies that contained objective sources of data noted minimal frequency of GWG discussions and weight gain goals and approximately half of HCPs engaged in weight-related behavioral counseling.

DISCUSSION

Certain groups of women were more likely to report receiving GWG advice than others. Women of higher socioeconomic status, older age, nulliparous, with history of dieting, with low levels of PA in the first trimester, and women with higher BMI were significantly more likely to be counseled on GWG. Although speculative, women of higher socioeconomic status may have better access to healthcare, better means to address some of the contributing factors to weight gain, less risk of pregnancy complications, and may be more knowledgeable of health behaviors in pregnancy. In addition, Phelan et al⁵² discussed that HCPs may be faced with literacy barriers or more acute medical and psychosocial challenges when caring for women of lower socioeconomic status. It is possible that women of older age may receive more weight counseling as they may be followed more closely in pregnancy because of known age-related health risks. Healthcare providers may counsel nulliparous women more because they assume the women are unaware. For women with a low level of PA, HCPs may presume that their low activity is indicative of poor lifestyle habits thus increasing the susceptibility to excessive weight gain. It is likely that women with overweight and obesity are counseled more often because their weight gain range is smaller, and they pose a greater risk in the antenatal period than normal weight women. However, there may be other contributing factors such as stigma and assumption that these women aren't already engaging in healthy lifestyle behaviors.

In the literature, prevalence and content of GWG counseling varied drastically, but was often low and inaccurate. A discrepancy also exists between patient and provider perspectives of GWG counseling. The few studies that use objective measurements likewise show a lack of weight documentation over the duration of pregnancy. Patients have even reported receiving conflicting advice between different HCP disciplines, which may be attributed to HCPs not being fully aware of the IOM recommendations. These mixed messages may impact the patient by making weight seem unimportant or making the patients too confused to attempt weight management. Among HCPs providing advice, an overwhelming majority were unable to identify the correct weight gain ranges based on a pregnant woman's prepregnancy BMI. The current body of research lacks thorough examination into how HCPs instruct their patients to manage their weight. Providing patients with a range and amount of appropriate weight gain may not be sufficient to manage GWG. Instructing patients on healthy behavioral changes may be more beneficial in managing GWG, such as providing references on caloric and PA requirements.

It was not surprising that reports of GWG discussion vary among different continents and countries. Globally, healthy maternal weight gain is of great concern for preventing the negative downstream sequelae associated with the low and high end of the spectrum. However, no international consensus exists across available maternal weight policies.⁸⁴ In the study by Scott et al examining global maternal weight policies, the majority of policies address the importance of monitoring GWG throughout the pregnancy; however, the content of the prenatal guidelines varied across countries. For instance, in North America, the 2009 IOM are typically used as maternal weight guidelines by HCPs,⁸⁵ whereas in Japan,⁸⁶ recommendations from the Japanese Ministry of Health, Labour, and Welfare for weight gain during pregnancy are used and tend to present smaller gains in comparison. Although this may be the case, it should be noted that the HCPs from the Japanese study made judgments based on their own experience rather than following any evidence-based guideline.⁶⁰ It is of equal importance to consider socioeconomic factors that may influence GWG discussions. In a study by Pinidiyapathirage and Wickremasinghe⁶¹ conducted in Sri Lanka, the researchers noted that although half of the patients reported being given GWG information, as a developing country, there are often more pressing health matters to address in the medical clinics like the lack of functioning toilets or safe water. Overall, practices related to establishing appropriate GWG and tailoring lifestyle counseling vary widely in different

country settings.⁸⁴ Given that ethnicity and socioeconomic status may have an impact on discordant weight gain, further research regarding the feasibility of a global GWG guideline across countries may be needed.⁸⁷

Likely barriers to achieving effective GWG knowledge translation between HCPs and their patients include: lack of time, lack of resources, and lack of education. It is also worth noting that the type of HCP discipline may pose as a barrier. As recently articulated by Morris and colleagues,⁷⁴ midwives by profession tend to take a more holistic approach to care compared with physicians, allowing them to focus on the overall wellness of their patients. Thus, by nature midwives tend to have more time to discuss health behaviors and GWG. In contrast, other physicians and prenatal specialists are perhaps more likely to see high-risk patients, where critical health problems may need to take priority over behavioral counseling practices. Healthcare providers also mentioned a lack of knowledge and lack of resources as barriers to engaging in GWG discussion. In fact, one participant in a study by Knight-Agarwal et al⁷⁷ discussed that if the guidelines for what professionals are supposed to do are not clear, then so too are the messages that they are giving their patient. Healthcare providers also mentioned the need for additional tools and resources, for example, the development of an electronic medical record application⁶⁵ that included a form for tracking GWG or patient handouts.

One such knowledge translation tool that may be of use is the Canadian Obesity Network's 5As of Health Pregnancy Weight Gain. This tool is directed toward prenatal HCPs and uses a modified 5As framework (*ask, assess, advise, agree, assist*) to help them sensitively and practically provide GWG advice.⁸⁸ Considering most women are interested in GWG and are willing to achieve a healthy weight during pregnancy for their health and that of their offspring, the 5As tool provides HCPs with a promising standardized communication guide to discuss GWG with all their patients.

Overall, this narrative review was the first to our knowledge to summarize the literature examining pregnancy weight counseling in prenatal care. Nevertheless, this review is subject to limitations as it was not a true systematic review. Our search strategy may not have accurately captured all available information relating to this subject, and there was no quality assessment for the included studies. In addition, the included literature consisted mainly of self-reports that are indeed subject to reporting bias. As a means to reduce bias in this review, it should be noted that both qualitative and quantitative reports were provided from both patients and HCPs so that different perspectives could corroborate the evidence presented. Lastly, the patient-HCP interface

is a complex interaction with interdisciplinary aspects that may extend further than just the clinic. For instance, healthcare delivery systems, clinical microsystem and macrosystem, government funding, and medical education may all indirectly influence the dissemination of prenatal health information to patients.⁸⁹ In contrast, patients may face interpersonal, educational, or socioeconomic barriers to understanding health information. There may be a need to examine broader intricacies that impact prenatal health education on both patient and provider ends. Future research should focus on using more objective methods to examine patient-provider interactions, assessing and overcoming underlying barriers to GWG communication, and on the development of clinical knowledge translation tools.

CONCLUSIONS

Although the sheer volume of literature on prenatal weight counseling practices has increased over time, the evidence remains variable and inconclusive. Many discrepancies exist in the literature, including differences between studies, different geographic regions, patient populations, and HCP populations. There exists a discord in weight gain knowledge translation between prenatal patient and provider. Common barriers to weight discussions included a lack of resources and education. There is an urgent need for care providers and patients alike to better understand ways to manage weight gain in pregnancy. Future research should focus on using more objective measurements to examine underlying factors relating to GWG counseling and on clinical guides to facilitate weight management throughout pregnancy.

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Supplemental Information

Supplementary Material 1. Characteristics of Included Quantitative Studies (n=34)

Source (Author/Year)	Year	Coun try	Guidelines (Year)	Sample	Study Design	Perspective Who reported the information? For patients , from whom was the care delivered by?
Abraham S.	2001	Austr alia	Not Specified	67	Cross-sectional survey	HCP - Obstetrician
Boothe- LaRoche A, et al.	2014	USA	IOM (2009)	250	Cross-sectional survey	HCP - Obstetrician
Ellison G, et al.	1997	UK	Not Specified	672	Cross-sectional survey	HCP - Midwife
Ferraro ZM, et al.	2013	Canad a	- IOM (2009) - SOGC Guidelines (year?)	174	Cross-sectional survey	HCP -49% Obstetrician -18% Midwife -17% General Practitioner -12.6% Maternal Fetal Medicine Specialist -3% Registered Nurse
Grohmann B, et al.	2012	Canad a	IOM (2009)	96	Cross-sectional survey	HCP -Obstetrician -Family Physician -Registered Nurse -Registered Dietician
Herring SJ, et al.	2010	USA	IOM (1990)	58	Cross-sectional survey	HCP -55% Obstetrician -14% Registered Nurse -31% Midwife
Kogan MD, et al.	1994	USA	Public Health Service's Expert Panel on the	9,932	Cross-sectional survey	HCP -Not Specified

			Content of Prenatal Care Report (1989)			
Lutsiv O, et al.	2012	Canada	IOM (2009)	42	Cross-sectional survey	HCP - Obstetrician - Midwife - Family Physician
Macleod M, et al.	2013	UK	Not Specified	78	Cross-sectional survey	HCP - Midwife
Moore Simas TA, et al.	2013	USA	IOM (2009)	660	Cross-sectional survey	HCP - 51% Obstetrician/Gynecology Residents - 49% Family Physicians Residents
Morris J, et al.	2017	Canada	Not Specified	Not Specified	Cross-sectional Survey	HCP - General Practitioner - Obstetrician - Midwife - Nurse
Power ML, et al.	2006	USA	ACOG	900	Cross-sectional survey	HCP - Practicing Members of ACOG
Stewart ZA, et al.	2012	Australia	Not Specified	103	Cross-sectional survey	HCP - 52% Midwife - 48% Obstetrician
Wilkinson SA, et al.	2013	Australia	Statewide (Queensland) Clinical Guidelines	73	Cross-sectional survey	HCP - Obstetrician - Midwife - Allied Health Staff
De Jersey SJ, et al.	2012	Australia	IOM (2009)	664	Prospective observational cohort	Patient
Ferrari RM, et al.	2013	USA	IOM (1990)	1,454	Longitudinal cohort study	Patient (delivered by: Registered Nurse, General Practitioner, Other)
Krukowski RA, et al.	2017	USA	IOM (2009)	230	Cross sectional survey	Patient (delivered by: General Practitioner)
Ledoux T, et al.	2015	USA	IOM (2009)	246	Cross-sectional survey	Patient

Liu J, et al.	2016	USA	IOM (1990)	3,402	Cross-sectional survey	Patient
McDonald SD, et al.	2011	Canada	IOM (2009)	310	Cross-sectional survey	Patient (delivered by: Obstetrician, Midwife, Nurse Practitioner, Family Physician)
McDonald SD, et al.	2012	Canada	IOM (2009)	308	Cross-sectional survey	Patient (delivered by: Midwife, Family Physician, Obstetrician, Other)
Merkx A, et al.	2015	Netherlands	IOM (2009)	455	Cross-sectional survey	Patient (delivered by: Midwife)
Olagbuji BN, et al.	2015	Nigeria	Not Specified	348	Cross-sectional survey	Patient (delivered by: Obstetrician, General Practitioner, Registered Nurse)
Phelan S, et al.	2011	USA	Not Specified	401	Cross-sectional survey	Patient (delivered by: General Practitioner, Registered Nurse, Nutrition Counsellor)
Pinidiyapathirage MJ, et al.	2007	Sri Lanka	IOM (1990)	400	Cross-sectional survey	Patient (delivered by public health staff including nursing sisters, inspectors, midwives, working under a Medical Office of Health (?))
Shulman R, et al.	2016	USA	IOM (2009)	338	Cross-sectional survey	Patient (delivered by: 66.6% General Practitioner, 33.4% HCP-Not Specified)
Swift JA, et al.	2016	UK	Not Specified	193	Cross-sectional survey	Patient
Taffel SM, et al.	1986	USA	- Williams Obstetrics (1971) - Committee on Maternal Nutrition of the National Academy of Sciences (1970) - ACOG (1974)	7,704	Cross-sectional survey	Patient (delivered by: HCP-Not Specified)

			- American Academy of Pediatrics			
Taffel SM, et al.	1993	USA	IOM (1990)	9,953	Cross-sectional survey	Patient
Vinturache A, et al.	2017	Canada	IOM (2009)	1,996	Cross-sectional survey	Patient
Waring ME, et al.	2014	USA	IOM (2009)	149	Prospective cohort	Patient
Willcox JC, et al.	2015	Australia	IOM (2009)	368	Cross-sectional survey	Patient (delivered by: General Practitioner, Midwife)
McDonald SD, et al.	2014	Canada	IOM (2009)	300	Retrospective cohort	Medical chart documentation of GWG discussion (delivered by: 41% shared responsibility, 40% exclusively Obstetrician, 18% exclusively Midwife, 0.3% exclusively Family Physician)
Moore Simas TA, et al.	2010	USA	Not Specified	477	Retrospective cohort	Medical chart documentation of GWG discussion (delivered by: 50% Faculty Practice, 50% Resident Practice)

ACOG= American College of Obstetricians and Gynecologists; GWG= Gestational Weight Gain; HCP=Healthcare Practitioner; IOM= Institute of Medicine Pregnancy Weight Guidelines; SOGC= Society of Obstetricians and Gynecologists of Canada; UK= United Kingdom; USA= United States.

Supplementary Material 2. Characteristics of Included Qualitative Studies (n=20).

Source (Author/Year)	Year	Country	Guidelines (Year)	Sample	Study Design	Perspective Who reported the information? For patients , from whom was the care delivered by?
Chang T, et al.	2013	USA	Not Specified	10	Semi-structured interview	HCP - 30% Obstetrician - 30% Family Physician - 40% Midwife
Foster CE, et al.	2014	UK	Not Specified	9	In-depth interview	HCP - Midwife
Knight- Agarwal CR et al.	2014	Australia	IOM (2009)	Not Specified	Focus groups	HCP - Obstetrician - Midwife
Oken E, et a.	2013	USA	IOM (2009)	16	In-depth interview	HCP - 62.5% Midwife - 37.5% Family Physicians
Stotland NE, et al.	2010	USA	Not Specified	52	Focus groups	HCP - Obstetrician - Midwife - Nurse
Willcox JC, et al.	2013	Australia	IOM (2009)	15	Semi-structured interview	HCP - Midwife
Arden MA, et al.	2014	UK	NICE Guidelines on weight management in pregnancy (2010)	400 online posts	Cross-sectional	Patient (delivered by: HCP-Not Specified)
Baron R, et al.	2017	Netherlands	Not Specified	22	Interview with open-ended questions	Patient (delivered by: Midwife)
Fieldwick D, et al.	2014	New Zealand	IOM (2009)	12	Semi-structured focus groups and in-depth interviews	Patient (delivered by: HCP-Not Specified)

Knight-Agarwal CR, et al.	2016	Australia	Australian guidelines	16	Semi-structured interview	Patient (delivered by: HCP-Not Specified)
Kominiarek MA, et al.	2015	USA	IOM (2009)	16	Focus groups	Patient (delivered by: 25% Certified Nurse Midwife, 63% General Practitioner, 13% Other)
Nikolopoulos H, et al.	2017	Canada	Not Specified	26	Focus groups	Patient (delivered by: 58% Obstetrician, 38% Family Physician, 4% Midwife)
Stengel MR, et al.	2012	USA	IOM (2009)	24	Semi-structured interview	Patient (delivered by: HCP- Not Specified)
Tovar A, et al.	2010	USA	IOM (1990)	29	Focus groups	Patient (delivered by: HCP- Not Specified)
Whitaker KM, et al.	2016	USA	IOM (2009)	30	One-on-one interviews	Patient (delivered by: 45% General Practitioner, 45% Residents, 10% Nurse Practitioner)
Wiles R.	1998	England	UK Health Education Authority (1994)	37	In-depth interview	Patient (delivered by: General Practitioner, Midwife)
Duthie EA, et al.	2013	USA	IOM (2009)	26	One-on-one semi-structured interviews	Both - 73% Pregnant Women - 27% Obstetrician
Haruna M, et al.	2010	Japan	National Guidelines (Ministry of Health, Labor and Welfare, 2006)	26	Focus groups	Both - 34% Pregnant Women - 34% Midwives - 31% Obstetricians
Olander EK, et al.	2011	England	Not Specified	29	Focus groups	Both - 31% Prenatal Women - 48% Postnatal Women - 7% Midwives - 7% Social Workers - 7% Children Centre Managers

Washington Cole KO, et al.	2017	USA	Not Specified	142	Audio Recordings	Audio Recordings - 85% Patients - 15% Obstetricians
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NICE = National Institute for Health and Clinical Excellence; HCP=Healthcare Practitioner; IOM= Institute of Medicine
Pregnancy Weight Guidelines; UK= United Kingdom; USA= United States.

CHAPTER 3: EMAT SURVEY

(Article 2)

Preamble

This chapter continues the investigation of patient-provider GWG counselling by analyzing data from an electronic maternal health survey (EMat). This survey is unique from the previously discussed literature as it not only assesses the prevalence of GWG and dietary counseling, it also assesses knowledge, behaviours, and perceptions of a variety of prenatal health practices (Objective 2). The study reports on data from Canadian women as well as some representation from women all over the world.

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Perceptions of Weight Gain in Pregnancy:
Results of an Electronic Maternal Health Survey

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Abstract

Problem: Too much or too little gestational weight gain can negatively impact maternal and fetal health, according to the Institute of Medicine Guidelines. **Background:** Maternal nutrition and physical activity are known contributors to gestational weight gain and are key health promotion foci during pregnancy. However, there appears to be inconsistent weight gain communication among healthcare providers during prenatal care. **Question:** What weight and dietary counselling practices are occurring in prenatal care? **Aim:** To characterize women's perceptions of provider-provided weight and dietary counselling. **Methods:** A reliable and validated cross-sectional electronic survey was administered to currently pregnant women and women who had recently given birth. The web-based questionnaire was self-administered and took 10-25 minutes.

Findings: A total of 1507 eligible women participated in the survey. More than half (57%) of women reported that their provider talked to them about personal weight gain limits. Of these patients, about a third (34%) of patients were counselled regularly at each or most visits. Among the women that were not counselled on personal weight gain limits, over half (56%) reported that HCP guidance would have been helpful to achieve their target weight. Less than half (45%) of participants reported that their provider discussed dietary requirements or changes in pregnancy.

Discussion: These findings highlight areas for improvement in prenatal dialogue to better outcomes for both mother and baby. **Conclusion:** Future research in tools should be developed to assist healthcare providers with engaging such important dialogue with their patients.

Keywords: Pregnancy weight gain counselling, prenatal healthcare.

1.0 Introduction

Statement of Significance

Issue

Gestational weight gain (GWG) outside of the Institute of Medicine Guidelines can be harmful to both maternal and fetal health.

What is already known

Maternal nutrition and physical activity are known contributors to GWG and are key health promotion foci during pregnancy. However, there appears to be inconsistent GWG communication among healthcare providers (HCPs) during prenatal care.

What this Paper Adds

These findings highlight areas for improvement in HCP-mediated prenatal dialogue to better outcomes for both mother and baby.

Pregnancy is a period of tremendous growth and development for both mother and baby. The *in utero* environment that a fetus develops in can have both immediate and long-term effects on the child¹. Gestational weight gain (GWG) is a normal and expected aspect of pregnancy, but the amount of weight that a mother gains can impact the health of both the mother and the baby. Weight gain that is discordant with the Institute of Medicine (IOM) Guidelines² has been associated with a variety of negative health outcomes²⁻⁸, regardless of what a mother weighs before her pregnancy. Gaining too little weight in pregnancy is associated with an increased risk of a small-for-gestational-age baby and preterm birth^{5,6}.

Conversely, too much weight gain (or excessive GWG) is associated with an increased risk of hypertensive disorder, preeclampsia, caesarian delivery, gestational diabetes and

downstream type two diabetes in the mother ^{3,4,6}. Excessive GWG is also linked with a higher chance of delivering a large-for-gestational-age or macrosomic baby and downstream child overweight or obesity ^{6,7,9}. Health risks can be reduced through appropriate GWG independent of the woman's pre-pregnancy body mass index ^{6,9,10}, therefore it is critical that an optimal weight gain is achieved in pregnancy.

Adopting a variety of healthy lifestyle factors by the mother in pregnancy can support guideline-concordant GWG. Such factors include sleep ^{11,12}, physical activity ^{13,14}, and obtaining a healthy diet in pregnancy ^{13,15}. Proper diet and physical activity are particularly helpful in obtaining optimal GWG. For example, women may be unaware that their caloric requirements in pregnancy do not change at all in the first trimester, and only increase by 350 and 450 calories, in their second and third trimesters, respectively ¹⁶. For women with obesity, there is data to suggest that current prediction models for energy intake overestimate requirements and these women may be susceptible to over-gaining ¹⁷. With regards to physical activity, the American College of Obstetrics and Gynecology recommend 30 minutes of exercise on most, if not every, day of the week ¹⁸ for health benefits such as improved fitness, weight, psychological wellbeing, fetal heart rate, placenta viability, and optimal lean body mass in early childhood ¹⁹. Therefore, it is important to consider dietary and physical activity practices in managing GWG.

Behavioural interventions in pregnancy have shown success in lowering the total amount of weight gained in pregnancy, thus reducing the occurrence of excessive GWG ^{13,20,21}. The prenatal period is an ideal time to introduce lifestyle modifications given that women are motivated to improve behaviours for the health of her baby ^{22,23} and are in regular contact with their healthcare provider (HCP). In fact, GWG counselling by prenatal HCPs has been shown to significantly help patients improve personal weight gain targets ²⁴⁻²⁶. Additionally, women who

are aware of the IOM guidelines are significantly more likely to achieve proper GWG ²⁷, when compared to women who are unfamiliar with the guidelines. To illustrate the magnitude of the HCP effect, women who were explicitly being told to gain too much weight by a HCP were as much as two times more likely to gain above the IOM guidelines ²⁴.

Despite the importance of HCP-mediated GWG conversations, it has been shown that HCP counselling is often insufficient. A recent literature review demonstrates that the frequency of GWG counselling is generally low and contains a large amount of misinformation ²⁸. Understanding pregnant women's perceptions of GWG counselling and weight-related pregnancy behaviours could provide valuable insight into the development of GWG education tools for patients and may improve HCP-mediated GWG messaging in prenatal care. Therefore, given the impact of GWG and HCP communication on prenatal health, the objective of this study was to determine pregnant women's perceptions of the occurrence of diet and weight management counselling in prenatal healthcare.

2.0 Methods

2.1 Data Collection

All women were eligible to participate if they were over the age of 18 and were either pregnant at the time of the survey or had given birth in the past five years. Participants were recruited by word of mouth and through online social media (Facebook and Twitter) advertisements that contained secure links to the survey. Data were collected by a previously validated self-administered Electronic Maternal Health Survey (*EMat Health Survey*) that assessed knowledge, behaviours, and perceptions of a variety of prenatal health practices ²⁹. The questionnaire addressed prenatal health concepts such as weight gain, physical activity, diet,

social support and locus of control in pregnancy. The survey contained one section with questions assessing the woman's behaviours and perceptions of their current pregnancy and one section with related questions for their most recent past pregnancy. The layout of the survey contained branching logic so that women filled out the part(s) of the survey most relevant to their current and previous pregnancy status. Participants took between 15 and 25 minutes to complete the survey, depending on whether the participant was currently pregnant, previously pregnant, or both.

The EMat Health Survey and its data were captured in REDCap, a secure online data-capture tool run by the Children's Hospital of Eastern Ontario (CHEO) in Ottawa. Ethical approval for this study was obtained by the CHEO Research Ethics Board (CHEOREB#09/03E) and the University of Ottawa Ethics Board (14/183X). Informed consent was obtained from each participant electronically before the initiation of the survey questions.

2.2 Statistical Analysis

Descriptive statistics (number, percent) for categorical variables were used to describe characteristics of the sample and questionnaire results. Logistic regression analyses were conducted to explore associations between participant demographics and GWG counselling. Variables that were significant at $p \leq 0.05$ were included in the multivariate logistic regression models. The outcome variables for the regression were whether or not the women were counselled on dietary changes and weight gain limits by their prenatal healthcare provider in pregnancy. Diverse demographic dependent variables were explored including age, gestational age (for currently pregnant women), type of country (developed or developing), ethnicity, marital status, education, employment status, setting (urban, suburban or rural), pre-pregnancy

BMI, and whether the participants consumed alcohol or cigarettes. Prenatal healthcare providers are defined as anyone that provided health care at any point during their pregnancy (obstetrician, midwife, family doctor, etc.). The Hosmer-Lemeshow goodness of fit test was used to describe the predictive value of the model. Intervariable correlations were assessed using the Pearson's Correlation. All statistical analyses were conducted with IBM SPSS Statistics for Windows, Version 24.0 (Armonk, NY: IBM Corp.).

3.0 Results

3.1 Sample Characteristics

Of the 1713 women who participated in the survey, a total of 1507 women (88%) were eligible and included in the results. There were 264 women that were pregnant at the time of the study participation and 1243 who responded for at least one previous pregnancy in the past five years. The majority of participants were from developed countries (98%) (e.g. Canada (95%), the United States of America (2%)) (*Table 1*). Most participants were over 30 years of age (83%), white (88%), and married (95%). The participants were generally of high socioeconomic status with 90% having completed a bachelor's degree or higher and 71% having a household income of at least \$90,000. More than half the women were of normal weight (66%), and a third of the women were overweight or obese (51%). Only a minority of the population smoked cigarettes (3%) and consumed alcohol (22%) at least once during their pregnancy.

3.2 Diet and Weight Gain Perceptions and Behaviours

Slightly more than half of the women reported that their prenatal HCP talked to them about their personal weight gain limits (57%) (*Table 2*). Among the women receiving counselling on GWG limits, only 26% of participants were followed up with at each visit during

their pregnancy, and 66% of patients were only counselled either once or once in a while. Among the women that were not counselled on weight limits, over half of participants (56%) reported that HCP guidance would have helped them to always or most often try to follow healthy behaviours to achieve their target weight gain. Regarding HCP-mediated discussions about dietary changes in pregnancy, less than half of the women (45%) reported being counselled by their HCP.

As seen in *Table 3*, HCPs are the most trusted sources of prenatal weight gain and diet advice (93% and 88%, respectively). However, 32% of women reported also receiving advice from their family and friends regarding GWG. A total of 71% of participants thought that their personal targets were realistic. Reported barriers to achieving target GWG in pregnancy included the perception that it is too difficult to exercise in pregnancy (44%), a lack of HCP guidance (28%), a lack of support from family/friends (22%), and the philosophy that weight gain in pregnancy is out of the woman's locus of control (15%).

3.3 Association between participant demographics and GWG counselling

Women that were pregnant at the time of completing the survey were more likely to receive dietary counselling in their 25-29th week of pregnancy when compared to the end of their pregnancy (38-41 weeks) [OR 6.48 (1.61-26.09), $p=0.003$] (*Table 4*). Previously pregnant women receiving prenatal care in developed countries were less likely to be advised about dietary when compared to developing countries [OR 0.23 (0.09-0.60), $p=0.01$]. When looking at patient age, participants were less likely to receive dietary advice with increasing age. There were no statistical differences in dietary counselling among different ethnicities or pre-pregnancy BMI groups. As illustrated in *Table 5*, there were also no significant differences in HCP counselling

as it related to GWG based on ethnicity, maternal age, gestational age, BMI-category or country of origin.

4.0 Discussion

This study is the first of our knowledge to describe weight gain perceptions and weight gain counselling in prenatal care, as perceived by such a large sample (n=1507) of women, including women from various countries around the world.

Prenatal counselling about both weight gain and diet was found to be low, with only 57% and 45% of women reporting receiving guidance/feedback, respectively. The results of dietary counselling observed in our study was slightly lower than observed in previous research with smaller sample sizes ³⁰. Although the frequency of GWG counselling has been found to be inconsistent in the literature, a low prevalence of counselling has commonly been reported ^{28,31}. In addition to occasional GWG counselling from HCPs, participants also reported receiving advice from non-HCP sources such as their family and/or friends. There was a strong consensus that HCPs are the most trustworthy source of both dietary and weight-related advice. Despite the overall low occurrence of HCP-mediated advice, counselling was more commonly related to GWG limits in pregnancy than for dietary changes in pregnancy. Interestingly, even though over half of women (57%) reported being counselled at some point about GWG, only a minority (34%) were counselled at most of their visits. This suggests that GWG counselling is not occurring regularly throughout the duration of a woman's pregnancy, even though GWG counselling is meant to be an ongoing dialogue at each stage of pregnancy.

This study also uniquely assessed pregnant women's perceptions of the attainability of GWG guidelines. While the majority of participants (71%) thought that their weight gain limits were realistic, it is noteworthy that less than half of these women (44%) actually made an effort

to stay within the guidelines. This may be related to some of the most common barriers reported such as a lack of social support, lack of HCP guidance and difficulty exercising. Research has shown that a woman's perception of GWG guidelines can impact her weight behaviours. For example, women who worry about GWG or perceive that weight gain is beyond their control are less likely to meet the IOM recommendations whereas women perceiving that weight gain is within their locus of control are more likely to meet appropriate GWG ³². It is therefore crucial that women are counselled on, aware of, and confident about pregnancy weight gain in order to reduce feelings of hopelessness and improve self-efficacy to manage weight.

Based on the population sampled in this study, there were no significant differences in counselling practices among the different demographic characteristics inferring that all women were counselled equally. However, this differs from the findings of a recently published literature review which has reported that women of higher socioeconomic status, older age, and higher pre-pregnancy BMI are more likely to be counselled about GWG ²⁸. With regards to dietary counselling in pregnancy, participants were more likely to receive counselling if they were within the middle of their pregnancy, living in a developing country, and younger. The younger age may be due to HCPs assuming that younger-aged women need to be counselled on diet more than older women because of lack of pregnancy experience. Developing countries may be more likely to provide dietary information as they have less access to nutrient-rich food thus making diet a priority for the mother and for the HCP-mediated discussion.

It is important to note that the participants from this study were mostly from developed countries and Canada in particular. In Canada, it is unclear whether GWG counselling is part of the curriculum for physician and midwifery training. Across research in the United States, Australia and the United Kingdom, many HCPs have reported a lack of education as a barrier to

counselling their patients on GWG ^{26,33,34}. This consideration is worthwhile as it shows how these gaps at the level of HCP training may impact prenatal care, thus affecting the perception and health of prenatal patients. There is a need for healthcare provider education that highlights the importance of GWG and weight-related behaviours in pregnancy. There are also other indirect healthcare considerations that may affect healthcare education such as funding, and organizational system resources ³⁵.

There are certain limitations in this study that should be acknowledged. Firstly, there may be over-representation of the women who have had more than one pregnancy. For instance, a woman who was pregnant at the time of the study (currently pregnant) but who also had another child in the past five years (previously pregnant) would have responded to both survey sections, even though she may have had the same HCP and experience. Next, the questionnaire was self-administered which may allow for self-reporting bias. Nevertheless, this survey's self-administration process helped contribute to our large sample size which was a strength of this study. Even though the population of this study was of relatively high socioeconomic status, it is still comparable to the census income for the population of Canada as reported by Statistics Canada in 2016 ³⁶. Participants in this study may have been limited to such high socioeconomic statuses due to snowball sampling, social media recruitment and word-of-mouth recruitment strategies. Lastly, this questionnaire was missing comparable questions regarding HCP counselling on other well-known weight-contributors in pregnancy, such as physical activity counselling or sleep counselling.

5.0 Implications for Practice and/or Policy

The importance of IOM-concordant GWG and GWG-counselling should be added to all prenatal HCP education curriculums. Also, HCPs practice and policy should include the use of health knowledge translation tools to aide GWG counselling in pregnancy. For instance, the Canadian Obesity Network has developed a tool called the *5As of Healthy Pregnancy Weight Gain* which aims to provide HCPs with knowledge and a checklist to effectively and sensitively discuss GWG with their patients ³⁷. Another tool that has been suggested is the development of GWG checklists as part of electronic medical records so that advice can be automated and the information is more easily accessible ³⁸. Lastly, evidence-based mobile health applications may prove a valuable tool given the ubiquity of smartphones. Such phone applications may be recommended by HCPs to their patients so that pregnant women could receive personalized information, advice, and resources for pregnant women throughout the duration of their pregnancy and post-partum period

6.0 Conclusion

Women's perceptions of the occurrence of HCP-mediated weight and diet counselling are unfavourable. Although pregnant women receive prenatal advice from non-HCP sources, almost all participants agreed that HCPs were the most reliable source of information and that HCP guidance would be helpful to achieve personal weight targets. This study found that all patients were counselled equally on GWG, but patients towards the middle of pregnancy, in developing countries and younger were more likely to receive dietary advice. Future research should aim to develop reliable ways for knowledge translation to be improved. Future research may also serve to discover reasons *why* weight and diet counselling isn't occurring and to develop better knowledge translation programs.

7.0 Tables

Table 1. Participant characteristics at the time of survey response (n=1507).

	All [n (%)]	Currently Pregnant [n (%)]	Previously Pregnant [n (%)]
Country			
Canada	1454 (95)	238 (96)	1216 (95)
USA	37 (2)	5 (2)	32 (2)
Other	44 (3)	5 (2)	39 (3)
Developed country	1507 (98)	243 (100)	1264 (98)
Developing country	23 (2)	0 (0)	23 (2)
Age Category			
18-23	23 (2)	7 (3)	16 (1)
24-29	219 (15)	68 (27)	151 (12)
30-34	597 (40)	115 (45)	482 (39)
35-39	482 (32)	55 (22)	427 (35)
40-44	140 (9)	9 (4)	131 (11)
56-59	24 (2)	0 (0)	24 (2)
>50	5 (<1)	1 (<1)	4 (<1)
Ethnicity			
White	1308 (88)	221 (88)	1087 (88)
Black	11 (1)	1 (0)	10 (1)
Asian	85 (6)	15 (6)	70 (6)
Latin American	19 (1)	2 (1)	17 (1)
Arab	5 (0)	3 (1)	2 (0)
Aboriginal	31 (2)	3 (1)	28 (2)
Other	23 (2)	5 (2)	18 (1)
Marital Status			
Single	67 (4)	9 (4)	58 (4)
In relationship	11 (1)	7 (3)	4 (0)
Married/common-law	1405 (95)	238 (93)	1167 (95)
Widowed	1 (0)	1 (0)	0 (0)
Other	1 (0)	-	1
Education			
High school or less	51 (3)	13 (5)	38 (3)
Some post-secondary	84 (6)	13 (5)	71 (6)
College diploma	208 (14)	40 (16)	168 (14)
University degree	1144 (76)	189 (74)	955 (77)
Income			
< \$30,000	48 (3)	8 (3)	40 (3)
\$30,000 - \$60,000	131 (9)	19 (8)	112 (10)
\$60,000 - \$90,000	225 (16)	49 (21)	176 (15)
90,000 - \$120,000	292 (21)	63 (27)	229 (20)
>\$120,000	1002 (50)	98 (41)	604 (53)
Pre-pregnancy BMI			
Underweight	39 (3)	3 (1)	36 (3)
Normal weight	1001 (66)	161 (67)	840 (66)
Overweight	389 (26)	63 (26)	326 (26)

	Obese	83 (5)	15 (6)	68 (5)
Smoking				
	Yes	39 (3)	4 (2)	35 (3)
	No	1405 (97)	233 (98)	1172 (97)
Alcohol				
	Yes	313 (22)	41 (18)	272 (22)
	No	1125 (78)	184 (82)	941 (78)

Table 2. Perceived interactions with healthcare provider regarding weight gain and caloric requirements in pregnancy for previously pregnant participants (n=1243).

Question	n (%)
Did your HCP talk to you about your weight gain limits?	
Yes	729 (57)
No	543 (43)
If yes, how often did your HCP talk to you about your weight gain limits?	
Every visit	194 (26)
Every other visit	56 (8)
Once in a while	332 (46)
Only once	143 (20)
If yes, did you make an effort to stay within these weight gain limits?	
Always or mostly	115 (16)
Most of the time	204 (28)
Sometimes	189 (26)
Rarely or never	216 (30)
If you received no guidance, do you feel that you would have made an effort to stay within the weight limits had they been provided to you?	
Always	69 (24)
Most of the time	94 (32)
Sometimes	73 (25)
Rarely or never	55 (20)
Did your HCP discuss any necessary diet changes you should make during your pregnancy (calorie changes, vitamin requirements, etc.)?	
Yes	543 (45)
No	672 (55)

Table 3. Perceptions and barriers to weight gain in pregnancy.

Question	n (%)
Did you receive advice from your family or friends about how much weight to gain while pregnant?	
Yes, from family	115 (10)
Yes, from friends	54 (4)
Yes, from both	218 (18)
No	802 (68)
Do you think your weight gain targets are realistic for you?	
Yes	54 (71)
No	9 (12)
I don't know	13 (17)
What do you believe are the barriers to gaining within a targeted weight during pregnancy? (select all that apply)	
Lack of support from family/friends	223 (22)
Lack of guidance from HCP	283 (28)
Weight gain is out of my control	152 (15)
Difficult to exercise while pregnant	442 (44)
There are no barriers	255 (25)
Other	177 (18)
Whose advice do you trust the most with regards to weight gain in pregnancy?	
HCP	1119 (93)
Family	32 (3)
Friends	24 (2)
Significant other	24 (2)
Whose advice do you trust the most with regards to diet while pregnant?	
HCP	1235 (88)
Family	27 (2)
Friends	19 (1)
Significant other	20 (1)
Media/internet	109 (8)

Table 4. Logistic regression results for dietary counselling in pregnancy (n=217 currently pregnant and n=1183 previously pregnant women).

Characteristic	Currently Pregnant		Previously Pregnant	
	Odds Ratio (90% CI)	p-Value	Odds Ratio (90% CI)	p-Value
Gestational Age (weeks)				
≤24	3.921 (1.041-14.775)	.090	-	-
25-29	6.482 (1.610-26.094)	.027	-	-
30-33	4.602 (1.094-19.359)	.080	-	-
34-37	4.564 (1.104-18.863)	.078	-	-
38-41		.263	-	-
Age Group (years)				
18-23	1.413 (.080-25.078)	.843	.406 (.104-1.587)	.277
24-29	5.066 (.791-32.470)	.151	.225 (.084-.602)	.013
30-34	4.364 (.694-27.425)	.187	.239 (.092-.621)	.014
35-39	5.065 (.78-32.893)	.154	.224 (.086-.585)	.010
40-44	-	.559	.244 (.090-.658)	.019
45-49	*	*	-	.182
Ethnicity				
White	.197 (.024-1.613)	.204	.602 (.315-1.154)	.199
Black	*	*	1.347 (.274-6.636)	.758
Asian	.121 (.011-1.346)	.149	.539 (.249-1.168)	.189
Latin American	*	*	1.043 (.330-3.298)	.952
Arab	.465 (.020-10.804)	.689	.000	.999
Aboriginal	-	.799		.619
Developed Country	*	*	.231 (.089-.596)	.011
Pregravid BMI				
Underweight	5.164 (.442-60.348)	.272	.932 (.460-1.886)	.762
Normal weight	1.502 (.505-4.468)	.539	.797 (.514-1.234)	.869
Overweight	.607 (.186-1.984)	.488	.758 (.477-1.205)	.393
Obese	-	.066	-	.326
Constant	.150	.332	29.26	.000

*Insufficient data for the logistic regression equation.

- Not applicable.

Results significant at the $p \leq 0.05$ value in bold.

Table 5. Logistic regression results for weight gain counselling in pregnancy (n=228 currently pregnant and n=1240 previously pregnant women).

Characteristic	Currently Pregnant		Previously Pregnant	
	Odds Ratio (90% CI)	p-Value	Odds Ratio (90% CI)	p-Value
Gestational Age (weeks)				
≤24	.521 (.194-1.397)	.277	-	-
25-29	1.785 (.613-5.198)	.373	-	-
30-33	.876 (.286-2.676)	.845	-	-
34-37	1.036 (.349-3.075)	.957	-	-
38-41	-	.039	-	-
Ethnicity				
White	.000 (-)	.999	.757 (.401-1.430)	.472
Black	.567 (-)	1.000	.653 (.156-2.736)	.625
Asian	.000 (-)	.999	1.017 (.478-2.164)	.971
Latin American	.628 (-)	1.000	.807 (.286-2.424)	.748
Arab	.000 (-)	.999	.000 (-)	.999
Aboriginal		.998		.878
Developed Country	*	*	.657 (.296-1.460)	.387
Pregravid BMI				
Underweight	1.404 (.135-14.587)	.812	1.154 (.572-2.327)	.737
Normal weight	.706 (.242-2.063)	.593	1.053 (.687-1.613)	.843
Overweight	1.022 (.329-3.170)	.975	1.022 (.651-1.603)	.938
Obese		.692		.984
Constant	.657	1.000	.000	1.000

*Insufficient data for the logistic regression equation.

- Not applicable.

Results significant at the $p \leq 0.05$ value in bold.

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CHAPTER 4: 5As STUDY

(Article 3)

Preamble

While the previous two chapters of this thesis aimed to assess current GWG communication, this chapter instead works towards the development of a knowledge translation tool to improve the unsatisfactory HCP-mediated GWG counselling earlier described. This study consists of a pilot evaluation of the 5As of Healthy Pregnancy Weight Gain tool (Objective 3) by a quasi-experimental design. The 5As tool, directed to help prenatal clinicians discuss GWG in a sensitive and holistic way with their patients, was implemented in two prenatal health centres in Ottawa, Ontario.

This article was submitted to *Women's Health Issues* for maximum dissemination to invoke clinical change.

A Pilot Study Evaluating the Effectiveness
of the “5As of Healthy Pregnancy Weight Gain” Tool

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Abstract

Introduction: Gestational weight gain (GWG) outside Institute of Medicine Guidelines may be harmful to mother and baby. Prenatal healthcare providers (HCPs) are important sources of health information, but not all discuss GWG with their patients. The Canadian Obesity Network's 5As of Healthy Pregnancy Weight Gain tool was developed to help HCPs counsel their patients on GWG. The 5As stand for: *Ask, Assess, Advise, Agree* and *Assist* in pregnancy weight management.

Objectives: To evaluate the impact of the 5As tool on patient perceptions of GWG discussions with their HCP and to identify potential ways to improve the tool.

Methods: A quasi-experimental study design was conducted where HCPs were trained in the use of the 5As tool via a workshop (intervention). Patients were tested at baseline and post-intervention using an electronic questionnaire measuring patient-perceived 5As counselling. Pregnant women were invited to participate in the study if they were attending their first appointment with participating HCPs, spoke English and were over 18 years old.

Results: A total of 100 pregnant women (50 baseline and 50 post-intervention) and 15 HCPs (11 midwives and four obstetricians) participated in this study. Participants receiving care from 5As-trained HCPs reported scores twice as high ($p=0.047$) in *Ask* and were almost three times more likely to be *Advised* an exact amount of target weight to gain ($p=0.030$). HCPs suggested reducing the content, improving HCP education and improving the patient handouts.

Conclusion: The 5As of Healthy Pregnancy Weight Gain Tool is effective at *initiating* HCP-mediated GWG counselling, yet work is still needed to improve uptake and dissemination for all components of the 5As. Whether this contributes to prenatal behaviour change remains to be

established. Future steps include modifying the tool based on HCP feedback, the development of novel knowledge translation tools and improving education for HCPs and patients.

1.0 Introduction

1.1 Gestational Weight Gain

The Institute of Medicine (IOM) has developed an evidence-based guideline for a healthy range of weight gain in pregnancy that is based on a women's pregravid body mass index (BMI) (1). Gestational weight gain (GWG) is a normal and anticipated aspect of every pregnancy, but gaining more or less than the IOM recommendations may prove harmful to both the mother and her baby (1–7). Independent studies and meta-analyses have shown that inadequate GWG is associated with higher chances of a small-for-gestational-age baby (4,6,8) and delivering pre-term (6). While inadequate GWG remains important to maternal and fetal health, the effects of excessive GWG constitute a large public health issue. A systematic review and meta-analysis of over one million pregnant women showed that almost half of all women exceed the IOM GWG guidelines (1). Women who exceed their weight gain guidelines are at significantly higher risk for hypertensive disorders, preeclampsia, caesarian deliveries, abnormal glucose metabolism, gestational diabetes and downstream type two diabetes (2,5,6). Their babies are at an increased risk of being large-for-gestational-age or macrosomic at birth and have increased susceptibility to downstream overweight or obesity due to their aberrant development and growth trajectories from birth (2,5–7,9). Recent statistics show that one in three children (two to 17 years old) in Canada are overweight or obese (10) which may be due, in part, to excess weight in pregnancy and its contributing factors. Sub-optimal antepartum weight management is a critical area where care providers can help limit the intergenerational cycle of obesity and lessen the burden of chronic health issues worldwide (3).

1.2 Prenatal Healthcare Provider Interaction

Gestational weight gain is a characteristic of the recommended best practice topics for prenatal health promotion (11). It is essential that women be aware that regardless of their BMI before conception, healthy lifestyle behaviours in pregnancy may improve gestational weight management and limit poor medical and surgical outcomes (9). Examples of lifestyle behaviours requiring optimization include caloric and nutritional intake (12), physical activity (13,14) and sleep (15,16). Prenatal healthcare providers (HCPs) have a direct impact on an expectant woman's confidence and ability to achieve healthy GWG. This has been demonstrated by several research studies showing a positive relationship between GWG counselling by HCPs and improved weight-related outcomes (17–21). A recent analysis by our research group has shown that women are more likely to achieve appropriate GWG if they perceive that they are in control of their GWG, which a HCP may help them recognize (21). The Health Belief Model suggests that communication targeting self-efficacy, barriers, benefits, and risks is likely to lead to more successful behavioural change (22). During pregnancy, a mother tends to be motivated to make healthy changes for her baby and may be more receptive to a behavioural intervention (23,24).

1.3 5As of Healthy Pregnancy Weight Gain

Current prenatal HCP-mediated GWG counselling, however, appears to be insufficient with regards to content, frequency, and accuracy (25). Knowledge translation aides, such as evidence-based smartphone applications for pregnant patients or electronic medical records with GWG trackers for HCPs may be valuable in the improvement of GWG counselling and medical outcomes of pregnancy (26). One such tool includes the Canadian Obesity Network (CON)'s *5As of Healthy Pregnancy Weight Gain*. This tool provides a systematic guide for HCPs to approach

the subject of GWG with their patients in a sensitive and effective manner throughout pregnancy. When adopted, the 5As conceptual framework techniques have been shown to be clinically effective in smoking cessation (27) and obesity management (28,29). The CON's adaption of this framework into the *5As of Obesity Management* resulted in a twofold increase in the initiation of obesity management (28), indicating the magnitude of effect this tool has in clinical settings. The adaptation of the 5As framework towards the pregnant population was completed in 2009 by an interdisciplinary team of nurses, midwives, primary care physicians, obstetricians, researchers and policy-makers (30). The 5As of Pregnancy Weight Gain tool, described in Table 1, consists of a desktop tool to encourage GWG discussion, a detailed HCP guide that describes the 5As and IOM GWG guidelines, an HCP checklist of the 5As steps and a patient handout that contains a list of weight management resources.

1.4 Objectives

The objectives of this study were, therefore, to conduct a pilot evaluation of the 5As of Healthy Pregnancy Weight Gain tool on the frequency of 5As-related GWG discussions and to determine HCP perceptions on ways to improve the tool.

2.0 Methods

2.1 Study Design

This study consisted of a quasi-experimental design with two observation periods (baseline and post-intervention). Participants were recruited through two participating prenatal health centres in Ottawa, Ontario. The first study location was a clinic with four participating obstetricians and the second location was a midwifery clinic with 11 participating midwives. All

aspects of this study were approved by the University of Ottawa Research Ethics Board (H11-15-30), and informed consent was obtained by all participating patients and HCPs.

2.2 Data Collection

Any English-speaking woman over the age of 18 and receiving prenatal care in participating study locations were invited to participate in the study at the end of their first prenatal visit. Participants were recruited either in person by research personnel or by study flyers hanging in the waiting rooms of participating clinics. Consenting patients had the choice to complete the 5As survey in person on a study iPad or via a survey link forwarded to their personal email. Each survey took between 10 to 15 minutes to complete.

Data were captured and stored in REDCap, a secure online data-collection tool (Children's Hospital of Eastern Ontario, Ottawa). The first section of the questionnaire contained questions related to self-reported anthropometric and socioeconomic data. The second section contained questions regarding each of the 5 As for gestational weight gain counselling, adapted from the validated and reliable Patient Assessment of Care for Chronic Conditions (PACIC). The PACIC questionnaire was adapted to the 5As framework in previous research (28).

2.3 Healthcare Provider Intervention

The intervention for this study consisted of a 60-minute standardized training workshop for participating HCPs. The workshop highlighted the importance of GWG, GWG communication with their patients and demonstrated the use of the 5A's tool. All participating HCPs were provided physical copies of the 5As of Health Pregnancy Weight Gain Tools: a stack of 5As checklists, patient handouts, a desktop tool, and an HCP information booklet. A one-

month implementation period was applied before data collection of the post-intervention study group to allow time for the HCPs to become familiar with using the tool in their daily practice.

2.4 Healthcare Provider Feedback

Following the entire study period, participating HCPs completed a brief online questionnaire to describe their experience with the 5As Tool and provide suggestions for improvement.

2.5 Statistical Analysis

Descriptive statistics (mean, number, percent) for categorical variables were used to describe characteristics of the sample and questionnaire results. Comparisons between the characteristics of the baseline and post-intervention populations were calculated by Pearson's Chi-Square and Fisher's Exact tests for categorical variables and Student's T-tests for continuous variables. In advance of analysis, all variables of interest were assessed for normality.

3.0 Results

3.1 Sample Characteristics

A total of 100 eligible pregnant women participated in this study: 50 pre-intervention and 50 post-intervention. In addition to the pregnant women, we included 15 prenatal healthcare providers: 4 obstetricians and 11 midwives. As seen in Table 1, most of the pregnant participants were of normal weight pre-pregnancy (57%), receiving care from an obstetrician (60%), between 25-39 years in age (92%), and white (83%). Also, most women were of high socioeconomic status with 96% having at least some post-secondary education and 57% living in a household

earning over \$90,000/year. Although there were no women with pre-existing diabetes, high cholesterol or high fatty liver content, certain medical diagnoses such as high blood pressure (8%), overweight or obesity (7%), previous issues with GWG (1%) and depression (7%) were reported. There were no statistically significant differences in sample characteristics between the pre- and post-intervention groups other than household income.

Sources of weight gain information reported from patients included online (59%), friends (48%), family (45%), books (43%) and personal experience (32%) (Table 3).

3.2 Results for each of the 5As of Healthy Pregnancy Weight Gain

Table 4 describes the outcomes for the assessment of each of the five ‘A’ items. There was a significant increase in patients being *Asked* their ideas on how to manage their weight gain in the post-intervention patients when compared to patients receiving care from untrained HCPs (control). The scores for this 5As component doubled moving from 11.19 in the control group to 22.66 in the post-intervention group. There were non-significant increases in most other *Ask* items. Regarding *Assess*, approximately half of the patients in each group (54% in the control and 50% in the post-intervention) had their weight measured at that prenatal visit. In the *Advise* category, there was a significant number of post-intervention participants being told exactly how many pounds/kilograms they needed to gain in their pregnancy in comparison to the control group. The number of patients being counselled on an exact range of pounds/kilograms to gain was almost threefold higher in the post-intervention group (34%) as opposed to control (12%). Regarding the *Agree* and *Assist* categories of the 5As, there were small differences in 5As-related discussions, but none reaching statistical significance.

3.3 Healthcare Provider Feedback

Of the 15 participating HCPs, we received feedback from 11 (73%). A summary of the HCP feedback responses is presented in Table 5. The majority (63%) of HCPs discussed the 5As tool and/or workshop with other HCPs during the study period. All HCPs reported discussing prenatal vitamins, physical activity, weight management and smoking/alcohol use at the first prenatal visit with their patients. Most HCPs reported that they used the 5As tool either at the very first prenatal appointment (64%) and/or at any time during the first trimester (64%), but fewer HCPs reported using the tool at each visit (9%). Barriers to discussing GWG with patients included competing medical priorities (45%), a lack of time (45%), concern that their patient may be upset at the topic (27%) and a self-perceived lack of knowledge (9%).

Almost half of the HCPs (46%) agreed that the 5As tool provided more knowledge to discuss GWG with their patients, and over half (55%) strongly agreed that it gave them greater confidence to engage in the discussion. The 5As Tool and workshop were deemed relevant and useful for all obstetricians, but only 22% of midwives. Up to 45% of HCPs found both the workshop and tools in combination to be most useful for their practice. Suggestions were made as to how to improve the training workshop (intervention), including making the workshop more stimulating (9%) and hosting more than one session (45%). Suggestions to improve the CON's 5As Healthy Pregnancy Weight Gain Tool include reducing some of the content in the tool (27%), improving the patient handouts (9%) and providing clearer and more thorough HCP education (9%).

4.0 Discussion

This study evaluated the CON's 5As of Healthy Pregnancy Weight Gain Tool by using a sample of 100 pregnant participants, 11 midwives, and four obstetricians. We implemented a quasi-experimental design of 50 pre-intervention (control) participants and 50 post-intervention participants. Study participants were primarily of high socioeconomic status, in relationships, white, over 25 years of age and normal weight based on pre-pregnancy BMI classification. This reflects the population of the national capital region (Ottawa, Ontario) (31). There was a low prevalence of pre-existing medical conditions which was important to measure as severe medical conditions may take precedence over the GWG conversations during prenatal visits. Although HCPs should be the most reliable source of information, patients are still finding pregnancy weight information through other mediums. External sources of information reported by participants included the internet, friends, family, books or previous personal experience. The use of such external information sources may be a potential reason as to why certain patients did not discuss weight gain with their HCP: if the women felt like they already had sufficient weight gain knowledge, they may not have brought up such questions during their prenatal appointments.

Midwives and obstetricians trained in the use of the 5As tool were more likely to 1) ask their patients for their ideas on how to best manage their pregnancy weight gain and 2) tell their patient the exact range of pounds/kilograms they should gain in that pregnancy for optimal health. The significant increase in *Ask* and *Advise* components of the 5As tool in our study is similar to other literature (29,32). In an observational study using audio recordings to assess the use of 5As in standard prenatal care, *Advise* was one of the most commonly used components

(32). Similarly in an evaluation of the 5As for obesity management in non-pregnant participants, Advise was one of the most common practices with *Agree* and *Assist* more rarely used (29).

It is not surprising to see an increase in these *Ask* and *Advise* interactions considering that these components of the 5As tool may be considered the fastest and easiest parts of the counselling process and that we evaluated only the first prenatal visit. For example, it requires more in-depth listening, two-way dialogue, time and holistic views to fully *Assess* or *Assist* a patient with her weight. The timing of the assessments is important to consider since the complete implementation of the 5As tool for continuous weight management is a process that occurs throughout the entirety of one's pregnancy. We would expect more dialogue and more comprehensive counselling to occur over time once the patient and HCP have a closer relationship and should concern over weight occur. It is also noteworthy that even though there were no statistically significant increases in the *Assess*, *Agree* and *Assist* components of the 5As, the slight increases between the control and intervention groups may still be considered clinically meaningful. It is of course always a positive quality if patients report an improvement in weight-related dialogue with their HCPs. In general, although significant increases were observed in *Ask* and *Advise*, the overall number of women reporting counselling, even in the intervention group, were low. Therefore, there is still work to be done with improving all aspects of GWG guidance and care provider engagement.

The HCP perceptions of the 5As Tool and training workshop were mixed. Although all HCPs reported discussing GWG with their patients, it is interesting that there were much lower scores of weight-related discussions reported among patients via the 5As questionnaire. Such differences in perception between patient and HCP may be due to either self-reporting bias by the HCPs or inefficient knowledge translation and uptake between the HCP and patient. Most

HCPs agree that the 5As Tool gave them more knowledge, confidence, and motivation to discuss GWG with their patients. Barriers to discussing GWG, after implementing the 5As tool, included lack of time, competing medical issues, a concern that their patient may get upset and lack of sufficient related knowledge. These barriers are consistent to the barriers reported among other literature (33), though HCPs from other studies have also indicated the assumption that GWG counselling is ineffective or discrepancies regarding whether it's within their role to provide GWG counselling. In this study, obstetricians indicated competing medical issues more often than midwives, whereas midwives indicated worries about their patient being upset more frequently than obstetricians. The discrepancies in responses between obstetricians and midwives may be due to the differences in nature between these two professions; obstetricians are more likely to receive more high-risk patients and midwives tend to have more time to focus on more sensitive and patient-centered care. Suggestions for improvement to the 5As tool included providing more than one workshop, making the tool more engaging, reducing the content in the tool, providing improved patient handouts, and more HCP education.

This study had various limitations which may have influenced the results. Although the HCPs were initially blinded to the full nature of the study for the baseline assessment, blinding was not fully achieved. HCPs at baseline were initially made aware of the study variables to some extent during the consent and briefing process which means that they may have increased their GWG discussions at baseline even before the intervention. Despite assessment days taking place at random, the HCPs were aware of the research assistant and may have only increased their GWG discussions with the patients they knew were being evaluated on that day. As well, there is always the possibility of self-reporting biases from both the patients and HCPs. The last and most important limitation of this study was the fact that the 5As-related GWG discussions

were only evaluated during the first prenatal visit. As previously discussed, the 5As tool and GWG counselling is an ongoing process which requires dialogue between patient and HCP along the course of a woman's entire pregnancy with evolving issues, barriers and weight trends which may have occurred beyond just the first prenatal visit that was measured in this investigation.

Future prospective research from preconception to postpartum should focus on evaluating the 5As tool longitudinally so that a more accurate and holistic picture of pregnancy weight gain counselling could be made. Additionally, we should prioritize evaluating other far-reaching tools for the improvement of GWG dialogue, including the use of electronic medical records, institutional education strategies for HCPs and smartphone applications for women.

5.0 Conclusion

This study implemented and evaluated the Canadian Obesity Network's 5As of Healthy Pregnancy Weight Gain in a group of 15 prenatal HCPs. Patients receiving care from HCPs trained in the use of the 5As tool were significantly more likely to report being *Asked* and *Advised* about pregnancy weight gain. Although slight improvements were reported, there were no significant changes in the appearance of *Assess*, *Agree* or *Assist* components which may in part be due to the specific time point of data capture (i.e., first visit) in this study. Incorporating patient and HCP feedback will facilitate knowledge uptake and evaluation of lifestyle behaviors in pregnancy.

6.0 Tables

Table 1. Description of each of the five *A*'s in the 5As of Health Pregnancy Weight Gain.

5A Item	Description
Ask	Ask, non-judgmentally, for permission to discuss weight.
Assess	Assess pre-pregnancy BMI and pregnancy weight gain throughout pregnancy.
Advise	Advise on GWG guidelines and on risks of discordant GWG.
Agree	Agree on realistic behavioural goals and create a plan for action.
Assist	Assist patients in identifying and resolving barriers to healthy GWG.

Table 2. Description of study population (n=100). All values compared by Fisher's Exact test unless otherwise specified.

	Control n (%)	Post- Intervention n (%)	All	p-value
Total n	50	50	100	
BMI				0.941
Underweight	1 (2)	2 (4)	3 (3)	
Normal weight	27 (55)	29 (58)	56 (57)	
Overweight	12 (24)	10 (20)	22 (22)	
Obese	9 (18)	9 (18)	18 (18)	
Receiving Care From				0.461 ^a
Midwife	18 (36)	22 (44)	40 (40)	
Obstetrician	32 (64)	28 (56)	60 (60)	
Age Group				0.681
18-24	2 (4)	1 (2)	3 (3)	
25-29	13 (26)	15 (30)	28 (28)	
30-34	15 (30)	18 (36)	33 (33)	
35-39	16 (32)	15 (30)	31 (31)	
≥40	4 (8)	1 (2)	5 (5)	
Ethnicity				0.660
White	27 (84)	41 (82)	68 (83)	
Black	0 (0)	3 (6)	3 (4)	
Asian	4 (13)	5 (10)	9 (11)	
Arab	1 (3)	1 (2)	2 (2)	
Relationship Status				0.640
Relationship	32 (97)	49 (98)	81 (98)	
Single	1 (3)	1 (2)	2 (2)	
Education				0.147
High school or less	2 (6)	2 (4)	4 (5)	
Some post-secondary	8 (24)	5 (10)	13 (16)	

University degree	23 (70)	43 (86)	66 (80)	
Income				0.007
<\$30,000	6 (19)	1 (2)	7 (9)	
\$30,000-59,999	1 (3)	10 (22)	11 (14)	
\$60,000-89,999	5 (16)	10 (22)	15 (19)	
\$90,000-119,999	4 (13)	11 (24)	15 (19)	
≥120	16 (50)	14 (30)	30 (38)	
Region				0.701
Urban	17 (52)	21 (42)	38 (46)	
Suburban	13 (39)	22 (44)	35 (42)	
Rural	3 (9)	7 (14)	10 (12)	
Pre-existing condition				0.611
High blood pressure	4 (8)	4 (8)	8 (8)	
Overweight or obesity	4 (8)	3 (6)	7 (7)	
^b GWG issues	0 (0)	1 (2)	1 (1)	
Depression	4 (8)	3 (6)	7 (7)	

^a Chi-square.

^b Defined as either inadequate or excessive in a previous or current pregnancy.

Table 3. Reported sources of non-HCP weight gain information for pregnant participants (n=100).

Information Source	Number of Participants
Family	45
Friends	48
Online	59
Books	43
Personal Experience	32

Table 4. Results of the control (n=50) and intervention (n=50) groups regarding weight gain counselling in pregnancy. All variables compared with student's T-test unless otherwise indicated. Effect size calculated using Cohen's d unless otherwise specified.

Item	Question	Control Mean (SD)	Intervention Mean (SD)	p-value	Effect Size
Ask					
	<i>Were you asked what you would like to discuss about your pregnancy weight gain at this visit?</i>	54.30 (39.98)	49.28 (43.86)	0.596	0.121
	<i>Were you asked if you would like to talk about your goals for dealing with pregnancy weight gain?</i>	11.07 (23.26)	21.79 (32.39)	0.091	0.380
	<i>Were you asked about how your weight affects your life?</i>	7.86 (17.79)	9.24 (20.59)	0.743	0.072
	<i>Were you asked for your ideas on how to best manage your pregnancy weight gain?</i>	11.19 (22.04)	22.66 (29.39)	0.047	0.442
Assess					
	<i>Did your doctor/midwife measure your weight today? ^a</i>	27 (54%)	25 (50%)	0.689	1.087
	<i>Were you sure that your doctor/midwife thought about your values and traditions when they recommended treatments?</i>	49.37 (38.17)	48.97 (39.04)	0.965	0.010
	<i>Were you asked how your work, family, social or financial situation related to taking care of your pregnancy and/or pregnancy weight gain?</i>	36.71 (38.65)	32.53 (39.79)	0.635	0.107
Advise					
	<i>Did your HCP tell you how many pounds you need to gain in this pregnancy? ^a</i>	6 (12%)	17 (34%)	0.030	1.364
	<i>Were you shown how what you did to take care of your weight influenced your health or the health of your baby?</i>	20.83 (30.60)	30.03 (35.40)	0.219	0.278
	<i>Were you told how important what you do to take care of your pregnancy weight gain (e.g. exercise, diet) is for your health?</i>	25.24 (35.41)	40.69 (38.42)	0.071	0.418
Agree					
	<i>Were you helped to set specific goals to improve your eating or physical activity?</i>	16.26 (28.11)	19.38 (29.40)	0.626	0.108
	<i>Were you helped to make a pregnancy weight management plan that you could do in your daily life?</i>	10.86 (20.40)	12.12 (21.90)	0.785	0.060
	<i>Were you helped to plan ahead so you could take care of your pregnancy weight gain even in hard times?</i>	10.22 (22.15)	17.00 (26.48)	0.212	0.278

	<i>Did you set a pregnancy weight gain goal together with your doctor/midwife?</i>	15.16 (29.65)	26.44 (35.50)	0.131	0.345
Assist					
	<i>Did your doctor/midwife talk with you about how to deal with barriers to weight management (such as stress, pain, sleep, finding time)?</i>	25.14 (3.79)	32.24 (5.16)	0.117	1.568
	<i>Were you given weight management options to think about?</i>	11.19 (22.90)	17.61 (26.26)	0.235	0.261
	<i>Were you given a written list of things you should do to manage your pregnancy weight gain?</i>	7.95 (17.27)	10.37 (18.87)	0.540	0.134
	<i>Were you given a copy of your pregnancy weight management plan?</i>	6.02 (14.52)	4.90 (10.37)	0.687	0.089
	<i>Were you encouraged to go to a specific group or class to help you manage your pregnancy weight gain?</i>	4.40 (12.92)	2.71 (5.18)	0.433	0.172
	<i>Were you referred to a dietitian, health educator or counsellor?</i>	10.67 (23.02)	6.90 (13.87)	0.368	0.198
	<i>Were you given alternatives to help you record the progress you are making on your pregnancy weight management goals?</i>	4.63 (12.26)	10.13 (22.14)	0.174	0.307

^a Results for categorical (“yes” or “no”) variables indicated as n (%), Pearson’s Chi square value and relative risk.

Table 5. Healthcare provider characteristics and perceptions on the 5As tool at the end of the entire study period. Although 15 healthcare providers participated in the study, only 11 responded to the feedback survey.

Characteristic	Midwife n (%)	Obstetrician n (%)	All n (%)
Total n	9 (82)	2 (18)	11 (100)
Number of Years Practicing			
<1 year	1 (11)	0	1 (9)
1-3 years	2 (22)	0	2 (18)
4-6 years	2 (22)	0	2 (18)
7-9 years	0	1 (50)	1 (9)
≥10 years	4 (44)	1 (50)	5 (45)
What do you discuss with your pregnant patient?			
Vitamins	9 (100)	2 (100)	11 (100)
Physical activity	9 (100)	2 (100)	11 (100)
Weight management	9 (100)	2 (100)	11 (100)
Smoking/Alcohol use	9 (100)	2 (100)	11 (100)
Nutrition	8 (89)	2 (100)	10 (91)
Vaccinations	6 (67)	2 (100)	8 (73)
Mental health	1 (11)	0	1 (11)
Did you discuss the 5As tool with your colleagues?			
Yes, regularly	1 (11)	0	1 (9)
Yes, sometimes	3 (33)	0	3 (27)
Yes, rarely	3 (33)	0	3 (27)
No	1 (11)	2 (100)	3 (27)
When did you most use the 5As tool?			
First appointment	6 (67)	1 (50)	7 (64)
First trimester	7 (78)	0	7 (64)
Second trimester	1 (11)	1 (50)	2 (18)
Third trimester	1 (11)	0	1 (9)
Each prenatal visit	0	1 (50)	1 (9)
What are your barriers to discussing pregnancy weight gain with your patients?			
Competing medical issues	3 (33)	2 (100)	5 (45)
Lack of time	4 (44)	1 (50)	5 (45)
I think patient may get upset	3 (33)	0	3 (27)
Lack of knowledge	1 (11)	0	1 (9)
The 5As Tool gave me more knowledge to discuss pregnancy weight gain with my patients.			
Disagree completely	2 (22)	0	2 (18)
Disagree	0	0	0
Neutral	4 (44)	0	4 (36)
Agree	3 (33)	2 (100)	5 (46)
Agree completely	0	0	0

The 5As Tool gave me more confidence to discuss pregnancy weight gain with my patients.			
Disagree completely	1 (11)	0	1 (9)
Disagree	1 (11)	0	1 (9)
Neutral	2 (22)	0	2 (18)
Agree	0	0	0
Agree completely	4 (44)	2 (100)	6 (55)
The 5As Tool gave me more motivation to discuss pregnancy weight gain with my patients.			
Disagree completely	1 (11)	1 (50)	2 (18)
Disagree	0	0	0
Neutral	5 (56)	0	5 (46)
Agree	0	0	0
Agree completely	3 (33)	1 (50)	4 (36)
This tool was relevant and useful for discussing pregnancy weight gain with my patients.			
Disagree completely	0	0	0
Disagree	1 (11)	0	1 (9)
Neutral	5 (56)	0	5 (45)
Agree	0	0	0
Agree completely	2 (22)	2 (100)	4 (36)
Which aspect of this intervention did you find most useful?			
5As checklist tool	2 (22)	1 (50)	3 (27)
Training workshop	3 (33)	0	3 (27)
Both	4 (44)	1 (50)	5 (45)
How would you improve the training workshop?			
Make more stimulating	1 (11)	0	1 (9)
Host more than one	5 (56)	0	5 (45)
How would you improve the tool?			
Reduce the content in the tool	3 (33)	0	3 (27)
Better client handout	1 (11)	0	1 (9)
More HCP education	1 (11)	0	1 (9)

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CHAPTER 5: SUMMARY AND DISCUSSION

5.1 Narrative Literature Review

The first objective of this thesis was to examine the body of literature assessing weight gain discussions in prenatal clinics to better understand both current and historical GWG healthcare messaging. To our knowledge, this is the first review to summarize the full extent of such prenatal healthcare messaging.

The prevalence and content of GWG counselling reported in the 54 included articles varied drastically but was often low and inaccurate. Among the HCPs providing advice, most studies reported that the majority were unable to identify the correct weight gain ranges for a pregnant woman based on pre-pregnancy BMI. A common theme among the research was the description of assessments on whether HCPs *were* or *were not* discussing GWG more often than assessments on advice for *how* to manage GWG. It is unknown if this is owing to a lack of research on how HCPs are helping their patients manage GWG or if it is through the limited volume of this type of counselling. This review paper also identified appreciable discrepancies between patient and provider perspectives, with providers reporting having discussed GWG slightly more often than patients. This discrepancy may be a result of either self-reporting bias by HCPs or lack of recall by patients, but it is most likely due to an inefficient knowledge translation and exchange.

Women of higher socioeconomic status, older age, nulliparous, with a history of dieting, with low levels of physical activity in the first trimester and women with higher BMI, were significantly more likely to be counselled on GWG. As discussed in chapter 2, we speculate contributors include the diverse array of various health literacy and access levels, geographic areas, psychological challenges, pregnancy risks, experience, stigmatization, and perceived

lifestyle habits among different pregnant women of different circumstances. The narrative review also commented on HCP-perceived barriers reported in the literature, which mainly include insufficient time, shortage of resources and lack of education.

While new information was gleaned from this work, our narrative review incorporated a broad scope of evidence, and no quality assessment was performed on the included literature. As such, our review was not performed with the same degree of rigor as a systematic review which, by reducing potential biases, would have strengthened the final output. Another limitation is that patient-provider interactions may not be the entire picture of healthcare messaging as there are other influencing factors at play, such as health delivery systems, funding, and medical education institutions.

5.2 EMat Survey

The second objective of this thesis was to determine pregnant women's perceptions of the occurrence of diet and weight management counselling in prenatal care. This was undertaken by exploring data captured through a large electronic cross-sectional maternal health survey. The EMat survey contained prenatal experiences as perceived by 1507 pregnant or previously pregnant women. Although most participants were Canadian, this survey uniquely contained certain responses from women on multiple continents around the world allowing vast geographic representation.

Only about half of participants reported that their HCP counselled about weight gain or diet in pregnancy, with advice about GWG being more common than dietary counselling. The participants that were counselled on GWG reported that they were mostly counselled during the first visit, with fewer women being counselled later throughout pregnancy. This is less than

satisfactory knowing that GWG counselling is an ongoing process. Women reported the use of various other non-regulated resources, such as friends, family, books, personal experience, and the internet to receive such health information, indicating that these women may be receiving GWG and dietary advice but not directly personalized from a health professional.

It is curious that the majority of participants indicated that they thought their weight gain limits were realistic, but only less than half of the same participants made a conscious effort to stay within the guidelines. It can be speculated that more continuous and holistic GWG counselling follow-up from an HCP may help. The low number of women making lifestyle modifications to reach their target GWG may be related to some of the common barriers reported such as a lack of social support, lack of HCP guidance and difficulty exercising while pregnant. These barriers were concordant with those reported among the literature as summarized in Chapter 2's narrative review.

Limitations to this research study, as described further in Chapter 3, include the over-representation of multiparous women, the self-reporting data collection methods which may have introduced bias, and the lack of comparable questions regarding HCP counselling on other well-known weight-contributors in pregnancy, such as physical activity counselling.

5.3 5As Study

The final objective of this thesis sought to test the effectiveness of the 5As of Healthy Pregnancy Weight Gain tool, a tool designed to improve the current GWG counselling between patients and HCPs. This tool, which suitably addresses certain commonly reported barriers to counselling, aims to assist HCPs in initiating and continuing holistic GWG counseling to their patients.

Midwives and obstetricians trained in the 5As tool were more likely to 1) *Ask* for their patients for their ideas on how to best manage their pregnancy weight gain and 2) tell their patients exactly how many pounds/kilograms they must gain in that pregnancy (*Advise*). The significant increase in *Ask* and *Advise* components of this tool were not surprising given that these are the simplest and less invasive aspects of the 5As framework of counselling. For the other 5As items, there were still slight improvements in the post-intervention group meaning that there were still clinically-relevant changes being made by the trained HCPs. The HCPs participating in this study had mixed reviews of the 5As tool and offered suggestions for improvement. Their barriers to discussing GWG, even after training in the use of the 5As tool, were identical to the other barriers described in this thesis (e.g. insufficient time, training, and confidence).

The 5As study is subject to various limitations which may potentially include the lack of full blinding at baseline, an overcompensation of GWG counselling when the research assistant was seen in the clinic by HCPs post-intervention, and self-reporting bias by HCPs. Lastly, a large limitation of this particular study was the restriction of patient surveys to just patients attending their first prenatal visit. Although this was appropriate for a pilot evaluation, future work should absolutely aim to evaluate the 5As tool during each stage of pregnancy.

5.4 Healthcare Considerations

The investigations in Chapters 2 (Narrative Review), 3 (EMat Survey) and 4 (5As Study) of this thesis all report on similar barriers to GWG counselling. For HCPs: time, resources, education, concern over their patient's feelings and uncertainty over whose role it is to counsel on weight. Even investigations into patient perceptions touched on the absence of HCP support

as a barrier to obtaining their personal weight goals. Although certain of these limitations such as lack of time are hard to modify due to the nature of current healthcare system arrangements, a deficiency of resources and education is a modifiable barrier that researchers and policy-makers should work to improve.

It is unclear whether GWG counselling is part of the curriculum for physician and midwifery training but based on the findings presented in the studies from this thesis, one would postulate that it is not recognized as a critical aspect of HCP training or at least there is insufficient knowledge uptake. Gaps at the level of HCP training may greatly impact prenatal care thus affecting the perception and health of prenatal patients. There is undoubtedly a need for healthcare provider education that highlights the importance of GWG and weight-related behaviours in pregnancy. There are also other healthcare considerations that may affect healthcare education such as funding, and organizational systems resources which must be resolved before changes to current training curriculum or practice requirements can be appropriately designed.

Conclusion

This thesis assessed weight gain counselling in prenatal care and evaluated a knowledge translation aide to help improve counselling frequency and quality. Weight gain counselling is an essential component of prenatal healthcare, but discussions between HCPs and patients is inconsistent and inaccurate with regards to IOM recommendations. We recognize that HCPs are balancing multiple priorities and that other substantive or acutely dangerous issues are at the forefront. However, a solid appreciation for both the short- and long-term consequences of

discordant GWG would prove beneficial to healthcare interactions and for the health of patients and their babies.

Future steps include the further development of GWG knowledge translation tools for both patients and HCPs. For HCPs, such developments may include the further optimization of the 5As tool as well as other checklists and even electronic versions of GWG fields. For patients, evidence-based and reliable information tools such as customized smartphone applications could be useful in reaching women during their everyday lives. Lastly, future steps may ultimately include improving HCP GWG education at the institutional level so that HCPs are fully immersed in training as part of their standard practice from the very beginning of their careers.

APPENDIX

Appendix 1. Ethics Approval Certificate for EMat Study.



RESEARCH INSTITUTE
INSTITUT DE RECHERCHE

Research Ethics Board 2017 Annual Renewal (Delegated)

Principal Investigator: Dr. Gary Goldfield

REB Protocol No: 14/183X

Romeo File No: 20140503

Project Title: CHEOREB# 14/183X - Women's Perceptions of the Current Weight Gain Guidelines during Pregnancy

Primary Affiliation: HALO\HALO

Protocol Status: Active

Approval Date: November 27, 2017 **Approval Valid Until:** December 15, 2018

Annual Renewal Submission Deadline: November 15, 2018

Documents Reviewed & Approved:

Document Name	Comments	Version Date
Protocol	Protocol unchanged	2014/10/17
Consent Form	Consent and questionnaire linked	2016/12/14

This is to notify you that the CHEO REB has granted approval to the renewal for the above named research study for a period of one year. The renewal was reviewed and approved by the Chair or a delegate of the Chair. Decisions made by the Chair under delegated review are ratified by the full Board at its subsequent meeting.

Appendix 2. Ethics Approval Certificate for 5As Study

File Number: H11-15-30

Date (mm/dd/yyyy): 04/12/2018



Université d'Ottawa
Bureau d'éthique et d'intégrité de la recherche

University of Ottawa
Office of Research Ethics and Integrity

Ethics Approval Notice **Health Sciences and Science REB**

Principal Investigator / Supervisor / Co-investigator(s) / Student(s)

<u>First Name</u>	<u>Last Name</u>	<u>Affiliation</u>	<u>Role</u>
Kristi	Adamo	Health Sciences / Human Kinetics	Principal Investigator
Raywat	Deonandan	Health Sciences / Others	Co-Supervisor
Ashley	Weeks	Health Sciences / Others	Student Researcher

File Number: H11-15-30

Type of Project: Professor

Title: A pilot study examining the effects of the "5 As for Healthy Pregnancy Weight Gain" on MD weight management dialogue and patient experiences

Renewal Date (mm/dd/yyyy)	Expiry Date (mm/dd/yyyy)	Approval Type
04/12/2018	03/01/2019	Renewal

Special Conditions / Comments:
N/A

Appendix 3. Slides for 5As HCP Training Workshop



Overview

- The 5 Key Principles of Healthy Pregnancy Weight Gain
- **ASK** for Permission to Discuss Weight
- **ASSESS** Potential “Root Causes” of Guideline-Discordant Weight Gain
- **ADVISE** on Pregnancy Weight Gain Risk and Management Options
- **AGREE** on a Realistic SMART Plan to Achieve Health Behaviour Outcomes
- **ASSIST** Women in Identifying Barriers and Facilitators, Educate, Refer and Arrange Follow-Up

Key Principles



Discussion About Gestational Weight Gain Should Occur With Every Woman Who is Pregnant or Planning a Pregnancy



Achieving Healthy Gestational Weight Gain is About Improving Health and Well-Being of Both Mothers and Babies



Early Action Means Addressing Root Causes and Removing Roadblocks



Pregnancy-Related Health Beliefs Can Be Powerful Influences on Weight Gain in Pregnancy



Achieving Goals is Different for Every Woman

Key Principles



Discussion About Gestational Weight Gain Should Occur With Every Woman Who is Pregnant or Planning a Pregnancy

- A woman planning or experiencing a pregnancy is usually very motivated to be as healthy as possible.
- Discussion of gestational weight gain from a patient-centered perspective allows providers to have sensitive conversations that are meaningful to the individual woman, regardless of her prepregnancy body mass index (BMI – underweight, normal weight, overweight, or obese).
- Supporting all women to keep gestational weight gain within recommended parameters is important because unhealthy weight gain (excessively lower or higher than recommended) is linked to a range of negative health outcomes for mothers, babies, and children.

Key Principles



Achieving Healthy Gestational Weight Gain is About Improving Health and Well-Being of Both Mothers and Babies

- Success should be measured by the degree to which a women adopts behaviours that improve or maintain health, in addition to the amount of weight she gains.
- Even modest approximations to the recommended gestational weight gain can improve personal health and reduce post-partum weight retention.

Key Principles



Early Action Means Addressing Root Causes and Removing Roadblocks

- Successful weight management of gestational weight gain begins with identifying how much weight a woman should gain based on her prepregnancy BMI category and having early and repeated discussions to identify and address the myths, barriers, and facilitators of managing gestational weight gain.
- Refer to Health Canada guidelines.

Key Principles



Pregnancy-Related Health Beliefs Can Be Powerful Influences on Weight Gain in Pregnancy

- Understanding a woman's cultural context is critical.
- Making assumptions about health behaviours can lead to ineffective interventions.

Key Principles



Achieving Goals is Different for Every Woman

- Women vary considerably in their readiness and capacity for managing gestational weight gain.
- “Achieving Goals” can be defined as better quality of life, greater self-esteem, higher energy levels, improved overall health and/or achieving weight gain within the recommended range.
- Guideline-concordant weight gain in pregnancy is not a realistic goal for some women, and setting unachievable targets might simply set women up for failure.
- Instead, help women set weight targets that they can achieve to try to improve health for themselves and their babies.



ASK for Permission to Discuss Weight

Body weight may be a sensitive issue. Even though weight gain in pregnancy is expected, 'asking' is an important first step.



ASK



Be Non-Judgmentally Curious



Ask Questions Before Making Statements



Explore Readiness for Change



ASK



Be Non-Judgmentally Curious

- Do acknowledge that weight gain is healthy and to be expected during pregnancy.
- Do provide education about the recommended amount of weight gain to optimize health.
- Do not make assumptions about a woman's life, lifestyle or motivation. She may be living as healthy a lifestyle as she can, or she may be ready to take action, or in the action stage of making changes.



ASK



Ask Questions Before Making Statements

- Be non-judgmentally curious. Ask questions, listen to the woman's answers and respond in a manner that validates her experience, acknowledges her autonomy to make her own choices and invites her to consider the benefits of your recommendations. Do provide education about the recommended amount of weight gain to optimize health.
- If she is not ready to follow through on your recommendations be prepared to address her concerns and barriers and explore her reasons not to change. Ask for permission to keep the conversation about healthy weight gain going at future visits.



ASK



Explore Readiness for Change

- Determining a woman's readiness to change behaviour in accordance with your recommendations is essential for success. Recognize that different women will be at different stages of readiness.
- Supporting behaviour change and increasing readiness if it is lacking requires a genuine collaboration that acknowledges that the woman is central.
- Initiating change when a woman is not ready can result in frustration and elicit resistance and learned helplessness. This can interfere with future attempts to support healthy change.



ASK

Sample Questions on How to Begin a Conversation about Weight:

- Could we discuss your thoughts and feelings regarding weight gain during your pregnancy?
- Are you concerned about weight gain during pregnancy?
- Would you be interested in information about weight gain during pregnancy?



ASK



ASSESS Potential “Root Causes” of Guideline-Discordant Weight Gain



ASSESS

- Assess prepregnancy BMI
- Weigh at every prenatal visit
- Use the 4Ms framework (mental, mechanical, metabolic and milieu) to assess drivers and complications of guideline-discordant pregnancy weight gain as well as barriers to guideline-concordant pregnancy weight gain at every prenatal visit
- Consider pregnancy-related health beliefs – these can be powerful influences on gestational weight gain



ASSESS

Obesity Class

Prepregnancy BMI	Mean ^a rate of weight gain in the 2 nd and 3 rd trimester		Recommended total weight gain ^b (for singleton pregnancies)	
	kg/week	lb/week	kg	lbs
Underweight (<18.5kg/m ²)	0.5	1.0	12.5 – 18	28 – 40
Normal weight (18.5-24.9kg/m ²)	0.4	1.0	11.5 – 16	25 – 35
Overweight (25.0-29.9kg/m ²)	0.3	0.6	7 – 11.5	15 – 25
Obese (≥30.0kg/m ²) ^c	0.2	0.5	5 – 9	11 – 20

Taken from Health Canada website: www.hc-sc.gc.ca/fn-an/nutrition/prenatal/ewba-mbsa-eng.php

a. Rounded values

b. Calculations for the recommended weight gain range assume a gain of 0.5 to 2 kg (1.1 to 4.4 lbs) in the first trimester (Siega-Riz et al., 1994; Abrams et al., 1995; Carmichael et al., 1997).

c. A lower weight gain may be advised for women with a BMI of 35 or greater, based on clinical judgment and a thorough assessment of the risks and benefits to mother and child (Crane et al., 2009; Oken et al., 2009; Hinkle et al., 2010).



ASSESS

The 4Ms of Gestational Weight Gain:



Mental

- Addiction
- Anxiety
- Body Image
- Depression
- Emotional eating and eating disorders
- Cravings and aversions
- Insomnia



Mechanical

- Incontinence
- Pain
- Sleep disturbance
- Disability and reduced mobility



Metabolic

- Diabetes mellitus
- Hyperemesis gravidarum and nausea
- Medications
- Multiple gestation
- Preeclampsia



Milieu

- Family structure including relationships and children
- Employment
- Ethnicity and culture
- Accessibility to healthy food
- Income
- Support at home and at work



ADVISE on Pregnancy Weight Gain Risk and Management Options



ADVISE

- Gestational weight gain (lower or higher than recommended) is linked to negative health outcomes for mothers and their babies.
- Gestational weight management should be **improving health** and **well-being** for both the woman and her baby rather than only measuring weight.



ADVISE

Discuss the need for a strategy throughout pregnancy and the postpartum period.

Explain benefits of gaining within the guidelines.

Advise on management options.



ADVISE

Discuss the need for a strategy throughout pregnancy and the postpartum period

- All management strategies must be **feasible and sustainable**.
- Different strategies may be needed at different stages.



ADVISE

Explain Benefits of Gaining Within the Guidelines

Healthy Weight gain within the guidelines can result in substantial health improvements for:

Women:

- Fewer complications before, during, and after birth.
- Blood glucose control.
- Blood pressure control.
- Less weight to lose after birth.

Babies:

- Healthy birth weight.
- Less birth trauma.
- Less chance of needing to be admitted to a special care nursery/intensive care nursery (e.g. blood glucose control, temperature control).
- Less chance of overweight and obesity during childhood and as an adult.



ADVISE

Advise on Management Options



WEIGHT GAIN



SLEEP, TIME, and STRESS



EATING BEHAVIOUR



PHYSICAL ACTIVITY



SEDENTARY BEHAVIOUR



MENTAL HEALTH



ADVISE



WEIGHT GAIN

Should be based on prepregnancy BMI.
Women with higher prepregnancy BMI require less weight gain. Please refer to the guidelines



ADVISE



SLEEP, TIME, and STRESS

Management interventions may improve eating and activity behaviours as well as mood.



ADVISE



EATING BEHAVIOURS

Should focus on healthy nutrition.

An extra 2 – 3 Food Guide servings totaling about 250-500kcal/day

- Trimesters 2 and 3 only.
- Fruit and vegetables, grains, milk and alternatives, meat and alternatives.
- E.g. 1 piece of fruit + $\frac{3}{4}$ c of yogurt; 1 piece of toast + 1 cup of milk.
- Exercise caution with cravings.



ADVISE



PHYSICAL ACTIVITY

Interventions should promote physical activity (if there are no contraindications) throughout pregnancy.



ADVISE



SEDENTARY BEHAVIOUR

Women should be encouraged to reduce sedentary time (e.g. television, computer, social media, video games).



ADVISE



MENTAL HEALTH

Is an important aspect of health. Women should be encouraged to focus on experiences (activities or relationships) that enhance positive self-esteem, well-being and quality of life throughout their pregnancy. Referral for mental health treatment in situations where there are underlying/co-morbid psychological issues or problems is recommended.



AGREE on a Realistic SMART Plan to Achieve Health Behaviour Outcomes



AGREE



Agree on Sustainable Behavioural Goals



Behavioural Goals Should be SMART



Agree on the Plan



AGREE



Agree on Sustainable Behavioural Goals

- Focus on sustainable behavioural changes rather than on specific weight targets.
- Unrealistic goals can lead to **disappointment** and may encourage unhealthy habits and **non-adherence**.
- Even for a woman who has exceeded weight gain recommendations, meeting the recommended rates of weekly weight gain may be the best goal.
- Behavioural goals may be different for each woman.



AGREE



Behavioural goals should be SMART:

- Specific
 - Measurable
 - Achievable
 - Rewarding
 - Time-bound
-
- Flexible self-monitoring with a lifestyle journal can help initiate and sustain behavioural change



AGREE



Agree on the Plan

- Management plans should be realistic and sustainable.
- Management plans should consider addressing environmental, socio-economical, familial, or cultural **drivers** of excessive weight gain (e.g. anxiety, family stressors, etc.).
- The **success** of the plan should be measured as sustained **healthy behaviours** and mother's **well-being** (e.g. physical and mental health).



**ASSIST Women in Identifying Barriers
and Facilitators, Educate, Refer and
Arrange Follow-Up**



ASSIST



Assist Women in Identifying and Addressing Drivers and Barriers



Assist Women in Identifying Facilitators and in Maintaining Healthy Behaviours



Offer Education and Resources



Refer to Appropriate Providers



Arrange Follow-Up



ASSIST



Assist Women in Identifying and Addressing Drivers and Barriers

- Drivers and barriers may include **environmental, socio-economical, emotional, medical or cultural factors.**
- **Physical barriers or physical discomfort** (e.g. lack of sleep, mobility) may hinder participation in routine daily activities.



ASSIST



Assist Women in Identifying Facilitators and in Maintaining Healthy Behaviours

- Supporting women to maintain/regain healthy behaviours may increase their personal commitment to health in the face of barriers.
- Identifying facilitators to guideline-concordant gestational weight gain may help tip the balance toward motivation for healthy behaviour as well as support self-efficacy.



ASSIST



Offer Education and Resources

- Education to improve understanding is central to self-management.
- Help women identify and seek out CREDIBLE pregnancy specific health behaviour and weight-management information and resources.



ASSIST



Refer to Appropriate Providers

- Evidence supports that weight management throughout pregnancy is more successful using an **interdisciplinary** team approach.
- Choice of appropriate provider (e.g. GP, OB, MFM, midwife, nurse, dietitian, exercise physiologist, psychologist, etc.) should reflect identified DRIVERS and **complications** of excessive weight gain as well as BARRIERS to weight management during this critical period.



ASSIST



Arrange Follow-Up

- Follow-up is **essential**, given the prevalence of excessive weight gain in pregnancy and the subsequent high probability of post-partum weight retention, which can lead to immediate and downstream complications.
- The child-bearing years are a natural period of weight cycling (for those who have experienced more than one pregnancy), and returning to a healthy weight should be encouraged.

Professional Resources

Adamo K, Bell R, McDonald S, Piccinini-Vallis H, Vallis M, with the Canadian Obesity Network Healthy Pregnancy Working Group. 5As of Healthy Pregnancy Weight Gain. <http://www.obesitynetwork.ca/pregnancy>. Published July 2014.

To download a copy of the Practitioner Guide, visit
www.obesitynetwork.ca/pregnancy

