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Eating for Two Without Eating Too Much: Optimizing Gestational Weight Gain

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Abstract

This evidence-based pilot project was implemented to optimize gestational weight gain (GWG) among women enrolled for prenatal care at a private practice. Evidence from meta-analyses and large studies show: 1) an association between excess GWG and increased risk of fetal macrosomia and increased cesarean delivery; 2) 66% of women do not know their healthy GWG target; 3) a 20% reduction in excess GWG in women receiving diet or exercise interventions or both. In addition, visual plotting of weight gain has helped overweight adults reduce and maintain weight loss over a one-year period. Nutrition assessment using a validated nutritional screening questionnaire called starting the conversation (STC) was utilized to screen women for their dietary habits, measure readiness for change, and set individualized dietary change goals at the first prenatal appointment. Women were provided verbal and written education on increasing physical activity and exercise to at least 150 minutes per week at moderate intensity. An individualized visual plot of gestational weight gain was created and shown to woman at every visit with anticipatory guidance on expected weight gain for upcoming prenatal visits. Data was collected retrospectively and reviewed from patients' charts a year prior to intervention and compared to intervention year. The data was assessed for (1) Change in nutritional assessment score at 36 weeks in comparison to score at first prenatal visit (2). Proportion of women gaining appropriate weight. Only 7% screened positive for needing further nutritional education by scoring greater than seven on the STC pre-screening, and none screened positive on the STC post-screening. Only 35% of participants exceeded the recommended weight gain, compared to 64% the year prior.

Précis: Comparison of percent maximum GWG per IOM recommendations showed a 29% reduction in women with excessive gestational weight gain in the intervention year compared to the year prior.

Keywords: Gestational weight gain (GWG), visual weight plot, obesity

Introduction

Problem Description

Obesity and excessive weight gain in pregnancy is an increasing problem in the United States. As of 2015, 48% of women, gained weight excessively during pregnancy (Center for Disease Control [CDC], 2018). The total healthcare cost associated with excessive weight gain and postpartum weight retention for mother and baby is unknown, but obesity alone cost United States tax payer an astronomical $147 billion per year (CDC, 2018). Furthermore, a survey of 159 pregnant women revealed that 66% did not know their correct GWG recommendation (Ledoux et al., 2018).

A systematic review and meta-analysis evaluating twenty-three studies and over one million women showed an association between GWG above Institute of Medicine's (IOM) guideline and increased risk of fetal macrosomia, large for gestational age and increased cesarean birth (Goldstein et al., 2017). Similarly, greater incidence of postpartum weight retention is associated with gaining above the IOM recommendation with a resulting increase in metabolic risk factors such as central adiposity, dyslipidemia, and glucose intolerance (Gilmore, Klempel-Donchenko, & Redman, 2015).

The 2009 IOM guideline for weight gain in pregnancy was published to redefine appropriate weight gain in pregnancy. The IOM guideline was utilized as a benchmark for appropriate GWG. The guidelines are based on pre-pregnancy body mass index (BMI) as follows: gain 25-35 pounds if pre-pregnancy BMI is between 18.5 - 24.5kg/m^2, gain 15-25 pounds if pre-pregnancy BMI is between 25 - 29.9kg/m^2, and gain 11- 20 pounds if pre-pregnancy BMI is between $\geq$30kg/m^2 (Institute of Medicine, 2009).

Research evidence surrounding preventing excessive gestational weight gain identified that visual weight plots, as well as diet, exercise, and lifestyle interventions are effective strategies to minimize excessive weight gain. Widen and Siega-Riz (2010), adapted starting the conversation (STC), a brief seven question validated nutritional screening questionnaire for pregnancy. The questionnaire provides structure for individualized assessment and facilitates nutritional counselling. The STC in pregnancy screens patients for readiness for change, dietary habits and concludes with individualized diet goal for subsequent visit. The validity of the STC was demonstrated in 463 diabetic adults by Paxton, Strycker, Toobert, Ammerman, and Glasgow (2011). Pacanowski and Levitsky (2015), utilized frequent weighing and visual weight plot without a prescribed diet or exercise routine in 135 overweight adults. Overall, the intervention group lost more weight, and maintained the weight loss over a one-year period.

Vesco et al., (2014) tested the efficacy of weight management techniques used in non-pregnant adult in obese pregnant women: DASH diet, weekly group meeting, individual calorie goal, food and activity diary, and thirty minutes of moderate physical activity per day. One hundred and fourteen pregnant women were randomized into either the intervention group (n =58) or the control group (usual care group n=56), between seven weeks and twenty-one weeks gestation. The post-intervention outcome was measured at thirty-four weeks gestation and two weeks postpartum. The intervention group gained less weight with a mean difference of -3.4 kg, 95% CI (-5.1 to -1.8) at thirty-four weeks gestation; and at two weeks postpartum, a mean difference -3.8kg, 95% CI (-5.9 to -1.7).

In a systematic review, Muktabhant et al., (2015) evaluated the effectiveness of low glycemic / healthy eating diet or exercise, or both in preventing excessive weight gain in pregnancy. The review consisted of 49 randomized control trials (RCTs) involving a total of 11,444 women. In the intervention group, the diets tested were low sugar, low-fat and low-calorie foods. The physical activity component often involved moderate intensity walking, dance, or aerobic classes. The control group received standard care. Overall, there was a 20% reduction in gestational weight gain observed in women receiving intervention of diet or exercise or both compared to control group, with an overall risk ratio of 0.80, 95% CI (0.73 to 0.87).

Quinlivan, Franzcog, Julania, and Lam (2011) performed a meta-analysis to determine if dietary intervention to restrict gestational weight gain to IOM recommendations can restrict maternal weight gain without comprising newborn's birth weight. The review consisted of four RCTs involving 537 women. The dietary intervention included food diary with counseling sessions, food diary with prescribed balanced diet program plus conventional prenatal dietary management, calorie reduction with healthy replacement counseling session with prenatal care, and multidisciplinary program with weight monitoring, dietary intervention, and counseling. The control group consisted of usual care. Overall, the dietary interventions reduced maternal weight by -6.5kg 95% CI (-7.6 to -5.4 kg) without significant impact on newborn birth weight with mean difference of 8.5g 95% CI (-84.9 to 101.9). The 6.5kg average reduction in gestational weight in the studies meant that the participants GWG matched IOM recommendations.

Walker et al., (2018) performed a meta-analysis and systematic review aimed at creating a community-level tool box for preventing excessive GWG. This article synthesized evidence from 89 RCT's and compared efficacy of approaches such as diet, physical activity, lifestyle, sleep, eHealth and medication. They also compared ideal time in pregnancy to start an intervention, frequency of intervention and delivery method (individual vs group-based). The diet-based intervention had the largest weighted difference compared to other interventions. However, metaregression revealed that there was no specific prescribed diet type, and physical activity frequency, intensity, or setting needed to prevent excessive GWG. Furthermore, a 2019 systematic review and meta-analysis concluded that the most successful component of dietary interventions during pregnancy was individualized diet education provided by a nurse (Vincze et al., 2019).

The combined evidence from the aforementioned studies was used to design a pilot project with emphasis on individualized patient education and use of visual reminder of gestational weight gain with anticipatory guidance at every appointment.

Model / Rationale

The Iowa model utilizes research to guide practice by using problem or knowledge focused triggers to drive change in healthcare while emphasizing the importance of the entire healthcare system: the infrastructure, the stakeholders, and the patient (Everett & Titler, 2006). For this project, the knowledge focus trigger was poor adherence to IOM's appropriate gestational weight gain standards in primary care. The rationale for utilizing the Iowa model is the structure it provides for critiquing and synthesizing research evidence into practice, as well as the opportunity to pilot change, evaluate, standardize and disseminate outcome. One obvious strength of the IOWA

model is that it provides a systematic approach to making a significant practice difference (Loyd, D'Errico, & Bristol, 2016). In addition, the Iowa model utilizes a collaborative approach which is ideal for a primary care clinic. Another strength is that the use of a pilot project enables assessment of appropriateness of the change for the organization before more financial investment is made to solidify the change. One potential weakness of this model, is that the loss of one stakeholder can potentially hinder practice change

Population at Risk

The latest Maternal Infant Health Assessment (MIHA) survey published by the California Department of Public Health showed that in San Diego County in 2013-2014 41.4% of women in California, and 35.7% of women in San Diego county gained weight excessively during pregnancy. The report further showed that 90.3% of pregnant women in San Diego county initiated prenatal care in the first trimester. The age distribution of the mothers were 4% age 15-19 years, 76.1% age 20-34 years, and 19.9% age 35 years and greater. The race or ethnicity distribution of the mothers in San Diego County were 43.3% Hispanic, 5.1% Black, 38.7% White, and 12.4% Asian / Pacific Islander (California Department of Public Health, 2016).

Specific Aim

The purpose of this project was to utilize patient education and a visual weight tracking plot to decrease the percentage of women who exceed the IOM's GWG recommendations by 20% within nine months.

Methods

Setting and Project Development

The project was implemented at a private Obstetrics (OB) and Gynecology (GYN) practice in a suburb of San Diego County. The clinic offers a wide range of services to include complete pregnancy OB care, fetal ultrasonography, GYN surgery, infertility care, family planning, contraception, and medically supported weight loss. The clinic accepts a variety of health insurance plans and self-pay clientele. The chief executive officer (CEO) of the clinic is a solo practicing physician who oversees all clinical care provided. There is a dedicated business manager who overseas business-related aspects of the clinic. There are two full time, and one part-time medical assistants in the practice. The nurse practitioner student worked with women under the mentorship of the physician to coordinate and implement the project. The stakeholders for the project were the physician, the business manager, the faculty adviser, and the NP student.

The project was approved by the clinic's CEO and the University of San Diego's (USD) Institutional Review Board (IRB) in April 2019, and May 2019 respectively. The two full time medical assistants (MA) were trained on including the nutritional screening tool in the prenatal packets and on adding the appropriate visual weight plot based on pre-pregnancy BMI to the patient's chart in May 2019. The projected was implemented from June 2019 through March 2020. All women seeking prenatal care were provided the same educational intervention, but data analysis was limited to participants who started prenatal care between June and August 2019 with a starting gestational age of 20 weeks or less. No consent was obtained for participation, because the interventions were provided as the new and improved standard of care for all patients.

Interventions

A nutritional screening questionnaire called Starting the Conversation (STC) was included in the new patient packet, so that the women had the opportunity to fill out the questionnaire in the lobby while waiting for the provider to see them. The questionnaire screens for readiness for change, as well as current dietary habits. Scores of zero to seven indicate good to fair nutrition, whereas scores of eight or greater indicate a need for intervention. The nurse practitioner (NP) student or the physician reviewed the STC questionnaire with the patient at the time of the appointment and discussed the dietary goals identified by patients. The STC questionnaire were repeated at 36 weeks' gestation for all women to assess for change in score post-education

The NP student also provided individualized verbal and written education focused on total healthy gestational weight gain, additional calorie needs for a healthy pregnancy, exercise goals, and reviewed the use visual weight plot to track weight gain. The individualized weight gain goal is based on their pre-pregnancy body mass index (BMI) and IOM's recommendation as follows: gain 25-35 pounds if pre-pregnancy BMI is between 18.5 - 24.5kg/m^2, gain 15-25 pounds if pre-pregnancy BMI is between 25 - 29.9kg/m^2, and gain 11- 20 pounds if pre-pregnancy BMI is between $\geq$30kg/m^2 (IOM, 2009). The California Department of Public Health prenatal weight grids was utilized for the visual weight plot based on pre- pregnancy BMI (California Department of Public Health, 2013). The visual weight plot was shown to participants on paper at every prenatal appointment until delivery.

Furthermore, women were educated that it is healthy to exercise during pregnancy and that the current recommendation is to achieve at least 150 minutes of

moderate intensity exercise weekly (CDC, 2019). The recommendations were customized for patients based on their preferred routine. For example, the goal can be achieved with a smartwatch or step counter by completing at least 2000 steps in 25 minutes, six times each week (for a moderate intensity pace at 3miles/hour).

Individualized education on additional calorie need for a healthy pregnancy were provided. For example, for patient with pre-pregnancy weight in the normal category, there is no change in calorie need in the first trimester, approximately 340 calorie/day increase is required in the second trimester, and about 450 calorie/day increase is needed in the third trimester to support a healthy pregnancy (IOM, 2009). Furthermore, patients were provided an educational brochure to reinforce teaching following their appointment, along with optional food and exercise logs to keep track of their progress.

Participants

A total of 16 participants started the program between the months of June and August 2019. Gestational age of participant at the start of the program ranged from 6-19 weeks. Body mass index (BMI) of participants ranged from 19.02 kg/m^2 to 37.84 kg/m^2. Of the 16 participants that started the program, one participant had a spontaneous abortion at 9 weeks' gestation, and the other participant moved or transferred care at 28 weeks gestation. Majority of the participants were Hispanic at 43%, 29% were Caucasian, 21% Asian, 14% African American, and 7% Middle Eastern.

Measurements:

One of the process indicators was the proportion of women with an increase in nutritional screening assessment score pre and post educational intervention. The STC assessment was completed at the first prenatal visit and was repeated at 36 weeks'

gestation. The goal was to have at least 75% of participants complete both STC screening. Another process indicator was weight measurements, specifically the proportion of patients who had at least four data points on their completed visual weight gain plots by week 36 of pregnancy. The women's weight was measured prior to every scheduled appointment. The women were instructed to remove as much outerwear as possible, including shoes. The goal was to have 75% of patients with at least four data points on their completed visual weight gain plot by 36 weeks' gestation. The outcome measure was the proportion of women who exceeded or did not exceed their IOM total gestational weight gain goal by BMI category within nine months during the intervention months (June 2019-March 2020) as compared to the year prior to the intervention from June 2018 - March 2019.

Results

Of the 16 mothers that started their prenatal care during the intervention period, 14 mothers completed the program. All 14 mothers (100%) completed the STC pre-screening upon initiation of prenatal care, and 13 out of 14 mothers (93%) completed the STC post-screening at 36 weeks. The STC pre-screening score ranged from 1 to 10, with a mean score of four. Only one out of fourteen mothers (7%) screened positive for needing further nutritional education by scoring greater than seven on the STC pre-screening. The STC post-screening score ranged from 1 to 7, with a mean score of three. zero out of 14 mothers (0%) screened positive for needing further nutritional education on the STC post-screening at 36 weeks. All 14 women (100%) had at least four data points plotted on their visual weight plot to track their GWG. In June 2019 - March 2020, only 5 out of 14 mothers (35%) exceeded their total gestational weight gain goal.

In comparison, retrospective review of data obtained from the electronic medical record from June 2018 - March 2019, revealed that 9 out of 14 mothers (64%) exceeded their total gestational weight gain goal (see Figure 1).

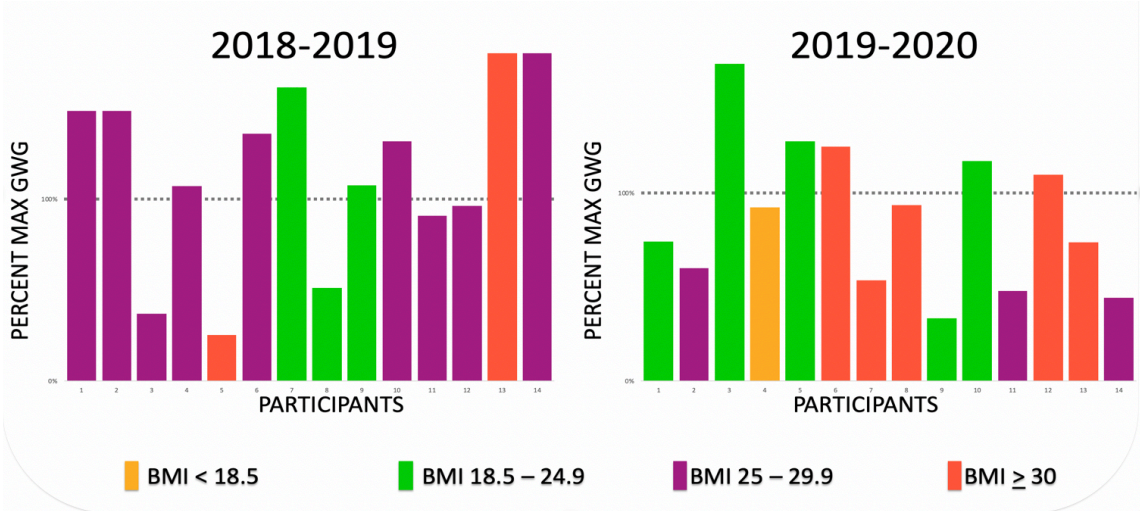

Figure 1. Total gestational weight gain (GWG) comparison of participants based on pre-pregnancy BMI.

Discussion

Strengths

This evidenced-based pilot project was successfully implemented in a private obstetrics and gynecology clinic. The project achieved a 29% reduction in the percentage of mothers that exceeded the IOM's total GWG recommendations within nine months, surpassing its initial 20% reduction goal. The program was well attended, 87% of pregnant participants that started the program, successfully finished it. Favorable factors include the fact that the project was implemented during regularly scheduled prenatal appointments and did not require additional clinic visits or co-pay from patients. The STC nutritional screening questionnaire was a great way to introduce nutritional

education, because it also screened for readiness for change and allowed patient to self-identify areas for improvement. The cost of implementation was minimal at approximately $388.

Cost-Benefit Analysis

There are both financial and non-financial benefits associated with the EBP project. Non-financial benefits include reducing maternal and fetal risks and potentially higher patient satisfaction. The financial benefits include cost avoidance on potential complications and increased reimbursement benefits. As shown in Table 1 below, the most significant cost is associated with personnel training. The training was not extensive and was done within 15 minutes during a routinely scheduled staff meeting. The main recurring cost was approximately $10 for making copies of brochures and logs for 16 patients over nine months. On the other hand, the total benefit is $10, 549, with a 9,953% average return on investment.

Table 1

Project Cost

Resources	**Cost**	**Rationale**
MA training ($20 per hour X 2 MA's) for 2 hours	$80.00	Train MA's to administer STC tool and provide visualized weight chart at each visit.
Physician training X2 hour, at $104 per hour	$208.00	Train MD to score and use the STC tool and visualized weight grid
Informational materials 100 copies x $0.10	$10.00	Average print cost f $0:10 per page
Total cost	$298.00	
Benefit	**Cost**	**Rationale**
Gestational diabetes (GDM) per case per year	$5800	Excessive weight gain associated with increased negative outcome such as GDM.
Hospital per night cost	$3500	Downstream Consequences of excessive GWG.
Increased reimbursement	$1249	Potential reimbursement for participation in CPSP program on Medi-Cal patients per patient per year
Total benefit	**$10, 549**	

Cost Benefit Analysis	$35.39	$\frac{\text{program benifit}}{\text{program cost}} = \frac{\$10{,}549}{\$298} = \$35.39$
Return on Investment	9,953%	(net program benefit – program cost) / (program costs) = ($10549 – $298 / (298)

Limitations

The pilot project was time intensive, because it required approximately16 – 36 weeks to implement. The individualized educational intervention at the first prenatal appointment took 10 – 15 minutes in addition to the scheduled appointment time, resulting in potential appointment delays for the rest of the day and potential loss of relative value units (RVU). The nutritional screening questionnaire was based on subjective data recall and as such was not useful as a pre- and post-screening questionnaire. For instance, one patient changed her initial pre-screening score from six (indicating good to fair nutrition) to a score of ten (indicating poor nutrition) due to the presence of an engaged spouse who prompted the participant to be more honest in her response. Furthermore, weight measurements during the winter months were potentially less accurate because patients wore generally heavier clothing, and some declined to take off boots or shoes at the third trimester due to difficulty of putting it back on again. In addition, the intervention took place over four major holidays including Halloween, Thanksgiving, Christmas, and New-year which makes adherences to lifestyle choices more difficult. Lastly, the visual weight plots were under-utilized in the absence of the NP student, due to the additional time requirement.

Sustainability

There are two main ways to ensure sustainability of the project. The first step is to apply for existing sources of funding and reimbursement. The pilot project program goal

aligns with the Comprehensive Perinatal Service program (CPSP) goal of healthy mothers delivering healthy normal weight babies (California Department of Public Health, 2020). Participation in the CPSP program increases revenue on Medi-Cal patients by approximately $1200 per patient per year. Besides, the visual weight grid that we utilized for the EBP project was created by the California Department of Public Health and is a requirement for participation in the CPSP program. The second step to achieving project sustainability is to embed the visual weight plot into the electronic medical record (EMR) to improve ease of use, and reduce time commitment to manually plot the weight.

Conclusion

Excessive gestational weight gain is a problem that is both economically costly and associated with increased adverse fetal and maternal outcomes to mother and baby. The IOM guideline for appropriate gestational weight gain helps to reduce incidence of adverse maternal and fetal outcome. Providing adequate patient education while utilizing a visual weight plot is one way to promote appropriate gestational weight gain among pregnant women per current IOM recommendation. Doctor of Nursing Practice providers working in Women's Health centers across the nation are in an excellent position to spearhead evidence-based interventions to improve the health outcome of pregnant women and their baby.

References

American Psychological Association. (2020). *Publication manual of the American Psychological Association* (7th ed.). https://dx.doi.org/10.1037/0000165-000

California Department of Public Health (2013). Prenatal weight gain grid. Retrieved from http://www.publichealth.lacounty.gov/mch/cpsp/forms/Prenatal%20Weight%20Gain%20Grids.pdf

California Department of Public Health (2016). Maternal and Infant Health Assessment (MIHA) data snapshot, County of San Diego, 2013-2014. Retrieved from https://www.cdph.ca.gov/Programs/CFH/DMCAH/MIHA/CDPH%20Document%20Library/SnapshotCoSanDiego2013-2014.pdf

California Department of Public Health (2019). Comprehensive Perinatal Service Program (CPSP). Retrieved from https://www.cdph.ca.gov/Programs/CFH/DMCAH/CPSP/pages/default.aspx

Centers for Disease Control and Prevention (2018). Weight gain during pregnancy. Retrieved from https://www.cdc.gov/reproductivehealth/maternalinfanthealth/pregnancy-weight-gain.htm

Centers for Disease Control and prevention (2019). Physical activity: Healthy pregnant or postpartum women. Retrieved from https://www.cdc.gov/physicalactivity/basics/pregnancy/index.htm?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fphysicalactivity%2Feveryone%2Fguidelines%2Fpregnancy.html

Everett, L.Q. & Titler, M.G., (2006). Making EBP part of clinical practice: The Iowa Model. in Levin, R.F. & Feldman, H.R. (Ed*). Teaching Evidence-Based Practice in Nursing*. (pgs 295-324). New York, NY: Springer Publishing

Gilmore, L.A., Klempel-Donchenko, M., Redman, L.M., (2015) Pregnancy as a window to future health: Excessive gestational weight gain and obesity. *Seminars in Perinatology. 39 (4)*: 296-303. http://dx.doi.org.sally.sandiego.edu/10.1053/j.semiperi.2015.05.009

Goldstein, R.F., Abell, S.K., Ranasinha, S., Misso, M., Boyle, J.A., Black, M.H.,…Teede, H.J. (2017). Association of gestational weight gain with maternal and infant outcomes: a systematic review and meta-analysis. *Journal of American Medical Association 317 (21)* 2207- 2225. http://dx.doi.org.sally.sandiego.edu/10.1001/jama.2017.3635

Institute of Medicine (2009). Weight gain during pregnancy: Reexamining the guidelines Retrieved from https://www.cbsnews.com/htdocs/pdf/052809_pregnancy.pdf

Ledoux, T., Daundasekara, S., Van Den Berg, P., Leung, P., Walker, L., & Berens, P. D. (2018). Association between health beliefs and gestational weight gain. *Journal of Women's Health (15409996)*, *27*(3), 341–347. http://dx.doi.org/10.1089/jwh.2016.6185

Loyd, S., D'Errico, E., Bristol S. (2016). Use of the Iowa model of research in practice as a curriculum framework for doctor of nursing practice (DNP) project completion. *National League of Nursing Volume 37, Retrieved from* http://0-search.ebscohost.com.sally.sandiego.edu/login.aspx?direct=true&db=rzh&AN=114678196&site=ehost-live

Muktabhant, B., Lawrie, T. A., Lumbiganon, P., & Laopaiboon, M. (2015). Diet or exercise, or both, for preventing excessive weight gain in pregnancy. Cochrane Database Systematic Review, 6, CD007145. http://dx.doi.org/10.1002/14651858.CD007145.pub3.

Pacanowski, C. R., & Levitsky, D. A. (2015). Frequent self-weighing and visual feedback for weight loss in overweight adults. *Journal of Obesity*, *2015*, 1–9. https://dx.doi.org/10.1155/2015/763680

Paxton, A. E., Strycker, L. A., Toobert, D. J., Ammerman, A. S., & Glasgow, R. E. (2011). Starting the conversation: Performance of a brief dietary assessment and intervention tool for health professionals. *American Journal of Preventive Medicine*, *40*(1), 67–71. https://dx.doi.org/10.1016/j.amepre.2010.10.009

Poston, L. (2017). Obesity in pregnancy: Where are we now, where should we go? *Midwifery 49, 4-6,* http://www.midwiferyjournal.com/article/S0266-6138(17)30021-9/pdf

Quinlivan, J. A., Franzcog., Julania, S., & Lam, L. (2011). Antenatal dietary interventions in obese pregnant women to restrict gestational weight gain to Institute of Medicine recommendations, a meta-analysis. *American College of Obstetricians and Gynecologists*, 18 (6),1395–1401

Siega-Riz, A. M., & Gray, G. L. (2013). Gestational weight gain recommendations in the context of the obesity epidemic. *Nutrition Reviews, 71(01).* http://dx.doi.org/10.1111/nure.12074

Vesco, K. K., Karanja, N., King, J. C., Gillman, M. W., Leo, M.C., Perrin, N., …Stevens, V. J. (2014). Efficacy of a group-based intervention for limiting gestational

weight gain among obese women: A randomized control trial. *Obesity Journal 22 (9)*: 1989-1996. http://dx.doi.org.sally.sandiego.edu

Vincze, L., Rollo, M., Hutchesson, M., Hauck, Y., MacDonald-Wicks, L., Wood, L., … Collins, C. (2019). Interventions including a nutrition component aimed at managing gestational weight gain or postpartum weight retention: a systematic review and meta-analysis. *JBI Database of Systematic Reviews and Implementation Reports*, *17*(3), 297–364. https://dx.doi.org/10.11124/JBISRIR-2017-003593

Walker, R., Bennett, C., Blumfield, M., Gwini, S., Ma, J., Wang, F., … Truby, H. (2018). Attenuating pregnancy weight gain-what works and why: A systematic review and meta-analysis. *Nutrients, 10(7),* 944. https://dx.doi.org/10.3390/nu10070944

Widen, E., & Siega-Riz, A. M. (2010). Prenatal nutrition: A practical guide for assessment and counseling. *Journal of Midwifery & Women's Health*, *55*(6), 540–549. https://dx.doi.org/10.1016/j.jmwh.2010.06.017