Preventing prematurity: Preconception, prenatal and postpartum nursing care

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Article purpose
The purpose of this article is to provide an overview of nursing care for women of childbearing age from preconception to postpartum related to preventing preterm labor and birth. The article also describes areas for future research on this topic.

Objectives
After reading this article, the learner will be able to:
1. Describe aspects of preconception, prenatal and postpartum nursing care aimed at addressing preterm labor and birth.
2. Summarize suggested research geared towards addressing physiologic or sociobehavioral mechanisms to prevent preterm labor and birth.

The importance of preconception care
The importance of preconception care and counseling has gained emphasis over the past decade as a result of the Select Panel on Preconception Care assembled by the Centers for Disease Control and Prevention (CDC) in 2005 (Johnson et al., 2006). The panel defined preconception care as “a set of interventions that aim to identify and modify biomedical behavioral and social risks to a woman’s health or pregnancy outcome through prevention and management” (p. 3).

Thirty to 90 percent of women can benefit from appropriate interventions prior to pregnancy (Hadar, Ashwal & Hod, 2015). However, only 30 percent of women currently receive preconception care, and this number is even lower in minority women (Oza-Frank, Gilson, Keim, Lynch & Klebanoff, 2014). To make preconception care accessible to all women in this country, care must include public health resources, programs and strategies for women in need (Johnson et al., 2006).
A number of poor pregnancy outcomes are associated with potentially preventable risk factors that can be identified, addressed and minimized with preconception care and counseling. The CDC panel (Johnson et al., 2006) developed recommendations for routine well-women health visits to guide the care of women to reduce risk factors. The promotion and management of overall health encompasses chronic disease control, avoidance of addictive behaviors and environmental exposures (smoke, alcohol, drugs and chemicals) and inclusion of preventative health measures (immunizations, vitamins, dental hygiene and weight management), all of which are integral in primary care of women. With appropriate clinical guidance, health care providers and women can identify and modify risk factors before conception.

Chronic health conditions

Women and their health care providers must work together to manage chronic diseases preconceptionally to help mitigate risk for preterm birth and other adverse pregnancy outcomes. Providers counsel women to lose weight, lower their blood pressure and control their blood glucose levels; they also discuss medication management and make alterations to treatment plans as appropriate for impending pregnancy. Well-woman and preconception care can help women reach an optimal state of health before pregnancy. For example, losing weight before pregnancy is important as obesity is associated with chronic diseases, such as hypertension, diabetes and asthma, all of which increase the risk of poor pregnancy outcomes, specifically preterm birth.

Not only can preconception care help women attain a higher degree of wellness, it also helps women optimally manage chronic health conditions before becoming pregnant. For example, women who suffer from chronic hypertension are at increased risk of developing preeclampsia, which often results in an indicated premature delivery (American College of Obstetrics and Gynecologist [ACOG], 2013). Thus, managing blood pressure before pregnancy is essential. Likewise, the link between preterm birth and type 1, type 2 and gestational diabetes has been well documented (Rosenburg, Garbers, Lipkind & Chiasson, 2005). Achieving optimal glucose control before getting pregnant increases the likelihood of positive pregnancy outcomes. Similarly, working with women during well-woman care to identify and remove triggers for asthma exacerbation is important as these exacerbations are common during pregnancy and often treated with oral corticosteroids; the use of corticosteroids to treat these exacerbations is associated with an increased incidence of preterm delivery (Namazy et al., 2013).

Other chronic health conditions related to increased incidence of preterm delivery that can be managed as part of well-woman and preconception care include kidney disease (Nevis et al., 2011) hypothyroidism and hyperthyroidism (Alkalay, 2009; Mannisto et al., 2013) and rheumatoid arthritis (Langen, Chakravart, Liaquat, El-Sayed & Druzin, 2014). Lupus, an autoimmune disorder that affects various body organs, primarily affects women of childbearing age and has been associated with a number of negative pregnancy outcomes, including miscarriage, preeclampsia, preterm birth and intrauterine growth restriction (IUGR) (Madazali, Yüksel, Oncul, Imamoglu & Yılmaz, 2014). Intrauterine infections, including sexually transmitted diseases, account for 40 percent of preterm births (Agrawal & Hirsch, 2012), emphasizing the importance of diagnosing and treating them in the preconception period.

Genetic disorders

Women who have genetic disorders often experience complications during pregnancy, such as preterm birth. These women need special preconception education about the effects of the disorder on pregnancy, the impact of pregnancy on their disorder as well as potential complications and side effects. For example, although many women with cystic fibrosis (CF) tolerate pregnancy well, there is a higher risk for morbidity and mortality due to poor adaptation to the pulmonary and respiratory changes that accompany pregnancy (Whitty, 2010). Women with CF who have moderate to severe lung disease and a forced expiratory volume <60 percent tend to have more preterm infants than women with milder disease (Whitty, 2010). ACOG (2011b) recommends genetic counseling and CF carrier screening preconceptionally to at-risk couples of reproductive age, especially those of European or Ashkenazi Jewish ancestry. Preconception care for women with CF focuses on nutrition, improving pulmonary function and preventing pulmonary infection.

Most women with neurofibromatosis are able to have a successful pregnancy with no apparent increase in mortality for the mother. However, these women are susceptible to preterm labor, with one study finding almost a twofold increase in the incidence of preterm birth compared to the control group (Terry et al., 2013). Preconception care for women with neurofibromatosis focuses on controlling blood
pressure because of neurofibromatosis-associated vasculopathy.

For women with polycystic kidney disease (PKD), preconception care that focuses on achieving normal blood pressure and optimal renal functioning is essential. Once a woman with PKD becomes pregnant, she is at risk for increased maternal and fetal complications unless her blood pressure and kidney function are optimized (Wu et al., 2016). In one study, rates of preterm birth were higher in mothers with PKD compared to a control group (Wu et al., 2016).

Preconception care for women with sickle cell disease (SCD) focuses on ensuring adequate maternal hemoglobin levels with prophylactic blood transfusions. Prophylactic red-cell transfusions decrease the incidence of preterm birth (Ngo et al., 2010). Eating an iron-rich diet to enhance hemoglobin levels is essential. Anemia puts women at risk for folate deficiency; adequate folic acid intake (400 mcg per day) decreases the incidence of neural tube defects (NTDs) (CDC, 2016a). If maternal hemoglobin is not optimized prior to pregnancy, the normal physiological changes of pregnancy, including an increase in blood viscosity and red cell mass, make managing SCD more difficult (Omole-Ohonsi, Ashimi, & Aiyedun, 2012). The rate of preterm birth is increased in mothers with SCD compared to those without the disease; Kuo and Caughey (2016) found that women with SCD are approximately 2.5 times as likely to have a preterm birth at <37 weeks gestation and almost 6 times as likely to have a preterm birth at <32 weeks gestation.

Preconception care for a woman with Turner syndrome is important as screening before pregnancy can help her know if she is at increased risk of death from aortic dissection or rupture (Pfeifer et al., 2012). Preconception care involving cardiology screening is a necessity because pregnancy is an absolute contraindication for women with Turner syndrome who have a cardiac anomaly (American Society for Reproductive Medicine, 2012). Preconceptionally, women with genetic disorders such as Turner syndrome may wish to explore interventions to decrease the likelihood of the fetus carrying abnormal genes. Opting to plan pregnancy using donated oocytes is not uncommon in women with genetic conditions, such as Turner syndrome (Hagman et al., 2013). However, even with oocyte donation, adverse fetal outcomes for women with Turner syndrome still occur. One study found approximately 40 percent of infants born to mothers with Turner syndrome were preterm (Chevalier et al., 2011).

Substance use

Smoking and tobacco use can have negative effects on a woman’s overall health, not just her reproductive health. Tobacco exposure has been linked to various kinds of cancers, cardiovascular disease and lung disease in addition to reproductive health issues, including infertility and abnormal fetal development (ACOG, 2011a; Moos, 2013). The U.S. Preventative Services Task Force (USPSTF) (2009) supports tobacco screening and cessation counseling and encourages the use of the 5 A’s intervention (ask, advise, assess, assist, arrange) as one of the most effective preventative health actions. ACOG (2015d) recommends smoking cessation programs prior to and during pregnancy due to the resulting decrease in preterm birth.

Consuming alcohol and using recreational drugs before and during pregnancy increases a woman’s risk of preventable negative health outcomes for mother and baby. Providers counsel women engaged in these behaviors preconceptionally and refer them for appropriate treatment. Alcohol use during pregnancy has been linked to miscarriage, fetal growth restriction, birth defects and developmental delays in babies (Moos et al., 2008). Recreational drug use has been associated with low birthweight (LBW), IUGR and decreased gestational age (Bailey, McCook, Hodge & McGrady, 2011). Bailey and colleagues (2011) also found that interventions that address recreational drug use are just as important as smoking cessation interventions in terms of improving infant outcomes. Women are more likely to change their unhealthy behaviors when they are trying to get pregnant (Chuang, Hillemeier, Dyer & Weisman, 2011); therefore it becomes imperative to provide appropriate resources preconceptionally, such as individual or group counseling, referral to quit lines, local support groups and educational materials on the risks of substance use during pregnancy (ACOG, 2011a; ACOG, 2015d). In some cases, medications may be recommended to assist in cessation and minimize withdrawal symptoms.

Mental health

Approximately 10 percent of women of childbearing age experience symptoms of depression (Centers for Disease Control and Prevention [CDC], 2016c). One out of 7 women has depression during pregnancy or in the puerperium (ACOG, 2015c). USPSTF guidelines mandate screening for depression in all women (Siu & USPSTF, 2016). This includes women who are trying to conceive or who are already pregnant or trying to get pregnant or who are already pregnant.
postpartum. However, given the relative lack of mental health resources in the United States, it is imperative that providers assess mental health as part of routine well-woman screening before pregnancy so women have time to access appropriate resources and seek appropriate counseling and care (Frieder, 2010). Pregnant women may be hesitant to use pharmacologic treatment because of the possibility of side effects, so identification and treatment of mental health conditions before pregnancy are warranted. Increased anxiety, stress and depression have been linked to poor birth outcomes, such as preterm birth and LBW (Goldenberg, Culhane, Iams & Romero, 2008; Shapiro, Fraser, Frasch & Seguin, 2013).

Immunizations
ACOG (2016b) encourages assessment of the immune status of all women of reproductive age. Given the efficacy of vaccines in preventing disease, providers evaluate women for risk and offer appropriate immunizations at annual physical exams. Providers encourage women of all ages to receive the influenza vaccine annually and stay current with their tetanus, diphtheria and pertussis (Tdap) immunization. The hepatitis B vaccine is recommended to women of reproductive age as it reduces the risk for liver failure and cirrhosis; the human papillomavirus (HPV) vaccine decreases the risk for cervical abnormalities and cancers (CDC, 2014).

CDC (2016b) provides guidelines for the administration of vaccines to women preconceptionally. Live vaccines, like the measles, mumps and rubella (MMR) and the varicella (chickenpox) vaccines, pose a risk to a developing fetus and are contraindicated during pregnancy; providers counsel women to avoid pregnancy within 3 months after receiving these vaccines (CDC, 2016b). Administering the hepatitis B vaccine in the preconception period prevents transmission of infection to infants, while the HPV vaccine can help maintain cervical competency in pregnancy (CDC, 2014).

Weight management
For best pregnancy outcomes, Institute of Medicine (IOM) (2009) guidelines recommend conceiving when maternal weight (classified by body mass index or BMI) is within the normal range. Identification of maternal weight status (underweight, normal weight, overweight or obese) during preconception care can lead to interventions targeted at achieving weight loss or gain, as appropriate. For most women of reproductive age in the United States who classify as overweight or obese, these interventions may include nutrition counseling to improve dietary content as well as recommendations and resources for increasing physical activity in the daily routine (IOM, 2009). Grieger, Grzeskowiak & Clifton (2014) found that preconception diets that consist of protein, whole grains and fruit are associated with a reduced likelihood of preterm birth, compared to diets with high sugar or salt content. ACOG (2016a) offers an obesity toolkit to help health care providers speak about weight with their patients and develop weight-loss interventions that women are willing to use.

Vitamins and supplements
Folic acid. CDC (2016a) recommends that women of childbearing age consume at least 400 mcg of folic acid per day to prevent NTDs in their baby, and that they eat a diet high in folate. Because most women do not achieve the recommended dose from food sources alone, CDC encourages multivitamins for all women of childbearing age.

Iron. Iron deficiency can cause fatigue, pallor and weakness; it affects many women and is one of the most common causes of anemia. Preconception well-woman screening for anemia can help women improve hemoglobin levels through nutrition and consumption of multivitamins, when appropriate.

Anemia has been associated with poor gestational weight gain and an increased risk for preterm birth (ACOG, 2008). Banhidy and colleagues (2011) found that women who received iron supplementation for anemia in the first trimester had a lower incidence of preterm birth than those who did not receive supplementation.

Herbal remedies
As many as half of all adults in the United States report using one or more dietary supplements, including herbs (Gahche et al., 2011). Many may think that herbal remedies are more natural and, therefore, safer than more conventional medicines. Women use herbal supplements more frequently than men to alleviate many problems, including nausea, sleep disturbances, constipation, stretch marks, fluid retention and anxiety (Faccinetti et al., 2012; Trabace et al., 2015). Although some herbal remedies are safe, others are linked to poor obstetric outcomes when used during pregnancy (see Table 1), emphasizing the importance of preconception counseling.
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Table 1. Herbal supplements commonly used in pregnancy and their association with preterm birth

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Used for</th>
<th>Associated with preterm birth?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Almond oil</td>
<td>Stretch marks</td>
<td>Yes</td>
</tr>
<tr>
<td>Chamomile</td>
<td>Anxiety, digestive problems, relaxation, sleep</td>
<td>Yes</td>
</tr>
<tr>
<td>Echinacea</td>
<td>Cold symptoms</td>
<td>No</td>
</tr>
<tr>
<td>Fennel</td>
<td>Fluid retention</td>
<td>Yes</td>
</tr>
<tr>
<td>Ginger</td>
<td>Nausea, vomiting</td>
<td>No</td>
</tr>
<tr>
<td>Ginseng</td>
<td>Fatigue</td>
<td>No</td>
</tr>
<tr>
<td>Fennel</td>
<td>Fluid retention</td>
<td>Yes</td>
</tr>
<tr>
<td>Licorice</td>
<td>Cold and cough symptoms</td>
<td>Yes</td>
</tr>
<tr>
<td>Valerian</td>
<td>Anxiety, insomnia</td>
<td>No</td>
</tr>
</tbody>
</table>

Facchinetti et al., 2011; Heitmann et al., 2013; Heitmann et al., 2016; Trabace et al., 2015

Table 2. OTC medications and their associated risks

<table>
<thead>
<tr>
<th>Class</th>
<th>Ailment</th>
<th>Medications</th>
<th>Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analgesic/Antipyretic</td>
<td>Pain, fever</td>
<td>Acetaminophen (Tylenol®)</td>
<td>No increased risk of congenital defects, stillbirth or spontaneous abortion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Aspirin</td>
<td>Avoid in pregnancy; risk of IUGR, fetal and maternal hemorrhage and gastrochisis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ibuprofen (Motrin®)</td>
<td>Avoid in third trimester; no increased risk of spontaneous abortion; associated with structural cardiac defects and increased risk of gastrochisis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Naproxen (Aleve®)</td>
<td>Avoid in third trimester; no increased risk of spontaneous abortion; associated with orofacial clefts and structural cardiac defects</td>
</tr>
</tbody>
</table>

Continued on next page

Medications

Over-the-counter (OTC) medications. Many women use OTC medications to help alleviate common discomforts, such as nausea, heartburn, headache, backache and constipation. Studies have linked some OTC medications to preterm birth and other fetal complications (Table 2). It is essential that clinicians inquire about every OTC medication that a woman is taking in order to educate her about risks and provide her with safer alternatives to use during pregnancy.

Prescription medications. Prescription medications are classified according to risk, with category D indicative of high risk during pregnancy and category X contraindicated in pregnancy. However, each year providers prescribe category D or X medications to more than 11 million women (Eisenberg, 2010). With almost half of all pregnancies being unplanned (Finer & Zolna, 2011), it is imperative that providers educate women about teratogenic risks associated with any prescription medication they take.

Health care providers screen and treat infections like sexually transmitted diseases (STDs) with antibiotics before pregnancy whenever possible to optimize outcomes for both the mother and baby (Lassi, Imam, Dean & Bhutta, 2014). In some instances, safer medication choices can be used during pregnancy. Providers and patients should discuss the risks of certain medications and weigh the benefits against possible effects on pregnancy before use. Clinicians also can offer women alternative therapies that are safe to use during pregnancy, such as acupuncture, acupressure, chiropractics, massage, mental imagery and evidence-based psychotherapy, such as interpersonal therapy or cognitive behavioral therapy (Huang, Coleman, Bridge, Yonkers & Katon, 2014).
Dental care and oral hygiene
Many studies have linked poor periodontal health to poor pregnancy outcomes, highlighting the importance of good oral hygiene during childbearing years (Ide & Papapanou, 2013). Preconceptionally, providers should encourage women to schedule regular dental visits to maintain optimal oral health. Poor oral health and tooth decay have been linked to preterm birth (Imran, Arif, Jamal & Karim, 2015), while improved maternal oral health decreases the risk of early childhood caries in offspring (Kloetzel, Huebner & Milgrom, 2011).

Interconception care
The period immediately preceding birth until the next conception is the interpregnancy interval (IPI).

Table 2. OTC medications and their associated risks (continued)

<table>
<thead>
<tr>
<th>Class</th>
<th>Ailment</th>
<th>Medications</th>
<th>Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antacid: Histamine H2 blockers, proton pump inhibitors</td>
<td>Heartburn, gastroesophageal reflux</td>
<td>Calcium carbonate (Tums®)</td>
<td>Considered safe during pregnancy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Omeprazole (Prilosec®)</td>
<td>No increased risk of preterm birth or spontaneous abortion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ranitidine (Zantac®)</td>
<td>No teratogenic effects</td>
</tr>
<tr>
<td>Antihistamine: First and second generation</td>
<td>Allergic rhinitis, nausea</td>
<td>Cetirizinc (Zyrtec®)</td>
<td>No significant risk of fetal malformation or teratogenic effects</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diphenhydramine (Benedryl®)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fexofenadine (Allegra®)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Loratadine (Claritin®)</td>
<td></td>
</tr>
<tr>
<td>Antidiarrheal</td>
<td>Diarrhea</td>
<td>Bismuth subsalicylate (Pepto-Bismol®)</td>
<td>Insufficient data; no association with congenital anomalies but should be avoided in the second and third trimesters</td>
</tr>
<tr>
<td>Anitussive</td>
<td>Cough</td>
<td>Dextremethorphan (Robitussin®)</td>
<td>No increased fetal risk</td>
</tr>
<tr>
<td>Decongestant</td>
<td>Allergic rhinitis, pregnancy rhinitis</td>
<td>Phenylephrine (Sudafed®)</td>
<td>Increased risk of congenital malformation</td>
</tr>
<tr>
<td>Expectorant</td>
<td>Cough</td>
<td>Guaifenesin (Mucinex®)</td>
<td>Avoid in first trimester; weakly associated with NTDs and inguinal hernias</td>
</tr>
<tr>
<td>Laxative</td>
<td>Constipation</td>
<td>Polyethylene glycol 2250 (Miralax®)</td>
<td>No increased fetal risk</td>
</tr>
<tr>
<td>Topical cream: Antifungal, antimicrobial, steroidal</td>
<td>Rash, skin irritation</td>
<td>Bacitracin</td>
<td>Considered safe during pregnancy; no association with fetal malformation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hydrocortisone 1 percent Nystatin (myocostatin)</td>
<td>Considered safe during pregnancy</td>
</tr>
</tbody>
</table>

Cabbage & Neal, 2011; Servy & Chang, 2014

An IPI of 18 to 60 months is optimal, as intervals <18 months or >60 months have been associated with poor pregnancy outcomes (Copen, Thoma, Kirmeyer & Division of Vital Statistics, 2015; Moos, 2013). IPIs <6 months are associated with the greatest risk of preterm birth, especially for women with a history of preterm birth (ACOG, 2016b; DeFranco et al., 2007), with a decrease in risk with each month gained (Moos, 2013). This emphasizes the importance of reviewing available contraceptive options with new mothers.

Many factors influence a woman’s contraceptive decision, including ease and convenience of use and how it may affect breast milk supply, weight gain and blood pressure. Health care providers should discuss all of these concerns with women to help them reach a contraceptive decision with which they can...
comply. Given the multitude of options, including oral contraceptive pills, intrauterine devices and physical barriers, women may decide to use one method and later switch to another. Health care providers who support a woman’s contraceptive decisions help foster compliance.

The importance of prenatal care
While well-woman and preconception care encompasses primary prevention, prenatal care focuses on surveillance and intervention. Prenatal care, one of the most widely used forms of preventive health care in the United States, is associated with better birth outcomes (Alexander & Kotelchuck, 2001; Krans & Davis; 2012; Van Dijk, Anderko & Stetzer, 2011).

Weight
In 2009, the IOM issued guidelines regarding recommended weight gain during pregnancy to maximize outcomes. These guidelines use pre-pregnancy BMI to categorize women as underweight, normal weight, overweight and obese and provide appropriate ranges for weight gain during pregnancy for each categorization (Table 3).

<table>
<thead>
<tr>
<th>Category</th>
<th>BMI (kg/m^2)</th>
<th>Total weight-gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>&lt;18.5</td>
<td>28 to 40 lbs</td>
</tr>
<tr>
<td>Normal weight</td>
<td>18.5 to 24.9</td>
<td>25 to 30 lbs</td>
</tr>
<tr>
<td>Overweight</td>
<td>25.0 to 29.0</td>
<td>15 to 25 lbs</td>
</tr>
<tr>
<td>Obese (includes all classes)</td>
<td>&gt;30.0</td>
<td>11 to 20 lbs</td>
</tr>
</tbody>
</table>

Johnson and colleagues (2013) found that about 3 out of every 4 pregnant women gain more weight than is recommended by the IOM. They also found that women who gain less than the IOM recommended weight during pregnancy have higher rates of preterm birth. One of the biggest challenges in optimizing weight in pregnancy is educating patients and providers that these guidelines exist and that resources are available to help women achieve recommended weight gain. For example, health care providers can refer women to registered dietitians or to online resources, such as choosemyplate.gov, which provides pregnancy-specific information and tools for healthy eating and physical activity (Downs, Savage & Rauff, 2014).

Nutrition
Nutrition counseling during pregnancy is important, not only to help women achieve appropriate weight gain, but also so women get the necessary vitamins, minerals and nutrients for optimal pregnancy. IOM (2005) guidelines for nutrition consumption during pregnancy provide suggested quantities of macronutrients like protein, fats and carbohydrates, as well as micronutrients like fiber and folic acid (Table 4).

A diet rich in protein, fruits and vegetables has been linked to appropriate birthweight and a reduced likelihood of preterm birth (Grieger, Grzeskowiak & Clifton, 2014). Pregnant women should aim to consume 71 g of protein per day (IOM, 2005). Carbohydrates and fats are equally important in appropriate proportions, though women may consume them in excess due to their affordability. Overconsumption of carbohydrates and fats can lead to obesity, which has been associated with preterm birth (Grieger, Grzeskowial & Clifton, 2014). Carbohydrates generally are better tolerated by women who are experiencing nausea, so they may make up a significant portion of a pregnant woman’s diet. An adequate fiber intake of at least 28 g per day can help to alleviate constipation that often occurs in pregnancy (Jefferson & Croton, 2013) and can have beneficial metabolic effects, including decreasing late gestational weight gain and postpartum weight retention (Brooteen, Youngblut, Golembeski, Magnus & Hannan, 2011; Drehmer et al., 2012; Maple-Brown et al., 2013).

Micronutrients also help foster good pregnancy outcomes. Folic acid supplementation decreases NTDs when taken preconceptionally and in the first trimester (CDC, 2016a). Adequate consumption of iron during pregnancy is necessary to prevent LBW and anemia, which have been linked to preeclampsia, a risk factor for preterm birth (Endeshaw, Ambaw, Aragaw & Ayaiew, 2014; Peña Rosas, De-Regil,Dowswell & Viteri, 2012). Calcium and vitamin D supplementation have demonstrated protective effects against preeclampsia (Endeshaw et al., 2014; Hofmeyr, Lawrie, Atallah, Duley & Torloni, 2014). Research has shown that calcium supports bone health of both mother and fetus (De Jersey, Ross, Himstedt, McIntyre & Callaway, 2011; Thomas & Weisman, 2006) and that vitamin D is necessary for effective calcium absorption (Dawodu & Akinbi, 2013). ACOG (2015a) recommends vitamin B6 as a safe OTC intervention for relieving symptoms of nausea and vomiting during pregnancy; it has not been found to have any harmful effects on the baby.
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Exercise
Regular exercise during pregnancy is crucial to maintaining and gaining weight appropriately. The U.S. Department of Health and Human Services (2010) recommends 150 minutes a week of moderate exercise for pregnant women, though most do not achieve this goal (Evenson & Wen, 2010). Walking satisfies this recommendation and is a safe physical activity for pregnant women (ACOG, 2015b; Downs, LeMasurier & DiNallo, 2009). Exercise during pregnancy offers many advantages, such as managing weight gain and having fewer obstetrical complications (Price, Amini, & Kappeler, 2012; Barakat, Pelaez, Montejo, Luaces & Zakynthinaki, 2011). The risk of preterm birth does not increase when a woman gets the recommended amount of regular exercise during pregnancy (Mascio, Magro-Malosso, Saccone, Marhefka & Berghella, 2016). Historically, providers have advised women at high risk of preterm birth to restrict activity and exercise. However, there is no evidence to suggest that little to no activity can help prevent preterm birth, as rates of preterm birth are similar in women who perform physical activity during pregnancy and in those who do not (Sosa, Althabe, Belizan & Bergel, 2015).

Sleep
As many as 84 percent of women experience sleep disturbance, poor sleep quality or short duration at some point during pregnancy (National Sleep Foundation, 2007). Early in pregnancy, hormonal changes are the root of most sleep disturbances, while later in pregnancy, physical discomforts are the greatest cause of sleep troubles (Hashmi, Bhatia, Bhatia & Khawaja, 2016). Insomnia, snoring and restless leg syndrome also frequently affect pregnant women (Facco, Kramer, Ho, Zee & Grobman, 2010). Poor sleep quality and quantity, both early and late in pregnancy, are associated with an increased risk for poor pregnancy outcomes (Okun, Dunkel-Schetter, Glynn, 2011). Sleep disturbances have been linked to exaggerated inflammatory responses, which are associated with preterm birth (Blair, Porter, Leblebicioglu & Christian, 2015). Women who report poor sleep quality also have higher levels of depression, anxiety and perceived stress (Okun, Dunkel-Schetter, Glynn, 2011).

Providers should evaluate women’s sleep routines and recommend modifications, when possible, to allow pregnant women the most restful sleep. Modifications include reducing caffeine intake, changing exercise patterns and adjusting work schedules. Providers also should account for environmental contributors to poor sleep, including temperature, sounds and light.

Mental health
Over the course of a lifetime, women are twice as likely as men to experience depression (Kessler, 2003). One out of 7 women have depression during pregnancy or in the puerperium (ACOG, 2015c). Maternal depression is associated with preeclampsia (Kim et al., 2013) and sleep disturbances (Field et al., 2007). Maternal depression, anxiety and stress have all been linked to poor birth outcomes, such as preterm birth and LBW (Goldenberg et al., 2008). Depression, anxiety and stress may lead women to increase negative health behaviors, such as smoking and drug or alcohol use, as a means of coping (Becker, Weinberger, Chaudy & Schmuckler, 2016). Therefore, assessing mental health as part of prenatal

<table>
<thead>
<tr>
<th>Macro-/Micronutrients</th>
<th>Recommended dietary allowance (RDA)</th>
<th>Acceptable macronutrient distribution range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macronutrients</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbohydrates</td>
<td>175 g/d</td>
<td>45 to 65 percent</td>
</tr>
<tr>
<td>Protein</td>
<td>71 g/d</td>
<td>10 to 35 percent</td>
</tr>
<tr>
<td>Fat</td>
<td>N/A</td>
<td>20 to 35 percent</td>
</tr>
<tr>
<td>Micronutrients</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fiber</td>
<td>28 g/d</td>
<td>N/A</td>
</tr>
<tr>
<td>Folic acid</td>
<td>400 mcg/d</td>
<td>N/A</td>
</tr>
<tr>
<td>Iron</td>
<td>27 mg/d</td>
<td>N/A</td>
</tr>
<tr>
<td>Calcium</td>
<td>1,300 mg/d</td>
<td>N/A</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>15 mcg/d</td>
<td>N/A</td>
</tr>
<tr>
<td>Vitamin B6</td>
<td>1.9 mg/d</td>
<td>N/A</td>
</tr>
</tbody>
</table>

IOM, 2005
Preventing prematurity: Preconception, prenatal and postpartum nursing care

Care and identifying interventions acceptable to women (such as cognitive behavioral therapy) are warranted.

Preventing disease

Vaccines have demonstrated efficiency in preventing many infectious diseases that affect women of childbearing age. Though limited data is available on the safety of vaccines during pregnancy due to lack of randomized control trials, a number of observational studies support the administration of certain inactivated immunizations during pregnancy. For example, Walls and colleagues (2016) found no significant difference in gestational age at birth with women who received the Tdap vaccine compared to those who did not. Nordin and colleagues (2014) found that receiving the influenza vaccine during pregnancy does not increase a woman’s risk of a preterm birth. In some cases, such as with pertussis and influenza, administering the vaccine during pregnancy provides maternal protection from disease, and the mother passes antibodies to her baby in the womb that have protective properties for the infant until they receive their first vaccinations, generally at 2 months of age. Specifically, the effectiveness of the maternal Tdap vaccination is as high as 91 percent in protecting infants from developing pertussis (Amirthalingam et al., 2014). The Advisory Committee on Immunization Practices (2012) recommends Tdap vaccines to all pregnant women regardless of previous vaccination history.

Infections

Intrauterine infections are one of the most common causes of early preterm birth (Goldenberg, Culhane, Iams & Romero, 2008). Preterm birth is associated with infections of the uterus, placenta, amniotic fluid, urinary tract and peritoneal cavity (Romero et al., 2007). Local infections like bacterial vaginosis (BV), an imbalance of vaginal flora, increase a woman’s risk of delivering preterm (Donders et al., 2009). However, some strands of BV, such as BVAB3, actually decrease the risk of preterm birth, so treating BV during pregnancy remains a conflicting matter (Foxman et al., 2014). Systemic infections, like malaria and periodontal infections, are associated with an increased risk of premature birth (ACOG, 2012).

Medications

More than 90 percent of pregnant women use OTC medications to alleviate common symptoms of pregnancy, with at least two-thirds of them taking acetaminophen (Cabbage & Neal, 2011; Servey & Chang, 2014). As many as 50 percent of pregnant women report taking at least one prescription medication during pregnancy (Mitchell et al., 2011). Medication use during the first trimester is particularly concerning as this is the time of fetal organ development (Mitchell et al., 2011; Moos, 2013).

Antibiotics. Antibiotics to combat infection are among the most frequent medications prescribed to pregnant women (Tejada, 2014). Maternal infections are common causes of preterm labor, but the impact of antibiotic therapy alone on preterm birth has not been established. Antibiotic treatment with the sole goal of preventing preterm birth has been ineffective (Tejada, 2014). However, through the use of antibiotics, maternal infections are more effectively managed and treated, which is beneficial in preventing preterm birth. When possible, health care providers should screen and treat infections like STDs with antibiotics before pregnancy to optimize outcomes for both mother and baby (Lassi, Imam, Dean & Bhutta, 2014).

Antidepressants. In the United States, antidepressant use during pregnancy has steadily increased from a rate of 1 percent in the early 1990s to as high as 8 percent in 2008 (Huybrechts, Sanghani, Avorn & Urato, 2014). There is an increased risk of preterm birth in women who take antidepressants, such as selective serotonin reuptake inhibitors (Huybrechts et al., 2014). Providers use a risk-benefit ratio to help women make decisions about whether or not to continue antidepressant use during pregnancy.

Antiemetics. Up to 80 percent of pregnant women experience nausea and vomiting (Anderka et al., 2012). Providers may prescribe antinausea and antimetic medications to pregnant women if diet and lifestyle changes, such as increasing fluids and eating small, frequent, bland meals, do not help (Anderka et al., 2012). Ondansetron is the most frequently prescribed antiemetic among pregnant women (Pasternak, Svanstrom & Hviid, 2013). In one cohort study, exposure to ondansetron during pregnancy was not found to significantly increase chances of preterm birth (Pasternak, Svanstrom & Hviid, 2013).

Herbal remedies. According to Facchinetti and colleagues (2012), as many as 45 percent of pregnant women use herbal remedies at some point during pregnancy. Herbal supplements, such as chamomile and licorice, have been linked to preterm labor and threatened miscarriage, and women who regularly
use topical almond oil throughout pregnancy are at higher risk for preterm birth than those who do not (Facchinetti et al., 2012). Echinacea, commonly ingested to alleviate upper respiratory and common cold symptoms, has not been found to increase the risk of preterm birth, LBW or small for gestational age (Heitmann, Havnen, Holst & Nordeng, 2016). Similarly, the use of ginger during pregnancy does not seem to increase the risk of negative pregnancy outcomes, including preterm birth, LBW, stillbirth or congenital malformations (Heitmann, Nordeng & Holst, 2013). When compared to non-users, regular consumption of fennel during pregnancy has been linked to preterm birth (Trabace et al., 2015). Use of valerian however, has not been shown to significantly affect rates of preterm birth or any other complication (Trabace et al., 2015). The use of ginseng during pregnancy has not been thoroughly studied in humans, but research has shown teratogenic effects in rodents (Liu et al., 2015). Though it has not been associated with adverse pregnancy outcomes like preterm labor, Paik and Lee (2015) support avoiding ginseng in the first trimester of pregnancy.

Community resources and support
Many women depend on resources in their community and various financial, environmental, medical, social and emotional support systems during and after pregnancy. Community resources can be as simple as open green spaces or safe neighborhoods that allow women the opportunity for physical activity, like walking. Or resources can be programs, like Women, Infants and Children (WIC), which provides education and assistance to purchase healthy foods to low-income pregnant, breastfeeding and postpartum women (U.S. Department of Agriculture and Nutrition Services, 2016).

Young, Laurent, Chung & Wu (2016) describe the association between neighborhood resources, such as availability of supermarkets and grocery stores, with a decreased risk for adverse pregnancy outcomes, such as gestational diabetes and preeclampsia. Farmer’s markets provide opportunities for women to purchase locally grown seasonal fruits and vegetables, often at more affordable cost than larger grocery stores.

Living in a neighborhood that is concentrated with fast food restaurants has been linked to risk factors for preterm birth, such as excessive maternal weight gain, gestational diabetes, increased stress and increased depression (Young, Laurent, Chung & Wu, 2016). In contrast, having the ability to eat healthy foods and participate in regular exercise helps women manage their weight, lower their risk for preterm birth and improve birth outcomes.

Prenatal access to doulas contributes positively to pregnancy outcomes. Kozhimmanil and colleagues (2016) found that preterm birth decreased among women who received care from doulas. Receiving group prenatal care, like CenteringPregnancy®, has demonstrated reduced rates of preterm birth (Ickovics et al., 2007; Picklesimer, Billings, Hale, Blackhurst & Covington-Kolb, 2012).

Environmental hazards and workplace exposure
With more women working during their childbearing years, there is increased likelihood of exposure to environmental toxins and occupational hazards at the workplace that may impact birth outcomes (Burdorf et al., 2011). The Occupational Safety and Health Administration (2017), part of the U.S. Department of Labor, has standards specific to chemicals such as lead, ethylene oxide and radiation therapies, which are known to be hazardous to women’s reproductive health. Figà-Talamanca (2006) found that exposure to certain chemicals and physical demands in the workplace are linked to LBW, preterm birth and spontaneous abortion.

Physical load. Heavy workloads and long hours standing are risk factors for preterm birth and LBW (Figà-Talamanca, 2006). Providers should counsel women with strenuous jobs to modify their workload during pregnancy to minimize their risk for preterm birth.

Phthalates. Phthalates are a group of chemicals used in products that pregnant women may come in contact with on a regular basis, including lotions, deodorants, perfumes and contaminated food and water (Ferguson, McElrath & Meeker, 2014). Women who are exposed to these chemicals during pregnancy have significantly higher risk for preterm birth (Ferguson, McElrath & Meeker, 2014). Prenatal care includes educating women so they can modify their behaviors to lower their risk.

Atrazine. Atrazine is a pesticide commonly used to control weeds at private residences, on golf courses and in crop fields. It has been found in contaminated drinking water as a result of soil run-off. Rinksy and colleagues (2012) linked high exposure to atrazine with increased risk of preterm birth. Providers should educate women about exposure to pesticides like atrazine and counsel them about limiting their exposure to prevent adverse birth outcomes.
The importance of postpartum care

Postpartum care encompasses physical, social and psychological well-being of mothers in the period following childbirth. Women typically return to their obstetric provider for a comprehensive physical exam approximately 6 weeks after giving birth. This visit includes anticipatory guidance for postpartum recovery (Table 5) and a discussion of family planning.

### Table 5. Topics to address in a postpartum visit

- Resolution of pregnancy complications, such as hypertension and gestational diabetes
- Fatigue and sleep deprivation
- Nutrition and physical activity as part of weight management
- Signs and symptoms of postpartum depression and other mental health concerns
- Return to sexual activity

ACOG, 2016b

Postpartum depression

Siu and the USPSTF (2016) recommend screening for depression in all adults 18 and older, including postpartum women. Implementing this screening ensures diagnosis and appropriate intervention and treatment of depressed women. Interventions, including referral to appropriate mental health providers for therapy, medications or cognitive behavioral therapy, help improve clinical outcomes.

Support systems

Many hospitals and birthing centers staff lactation consultants (LCs) or offer breastfeeding classes to new mothers. While troubleshooting breastfeeding issues, such as latching, engorgement and pumping, certified LCs provide nutritional guidance to help women boost and maintain breast milk supply. They offer appointments in office settings and through home visits to allow for maximum comfort of new mothers.

Many women turn to support groups for camaraderie and advice; they may benefit from conversing and sharing ideas with other women who facing new motherhood and challenges in the postpartum period. Kratz, Wong and Vaughn (2013) found an increase in health-promoting behaviors associated with social support.

Support groups can be formally hosted mom groups lead by nursing staff in a hospital or clinic setting. Or they may be informal community or neighborhood groups or even virtual groups where moms participate online through outlets like Facebook. Participation in any kind of support group can help decrease depression and stress in the prenatal and postpartum periods, thus improving the health outcomes of mother and baby (Anderson, 2013; Holtz, Smock & Reyes-Gastelum, 2015; Kratz, Wong & Vaughn, 2013).

Areas for future research

With advancing technologies and new research, nursing practice is constantly evolving to best meet the needs of patients. Preventing preterm birth is a huge goal that cannot be accomplished until the phenomenon is better understood. While we have identified risk factors and discovered ways to modify them to reduce risk preconceptionally, prenatally and postpartum, more research is necessary.

Disparities

Racial disparities of preterm birth are well documented, with black women being at greatest risk (Goldenberg et al., 2008). However, additional research should focus on other factors that contribute to preterm birth, such as age, marital status and annual income. Chronic stress and depression, often experienced by minority women as a result of racism or poverty, also are potential contributing factors.

Physiologic markers

The physiologic response to infection and inflammation has been associated with preterm labor and birth. Infections trigger immune responses that increase pro-inflammatory cytokines, while inflammation causes an increase in the production of stress hormones like corticotrophin-releasing-hormone (CRH). CRH is involved in the stress response and shows promising potential as a biomarker that could be used to predict preterm birth, especially in the presence of other identifiable risk factors (Ruiz et al., 2016).

Considerable research has been conducted linking various pro-inflammatory cytokines to preterm birth; however, the exact mechanisms are still unknown (Goldenberg, Culhane, Iams & Romero, 2008). Additional research is needed to determine particular levels of cytokines (such as IL-1B, IL-6, TNF-a) to be used as markers to identify and intervene with women at risk for preterm labor.
Conclusion

The etiology of preterm birth is multifactorial, and no single intervention is going to be successful in preventing it. A variety of strategies are necessary to address the multifaceted risks. Providers must implement interventions aimed at promoting the general health of women of childbearing age.

Health care providers can seize the opportunity to engage patients and encourage healthy lifestyle modifications in the preconception, prenatal and postpartum periods to optimize birth outcomes. By addressing modifiable risk factors, such as weight, disease management, substance abuse and medication use, providers help reduce poor birth outcomes and prevent preterm birth.

References


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