Pharmacists' Role in Preconception Care

Kelsey Weisenburger  
*Ohio Northern University*

Jamie Kellner  
*Ohio Northern University*

Hannah Granger  
*Ohio Northern University*

Natalie A. DiPietro Mager  
*Ohio Northern University, n-dipietro@onu.edu*

Follow this and additional works at: [https://digitalcommons.onu.edu/paw_review](https://digitalcommons.onu.edu/paw_review)

Part of the Other Pharmacy and Pharmaceutical Sciences Commons, and the Other Public Health Commons

This Article is brought to you for free and open access by the ONU Journals and Publications at DigitalCommons@ONU. It has been accepted for inclusion in Pharmacy and Wellness Review by an authorized editor of DigitalCommons@ONU. For more information, please contact digitalcommons@onu.edu.
Pharmacists’ Role in Preconception Care

Kelsey Weisenburger, fifth-year pharmacy student from Perrysburg, Ohio; Jamie Kellner, fifth-year pharmacy student from New Waterford, Ohio; Hannah Granger, fourth-year pharmacy student from Sardinia, Ohio; Natalie A. DiPietro Mager, PharmD, MPH, associate professor of pharmacy practice

Objectives
After completion of this program, the reader should be able to:
1. Explain the need for preconception care for women of childbearing age, regardless of pregnancy intentions, and the importance to public health.
2. Discuss roles for pharmacists in preconception care.
3. Describe the 14 evidence-based interventions recognized by the Centers for Disease Control and Prevention, and be able to identify how these interventions can be incorporated in practice.
4. Evaluate a woman’s need for preconception care in the context of comorbid disease states, lifestyle and behavioral factors.

Abstract
Within the current health care system, preconception care is often a misunderstood topic and, in many cases, a missed opportunity to improve women’s health and decrease adverse pregnancy outcomes. It is important that preconception care is delivered to all women of childbearing age, regardless of pregnancy intentions, as the interventions associated with preconception care can help improve a woman’s overall health. In 2006, the Centers for Disease Control and Prevention (CDC) released four goals, 10 recommendations, and 14 evidence-based interventions regarding preconception care. Pharmacists can have a significant role in ensuring preconception care for all women through the application of the 14 evidence-based interventions which can be viewed in terms of three broad categories: direct provision of care, education and referrals. Diabetes management, hepatitis B and rubella vaccination administration, and oral anticoagulant, antiepileptic, and isotretinoin drug therapy modifications are interventions that can be applied by pharmacists through direct provision of care. Pharmacists can also educate women on folate acid supplementation, obesity control, alcohol intake and smoking cessation. Referrals are recommended for human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS) and sexually transmitted infection (STI) screening and for the management of maternal phenylketonuria and hypothyroidism. The pharmacist’s role in preconception care also expands beyond the 14 evidence-based interventions, as pharmacists can play an important role in helping women and men develop reproductive life plans. Providing preconception care to all women of childbearing age represents an opportunity to encourage healthy behaviors and lifestyle changes that could improve population-based outcomes, while preparing individual patients for a potential pregnancy.

Key Terms
Health Behavior; Life Style; Obesity; Preconception Care; Pregnancy; Reproductive Life Plan; Vaccination; Women’s Health

Case Scenario: KR is a 33 year old female with type 2 diabetes (BMI=31). She currently smokes one pack of cigarettes per day and reports moderate alcohol use. She has not received any vaccines or immunizations since starting college at age 18. She has been using combined oral contraceptives for the past 10 years but states that she would like to become pregnant within the next few years. What recommendations for preconception care would be appropriate for KR?

Introduction
In the United States, approximately half of pregnancies are unintended. Unintended pregnancies include pregnancies that are unwanted and those that are mistimed. With unintended pregnancies occurring in a high percentage of patients, prenatal care often occurs too late to address the risks and modifiable behaviors associated with preventable birth defects and poor pregnancy outcomes. Organogenesis and embryogenesis have already begun by the time many women learn that they are pregnant, with the fetus being the most vulnerable during the first four to 10 weeks of pregnancy. This means that the potential consequences of behaviors deemed risky for pregnancies, such as smoking tobacco, consuming alcohol and consuming inadequate folic acid intake, may have already impacted the development of the fetus before a woman recognizes her pregnancy and can change her habits. In the United States in 2010, the infant mortality rate was 6.15 deaths per 1,000 live births. Although the infant mortality rate is impacted by various causes, the rates of infant and birth defects can be reduced through the provision of preconception care to all women of childbearing age.

What is Preconception Care?
Preconception care provides health care professionals with an opportunity to address a public health issue that is often missed. Preconception care consists of a set of interventions meant to minimize behavioral, social and health-related risks to a woman’s overall health and to improve outcomes for potential pregnancies. Reduction of modifiable risks and proper management of those risks that
cannot be changed, such as chronic disease states, is how optimal preconception health can be achieved in women of childbearing age with the help of health care professionals. In the United States, approximately 25 percent of women of childbearing age report smoking before pregnancy recognition, 24 percent admit to binge drinking and 25 percent were overweight before learning they were pregnant.1 So, it is clear that many women are engaging in modifiable behaviors that are known risks to pregnancy. Even if healthier habits were adopted upon pregnancy recognition, the interventions may be too late as the fetus has already been in its most vulnerable state while pregnancy was still unrecognized; therefore, risk reduction must occur prior to conception.

Providing preconception care encourages women to create healthy lifestyles that they can maintain throughout their life, regardless of whether or not they ever have a child. In February 2013, the Centers for Disease Control and Prevention (CDC) launched the Show Your Love campaign to help educate women about preconception care and to improve the health of women and infants.5 Recognizing that women have differing reproductive life goals, marketing materials were created to target two groups of women: those who plan to have a child and those who do not. For women planning a pregnancy, the campaign states, “Show your love. Your baby will thank you for it;” while the materials targeting women who do not want to become pregnant read, “Show your love. Your body will thank you for it.” The CDC’s Show Your Love campaign emphasizes that preconception care can improve the health of all women, not just those currently planning a pregnancy. Unfortunately, many women of childbearing age, as well as some health care professionals, lack full understanding of the goals and application of preconception care.6 The Show Your Love campaign materials, available from the CDC’s website, can be used to help demonstrate to patients the importance of preconception care.

Before the specific goals and application of preconception care can be discussed, the distinction must be made between preconception care and prenatal or perinatal care, which is provided throughout pregnancy.7 Though perinatal and preconception care refer to differing stages of a woman’s reproductive life cycle, many of the recommended interventions overlap. Interconception care, or care delivered in between pregnancies, is also considered a part of preconception care. Many incorrectly believe that preconception care is meant to be given immediately preceding pregnancy and that it only needs to target couples who are currently trying to have a child.6 It is true that preconception care is important for those trying to become pregnant in the near future, but it is also applicable to all women and men of childbearing potential, regardless of pregnancy intention. In fact, in a study of women who were seeking pregnancy, receipt of preconception care was positively associated with beneficial lifestyle changes of cessation of drinking alcohol and improvement in the use of daily multivitamins in the month before conception.8

It cannot be overlooked that preconception care has also been associated with improvements in behaviors that can benefit a woman’s overall health even if she is not currently planning a pregnancy.8 Therefore, preconception care should be given to women, and their partners if possible, regardless of pregnancy intentions. Appropriate contraceptive methods are considered part of preconception care for a woman who does not intend to become pregnant. Statistics have shown that 53 percent of women who had an unintended pregnancy were not using contraceptive methods at the time of conception, highlighting another area of preconception care that needs improvement.1 Counseling patients who do not intend to become pregnant in regard to their contraceptive options and helping patients to develop reproductive life plans are two ways health care professionals can help reduce unintended pregnancies.9 Reproductive life plans encourage women and men to consider their overall life goals, including education and career plans, and then consider how having children would potentially fit into those goals. The pharmacist can encourage patients to consider how many children they would like to have and what types of family planning methods they intend to use. Tools for working with patients to develop reproductive life plans are available online through the CDC.9 Providing appropriate preconception care to women, regardless of the pregnancy intentions identified in their reproductive life plans, allows for optimization of a woman’s physical, social and emotional well-being and also promotes a healthy pregnancy and child, should she become pregnant in the future. In order to achieve the goal of offering preconception care to all women, this type of care must be fully recognized by health care providers and be integrated into the current health care system.10

A Public Health Priority

Healthy People 2020 consists of objectives set by the U.S. Department of Health and Human Services that are used to guide health promotion and disease prevention.11 These science-based goals are developed every 10 years to increase awareness of specific health concerns affecting the nation and to promote an improvement in quality of life for all people. Healthy People 2020 not only addresses health disparities and current health concerns, but also outlines measurable, objective goals that allow the improvements in public health to be monitored. The goals are presented in such a way that they can be applied at the community, state and national levels to improve overall health care and address needs through evidence-based interventions. Healthy People focuses on targeting diseases with preventable causes and unhealthy behaviors that can be modified. Preconception care has a preventive care focus in regard to improving both maternal and infant health. Healthy People 2020 addresses several preconception care goals such as increasing the proportion of women of reproductive potential who take adequate folic acid, receive preconception care and adopt preconception health behaviors, use contraception to plan pregnancy, maintain a healthy weight before pregnancy and do not smoke before becoming pregnant.12

Also recognizing preconception care as a public health priority, the CDC published the Preconception Health and Health Care Initiative in 2006.13 This plan was guided by four broad goals (Figure 1), 10 recommendations for integrating pre-
conception care into health care (Figure 2) and 14 evidence-based interventions (Figure 3). The goals and recommendations have been added for completeness, but this article will expand on the evidence-based interventions and the pharmacists’ role. The objective of the CDC’s action plan was to enhance the knowledge of both women and their partners about preconception care. The 14 interventions can be split into four main categories: physical assessment, screenings, vaccinations and counseling for healthier behaviors. Although additional interventions may be proposed for preconception care, the remainder of this article focuses on those evidence-based interventions identified by the CDC and how they can be incorporated into pharmacy practice through direct provision of care, education and referrals.

Fourteen Proven Interventions

The Select Panel on Preconception Care, a CDC-chosen group of specialists in relevant areas of health care including obstetrics and gynecology, public health and family practice, defines 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 outcomes through prevention and management.” The CDC’s Preconception Health and Health Care Initiative illustrates how health care providers can proactively play a role in preconception care and thereby reduce adverse birth outcomes such as preterm and low birth weight deliveries, infant deaths, birth defects, maternal pregnancy complications and unintended pregnancies. Although the national recommendations and proven interventions have been in circulation since 2006, they have yet to be fully incorporated into routine clinical practice by health care professionals. Pharmacists have an opportunity to improve pregnancy outcomes by actively becoming involved in the proven interventions and educating the public and other health care providers about the importance of implementing the recommendations into everyday clinical practice. Pharmacists can become involved in three main ways: direct provision of care, education and referrals.

Direct Provision of Care

Vaccinations

Pharmacists can have direct involvement with proven interventions by administering services such as vaccinations to women of reproductive age per state law. Women at risk for hepatitis B virus (HBV) should be vaccinated to eliminate the potential risk of liver failure, carcinoma, cirrhosis and death that can be associated with HBV. Women who test seronegative for rubella should receive the rubella vaccine to protect the fetus against congenital rubella syndrome birth defects. The majority of women born in the United States likely have been vaccinated as a child with the measles, mumps and rubella (MMR) vaccine, but a prepregnancy blood test should be done to confirm immunity to the disease. If an MMR vaccine is needed, the woman should avoid becoming pregnant for at least four weeks after receiving the vaccine, as live vaccinations are contraindicated in pregnancy. There may be other vaccinations recommended during pregnancy; for example, Tdap administration conferring immunity to tetanus, diphtheria and pertussis is recommended during each pregnancy between weeks 27 and 36 of the gestational period.

Diabetes Management

Women with diabetes prior to conception have a threefold increased risk for birth defects compared to women without diabetes. Potential negative pregnancy outcomes in infants born to mothers with poorly controlled diabetes include abnormal development of the heart, brain, or spinal cord, large birth weight (greater than 9 pounds) and low blood sugar after birth. Preterm delivery, miscarriage and stillbirth have also been associated with uncontrolled diabetes. The mother is also at risk for high blood pressure, proteinuria and delivery by cesarean section to avoid potential injury associated with vaginal birth of a large child. These risks are significantly reduced by proper management of glucose levels and correct use of diabetic medications. It is recommended that in the months before conception women should strive to maintain a consistent blood glucose with HbA1C levels of approximately 6 percent, using treatments that would be safe in pregnancy. Women should be counseled to regularly monitor blood glucose levels and consider improvements in exercise and diet in the months prior to conception to aid in lowering A1C levels, further improving overall diabetes control. Women should also be counseled on folic acid intake (see following).

Category X Medications

Preconception care, especially from a pharmacist’s perspective, must include a focus on Category X medications, or those medications with proven teratogenic effects. Teratogenic anticoagulants such as warfarin should be avoided or, if possible, changed to a nonteratogenic alternative such as low molecular weight heparin in women of childbearing age, keeping in mind the risk/benefit ratio for patients with certain conditions like mechanical heart valves. Similarly, if possible, antiepileptic drugs should have normal dosages decreased to the lowest effective dose prior to conception. Prescribers should be especially cautious when considering valproic acid as an antiseizure agent as it is the most teratogenic medication of its class. Women utilizing antiepileptic medications should be counseled about folic acid (see following).
Pharmacists’ Role in Preconception Care

Figure 2. CDC: 10 Recommendations to Improve Preconception Care.11

<table>
<thead>
<tr>
<th>Patient Responsibility</th>
<th>• Advise both men and women to make a reproductive life plan.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Awareness</td>
<td>• Use a variety of methods to reach patients of all ages, cultures, etc. in order to increase awareness for preconception care and its importance.</td>
</tr>
<tr>
<td>Primary Care Visits</td>
<td>• Include risk assessment and educational counseling as part of preventive care to improve pregnancy outcomes.</td>
</tr>
<tr>
<td>Interventions for Risks</td>
<td>• Provide follow-up for recommended interventions with a focus on those considered high priority.</td>
</tr>
<tr>
<td>Interconception Care</td>
<td>• Focus on care in between pregnancies for those women who had poor pregnancy outcomes in a prior pregnancy.</td>
</tr>
<tr>
<td>Prepregnancy Counseling</td>
<td>• Offer prepregnancy health care visits for those who are trying to have a child.</td>
</tr>
<tr>
<td>Health Insurance Coverage</td>
<td>• Improve access to health care for lower income women by increasing both private and public health insurance coverage.</td>
</tr>
<tr>
<td>Public Health Programs</td>
<td>• Incorporate aspects of preconception care into existing public health programs in local communities.</td>
</tr>
<tr>
<td>Research</td>
<td>• Encourage the use of and continue to advance evidence-based interventions in preconception care.</td>
</tr>
<tr>
<td>Monitoring Improvements</td>
<td>• Utilize public health surveillance and other data systems to monitor the impact of preconception care.</td>
</tr>
</tbody>
</table>

Figure 3. CDC: 14 Evidence-Based Interventions in Preconception Care.11

<table>
<thead>
<tr>
<th>Direct Provision of Care</th>
<th>Education</th>
<th>Referrals</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Hepatitis B Vaccination</td>
<td>• Folic Acid Supplementation</td>
<td>• HIV/AIDS Screening &amp; Treatment</td>
</tr>
<tr>
<td>• Rubella Vaccination</td>
<td>• Obesity Control</td>
<td>• STI Screening &amp; Treatment</td>
</tr>
<tr>
<td>• Diabetes Management</td>
<td>• Alcohol Use</td>
<td>• Maternal PKU Management</td>
</tr>
<tr>
<td>• Oral Anticoagulant Therapy Management</td>
<td>• Smoking Cessation</td>
<td>• Hypothyroidism Management</td>
</tr>
<tr>
<td>• Antiepileptic Therapy Management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Isotretinoin Use Management</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Additionaly, any women receiving a Category X medication should be counseled on consistent and correct use of contraceptives. Other teratogenic agents not specifically addressed in the CDC’s 14 interventions, but that are important for the pharmacist to recognize, include ACE inhibitors, angiotensin II blockers and HMG-CoA reductase inhibitors (statins).19

In addition, women of childbearing age must take extra precautions to avoid conception while using isotretinoin for acne treatment and enroll in the iPLEDGE program before the medication can be prescribed or dispensed.21 Isotretinoin can result in serious birth defects and miscarriages if conception occurs during use or up to one month after discontinuation of the drug. The iPLEDGE program requires patients to use two forms of contraception simultaneously for one month prior, during and one month after isotretinoin use. Two negative pregnancy tests must be obtained before initial therapy can begin and a negative test must be obtained each month thereafter during therapy before receiving each prescription. The pharmacist must also verify that the patient has met the required criteria before dispensing the prescription each month.

**Education**

**Folic Acid Supplementation**

Folic acid is a B vitamin that the body uses to create healthy new cells.22 Daily use of folic acid has been proven to reduce the incidence of neural tube defects in unborn children by two-thirds compared to mothers with folic acid deficiency.1 For most women, the CDC recommends a daily dose of 400 mcg starting at least one month before conception and continuing throughout pregnancy.22 However, women with certain characteristics should be recommended higher doses: women with diabetes are usually recommended to take 4 to 5 mg/day; women using antiepileptic drugs, usually 4 mg/day; or women having experienced a previous neural tube defect-affected pregnancy, usually 4 mg/day.33 Many multivitamins contain 400 mcg of folic acid, but folic acid supplements are also available. As it is difficult to obtain a minimum of 400 mcg of folic acid through diet alone, all women of childbearing potential should be encouraged to use a vitamin or supplement daily.

**Obesity Management**

Obesity is defined as having a body mass index (BMI) of greater than or equal to 30.24 Obesity increases the risk of the mother developing complications such as gestational diabetes, hypertension, infection, thrombosis, obstructive sleep apnea, overdue pregnancy, labor problems, cesarean section and pregnancy loss. Maternal obesity is also associated with fetal effects, including above average birth weight, heart abnormalities, neural tube defects and the development of heart disease and/or diabetes in adulthood.24 Proper education and encouragement of obese women to begin eating a healthier diet and participating in a regular exercise routine can help them to reach a healthy weight before pregnancy. Scheduling a preconception appointment with their healthcare provider is also recommended to prevent adverse obesity-related outcomes for both the mother and the fetus.

**Elimination of Alcohol Use**

Alcohol is not considered safe to consume at any stage of pregnancy. Women who are pregnant or may become pregnant should avoid alcoholic beverages in order to prevent damage to the fetus.1 Alcohol in the mother’s blood is transferred to the child through the umbilical cord during pregnancy and can result in miscarriage, stillbirth and a variety of disabilities known as fetal alcohol spectrum disorders (FASD).25 Fetal alcohol spectrum disorders may include facial abnormalities, below average height, low body weight, learning disabilities, vision or hearing problems and issues with the heart, kidneys and bones. It is imperative that women of childbearing age are educated on the adverse outcomes of alcohol use during pregnancy as many women will not recognize their pregnancy until after the first four to six weeks of gestation.

**Smoking Cessation**

Smoking negatively impacts a woman’s ability to become pregnant as well as the health of the unborn child.26 Smoking may lead to miscarriage, preterm birth, low birth weight, cleft lip or cleft palate and sudden infant death syndrome (SIDS).15,26 Tobacco use can also cause the placenta to prematurely separate from the womb, causing unexpected bleeding. The most effective method of preventing such adverse events is to encourage smokers to participate in smoking cessation programs prior to conception and continue to avoid the use of tobacco products throughout the duration of pregnancy.

**Referrals**

**HIV/AIDS Screening and Treatment**

Human immunodeficiency virus status must be determined for best preconception care. Perinatal transmission, or transmission of HIV from mother to child during pregnancy, delivery or through breastfeeding, is the most common route of HIV infection among HIV positive children.27 All pregnant women should be screened as early as possible during each pregnancy for HIV infection. Early detection of HIV allows for timely development of antiretroviral regimens that can potentially prevent the virus from being transferred from mother to child.1 Properly taking antiretroviral medications early in pregnancy can reduce the risk of transmitting the virus from mother to child to less than 1 percent.27

**STI Screening**

Sexually transmitted infections (STIs) during pregnancy have been associated with physical and developmental deformities as well as fetal death.15 Sexually transmitted infections screening prior to pregnancy can help to identify and eradicate infections, such as gonorrhea and chlamydia, that often lead to ectopic pregnancy, infertility and chronic pelvic pain in the mother and possible blindness and mental retardation in newborns. The risk of contracting an STI prior to conception can be reduced by consistently using barrier methods and/or being in a long-term mutually monogamous relationship. If a woman fails to consistently follow preventive measures and becomes pregnant, the CDC recommends testing for the following STIs during every pregnant woman’s first prenatal visit: chlamydia, gonorrhea (if at risk), syphilis,
HIV, hepatitis B. Most STIs can be safely and effectively treated during pregnancy through the use of antibiotics.

Maternal PKU
A woman with phenylketonuria (PKU) who is considering pregnancy should make an appointment with her health care provider and return to a low phenylalanine diet if not currently following recommended dietary restrictions. Any degree of PKU poses risks to the fetus, but the condition can be effectively managed through adherence to a strict diet with limited intake of phenylalanine by avoiding foods high in protein. Appropriate treatment of maternal PKU prior to conception and during pregnancy has been shown to reduce the risk of PKU-related intellectual disabilities and cardiac defects in the fetus.

Thyroid Medication Adjustment
The doses of levothyroxine needed for treatment of hypothyroidism increase during early pregnancy and must be adjusted to ensure proper neurologic development of the fetus. Any woman considering pregnancy should regularly have her thyroid stimulating hormone (TSH) levels checked by a health care provider to ensure that she is being optimally treated prior to becoming pregnant. After becoming pregnant, levothyroxine doses often need to be increased by 25 to 50 percent; therefore, patients must be forewarned that frequent monitoring is important. Although not specifically addressed in the CDC’s interventions, hyperthyroidism must also be appropriately managed prior to and during pregnancy.

Preconception Care Recommendations for Men
Although preconception care is primarily targeted toward women of childbearing age, there are preconception recommendations that can improve men’s health. Providing preconception care to men benefits pregnancy outcomes as damaged DNA in sperm can lead to birth defects. Damaged DNA can be due to negative health behaviors such as smoking, alcohol use, anabolic steroid use, poor diets and excessive caffeine intake, all of which are modifiable factors. Encouraging men, in addition to women, to improve their health behaviors further reduces pregnancy outcome risks. Men receiving this care can also improve women’s health through proper screening and treatment of sexually transmitted infections. In addition, both male and female partners making changes to adopt healthier behaviors together provides support and encouragement which helps to improve adherence to the changes.

In addition to alcohol and tobacco use, other exposures that should be addressed as a part of preconception care for men include recreational drug use, anabolic steroid use, workplace exposures and hobbies that expose a man to heavy metals or organic solvents such as repairing or painting cars, refinishing furniture or cleaning guns. A thorough family health history should also be taken as a part of preconception care and with the creation of a reproductive life plan. It is recommended to take the history for three generations as some genetic diseases skip generations. Along with family history, information should also be gathered regarding a man’s medications and disease states as some medications or conditions can contribute to low fertility. Additionally, some medications are known risks to a fetus even when used in men. For example, due to the high risk of birth defects associated with isotretinoin use, males must also be enrolled in the iPLEDGE program and meet with their prescriber monthly before a pharmacist can dispense the medication.

Another topic to address with men is the importance of a well-balanced diet. This not only improves overall health and weight management, but certain antioxidants, like folate and zinc, help counteract the damaging effects of reactive oxygen species to sperm DNA. For a man with poor weight management, this can also be an opportunity to encourage healthier behaviors. Keeping a healthy weight is important for male fertility and can also be a way to support a woman’s health improvement efforts. It is important for men to be included in preconception care because this motivates their involvement in family planning. Couples should be encouraged to develop reproductive life plans together, and recommendations regarding preconception care can then be tailored to fit their specific goals.

Pharmacists’ Role in Preconception Care
Although all women of reproductive age would benefit from receiving preconception care, in a recent survey only 18.4 percent of women with a live birth reported receiving preconception care counseling, whereas 88.2 percent had postpartum check-ups. There is an opportunity for pharmacists to work with other health care professionals to close this gap in care and increase general knowledge of preconception care. Ideal preconception care includes screenings, risk evaluation and general education regarding modifiable risk factors as well as interventions when needed. Many of these components can be easily provided by pharmacists.

One of the barriers to implementing these recommendations into primary care is the lack of knowledge among health care professionals about the evidence associated with the proven interventions. Other barriers include lack of time in a standard appointment for counseling and lack of reimbursement by insurance companies. Poor public knowledge on the importance and availability of preconception care and, consequently, patients being unwilling to spend more time to receive this care are also barriers. Patients need health care professionals to help make them aware of the resources that are available to them. Pharmacists have an opportunity to become patient advocates in the field of preconception care and promote health care for women of reproductive age. Simple things that pharmacists can begin doing in every setting is asking women of reproductive age if they intend to become pregnant within the year and educating women about certain health conditions and medications that can adversely affect pregnancy. Even if women do not intend to become pregnant in the near future, preconception care interventions are still applicable to these patients in improving their overall health. Educating women about these topics not only promotes the well-being of the mother and child throughout pregnancy but also encourages women to have planned pregnancies that are discussed with health care professionals and proactively achieve a healthy lifestyle before
conception. This education also improves a woman's overall health, even if she does not ever become pregnant. As pointed out by the CDC's Show Your Love campaign, informing the general public of the benefits and accessibility of preconception care will allow women to make informed decisions regarding their own health and the health of their future child should they become pregnant.5

Pharmacists can have a significant role in incorporating preconception care into health care. With an easily accessible position in the community as well as health system settings, pharmacists have the potential to provide preconception care to patients who have a high burden of modifiable risk factors. Additionally, pharmacists interact with patients outside of physician visits and are able to help with monitoring and management of disease states. With access to medication records, pharmacists can identify patients with teratogenic medications, identify disease states based on medications and potentially review vaccination records. As the drug experts, pharmacists can appropriately counsel a woman who is on a medication that may be high risk should she become pregnant. In one study, 50 percent of women had at least one medication that they took regularly in early pregnancy, so this type of counseling is an important part of preconception care.1,3 Pharmacists are also the health care professionals with an opportunity to counsel women on over-the-counter medications and vitamins to improve general health as well as prepare for pregnancy, such as promoting folic acid use or selecting an appropriate prenatal vitamin. Tobacco cessation products and appropriate contraceptive methods are other counseling points that pharmacists are in prime position to address.3

Delivery of preconception care could be achieved as a part of medication therapy management (MTM).33 Medication therapy management is a type of care that is delivered by pharmacists that aims to optimize and monitor patients' drug therapies and to encourage patients to take an active role in their health in order to achieve better outcomes. There are several core elements to the MTM model, including the comprehensive medication review (CMR) and targeted medication review (TMR); both of which could be used as opportunities to deliver preconception care. A CMR allows the pharmacist and patient to fully discuss all their medications and disease states. This would be an ideal time to deliver preconception care to women of childbearing age and address any conditions a patient may have and how it impacts her health. A TMR could be used in identifying teratogenic medications that a woman may be taking, deciding whether an alternative medication is appropriate, as well as identifying medications that may not necessarily be teratogenic but still require strict monitoring in women who desire to become pregnant. A TMR may also be a useful way to recommend folic acid products or vaccines. In general, a lack of reimbursement has been identified as a barrier to delivering preconception care; however, some third-party payers, such as some state-managed Medicaid programs, will reimburse pharmacists for delivering MTM services.

Another opportunity for pharmacists to deliver preconcep-

tion care is through counseling on management of chronic disease states.3 Counseling, whether it is through MTM or not, can have a significant impact on women's management of chronic conditions that impact their preconception health. In one study, less than one-third of women with a chronic disease state fully understood how their condition would impact a future pregnancy, and only 15 percent of women of childbearing age who were taking category C, D or X prescriptions were aware of the associated risks.34 Women's knowledge of these disease states and medications can be greatly increased through counseling by pharmacists. One example of a chronic condition in which a woman would benefit from preconception counseling is hypertension, another health concern not specifically addressed in the CDC's 14 interventions. Approximately 5 percent of pregnant women have hypertension before pregnancy or 20 weeks before gestation.3 Hypertension is known to increase the risk of delivery via cesarean section, development of gestational diabetes, preeclampsia, preterm delivery and delivery of an infant that is small for gestational age.1,3 This is an important area for preconception care counseling because hypertension and gestational hypertension account for one in 50 stillbirths as well as one in every three cases of severe maternal morbidity.35 However, because hypertension does have modifiable risk factors, such as consuming less sodium and increasing exercise, this chronic disease state, in addition to all those previously mentioned, would benefit from preconception care counseling.

**Recommenda tions for case scenario using the evidence-based interventions:**

**Diabetes Management:** KR should be counseled on management strategies for her type 2 diabetes. It should be emphasized how important it is to carefully keep track of her blood glucose levels. KR should be counseled that if she decides she wants to become pregnant, an A1C goal of less than 6.3 percent is recommended, and less than 6 percent in the second and third trimesters of pregnancy.19 When ready to conceive, a comprehensive medication review should be performed to reduce the risk of fetal exposure to a teratogenic medication; until that point, KR should be counseled on consistent and correct use of contraceptives.

**Weight Management:** An overarching goal of reducing her BMI to the "normal" range (18.5 to 24.9) should be initiated by setting small, achievable goals such as losing 1 to 2 pounds per week. Recommend KR eat a balanced diet and adopt an exercise plan.

**Alcohol Use and Smoking Cessation:** KR should also be encouraged to eliminate alcohol use and begin a smoking cessation program. A pharmacist could help KR in this process by helping her select an appropriate smoking cessation product, encouraging change and following up with KR about her progress.

**Vaccinations:** KR should be updated on her vaccines, such as rubella and hepatitis B.

**Folic Acid:** A pharmacist should also recommend that KR begin taking a folic acid supplement. As she has diabetes, her recommended daily dose should be 4 to 5 mg/day.23

**Screenings:** Screening for STIs and HIV/AIDS should also be encouraged and treatment initiated as needed.
Pharmacists' Role in Preconception Care

Conclusion
Regardless of a woman's intention to become pregnant, providing preconception care to all women of childbearing age is an often-missed opportunity to encourage healthy behaviors and lifestyle changes that can improve population-based outcomes while preparing individual patients for a potential pregnancy. Although the benefits of this type of care are widely recognized and proven, it has yet to be effectively integrated into the current health care system. Pharmacists can use their role in the health care team to incorporate preconception care into practice, both in the community and hospital settings. Using the 14 evidence-based interventions outlined by the CDC, pharmacists, in collaboration with other health care providers, can ensure this care becomes routine for women of childbearing age through direct provision of care, patient education and referrals.

References
15. Dunlop AL, Jack B, Frey K. National Recommendations for Preconcep-
33. Type 1 or Type 2 Diabetes in Pregnant Women [Internet]. Atlanta (GA): Centers for Disease Control and Prevention; 2014 [updated 2014 Jan 10; cited 2014 Nov 1]. Available from: www.cdc.gov/reproductivehealth/tobacco/pregnancy/.

The authors have no conflict of interest or funding support to disclose.
Assessment Questions

1. Approximately, what percentage of pregnancies in the United States are classified as unintended?
   A. One-quarter
   B. One-third
   C. One-half
   D. Three-fourths

2. A 24 YOF comes into your pharmacy and mentions that she and her husband are trying to become pregnant. She would like to know if any vaccinations are recommended for her to receive prior to conception. Based on the CDC's 14 evidence-based interventions, which statement would be correct to tell your patient?
   A. All patients should receive the hepatitis B vaccination, regardless of risk factors.
   B. Women who are seronegative to rubella should consider MMR vaccination prior to conception to avoid congenital rubella syndrome.
   C. The Tdap vaccination must be given prior to conception because it is contraindicated during pregnancy.
   D. After receiving the vaccination for rubella, the patient should try to become pregnant as soon as possible.

3. Ideally, preconception care should be administered to
   A. women with the intent to become pregnant.
   B. women of childbearing age who are not trying to conceive.
   C. men.
   D. All the above.

4. According to the American Diabetes Association, what is the A1C goal for a woman with type 2 diabetes who is planning to become pregnant in the near future?
   A. <6.0%
   B. <6.3%
   C. <6.5%
   D. <7.0%

5. Which of the following are risks associated with maternal obesity during pregnancy?
   A. Neural tube defects
   B. Pregnancy loss
   C. Cesarean section
   D. All the above

6. Teratogenic medications must be properly managed and/or discontinued prior to pregnancy. Which of the following medications is not specifically mentioned in the CDC's 14 evidence-based interventions but is still important for pharmacists to recognize as a concern for women of childbearing age?
   A. Lisinopril
   B. Warfarin
   C. Valproic Acid
   D. Isotretinoin

7. Why are pharmacists in an ideal position to provide preconception care?
   A. Pharmacists are accessible to patients in the community.
   B. Pharmacists are able to review medication records to identify high risk drugs and disease states.
   C. Pharmacists lack the appropriate amount of time to provide interventions.
   D. A & B

8. All of the following statements are true, except:
   A. Interconception care is considered part of preconception care.
   B. Preconception care also includes contraceptive methods for women not planning a pregnancy.
   C. Interventions made in the first trimester of pregnancy can be classified as preconception care.
   D. The recommendations made in preconception care and perinatal care are often very similar.

9. Which of the following are positive lifestyle modifications that are considered part of preconception care and can benefit women, regardless of pregnancy intentions?
   A. Reduction in alcohol intake
   B. Smoking cessation
   C. Maintenance of normal BMI
   D. All of the above

10. If not properly treated, infections like gonorrhea and chlamydia are associated with risks for ________ .
    A. ectopic pregnancy.
    B. pelvic pain.
    C. infertility.
    D. All the above.

Ohio Northern University is accredited by the Accreditation Council for Pharmacy Education as a provider of continuing pharmacy education. This program is eligible for credit until 4/1/2018.

To receive continuing education credit for this program, you must answer the above questions and fill out the evaluation form. Please visit www.onu.edu/pharmacy to enter the required information. Please allow two to three weeks for electronic distribution of your continuing education certificate, which will be sent to your valid email address in PDF format.
To receive continuing education credit for this program, visit www.onu.edu/pharmacy/CEOR OR fill out the form below including your indicated answers to the assessment questions and return to:

Office of Continuing Education at the Raabe College of Pharmacy
Ohio Northern University
525 South Main Street
Ada, Ohio 45810

Program Title: Pharmacists' Role in Preconception Care
UAN: 0048-0000-15-005-H04-P  CEUs: 0.1 for pharmacists only

All information must be printed CLEARLY to ensure accurate record keeping for attendance and the awarding of continuing education credit. Certificates will be distributed as a PDF document to a valid email address.

Name:
Address:
City: State: Zip:
Phone: Email:
Pharmacy License #: State: ONU Alumni? Y N

Program Content:

<table>
<thead>
<tr>
<th>The program objectives were clear.</th>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>The program met the stated goals and objectives:</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>Explain the need for preconception care for women of childbearing age, regardless of pregnancy intentions, and the importance to public health.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>Discuss roles for pharmacists in preconception care.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>Describe the 14 evidence-based interventions recognized by the Centers for Disease Control and Prevention, and be able to identify how these interventions can be incorporated in practice.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>Evaluate a woman's need for preconception care in the context of comorbid disease states, lifestyle and behavioral factors.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
</tbody>
</table>

The program met your educational needs. | 1 2 3 4 5 |
Content of the program was interesting. | 1 2 3 4 5 |
Material presented was relevant to my practice. | 1 2 3 4 5 |

Comments/Suggestions for future programs:

Thank you!

Answers to Assessment Questions—Please Circle Your Answer


Any questions/comments regarding this continuing education program can be directed to Lauren Hamman, Advanced Administrative Assistant for the Office of Continuing Education (email: l-hamman@onu.edu, phone 419-772-2280).

Ohio Northern University is accredited by the Accreditation Council for Pharmacy Education as a provider of continuing pharmacy education. This program is eligible for credit until 4/1/2018.