Preconception Health Care

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Appropriate preconception health care improves pregnancy outcomes. When started at least one month before conception, folic acid supplements can prevent neural tube defects. Targeted genetic screening and counseling should be offered on the basis of age, ethnic background, or family history. Before conception, women should be screened for human immunodeficiency virus and syphilis infection and begin treatment to prevent the transmission of disease to the fetus. Immunizations against hepatitis B, rubella, and varicella should be completed, if needed. Women should be counseled on ways to prevent infection with toxoplasmosis, cytomegalovirus, and parvovirus B19. Environmental toxins such as cigarette smoke, alcohol, and street drugs, and chemicals such as solvents and pesticides should be avoided. In women with diabetes, it is important to optimize disease control through intensive management before pregnancy. Medications for hypertension, epilepsy, thromboembolism, depression, and anxiety should be reviewed and changed, if necessary, before the patient becomes pregnant. Counseling about exercise, obesity, nutritional deficiencies, and the overuse of vitamins A and D is beneficial. Physicians may also choose to discuss occupational and financial issues related to pregnancy and to screen patients for domestic violence. (Am Fam Physician 2002;65:2507-14,2521-2. Copyright® 2002 American Academy of Family Physicians.)

A patient information handout on preconception health care, written by the author of this article, is provided on page 2521.

Many women have their first visit for prenatal care at eight weeks of pregnancy or later, yet the period of time before the first prenatal visit carries the most risk to fetal development. A survey[1] of patients in a family practice residency clinic showed that 52 percent of 136 women with a negative pregnancy test had a medical risk that could adversely affect a future pregnancy. Because 40 to 50 percent of pregnancies are unintended,[2] family physicians should consider the potential for pregnancy when writing each prescription. Preconception assessment could be offered to women who request pregnancy testing and family planning advice. Preconception issues could be addressed during work physicals and at follow-up visits for patients with chronic diseases.[3,4] Written materials on preconception health care could be made available in waiting and examination rooms. This article covers various topics that family physicians could include in preconception health care. A comprehensive preconception health care checklist is provided in *Table 1*.

Prenatal vitamins should include at least 400 mcg of folic acid and 30 mg of elemental iron for patients at average risk.

Genetic Risks

Taking folic acid before conception reduces the incidence of neural tube defects, including spina bifida and anencephaly.[5] The average woman receives about 100 mcg of folic acid per day from fortified breads and grains.[6] Beginning at least one month before conception and continuing through the first three months of pregnancy, women should take a daily vitamin supplement containing at least 400 mcg of folic acid. Higher dosages are indicated for special-risk groups. A dosage of 1 mg per day is recommended for women with diabetes mellitus or epilepsy. Mothers who have given birth to children with neural tube defects should take 4 mg of folic acid per day for subsequent pregnancies.[7]

Many women are postponing child bearing until after age 35 years, which

TABLE 1
Preconception Health Care Checklist

Genetic
Folic acid supplement (400 mcg routine, 1 mg diabetes/epilepsy, 4 mg previous neural tube defect)
Carrier screening (ethnic background): sickle cell anemia, thalassemia, Tay-Sachs disease
Carrier screening (family history): cystic fibrosis, nonsyndromic hearing loss (connexin-26)

Screen for infectious diseases, treat, immunize, counsel
HIV
Syphilis
Hepatitis B immunization
Preconception immunizations (rubella, varicella)
Toxoplasmosis—avoid cat litter, garden soil, raw meat
Cytomegalovirus, parvovirus B19 (fifth disease)—frequent hand washing, universal precautions for child care and health care

Environmental toxins
Occupational exposures—Material Safety Data Sheets from employer
Household chemicals—avoid paint thinners and strippers, other solvents, pesticides
Smoking cessation—bupropion (Zyban), nicotine patches (Nicoderm)
Screen for alcoholism and use of illegal drugs

Medical assessment
Diabetes—optimize control
Hypertension—avoid ACE inhibitors, angiotensin II receptor antagonists, thiazide diuretics
Epilepsy—optimize control; folic acid, 1 mg per day
DVT—switch from warfarin (Coumadin) to heparin
Depression/anxiety—avoid benzodiazepines

Lifestyle
Recommend regular moderate exercise
Avoid hyperthermia (hot tubs, overheating)
Caution against obesity and being underweight
Assess risk of nutritional deficiencies (vegan, pica, milk intolerance, calcium or iron deficiency)
Avoid overuse of:
Vitamin A (limit to 3,000 IU per day)
Vitamin D (limit to 400 IU per day)
Caffeine (limit to two cups of coffee or six glasses of soda per day)
Screen for domestic violence

HIV= human immunodeficiency virus; ACE = angiotensin-converting enzyme; DVT = deep venous thrombosis.

TABLE 2
Carrier Screening by Ethnicity

Ethnic origin	*Screening recommended*	*Test*	*Frequency (percentage)*
Black	Sickle cell trait Beta-thalassemia	Sickle cell smear MCV <70	10 5
European Jewish	Tay-Sachs disease carrier	Hexosaminidase A	4
French Canadian	Tay-Sachs disease carrier	Hexosaminidase A	>5
Mediterranean	Alpha-, beta-thalassemia	MCV <70	10 to 20
Southeast Asian (Laotian, Thai, Cambodian, Hmong)	Alpha-, beta-thalassemia	MCV <70	20 to 40
Indian, Middle Eastern	Sickle cell trait Alpha-, beta-thalassemia	Sickle cell smear MCV <70	Unknown Unknown

MCV = mean corpuscular volume.

Adapted with permission from Cowchock FS, Johnson A, Jackson LG. Screening for genetic abnormalities. Infertil Reprod Med Clin North Am 1994;5:177-95.

poses a higher risk of medical problems during pregnancy and chromosomal abnormalities in the fetus. Older couples should be counseled about genetic risks and the availability of antenatal testing (amniocentesis and chorionic villus sampling), which may not be options if the first visit for prenatal care is delayed. The risk of infertility also increases with age, rising to 20 percent in couples older than 35 years.[8]

Ethnic background of either partner determines whether prenatal screening should be recommended for sickle cell trait, thalassemias, and Tay-Sachs disease carrier state *(Table 2)*.[9,10] A family history that is positive for certain diseases, such as cystic fibrosis and congenital hearing loss, indicates the need for additional screening.[11] Carrier screening for cystic fibrosis by linkage DNA analysis is recommended for

TABLE 3
Environmental Toxins

Hazard	*Types*	*Associated outcomes*	*Sources of exposure*
Metals	Lead	Abnormal sperm, menstrual disorders, miscarriages, stillbirths, mental retardation	Solder, lead pipes, batteries, paints, ceramics, smelter emissions
	Mercury	Impaired fetal motor and mental development	Thermometers, mirror coating, dyes, inks, pesticides, dental fillings, fish from contaminated waters
Solvents	Trichloroethylene, chloroform, benzene, toluene	Birth defects	Dry cleaning fluids, degreasers, paint strippers, drug and electronics industries
Plastics	Vinyl chloride	Decreased fertility, chromosomal aberrations, miscarriages, stillbirths, birth defects	Plastic manufacturing
Pollutants	Polychlorinated biphenyl, polybrominated biphenyl	Low birth weight, stillbirths	Pesticides; carbonless copy paper; rubber, chemicals, and electronics industries; fire retardants; food chain
Pesticides	2,4,5-T and 2,4-D organophosphates	Birth defects, miscarriages, low birth weight	Farm, home, and garden insect sprays; wood treatment
Gases	Carbon monoxide	Low birth weight, stillbirths	Auto exhaust, furnaces, kerosene heaters, cigarette smoke
	Anesthetic gases	Decreased fertility, miscarriages, birth defects	Dental offices, operating rooms, chemicals industries
Radiation	Radiographs, radioactive materials	Sterility, birth defects	Medical and dental offices, electronics industries

Adapted with permission from Cefalo RC, Moos MK. Preconceptional health promotion. In: Cefalo RC, Moos MK, eds. Preconceptional health care: a practical guide. 2d ed. St. Louis: Mosby, 1995:41-2.

patients with a family history of the disease in a cousin or closer relative. Recent recommendations propose that cystic fibrosis screening be offered to all white patients.[12] Fifty percent of cases of congenital hearing loss are linked to a single genetic defect in the protein connexin-26. In families with an affected family member, the affected person is usually tested first. If the test is positive, preconception testing can be offered for others in the family. Clinical laboratory tests for connexin-26 (nonsyndromic hearing loss, DFNB1/DFNA3) are available from specialty genetics laboratories.

Congenital Infections

Preconception testing for human immunodeficiency virus (HIV) is important because the Pediatric AIDS Clinical Trials Study Group[10] has shown that treatment with zidovudine (Retrovir) reduces the risk of transmission to the fetus from 25.5 percent to 8.3 percent. Screening should also be performed for syphilis. Earlier treatment of HIV and syphilis decreases the risk of transmission to the fetus.

Women who have not received the hepatitis B vaccine should be considered for immunization if they are at risk of sexually transmitted disease or blood exposure. The vaccine may be given during pregnancy; however, rubella and varicella, which are live-virus vaccines, should be given at least one month before conception.[13]

Toxoplasmosis, cytomegalovirus (CMV), and parvovirus B19 (fifth disease) may cause congenital infections if the mother becomes infected during pregnancy. Currently, no immunizations are available for these infections. Toxoplasmosis is a parasite commonly found in raw meat or cat feces. New owners of cats that go outside are most at risk. Women should be counseled to avoid contact with cat feces in litter boxes, wear gloves while gardening, and avoid eating raw or undercooked meat.[14] CMV exposure is especially risky for child care and health care workers. Persons at risk should wash their hands frequently and use gloves to prevent transmission.[14] Parvovirus B19 is transmitted by prolonged close contact with small children who have the disease in household or child care settings. Serologic testing is possible to document previous immunity but is not routinely recommended for these organisms.[15]

Environmental Toxins

The embryo or fetus is more susceptible to environmental toxins than adults. Drug or chemical exposure causes 3 to 6 percent of anomalies. The timing of the exposure determines the type and severity of anomaly. For example, an exposure before 17 days of fetal life could be lethal. Typically, from days 17 to 56 a toxin can cause a structural anomaly, and after day 56, a functional impair-

Hypertension medications that should be avoided during pregnancy include angiotensin-converting enzyme inhibitors, angiotensin II receptor antagonists, and thiazide diuretics.

TABLE 4
Pregnancy Category of Common Drugs

Drug class	*FDA pregnancy risk category**	*Medications*
Analgesics, arthritis	B	Acetaminophen; ibuprofen (Motrin), first, second†; naproxen (Naprosyn), first, second†; diclofenac (Voltaren), first, second†
	C	Tramadol (Ultram); narcotic agonists; celecoxib (Celebrex), first, second†; etodolac (Lodine), first, second†; ketorolac (Toradol), first, second†; rofecoxib (Vioxx), first, second†; sumatriptan (Imitrex)
	D	All nonsteroidal anti-inflammatory drugs, third;† methotrexate (Rheumatrex).
	X	Ergotamines (Ergostat), diclofenac/misoprostol (Arthrotec)
Anti-anxiety, sleep	B	Buspirone (BuSpar), diphenhydramine (Benadryl), zolpidem (Ambien)
	C	Hydroxyzine (Atarax)
	D	Most benzodiazepines
	X	Flurazepam (Dalmane), temazepam (Restoril)
Antibiotics	B	Azithromycin (Zithromax); cephalosporins; clindamycin (Cleocin); erythromycin; metronidazole (Flagyl); nitrofurantoin (Furadantin); penicillins; sulfonamides, first, second†
	C	Clarithromycin (Biaxin), quinolones, trimethoprim (Proloprim), vancomycin (Vancocin)
	D	Sulfonamides, third†; tetracyclines
Anticoagulants	C	Heparin, low-molecular-weight heparin (Lovenox)
	X	Warfarin (Coumadin)
Anticonvulsants	C	Ethosuximide (Zarontin), gabapentin (Neurontin), lamotrigine (Lamictal)
	D	Carbamazepine (Tegretol), clonazepam (Klonopin), phenobarbital, phenytoin (Dilantin), primidone (Mysoline), valproic acid (Depakene)
Antidepressants	B	Bupropion (Wellbutrin)
	C	Desipramine (Norpramin), doxepin (Sinequan), mirtazapine (Remeron), nefazodone (Serzone), SSRIs, trazodone (Desyrel), venlafaxine (Effexor)
	D	Amitriptyline (Elavil), imipramine (Tofranil), nortriptyline (Pamelor)
Antifungals	B	Nystatin (Mycostatin), terbinafine (Lamisil)
	C	Fluconazole (Diflucan), second, third†; griseofulvin (Grisactin); itraconazole (Sporanox), second, third†; ketoconazole (Nizoral), second, third†
	D	Fluconazole, first†; itraconazole, first†; ketoconazole, first†
Antihypertensives	B	Guanfacine (Tenex)
	C	Beta blockers, first†; calcium channel blockers; clonidine (Catapres); furosemide (Lasix); labetalol (Normodyne), first†; methyldopa (Aldomet); hydralazine (Apresoline)
	D	ACE inhibitors; angiotensin II receptor antagonists; beta blockers, second, third†; labetalol, second, third†; thiazide diuretics
Antiviral	B	Acyclovir (Zovirax), famciclovir (Famvir), valacyclovir (Valtrex), zanamivir (Relenza)
	C	Amantadine (Symmetrel), rimantadine (Flumadine), zidovudine (Retrovir), oseltamivir (Tamiflu)
Asthma/allergies	B	Cetirizine (Zyrtec), clemastine (Tavist), cromolyn (Intal), ipratropium (Atrovent), loratadine (Claritin), montelukast (Singulair), zafirlukast (Accolate)
	C	Albuterol (Ventolin); brompheniramine (Dimetane D_C); epinephrine (Epipen); fexofenadine (Allegra); guaifenesin (Humibid L.A.); prednisone; pseudoephedrine (Novafed), second, third†; theophylline; inhaled steroids
Diabetic agents	B	Acarbose (Precose), metformin (Glucophage), insulin (drug of choice)
	C	Glyburide (Micronase), glipizide (Glucotrol), pioglitazone (Actos), repaglinide (Prandin), rosiglitazone (Avandia)

(continued)

TABLE 4 *(continued)*

Drug class	*FDA pregnancy risk category**	*Medications*
GI medications	B	Dicyclomine (Bentyl), dimenhydrinate (Dramamine Injection), H_2 blockers, lansoprazole (Prevacid), metoclopramide (Reglan), sucralfate (Carafate)
	C	Hyoscyamine (Levsin), omeprazole (Prilosec), prochlorperazine (Compazine), promethazine (Phenergan), trimethobenzamide (Tigan)
	D	Bismuth subsalicylate
	X	Misoprostol (Cytotec)
Miscellaneous	C	Disulfiram (Antabuse)
	D	Lithium, nicotine patches (Nicoderm), nasal spray, and inhaler
	X	Nicotine gum, HMG-CoA reductase inhibitors, isotretinoin (Accutane), megadose vitamin A, oral contraceptives

NOTE: *Information on drugs new since the last edition of the referenced text was taken from the package insert.*

FDA = U.S. Food and Drug Administration; SSRIs= selective serotonin reuptake inhibitors; ACE = angiotensin-converting enzyme; GI = gastrointestinal; HMG-CoA = 3-hydroxy-3-methylglutaryl coenzyme A.

**—Category A—controlled studies in pregnant women have not demonstrated risk to fetus; Category B—either animal studies have not demonstrated risk to fetus and no controlled studies in women, or animal studies have demonstrated a risk not confirmed in controlled studies in women; Category C—either animal studies have demonstrated risk to fetus and no controlled studies in women, or studies in animals and women are not available; Category D—positive evidence of human fetal risk, but benefits from use in pregnant women may be acceptable (e.g., if drug is needed in a life-threatening situation or serious disease); Category X—positive evidence of human fetal risk outweighs any possible benefit; contraindicated.*

†—First, second, third designates trimester of pregnancy in which risk is present. When there is no trimester designation, the risk is present during all trimesters.

Information from Briggs GG, Freeman RK, Yaffe SJ. Drugs in pregnancy and lactation: a reference guide to fetal and neonatal risk. 5th ed. Baltimore: Williams & Wilkins, 1998:1159-69.

ment.[11] Some of the common environmental toxins are listed in *Table 3*,[11] and the U.S. Food and Drug Administration (FDA) pregnancy risk category of common drugs is provided in *Table 4*.[16]

Employers are legally required to inform workers of exposures to hazardous substances and to furnish them with Material Safety Data Sheets. In the home, pregnant women should avoid prolonged exposure to pesticides and to solvents such as paint thinners and strippers.[17] Ionizing radiation, including that from exposure to radiography and radioactive materials, is associated with genetic damage when delivered at high levels to the developing embryo.[11] Microwaves, ultrasound, and radio waves are nonionizing and safe.

Smoking increases the risk of miscarriage, low birth weight, perinatal mortality, and attention-deficit disorder in the child.[18] If the mother smokes less than one pack of cigarettes per day, the risk of a low-birth-weight infant increases by 50 percent; with more than one pack per day, the risk increases by 130 percent. If the mother quits smoking by 16 weeks of pregnancy, the risk to the fetus is similar to that of a nonsmoker.[19] The physician can recommend behavioral techniques, support groups, and family help. Nicotine patches or gum may be helpful before conception, but most authorities recommend avoiding them during pregnancy. Bupropion (Zyban) may be used during pregnancy. If the patient cannot stop smoking, the physician should help her set a goal to decrease her number of cigarettes to fewer than 10 per day, because many of the adverse effects are dose related.

Alcohol abuse can cause mental retardation, malformation, growth retardation, miscarriage, and behavioral disorders in infants. The effects are dose related: 19 percent of infants are affected when the mother consumes more than four drinks per day, while 11 percent are affected with two to four drinks per day.[20] Patients should be treated for alcoholism through interventional counseling, usually by referral to a treatment program.

Women using illegal drugs such as cocaine, marijuana, or heroin will need help quitting before pregnancy. Cocaine use is associated with miscarriage, prematurity, growth retardation, and congenital defects. Marijuana can cause prematurity and jitteriness in the neonate. Use of heroin may lead to intrauterine growth restriction, hyperactivity, and severe neonatal withdrawal syndrome.[11] Even a single teaching session about how drug use affects the fetus, along with reinforcement at subsequent visits, usually helps women who only occasionally use drugs. Women who use drugs daily should be referred to a substance abuse treatment program. Periodic urine drug testing may help to encourage abstinence. Women who use heroin should be referred to a supervised withdrawal program to be completed before conception. A methadone maintenance program is an alternative if the patient is unable to complete the withdrawal.[20]

TABLE 5
Preconception Care for Women with Diabetes Mellitus

- Use contraception until excellent glucose control is achieved
- Train in self-monitoring and balancing food intake, exercise, and insulin
- Transition to insulin (type 2 diabetes)
- Consider insulin pump
- Give the patient specific goals:
  - Fasting glucose, 60 to 100 mg per dL (3.3 to 5.6 mmol per L)
  - Two-hour postprandial glucose, 100 to 120 mg per dL (5.6 to 6.7 mmol per L)
  - HbA_{1C} within normal range for your laboratory
- Identify, evaluate, and treat:
  - Hypertension
  - Nephropathy
  - Retinopathy
  - Thyroid disease
  - Hyperlipidemia
- Counsel on risks of pregnancy, requirement for increased visits, and close monitoring
- Evaluate for relative contraindications to pregnancy:
  - Blood urea nitrogen greater than 30 mg per dL (10.7 mmol per L)
  - Creatinine clearance less than 30 mL per minute (0.5 mL per second)
  - Coronary artery disease

HbA_{1C} = glycosylated hemoglobin.

Information from Kitzmiller JL, Buchanan TA, Kjos S, Combs CA, Ratner RE. Pre-conception care of diabetes, congenital malformations, and spontaneous abortions. Diabetes Care 1996;19:514-41, and American Diabetes Association. Preconception care of women with diabetes. Clin Diabetes 2000;18:124-8.

Chronic Illnesses

DIABETES MELLITUS

Women whose diabetes is poorly controlled (defined as glycosylated hemoglobin [HbA_{1C}] levels higher than 8.4 percent) have a 32 percent rate of spontaneous abortion and a sevenfold increased risk of severe fetal anomalies compared with women who have good control. Intensive diabetic management starting before conception should decrease the risk of abortions and congenital anomalies and lessen the complications of pregnancy.[11] Insulin has long been the drug of choice for women with type 1 and type 2 diabetes mellitus during pregnancy. Research on the use of glyburide (Micronase) in patients with gestational diabetes shows promise for a future role of oral agents in women with pre-existing diabetes.[21] *Table 5*[22,23] lists the goals of the preconception visit for women who have diabetes.

HYPERTENSION

Most patients with chronic hypertension can expect an uncomplicated pregnancy but will require enhanced monitoring for the risks of preeclampsia, renal insufficiency, and fetal growth retardation. Medications should be reviewed for use during pregnancy. Methyldopa (Aldomet) and calcium channel blockers are commonly used during pregnancy. Drugs that should be avoided in the first and second trimesters of pregnancy are angiotensin-converting enzyme inhibitors, angiotensin II receptor antagonists, and thiazide diuretics, which are associated with congenital defects *(Table 4*[16]*)*.[11]

EPILEPSY

Children of mothers with epilepsy have a 4 to 8 percent risk of congenital anomalies, which may be caused by anticonvulsant medication or may be related to an increased genetic risk.[24] The role of hypoxia associated with maternal seizures is unclear. These children also have an increased risk of developing epilepsy. Preconception counseling should include optimizing seizure control, prescribing folic acid supplements, 1 to 4 mg per day, and offering referral to a genetic counselor. When possible, use of multiple anticonvulsants should be avoided. Physicians should aim to use the best single agent for the seizure type at the lowest protective level. There is no single drug of choice. The older agents are classified as FDA pregnancy risk category D *(Table 4)*,[16] and the newer agents are poorly studied. If the

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patient has been seizure-free for two years or longer, drug discontinuation with a long taper period (three months) may be successful.[25]

THROMBOEMBOLISM

Women who have a personal or family history of venous thromboembolism should be offered testing for thrombophilia before pregnancy.[26] Women with a history of a deep venous thrombosis (DVT) have a 7 to 12 percent risk of recurrence during pregnancy.[10] Heparin (in regular or low-molecular-weight form) is indicated for prophylaxis and should be started as early in pregnancy as possible. Women receiving warfarin (Coumadin) as maintenance therapy for DVT should be switched to heparin before conception, because warfarin is teratogenic.

DEPRESSION AND ANXIETY

About 10 percent of pregnant women have depression. Tricyclic antidepressants and selective serotonin reuptake inhibitors have not been shown to cause any teratogenic effects and may be used before conception.[27] Withdrawal syndromes can occur in neonates whose mothers are treated with tricyclic antidepressants near the time of delivery. Rarely, maternal use of benzodiazepines has been associated with anomalies such as cleft lip and palate, as well as a withdrawal syndrome in the newborn.[16]

Exercise and Nutrition

Regular moderate exercise is generally beneficial and has not been found to increase the risk of low birth weight or other problems.[28] In the first trimester, hyperthermia related to hot tub use has been associated with increases in congenital anomalies.[29] Pregnant women should limit vigorous exercise to avoid an increase in core body temperature above 38°C (100.4°F). They should be adequately hydrated, wear loose clothing, and avoid extreme environmental temperatures.[29]

Obesity and being underweight increase pregnancy risks. Obesity increases the risks of hypertension, preeclampsia, diabetes, and delivering a large infant.[11] Women who are obese should diet before conception and then switch to a maintenance diet of 1,800 calories per day while trying to conceive. Women of average height who weigh less than 120 lb are at risk of amenorrhea, infertility, having a low-birth-weight infant, preterm delivery, and anemia.[11] Low birth weight and prematurity are more related to dietary inadequacy at conception than to weight gain during pregnancy. The diets of women with low-birth-weight infants are often deficient in milk, whole grains, vegetables, and fruits.[30]

Other nutritional problems to watch for include pica, vegetarian diets, and milk intolerance. Pica is usually manifested as cravings for dirt, clay, or starch, and may result in malnourishment and ingestion of toxins and infectious agents. Work-up should include evaluation for anemia and possibly a psychiatric evaluation. If the patient cannot stop the behavior, nutritional counseling can focus on substitutions, such as powdered milk, pudding, or rice.[11] Vegetarians who consume eggs or dairy products usually have no nutritional deficiency; however, strict vegans may have deficiencies in amino acids, zinc, calcium, iron, and vitamins D and B_{12}.[11] Such patients may need to be referred to a nutritionist who can recommend proper food selection and supplementation. Milk intolerance is particularly common among black, Asian, and Native American women and may result in calcium deficiency. These women may be able to tolerate yogurt or cooked cheese. They can also benefit from using lactose-reduced milk, lactase tablets, or calcium supplements.

Overdoses of vitamin A, vitamin D, and caffeine may be toxic. Vitamin A is teratogenic in dosages of 20,000 to 50,000 IU per day.[11] The FDA recommends a limit of 3,000 IU per day. Dosages of vitamin D greater than 1,600 to 2,000 IU per day may cause fetal hypercalcemia and growth retardation.[11] Women should not exceed total dosages of 400 IU per day of vitamin D alone or combined in calcium supplements or multiple vitamins. Consumption of caffeine in amounts up to 300 mg per day (two cups of coffee or six glasses of tea or soda) is considered safe by most authorities. Higher amounts of caffeine may be associated with increased rates of abortion and low birth weight.[31]

Common mineral deficiencies in women of childbearing age include iron and calcium (40 percent of menstruating women have deficient iron stores). A daily prenatal vitamin containing 30 mg of elemental iron is sufficient when combined with a diet that includes meats and other foods high in iron.[11] Before conception, women need 1,200 mg of calcium per day, or the equivalent of a quart of milk or fortified orange juice, or six servings of fortified bread or cereals.

Psychosocial Factors

Domestic violence is reportedly underdiagnosed, and the incidence escalates during pregnancy. Physicians should routinely ask about domestic violence using non-

judgmental questions. Validating the woman's concerns and providing a supportive physician-patient relationship are key factors in helping women to leave a violent relationship.[32] Physicians should offer their patients materials on community resources and the telephone number of the local shelter for battered women.

A couple's readiness for children and the availability of sufficient financial resources should be discussed. Physicians may choose to discuss the effect of pregnancy on the mother's work income. If she has a job that requires prolonged standing,[28] will she be able to transfer to a more sedentary job in the last trimester of pregnancy? How will the family handle the loss of her income if she develops complications that require her to take time off? The couple should be advised to learn about their employers' policies regarding parental leave benefits as well as the maternity coverage of their health insurance plan.[33]

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