

Where It All Begins:
*The Impact of Preconception Care on
 Early Brain Development*

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 Before, Between and Beyond Pregnancy
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**Why
 Preconception Care?**

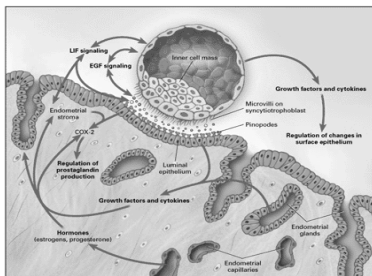
Why Preconception Care?

- Early prenatal care is too late.

**Early Prenatal Care Is Too Late
 To Prevent Some Birth Defects**

- The heart begins to beat at **22** days after conception
- The neural tube begins to form at **22** days after conception
- The palate fuses at **56** days after conception
- Critical period of teratogenesis – **Day 17 to Day 56**

**Early Prenatal Care Is Too Late
 To Prevent Implantation Errors**



Norwitz ER, Schust DJ, Fisher SL. Implantation and the survival of early pregnancy. N Engl J Med. 2001 Nov 8;345(19):1400-8.

**Early Prenatal Care Is Too Late
 To Restore Allostasis**

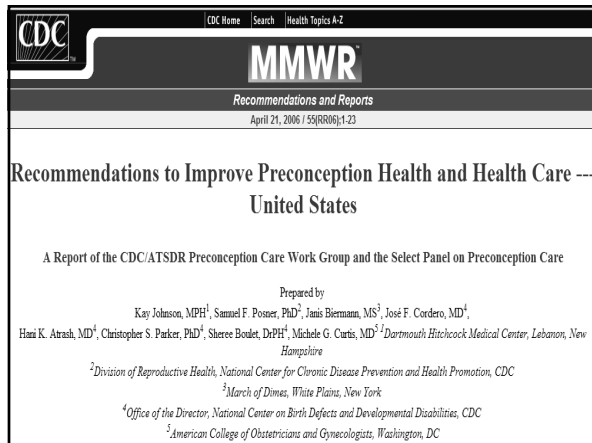
- Allostasis: maintain stability through change**

What Is Preconception Care?

What is Preconception Care?

- 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.

Johnson K, Posner SF, Biermann J, Cordero JF, Atrash HK, Parker CS, Boulet S, Curtis MG. CDC/ATSDR Preconception Care Work Group. Select Panel on Preconception Care. Recommendations to improve preconception health and health care—United States. A report of the CDC/ATSDR Preconception Care Work Group and the Select Panel on Preconception Care. MMWR Recomm Rep. 2006 Apr 21;55(RR-9).



CDC Home Search Health Topics A-Z

MMWR
Recommendations and Reports
April 21, 2006 / 55(RR09):1-23

Recommendations to Improve Preconception Health and Health Care—United States

A Report of the CDC/ATSDR Preconception Care Work Group and the Select Panel on Preconception Care

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Preconception Care

Second National Summit on Preconception Health and Health Care. Advancing the Health of Women and Infants Before, Between and Beyond Pregnancy.
The Summit will be held October 29-31 in Oakland, California.

Preconception care is recognized as a critical component of health care for women of reproductive age. The main goal of preconception care is to provide health promotion, screening and interventions for women of reproductive age to reduce risk factors that might affect future pregnancies. Through a two-year collaborative effort, CDC has successfully aligned the efforts of a number of its external partners and internal programs to develop a set of 10 recommendations for improving preconception health and care. These recommendations serve as a strategic plan for improving the health of women, their children, and their families.

Topic Contents

- Topic Home
- What is preconception care?
- Why is Preconception Care a public health concern?
- What is CDC doing to promote Preconception Care?
- FAQs for General Public
- FAQs for Professionals
- Next Steps

Quick Links

PREGNANCY Information

Preconception Resources
Birth Defects
Folic Acid
Fetal Alcohol Syndrome
Genomics and Disease Prevention



ACOG Committee on Gynecologic Practice

Committee Opinion

Number 313, September 2005

The Importance of Preconception Care in the Continuum of Women's Health Care

This document reflects emerging clinical and scientific advances as of the date issued and is subject to change. The information should not be construed as dictating an exclusive course of treatment or procedure to be followed.

The Committee wishes to thank the ACOG Preconception Care Work Group co-chairs, Michele G. Curtis, MD, and Paul J. Adams Hillard.

Key Components of Preconception Care

1. Reproductive life plan
2. Past reproductive history
3. Medical assessment
4. Medication use
5. Infections & immunizations
6. Genetic risks
7. Healthy weight & nutrition
8. Psychosocial & behavioral risks
9. Healthy environment
10. Physical assessment

1. Reproductive Life Plan

Reproductive Life Plan

- A set of personal goals about having (or not having) children based on personal values and resources
- A plan to achieve those goals

<http://www.cdc.gov/ncbddd/preconception/OandA.htm#5>

Examples of a Reproductive Life Plan

1. Do you hope to have any (more) children?
 2. How many children do you hope to have?
 3. How long do you plan to wait until you (next) become pregnant?
 4. How much space do you plan to have between your pregnancies?
 5. What do you plan to do until you are ready to become pregnant?
 6. What can I do today to help you achieve your plan?
-

Opportunities to promote healthy brain development

- Prevent unintended pregnancies and associated stress & behaviors
-

2. Past Reproductive History

those who fail to learn the lessons of history are doomed to repeat them.

George Santayana

Past Reproductive History

- Discuss recurrence risk
 - Peripartum cardiomyopathy
 - Preeclampsia
 - Preterm birth
 - Fetal growth restriction
 - Stillbirth
 - Preventable birth defects
 - Other prior adverse outcomes
 - Review old records
 - Determine cause of prior adverse outcome
 - Address ongoing biobehavioral risks to prevent recurrence
-

Opportunities to promote healthy brain development

- Interconception care
-

3. Medical Assessment

Medical Assessment

- Ongoing medical conditions
 - e.g. hypertension, diabetes, hypothyroidism, seizure disorders

Diabetes Mellitus

- Counsel about increased risk for congenital malformations
 - Cardiac defects
 - Neural tube defects
 - Aim to achieve normal glycosylated hemoglobin before pregnancy
-

Diabetes Mellitus

- Risk Assessment
 - Review of medical history, including concomitant diseases (e.g. renal disease)
 - Perform physical examination
 - Fundoscopic examination
 - Cardiac examination
 - Peripheral vascular examination
 - Neurological examination
 - Laboratory evaluation and diagnostic procedures
 - Glycosylated hemoglobin
 - Renal functions (serum creatinine, urinary excretion of albumin or total protein)
 - Thyroid stimulating hormones
 - Electrocardiogram (EKG) if diabetes is long-standing

American Diabetes Association. Preconception care of women with diabetes. Diabetes Care 2004;27(Suppl 1):S76-8.

Diabetes Mellitus

- Health promotion
 - Appropriate meal plan (ADA diet)
 - Self-monitoring of blood glucose
 - Self-administration of insulin and self-adjustment of insulin doses
 - Self or family recognition and treatment of hypoglycemia
 - Physical activities
 - Stress reduction
 - Effective contraception and optimal glycemic control before next pregnancy
- Clinical interventions
 - Pharmacologic therapy
 - Oral hypoglycemics or insulin during the interconception period
 - Insulin should be used during subsequent pregnancy
 - Follow-up should be every 1-2 month interval until stable glycemic control; frequent phone contacts are advised

American Diabetes Association. Preconception care of women with diabetes. Diabetes Care 2004;27(Suppl 1):S76-8.

Seizure Disorders

- Counsel about the risks of seizures during pregnancy & the risks of medications (e.g. valproic acid, carbamazepine, phenytoin) used to control them
- Consider a trial without medications for women who have not had a seizure in 2-3 years and who have a normal EEG
- should stay seizure-free for 6 months off medication before attempting to conceive.

Seizure disorders

- If anticonvulsants are needed, the least toxic anticonvulsant medication (e.g. lamotrigine, topiramate) should be initiated before pregnancy and the medication adjusted frequently to keep serum levels in the lowest effective range
- For women taking antiepileptic drugs who are considering a pregnancy, folic acid supplementation 5 mg/day is recommended for 1 month prior to conception and until the end of the 1st trimester

Opportunities to promote healthy brain development

- Refer for primary and specialty care
- Optimize women's health before pregnancy

4. Medication Use

Content of Preconception Care Risk Assessment

Category A	Adequate and well-controlled studies have failed to demonstrate a risk to the fetus in the first trimester of pregnancy (and there is no evidence of risk in later trimesters).
Category B	Animal reproduction studies have failed to demonstrate a risk to the fetus and there are no adequate and well-controlled studies in pregnant women OR Animal studies have shown an adverse effect, but adequate and well-controlled studies in pregnant women have failed to demonstrate a risk to the fetus in any trimester.
Category C	Animal reproduction studies have shown an adverse effect on the fetus and there are no adequate and well-controlled studies in humans, but potential benefits may warrant use of the drug in pregnant women despite potential risks.
Category D	There is positive evidence of human fetal risk based on adverse reaction data from investigational or marketing experience or studies in humans, but potential benefits may warrant use of the drug in pregnant women despite potential risks.
Category X	Studies in animals or humans have demonstrated fetal abnormalities and/or there is positive evidence of human fetal risk based on adverse reaction data from investigational or marketing experience, and the risks involved in use of the drug in pregnant women clearly outweigh potential benefits.

Food and Drug Administration

Examples of Drugs to Avoid

Agent	Comments
ACE inhibitors, ARBs	Kidney abnl if exposed in 2 nd or 3 rd tri
Statins	Abnormalities if exposure 4–9 th week
Testosterone	Masculinization of female fetus
Carbamazapine	Fetal death, mental retardation, malformations of heart, genitals; cleft palate and arteries
Coumadin derivatives (warfarin)	Risk of bone+ cartilage deformities, mental retardation, vision problems
Lithium	Increased risk of CV anomalies
Phenytoin	Risk of fetal hydantoin syndrome
Valproic acid	Use in 3-4 divided doses; not with carbamazapine + phenobarbital
Isotretinoin	Elevated risk of SAB and anomalies

Opportunities to promote healthy brain development

- Ask about medication use
- Refer to local OTIS (Organization of Teratology Information Services) for consultation
 - <http://www.ctispregnancy.org/>
 - 1-800-532-3749

5. Infections & Immunizations

Infections & Immunizations

- Infections
 - ✓ RTI
 - ✓ UTI
 - ✓ STI
 - ✓ Periodontal disease
- TORCH
 - ✓ Toxoplasmosis
 - ✓ Other (syphilis, hepatitis B, varicella)
 - ✓ Rubella
 - ✓ Cytomegalovirus
 - ✓ Herpes simplex

Infections & Immunizations

- Immunizations
 - ✓ Tdap
 - ✓ Hepatitis B
 - ✓ Influenza
 - ✓ Measles, Mumps and Rubella
 - ✓ Varicella
 - ✓ HPV

Opportunities to promote healthy brain development

- Refer to local health clinics
- Refer to oral health services

6. Genetic Risks

Genetic Risks

- Family history
- Age
- Ethnic background
 - "Ashkenazi Jewish Panel"
 - ✓ Gaucher disease Type 1,
 - ✓ Tay-Sachs,
 - ✓ Cystic fibrosis,
 - ✓ Familial dysautonomia (Riley-Day syndrome),
 - ✓ Canavan disease,
 - ✓ Niemann-Pick disease,
 - ✓ Fanconi anemia group C,
 - ✓ Bloom syndrome
 - Mucopolysaccharidosis IV
- Known genetic disorder (e.g. PKU)

Opportunities to promote preconception health

- Counsel about age-related risks

Infertility increases with age Percent of married women who are infertile by age group		Risk of chromosomal abnormalities By maternal age		
Age Group	Percent Infertile*	Maternal Age	Risk for Down's	Risk for Any Chromosomal Abnormalities
20-24	7	20	1/1,667	1/526
25-29	9	25	1/1,250	1/476
30-34	15	30	1/952	1/385
35-39	22	35	1/378	1/192
40-44	29	40	1/106	1/66
		41	1/82	1/53
		42	1/63	1/42
		43	1/49	1/33
		44	1/38	1/26
		45	1/30	1/21
		46	1/23	1/16
		47	1/18	1/13
		48	1/14	1/10

Miscarriage increases with age Percent of pregnancies resulting in miscarriage	
Age Group	Percent Miscarried
15-19	10
20-24	10
25-29	10
30-34	12
35-39	18
40-44	34
≥45	53

* Infertility is defined as inability to conceive after one year of unprotected sexual intercourse.

<http://www.asrm.org/Patients/patientbooklets/ageinfertility.pdf>

Opportunities to promote healthy brain development

- Phenylketonuria (PKU)
 - Counsel about low phenylalanine diet before conception
 - Refer to primary care physician to monitor phenylalanine levels monthly before and during pregnancy

7. Healthy Weight & Nutrition

Promote Healthy Weight

- Set realistic goals for healthy weight based on BMI
- For weight loss,
 - decrease caloric intake
 - Exercise
 - Keep track of weight & nutrition
- Maintain a healthy weight for 3-6 months before pregnancy

Promote Healthy Nutrition

- Step 1:** Achieve a healthy weight
- Step 2:** Eat a balanced diet every day
- Step 3:** Make every calorie count
- Step 4:** Go low on glycemic load
- Step 5:** Load up on smart fats
- Step 6:** Dump the dumb fats
- Step 7:** Eat high-quality proteins
- Step 8:** Eat a rainbow of fruits and vegetables
- Step 9:** Take a daily multivitamin containing folic acid
- Step 10:** Eat more brain foods and less toxic foods

Opportunities to promote healthy brain development

- All women of childbearing age should be encouraged to take a multivitamin supplement containing 0.4 mg (400 micrograms) of folic acid daily
 - 4 mg (4000 micrograms) if prior pregnancy affected by NTD
- Provide education about healthy weight and nutrition

Load Up On Smart Fats

- How much smart fats do I need?
 - Preconception: 220 mg DHA
 - Pregnancy: 300 mg DHA (650 mg DHA+EPA)
- Eat more DHA
 - Wild coldwater fish
 - 4-oz Alaskan wild salmon-830 mg DHA + 130mg EPA
 - Fish oil
 - Microalgae DHA supplement
 - DHA-fortified eggs
- Eat more LnA and less omega-6 & trans fats

What You Need to Know about Mercury in Fish & Shellfish

- 2004 EPA/FDA Joint Advisory for
 - Women who might become pregnant
 - Women who are pregnant
 - Nursing mothers
 - Young children
- Do not eat Shark, Swordfish, King Mackerel, or Tilefish
- Eat up to 12 ounces (2 average meals) a week
 - Shrimp, canned light tuna, salmon, pollock, catfish are low in mercury
 - Albacore ("white") tuna has more mercury than canned light tuna
- Check local advisories about locally caught fish
 - www.epa.gov/ost/fish

www.epa.gov/mercury

Dump the Dumb Fats

- Reduce fat intake
 - Total fat: <30% of total calories
 - Saturated fat: <5% of total calories
- Go non-fat on dairy
- Minimize red meat & unskinned poultry
- Avoid cooking with polyunsaturated vegetable oils
- Avoid deep-fried foods in restaurants
- Substitute natural vegetable oil spreads for butter and margarine
- Go *trans* fat-free and avoid partially-hydrogenated oils

8. Psychosocial & Behavioral Risks

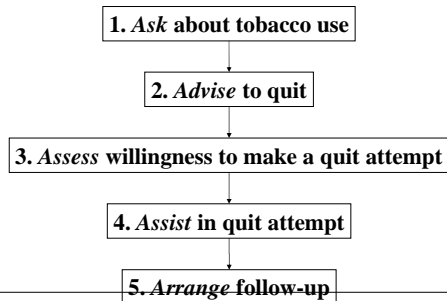
Screen for Intimate Partner Violence

- Have you been hit, kicked, punched, or otherwise hurt by someone in the past year? If so, by whom?
 - Do you feel safe in your current relationship? Are you afraid of your partner?
 - Is there a partner from a previous relationship who is making you feel unsafe now?
 - Has anyone, including your partner, ever forced you to have sex?
 - Does your partner physically scream or curse at you? If so, how often?
 - Does your partner insult or talk down to you? If so, how often?
 - Does your partner threaten you with harm? If so, how often?
-

Screen for Depression

- Postpartum Depression Screening Scale (PDSS)
 - Edinburgh Postnatal Depression Scale (EPDS)
 - Beck Depression Inventory (BDI)
 - Center for Epidemiologic Studies Depression Scale (CES-D)
-

The 5 A's Approach to Smoking Cessation



Smoking Cessation: Helpful Strategies

- Set quit date within 30 days and sign a contract
 - Develop approaches to manage withdrawal symptoms
 - Remove all tobacco products from her home
 - What to do in situations in which she usually smokes
 - Follow up to monitor progress and provide support
 - Encourage the patient
 - Express willingness to help
 - Ask about concerns or difficulties
 - Invite her to talk about her success
-

CAGE Questions

- Cut-down:** Have you ever felt you should cut down on your drinking?
 - Annoyed:** Have people annoyed you by criticizing your drinking?
 - Guilty:** Have you ever felt bad or guilty about your drinking?
 - Eye-opener:** Have you ever had a drink first thing in the morning (as an "eye opener") to steady your nerves or get rid of a hangover?
-

Opportunities to promote healthy brain development

- Screen for intimate partner violence
 - Screen for depression
 - Screen and refer for smoking, alcohol, drug use
-

9. Healthy Environment

Healthy Environments

- Home exposures
- Neighborhood exposures
- Work exposures

Detoxifying Your Home

Bedroom and Living Room

- Replace carpet with area rug or hardwood floor.
- Replace furniture made of pressed wood bonded with urea-formaldehyde resins with furniture made of solid wood or "exterior grade" pressed wood products.
- Replace foam mattress and couch with PBDE-free mattress and couch.
- Remove vinyl wallpaper and vinyl miniblinds which contain phthalates.
- Get rid of dust mites

Bathroom

- Get rid of antibacterial soap.
- Get rid of cosmetics, deodorants, shampoo, hair spray, lotion, and other personal care products with chemical additives.
- Avoid using air fresheners.
- Avoid using bleach, disinfectants, cleaning solutions, toilet bowl cleaners, and bathroom scouring powders containing chlorine.
- Get rid of molds and mildew.

Kitchen and Dining Room

- Get rid of toxic foods from your refrigerator, pantry, cabinet, and cupboard.
- Replace non-stick pans containing perfluorinated chemicals.
- Use plastic wrap and containers labeled "microwave safe." Avoid microwaving containers made from #3 (PVC) and #7 (polycarbonate) plastics.
- Keep your kitchen clean to avoid roaches and other pests.

Outdoors and Garage/Attic

- Avoid using pesticides on your lawn and garden.
- Keep pesticides, paint, and solvents in well ventilated areas in the attic or detached garage.
- Avoid using fabric softeners and detergents containing phthalates.

Opportunities to promote healthy brain development

- OSHA (Occupation Safety and Health Act)
- MSDS (Material Safety Data Sheet)
- OTIS (Organization of Teratology Information Services)
 - <http://www.ctispregnancy.org/>
 - 1-800-532-3749

10. Physical Assessment

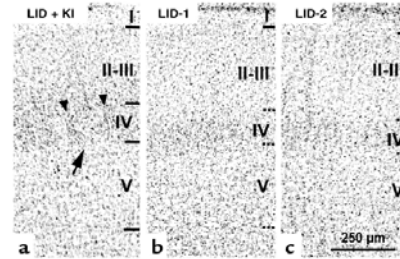
Content of Preconception Care Risk Assessment

- Laboratory tests
 - ✓ CBC
 - ✓ Type & screen
 - ✓ Rubella immunity
 - ✓ Hepatitis B surface antigen
 - ✓ HIV
 - ✓ VDRL
 - ✓ Urine testing
 - ✓ Pap smear
 - ✓ Cystic fibrosis
 - ✓ Thyroid stimulating hormone (TSH)
 - ✓ Glycosylated hemoglobin

Maternal Hypothyroidism & Fetal Brain Development

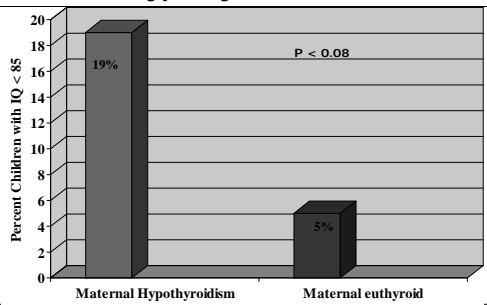
- Fetal thyroid active by 12 weeks
- Before 12 weeks the mother is the sole source of thyroid hormones
- Maternal hypothyroidism disrupts neuron migration
 - Lavado-Autric R, et al. Early maternal hypothyroxinemia alters histogenesis and cerebralCortex cytoarchitecture of the progeny. J Clin Invest 2003;111:1073-82.
- Maternal hypothyroidism alters expression of reelin-dab signaling system
 - Alvarez-Dolado M et al. Thyroid hormone regulates reelin and dab 1 expression during brain development. J Neurosci 1999;19:6979-93.

Maternal Hypothyroidism & Fetal Brain Development



Lavado-Autric R, et al. Early maternal hypothyroxinemia alters histogenesis and cerebral Cortex cytoarchitecture of the progeny. J Clin Invest 2003;111:1073-82.

Maternal Hypothyroidism & Child IQ



Haddow JE, Palomaki GE, Allan WC, et al. Maternal thyroid deficiency during pregnancy and Subsequent neuropsychological development of the child. N Engl J Med 1999;341:549-55.

Interconception Care

Case Study

- Woman with h/o preeclampsia x2

- The definition of insanity is doing the same thing over and over and expecting different results

Benjamin Franklin

□ "We must become the change we want to see."

- MOHANDAS GANDHI

