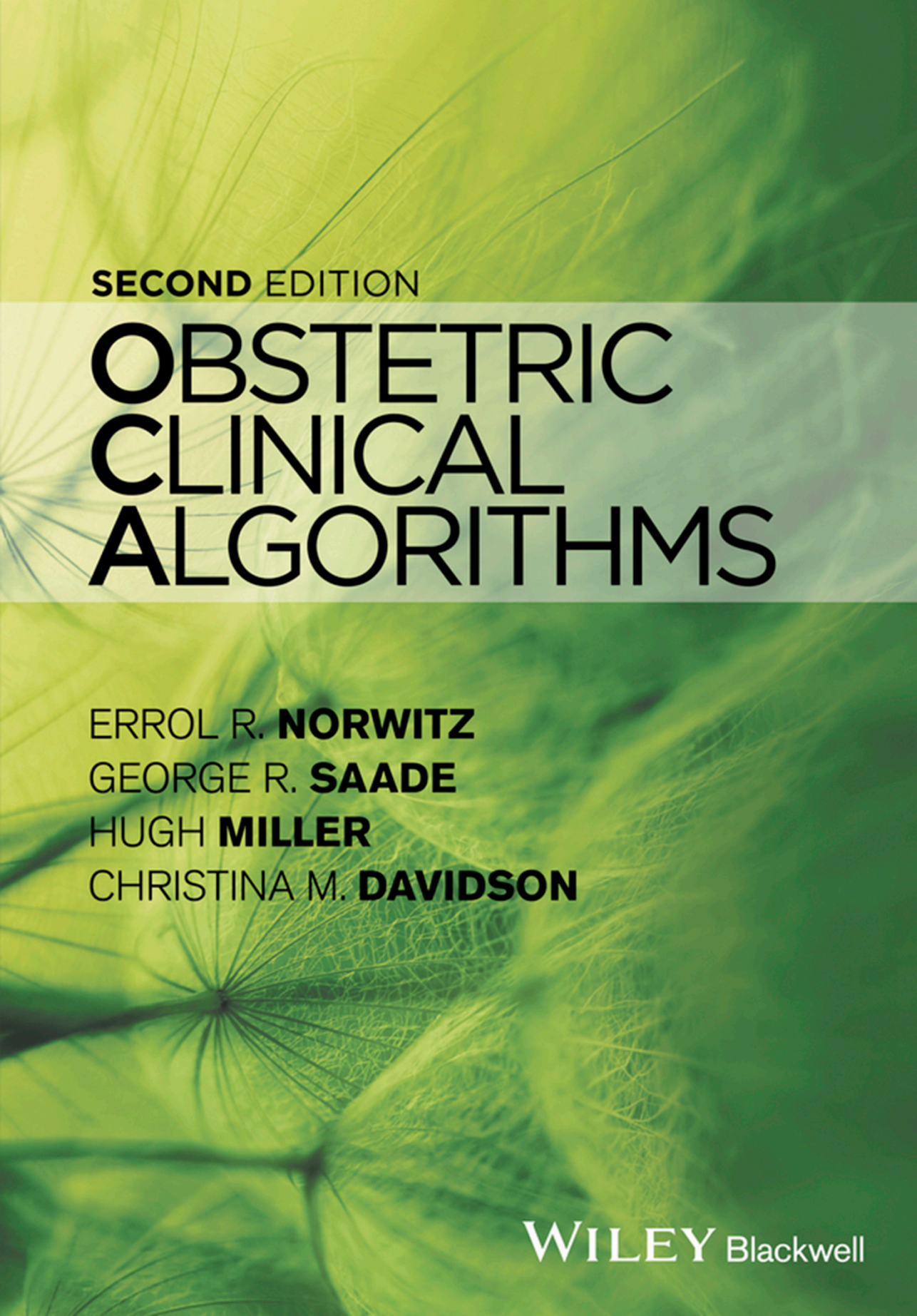
SECOND EDITION
OBSTETRIC CLINICAL ALGORITHMS
ERROL R. NORWITZ
GEORGE R. SAADE
HUGH MILLER
CHRISTINA M. DAVIDSON
WILEY Blackwell

Obstetric Clinical Algorithms

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Second Edition

Errol R. Norwitz, M.D., Ph.D., M.B.A.
Louis E. Phaneuf Professor of Obstetrics & Gynecology
Tufts University School of Medicine
Chairman., Department of Obstetrics & Gynecology
Tufts Medical Center
Boston, USA

George R. Saade, M.D.
University of Texas Medical Branch
Galveston, TX, USA

Hugh Miller, M.D.
Department of Obstetrics and Gynecology
University of Arizona
Tuscon, AZ, USA

Christina M. Davidson, M.D.
Baylor College of Medicine
Ben Taub Hospital
Houston, TX, USA

WILEY Blackwell

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Preface

Recent advances in obstetrical practice and research have resulted in significant improvements in maternal and perinatal outcome. Such improvements carry with them added responsibility for the obstetric care provider. The decision to embark on a particular course of management simply because "*that's the way we did it when I was in training*" or because "*it worked the last time I tried it*" is no longer acceptable. Clinical decisions should, wherever possible, be evidence-based. Evidence-based medicine can be defined as "*the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients*" [1]. In practice, evidence-based medicine requires expertise in retrieving, interpreting, and applying the results of scientific studies and in effectively communicating the risks and benefits of different courses of action to patients. This daunting task is compounded by the fact that the volume of medical literature is doubling every 10–15 years. Even within the relatively narrow field of Obstetrics & Gynecology, there are more than five major publications each month containing an excess of 100 original articles and 35 editorials. How then does a busy practitioner maintain a solid foundation of up-to-date knowledge and synthesize these data into individual management plans? New information can be gleaned from a variety of sources: the advice of colleagues and consultants, textbooks, lectures and continuing medical education courses, original research and review articles, and from published clinical guidelines and consensus statements. The internet has created an additional virtual dimension by allowing instant access to the medical literature to both providers and patients. It is with this background in mind that we have written *Obstetric Clinical Algorithms: Management and Evidence, 2nd edition*.

Standardization of management reduces medical errors and improves patient safety and obstetrical outcomes [2,3]. In this text, we have developed a series of obstetric algorithms based on best practice to mimic the decision-making processes that go on in our brains when faced with a vexing clinical problem. To further facilitate decision-making, we have superimposed "levels of evidence" as defined by the report of the US Preventive Services Task Force (USPSTF) of the Agency for Healthcare Research Quality, an independent panel of experts appointed and funded by the US government to systematically review evidence of effectiveness and develop recommendations for clinical preventive services [4]. The table below summarizes the 'levels of evidence' used in this text.

'Levels of Evidence' used in *Obstetric Clinical Algorithms: Management and Evidence, 2nd edition:*

Color key	Levels of evidence available on which to base recommendations*	Recommendation/ suggestions for practice
Red bold	**Level I/II-1**	**Definitely offer or provide this service**
Red regular	Level II-1/II-2	Consider offering or providing this service
Red italics	*Level II-2/III-3/III*	*Discuss this service, but insufficient evidence to strongly recommend it*
Black regular	Level II-3/III	Insufficient evidence to recommend this service, but may be a reasonable option

*Levels of evidence are based on the 'hierarchy of research design' used in the report of the 2nd US Preventive Services Task Force:

Level I: Evidence obtained from at least one properly powered and conducted randomized controlled trial (RCT); also includes well-conducted systematic review or meta-analysis of homogeneous RCTs.

Level II-1: Evidence obtained from well-designed controlled trials without randomization.

Level II-2: Evidence obtained from well-designed cohort or case-control analytic studies, preferably from more than one center or research group.

Level II-3: Evidence obtained from multiple time series with or without the intervention; dramatic results from uncontrolled trials might also be regarded as this type of evidence.

Level III: Opinions of respected authorities, based on clinical experience; descriptive studies or case reports; or reports of expert committees.

Obstetric care providers can be broadly divided into two philosophical camps: those who believe that everything possible should be offered in a given clinical setting in the hope that something may help (also called the "*we don't have all the information we need*" or "*might as well give it, it won't do any harm*" group) and those who hold out until there is consistent and compelling scientific evidence that an individual course of action is beneficial and has a favorable risk-to-benefit ratio (sometimes referred to as "*therapeutic nihilists*"). As protagonists of the latter camp, we argue that substantial harm can be done—both to individual patients and to society as a whole—by implementing management plans that have not been the subject of rigorous scientific investigation followed by thoughtful introduction into clinical practice. In *Obstetric Clinical Algorithms: Management and Evidence*, 2nd edition, we provide evidence-based management recommendations for common obstetrical conditions. It is the sincere hope of the authors that the reader will find this book both practical and informative. However, individual clinical decisions should not be based on medical algorithms alone, but should be guided also by provider experience and judgment.

Errol R. Norwitz
George R. Saade
Hugh Miller
Christina M. Davidson

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List of Abbreviations

ABG	arterial blood gas
AC	abdominal circumference
ACA	anticardiolipin antibody
ACE	angiotensin-converting enzyme
ACIP	Advisory Committee on Immunization Practices
ACOG	American College of Obstetricians and Gynecologists
AED	antiepileptic drug
AED	automated external defibrillator
AFE	amniotic fluid embolism
AFI	Amniotic Fluid Index
AGA	appropriate for gestational age
AGC	atypical glandular cells
AHA	American Heart Association
AIDS	acquired immune deficiency syndrome
AIS	adenocarcinoma in situ
AMA	advanced maternal age
ANA	antinuclear antibodies
APLAS	antiphospholipid antibody syndrome
ARB	angiotensin receptor blockers
ARDS	acute respiratory distress syndrome
ART	assisted reproductive technology
ART	antiretroviral therapy
ARV	antiretroviral
ASCUS	atypical squamous cells of undetermined significance
ATP	alloimmune thrombocytopenia
AZT	azidothymidine
BCG	Bacillus Calmette-Guérin
BMI	body mass index
BP	blood pressure
BPD	biparietal diameter
BPP	biophysical profile
BUN	blood urea nitrogen
BV	bacterial vaginosis
CAOS	chronic abruption-oligohydramnios sequence
CBC	complete blood count
CDC	Centers for Disease Control and Prevention in the U.S.
CFU	colony-forming units
CI	cervical insufficiency
CL	cervical length
CMV	cytomegalovirus
CO	cardiac output
CPD	cephalopelvic disproportion
CST	contraction stress test
CT	computed tomography
CTG	cardiotocography
CVS	chorionic villous sampling
CXR	chest radiograph
DCIS	ductal carcinoma in situ
DES	diethylstilbestrol
DIC	disseminated intravascular coagulopathy
DKA	diabetic ketoacidosis
DVT	deep vein thrombosis
ECC	endocervical curettage
ECG	electrocardiography
ECT	electroconvulsant therapy
ECV	external cephalic version
EDD	estimated date of delivery
EFM	electronic fetal monitoring
EFW	estimated fetal weight
ELISA	enzyme-linked immunosorbant assay
EMB	endometrial biopsy
FEV1	forced expiratory volume in one second
fFN	fetal fibronectin
FFP	fresh frozen plasma

FL	femur length
FSE	fetal scalp electrode
FTA-ABS	fluorescent treponemal antibody absorption
FVC	forced vital capacity
GBS	Group B β-hemolytic streptococcus
GCT	glucose challenge test
GDM	gestational diabetes mellitus
GFR	glomerular filtration rate
GLT	glucose load test
GTT	glucose tolerance test
HBsAb	anti-hepatitis B surface antibodies
HBsAg	hepatitis B surface antigen
HBIg	hepatitis B immunoglobulin
HBV	hepatitis B virus
HC	head circumference
hCG	human chorionic gonadotropin
HEG	hyperemesis gravidarum
HELLP	hemolysis, elevated liver enzymes, low platelets
HGSIL	high-grade squamous intraepithelial lesions
HIE	hypoxic ischemic encephalopathy
HIV	human immunodeficiency virus
HPV	human papilloma virus
HSV	herpes simplex virus
IAI	intraamniotic infection
ICP	intrahepatic cholestasis of pregnancy
ICU	intensive care unit
IgA	immunoglobulin A
IgG	immunoglobulin G
IGRA	interferon gamma release assay
INH	isoniazid
IOL	induction of labor
IOM	Institute of Medicine
ITP	immune thrombocytopenic purpura
IUFD	intrauterine fetal demise
IUGR	intrauterine growth restriction
IUPC	intrauterine pressure catheter
IV	intravenous
IVIG	intravenous immune globulin
LAC	lupus anticoagulant
LEEP	loop electrosurgical excision procedure
LFT	liver function test
LGA	large-for-gestational age
LGSIL	low-grade squamous intraepithelial lesions
LMP	last menstrual period
LMWH	low molecular weight heparin
LTL	laparoscopic tubal ligation
MCA	middle cerebral artery
MDI	metered dose inhaler
MFM	maternal-fetal medicine
MFPR	multifetal pregnancy reduction
MHA-TP	microhemagglutination assay for antibodies to *T. pallidum*
MoM	multiples of the median
MRCP MR	cholangiopancreatography
MRI	magnetic resonance imaging
MS-AFP	maternal serum α-fetoprotein
MTX	methotrexate
NIDDM	non-insulin-dependent diabetes mellitus
NIPT	noninvasive prenatal testing
NR-NST	non-reactive NST
NSAIDs	non-steroidal anti-inflammatory drugs
NST	non-stress testing
NT	nuchal translucency
NTD	neural tube defect
NVP	nausea and vomiting in pregnancy
OCT	oxytocin challenge test
OST	oxytocin stimulation test
PCOS	polycystic ovarian syndrome
PCP	*pneumocystis carinii* pneumonia
PCR	polymerase chain reaction
PE	pulmonary embolism
PEFR	peak expiratory flow rate
PKU	phenylketonuria
po	per os (orally)
POC	products of conception
PPD	purified protein derivative
PPH	postpartum hemorrhage
pPROM	preterm PROM
PRBC	packed red blood cell
PROM	premature rupture of membranes
PTT	partial thromboplastin time
PTU	propylthiouracil

PUBS percutaneous umbilical blood sampling
q every
QFT-GIT QuantiFERON®-TB Gold In-Tube test
RhoGAM anti-Rh[D]-immunoglobulin
R-NST reactive NST
RPL recurrent pregnancy loss
RPR rapid plasma reagin
SC subcuticular
SGA small for gestational age
SIADH syndrome of inappropriate ADH secretion
SLE systemic lupus erythematosus
SMA spinal muscular atrophy
SSI surgical site infection
STI sexually transmitted infection
TB tuberculosis
TBG thyroxine-binding globulin
TFT thyroid function test
TORCH toxoplasmosis, rubella, cytomegalovirus, herpes
TPPA *T. pallidum* particle agglutination assay
TRAP twin reverse arterial perfusion
TST tuberculin skin testing
TTP/HUS thrombotic thrombocytopenic purpura/hemolytic uremic syndrome
TTTS twin-to-twin transfusion syndrome
UA C&S urine culture and sensitivity
UDCA ursodeoxycholic acid
UFH unfractionated heparin
UTI urinary tract infection
VAS vibroacoustic stimulation
VBAC vaginal birth after cesarean
VDRL Venereal Disease Research Laboratory
VL viral load
V/Q ventilation-perfusion
VTE venous thromboembolism
ZDV zidovudine

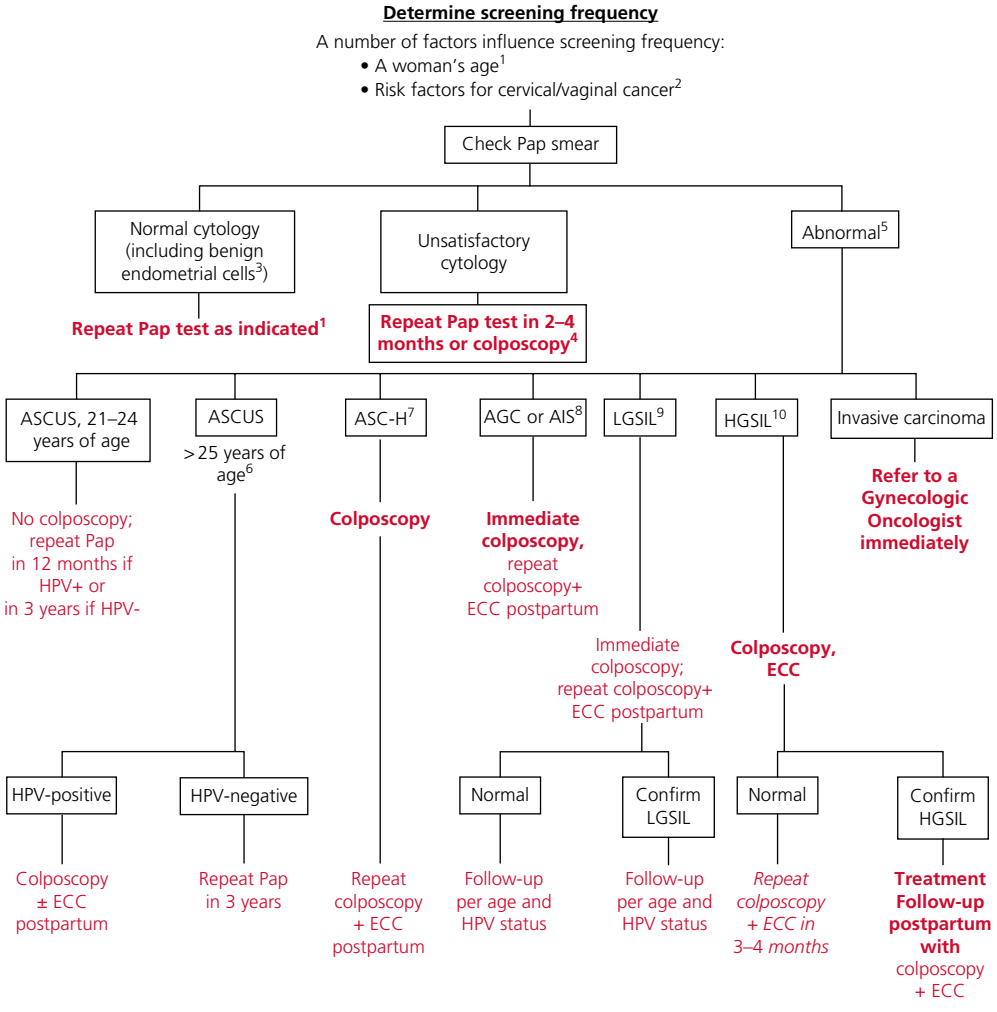
SECTION 1
Preventative Health

Levels of evidence

The levels of evidence used in this book are those recommended by the U.S. Preventive Services Task Force, an independent panel of experts responsible for developing evidence-based recommendations for primary care and prevention, in 2007 (http://www.ahrq.gov/clinic/uspstmeth.htm):

Level I: Evidence obtained from at least one properly designed randomized controlled trial.
Level II: Evidence obtained from controlled trials without randomization or cohort / case-controlled studies that include a comparison group.
Level III: Evidence from uncontrolled descriptive studies (including case series) or opinions of respected authorities or expert committees.
Level IV: Evidence from uncontrolled descriptive studies (including case series) or opinions of respected authorities or expert committees.

1 Abnormal Pap Smear in Pregnancy



1. Recommendations for screening and management of abnormal cervical cytology in pregnancy follow from the general guidelines for screening onset and frequency that were updated in 2012 to reflect the recommendations of the American Cancer Society ACOG, and U.S. Preventive Services Task Force for detection of cervical cancer. Routine pap screening should **not** be collected until age 21 regardless of first vaginal intercourse. The risk of severe dysplasia or cancer

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is very low among adolescents, but they should be encouraged to receive human papilloma virus (HPV) vaccination and counseled about safe sex practices to limit exposure to sexually transmitted infections. Women between the age of 21–29 years should be screened with cervical cytology alone. Women >30 years of age should be screened with cytology and HPV testing every 5 years (or with cytology alone every 3 years). Women with a history of cervical cancer, HIV or other risk factors (such as immunocompromise) should continue annual screening. These guidelines and the associated algorithm are based on a large database of patients including adolescents who were managed using former criteria in the Kaiser Healthcare system. The American Society of Colposcopy and Cervical Pathology (ASCCP) has developed an updated free App that can assist with the current recommendations.

2. Women who have risk factors for cervical/vaginal cancer (such as a history of *in utero* diethylstilbestrol (DES) exposure, HIV, women who are immunocompromised, or those on chronic steroids) should be screened annually.

3. Women aged 21–29 with normal cytology but absent or insufficient endocervical–transformation zone elements can continue regular screening, which should not include HPV testing. In women ≥30 years with a similar cytology result, HPV testing is recommended. Positive HPV results should prompt repeat co-testing in one year, unless the HPV genotype is known to be 16 or 18, in which case, immediate colposcopy is recommended. A negative HPV result in a woman ≥30 years means that she can go back to routine screening.

4. Unsatisfactory cytology is less common in current practice with the use of liquid-based media for cervical screening. Insufficient squamous cells to detect epithelial abnormalities generally arise from blood or inflammation that obscures the result. Repeat cytology is recommended in 2–4 months. Colposcopy can be considered in women >30 years with positive HPV, and is recommended in those women who have had two consecutive unsatisfactory cytology test results.

5. Women should always be informed of an abnormal Pap result by her physician or another healthcare professional who can answer basic questions and allay anxiety. Verbal notification should be followed with written information and clear recommendations for follow-up. Additionally, if there is evidence of infection along with cellular abnormalities, the infection should be treated.

6. The 2012 criteria substantially clarify the management of ASCUS, which is guided by HPV test results whether obtained reflexively or as a co-test. The management in pregnancy differs only in that colposcopy and endocervical curettage (ECC) should be deferred until 6 weeks postpartum unless a CIN 2+ lesion is suspected. Women ≥25 years old with a negative HPV test should be returned to a regular three-year follow-up cycle. Following pregnancy colposcopy is recommended in women who are HPV+ with annual co-test follow-up. Similarly, an endocervical curettage (ECC) should be obtained whenever possible and excisional procedures should be avoided to prevent over-treatment. In women 21–24 years old, cytology should be repeated in one year. A positive HPV result does not change the recommended follow-up, but a negative result should return the woman to a three-year follow-up cycle.

7. Atypical squamous cells cannot exclude high-grade squamous intraepithelial lesions (HSIL) (ASC-H), which is associated with a higher risk of CIN 3+ regardless of patient age and a five-year invasive cancer risk of 2% regardless of HPV status. That said, HPV is highly correlated with ASC-H, but the cancer risk demands that all women receive immediate colposcopy, including those 21–24 years of age. Colposcopy with directed biopsies of any area that might be concerning for micro invasion

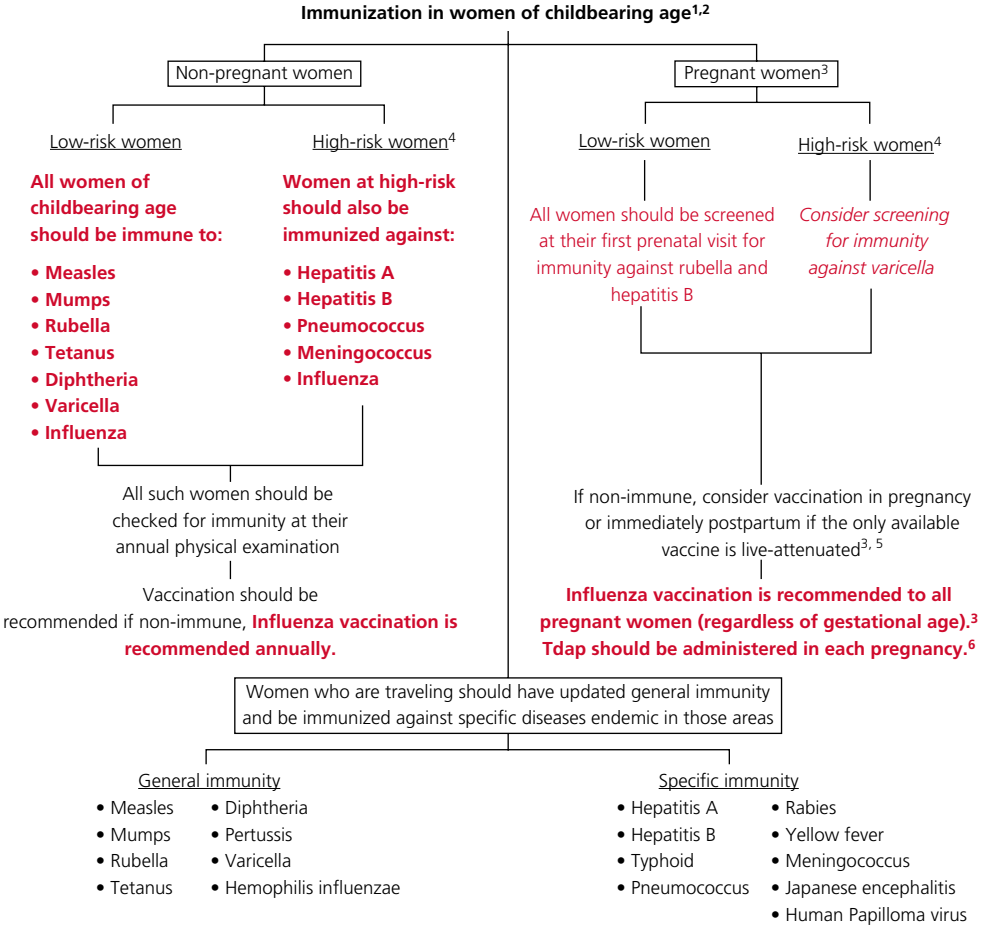
should be done by a highly trained clinician. Treatment should be dictated by histologic evaluation of the biopsied lesions.

8. Atypical glandular cells (AGC) or adenocarcinoma in situ (AIS) warrant aggressive investigation and close follow-up. Although the risk of cancer is lower in younger age groups, women ≥30 years have a 9% risk of CIN3+ and 2% risk of invasive cancer. All such women of all ages should have antenatal colposcopy with 6-weeks postpartum follow-up to include colposcopy, ECC and endometrial biopsy (EMB). Subsequent treatment and follow-up are dictated by the biopsy results, maternal age, and the histologic evaluation of the glandular elements.

9. Approximately 60% of low-grade squamous intraepithelial lesions (LGSIL) will regress spontaneously without treatment depending on the age of the patient, HPV status, and HPV genotype. For women ≥25 years old in whom HPV testing is negative, repeat co-testing in ome year is preferred but colposcopy is acceptable. However, if the HPV is positive, then colposcopy is preferred. If colposcopy is not part of the initial evaluation, subsequent co-testing needs to be entirely normal to allow patients to return to three-year follow-up. Any abnormality at the one-year follow-up visit should result in colposcopy. In women 21–24 years old, annual repeat cytology without HPV testing is preferred and colposcopy should be avoided unless the results recur for two consecutive years or if one of the following lesions is detected: ASC-H, AGC, or HSIL. Pregnant women ≥25 years old with low-grade squamous intraepithelial lesions should undergo immediate colposcopy without ECC, while those 21–24 years old should be evaluated postpartum.

10. High-grade squamous intraepithelial lesions (HGSIL) are associated with a 60% risk of CIN2+ and a 2% risk of invasive cervical cancer. Immediate colposcopy with directed biopsies of any area that might be concerning for micro invasion is recommended, regardless of maternal age. The antepartum diagnosed of HGSIL should prompt a 6-weeks postpartum follow-up colposcopy with ECC and treatment as dictated by the biopsy results. If diagnosed early in pregnancy, colposcopy can be repeated every 12 weeks. Treatment during pregnancy should be reserved for invasive carcinoma and should be managed in concert with a gynecologic oncologist.

2 Immunization



1. Immunization can be active (vaccines, toxoid) or passive (immunoglobulin, antiserum/antitoxin). In *active immunity*, the immune response is induced by wild infection or vaccination, which is generally robust and long-lasting. As such, subsequent exposure to the vaccine-preventable infection will result in the release of antibodies and the prevention of illness. In *passive immunity*, antibodies are acquired passively through maternal transfer across the placenta or breast milk or through the receipt of exogenous immunoglobulins. Protection is temporary and fades within a few weeks to months. The immune system of the recipient is

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therefore not programmed, and subsequent exposure to vaccine-preventable infections can lead to active infection.

2. *Vaccination* works by inducing antibodies in recipients that protects them against infection after future exposure to specific disease-causing microbes. The level of protection varies according to the strength and durability of the immune response induced by the vaccine as well as the virulence, prevalence, and ease of transmission of the infection itself. Vaccination programs may have different goals: (i) to protect at-risk individuals (e.g., meningococcal disease); (ii) to establish control by minimizing the overall prevalence of the infection (e.g., measles, varicella); or (iii) to attain global elimination of an infection (e.g., neonatal tetanus, polio).

3. Vaccination in pregnancy is of benefit and at times poses concern relative to the increased vulnerability of the mother and fetus. Inactivated vaccines are approved for use in pregnancy. The inactivated influenza vaccine should be given to **all pregnant women** during the influenza season (October through May in the northern hemisphere), regardless of gestational age. It is clear that there are significant maternal benefits including fewer cases of fever and respiratory illness and substantial neonatal protection through the transplacental passage of antibodies that provide months of protection at a time when the infant is vulnerable and could not be directly vaccinated. However, live-attenuated vaccines (including rubella, MMR, varicella) are not recommended for pregnant women despite the fact that no cases of congenital anomalies have been documented. Exceptions include yellow fever and polio, which can be given to pregnant women when traveling to high prevalence areas. In addition, women should be advised not to get pregnant within 1 month of receiving a live-attenuated vaccine. The live-attenuated influenza vaccine is available as an intranasal spray, which is considered safe in the postpartum period. Vaccines considered safe in pregnancy include tetanus, diphtheria, hepatitis B, and influenza. Tetanus immunization during pregnancy is a common strategy used in the developing world to combat neonatal tetanus

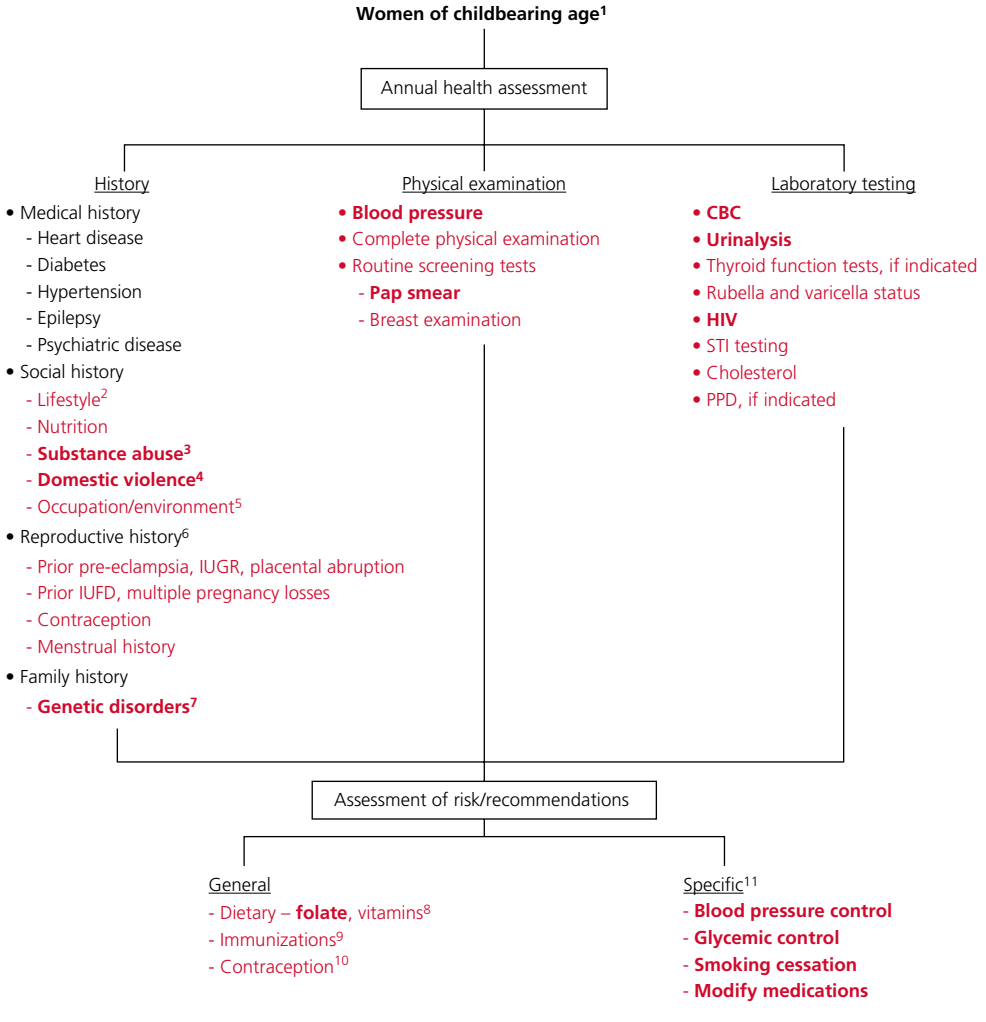
4. Risk factors for specific vaccine-preventable illnesses include:
- illicit drug users (hepatitis A and B, tetanus)
- men who have sex with men (hepatitis A) or >1 sexual partner in the past 6 months (hepatitis A, human papilloma virus)
- travel to or immigration from areas where infection is endemic (hepatitis A and B, measles, meningococcus, rubella, tetanus, varicella)
- healthcare workers (hepatitis B, influenza, varicella)
- nursing home residents (meningococcus, pneumococcus, varicella) or ≥50 years of age (influenza)
- chronic medical diseases: diabetes, asthma, HIV, liver disease and/or renal disease (hepatitis A, influenza, pneumococcus)
- adults who have had their spleens removed (meningococcus, pneumococcus)
- accidental or intentional puncture wounds (tetanus)

5. One of the ongoing controversies about vaccination in pregnancy is whether vaccines containing thimerosal pose a risk to the fetus. Thimerosal is a mercury-containing preservative that has been used in multidose vaccines since the 1930s. Although there has been concern about the cumulative levels of mercury, the current scientific evidence does not consider thimerosal to be associated with adverse outcomes in children exposed in utero. The Centers for Disease Control and Prevention's Advisory Committee on Immunization Practices (ACIP) does not recommend avoiding thimerosal containing vaccines. Although the ACIP does not recommend any specific formulation, there are newer trivalent and quadrivalent influenza vaccines (containing two A and two B influenza strains) that are available for use. The following

adult vaccines are thimerosal-free: Tdap (but not Td), Recombivax hepatitis B vaccine (but not Engerix-B), and some influenza vaccines (Fluzone with no thimerosal).

6. Tetanus toxoid, reduced diphtheria toxoid and acellular pertussis vaccine (Tdap) may be given at any time of pregnancy or the postpartum period but ideally is administered between 27–36 weeks to confer the best passive immunity through the transfer of antibodies to the fetus. This recommendation has developed to address the significant impact of pertussis disease in the newborn.

3 Preconception Care



1. Fetal organogenesis occurs before most women are aware that they are pregnant. As such, the ideal time for addressing primary prevention of reproductive health risks is in the preconception period. Since approximately half of all pregnancies in the United States are unplanned, all women of reproductive age should be considered candidates for discussion of these issues.

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2. Discuss social, financial, and psychological issues in preparation for pregnancy.

3. Maternal alcohol use is the leading known cause of congenital mental retardation and is the leading preventable cause of birth defects in the Western world. An accurate drinking history is best elicited using a tool that employs standardized screening questions (such as the CAGE questionnaire). The adverse effects of alcohol may be compounded with abuse of other drugs. Cigarette smoking, cocaine, and other drug use should be included in the history. Patients at risk should be provided education, contraceptive counselling, and referral for treatment as necessary.

4. Screen for domestic violence. Be aware of available state and local resources and state laws regarding mandatory reporting. Risk increases with pregnancy. Domestic violence is not isolated to any particular risk group in pregnancy; it cuts across socio-economic and ethnic lines.

5. Take an occupational history that will allow assessment of workplace risks to the pregnancy. Elicit information about any exposures to hazardous materials or biologic hazards (HIV, cytomegalovirus (CMV), toxoplasmosis) and review the use of safety equipment. Talk to patients about the appropriate and correct use of seat belts while in a moving vehicle.

6. Counsel patients with a history of preeclampsia, placental abruption, unexplained fetal death, or severe intrauterine growth restriction (IUGR) about the risks of recurrence. Low-dose aspirin starting at the end of the first trimester is recommended to prevent recurrent preeclampsia. The use of low-dose aspirin, calcium supplementation, and/or anticoagulation for women with documented inherited thrombophilias to prevent adverse pregnancy outcome is controversial, and cannot be routinely recommended.

7. Personal and family histories should be examined for evidence of genetic diseases. Genetic testing is available to determine a patient's carrier status for some autosomal recessive conditions such as Tay–Sachs, Canavan disease, sickle cell disease, and the thalassemias. Consider referral for further genetic counselling if patients are at high risk. ACOG currently recommends that all couples be offered prenatal testing for cystic fibrosis. ACMG (but not ACOG) recommends that all couples also be offered genetic testing for spinal muscular atrophy (SMA).

8. Emphasize the importance of nutrition. Assess appropriateness of patient's weight for height, special diets and nutrition patterns such as vegetarianism, fasting, pica, bulimia, and vitamin supplementation. Recommend folic acid supplementation as necessary: 0.4 mg per day for all pregnant women or women considering pregnancy, 4.0 mg per day if the woman has a personal/family history of a child with a neural tube defect or is on anticonvulsant medications (especially valproic acid). Counsel to avoid oversupplementation (such as vitamin A). Review the recommendations on dietary fish ingestion (<12 ounces per week of cooked fish) to minimize mercury intake, and steps for prevention of listeriosis (avoiding raw or undercooked meat/fish, unpasteurized milk and soft cheeses, unwashed fruit and vegetables) and toxoplasmosis (exposure to cat feces).

9. A thorough immunization history should be obtained that addresses vaccination. Women should be tested for immunity to rubella and vaccinated prior to pregnancy if not immune. Women without a history of chickenpox (varicella) should be tested and offered vaccination prior to pregnancy. Hepatitis B vaccination should be offered to all women at high risk, and screening for other sexually transmitted infections should be offered as needed. The U.S. Centers for Disease Control and Prevention (CDC) recommends that pregnancy be delayed for at least 1 month after receiving a live-attenuated vaccine

(such as MMR, varicella, live-attenuated influenza, BCG).

10. Discuss birth spacing and the options available for postpartum contraception.

11. Effects of the pregnancy on any medical conditions for both mother and fetus should be discussed. Pregnancy outcomes can be improved by optimizing control of chronic medical conditions prior to pregnancy (such as glycemic control in patients with diabetes and blood pressure control in patients with hypertension). Medications should be reviewed, and patients counselled regarding alternatives that may be safer in pregnancy. Close communication with the patient's primary care and subspecialty physicians should always be maintained.

4 Prenatal Care[1]

Obstetric Clinical Algorithms, Second Edition. Errol R. Norwitz, George R. Saade, Hugh Miller and Christina M. Davidson.

1. The goal of prenatal care is to promote the health and well-being of the pregnant woman, fetus, infant, and family up to 1 year after birth. To achieve these aims, prenatal care must be available and accessible. The three major components are: (i) early and continuing risk assessment, including preconception assessment (see Chapter 3, Preconception Care); (ii) continued health promotion; and (iii) both medical and psychosocial assessment and intervention.

2. Routine prenatal tests that should be completed for all pregnant women include complete blood count (CBC), blood group type and screen (Rh status), rubella serology, HIV, hepatitis B, syphilis serology (VDRL/RPR), Pap smear, cystic fibrosis (CF) carrier status, chlamydia/gonorrhea cultures, and urine culture and sensitivity (UA C&S).

3. Approximately 20% (1 in 5) of pregnancies are considered high risk. Risk factors for adverse pregnancy outcome may exist prior to pregnancy or develop during pregnancy or even during labor (examples are listed below, although this list should not be regarded as comprehensive).

4. The frequency and timing of prenatal visits will vary depending on the risk status of the pregnant woman and her fetus. In low-risk women, prenatal visits are typically recommended q 4 weeks to 28 weeks, q 2 weeks to 36 weeks, and then weekly until delivery.

5. See Chapter 12 (Preeclampsia).

6. See Chapter 53 (Prenatal diagnosis).

7. See Chapter 10 (Gestational diabetes mellitus)

8. See Chapter 24 (GBS)

9. See Chapter 55 (Screening for preterm birth)

High-Risk Pregnancies

Maternal factors

- Pre-existing medical conditions (diabetes, chronic hypertension, cardiac disease, renal disease, pulmonary disease)
- Preeclampsia
- Gestational diabetes
- Morbid obesity
- Extremes of maternal age
- Active venous thromboembolic disease
- Poor obstetric history (prior preterm birth, preterm PROM, stillbirth, IUGR, placental abruption, preeclampsia, recurrent miscarriage)

Fetal factors

- Fetal structural or chromosomal anomaly
- History of a prior baby with a structural or chromosomal anomaly
- Family or personal history of a genetic syndrome
- Toxic exposure (to environmental toxins, medications, illicit drugs)
- IUGR
- Fetal macrosomia
- Multiple pregnancy (esp. if monochorionic)
- Isoimmunization
- Intra-amniotic infection (chorioamnionitis)
- Nonreassuring fetal testing

Uteroplacental factors

- Preterm premature rupture of membranes
- Unexplained oligohydramnios
- Large uterine fibroids (esp. if submucosal)
- Prior cervical insufficiency
- Prior uterine surgery (especially prior "classic" hysterotomy)
- Placental abruption
- Placenta previa
- Uterine anomaly (didelphys, septate)
- Abnormal placentation (placenta accreta, increta or percreta)
- Vasa previa

SECTION 2
Maternal Disorders

Levels of evidence

The levels of evidence used in this book are those recommended by the U.S. Preventive Services Task Force, an independent panel of experts responsible for developing evidence-based recommendations for primary care and prevention, in 2007 (http://www.ahrq.gov/clinic/uspstmeth.htm):

Level I: Evidence obtained from at least one properly designed randomized controlled trial.
Level II: Evidence obtained from controlled trials without randomization or cohort / case-controlled studies that include a comparison group.
Level III: Evidence from uncontrolled descriptive studies (including case series) or opinions of respected authorities or expert committees.
Level IV: Evidence from uncontrolled descriptive studies (including case series) or opinions of respected authorities or expert committees.