Basic Standards for Fellowship Training in Maternal Fetal Medicine

American Osteopathic Association
and
American College of Osteopathic Obstetricians & Gynecologists

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BASIC STANDARDS FOR FELLOWSHIP TRAINING IN MATERNAL FETAL MEDICINE

ARTICLE I - INTRODUCTION
These are the basic standards for fellowship training in maternal fetal medicine as approved by the American Osteopathic Association and developed by the American College of Osteopathic Obstetricians and Gynecologists. These standards are designed to provide the osteopathic fellow with advanced and concentrated training in maternal fetal medicine and to prepare the fellow for examination for certification in maternal fetal medicine by the American Osteopathic Board of Obstetrics and Gynecology (AOBOG).

ARTICLE II – MISSION
The mission of the osteopathic Maternal Fetal Medicine fellowship program is to provide fellows with comprehensive structured cognitive and clinical education that will enable them to become competent, proficient and professional osteopathic specialists in Maternal Fetal Medicine.

ARTICLE III – EDUCATIONAL PROGRAM GOALS
The fellowship program is required to provide a curriculum that promotes and assesses competencies in the following seven areas in the discipline of Maternal Fetal Medicine.

1. **Osteopathic Philosophy and Osteopathic Manipulative Treatment**
   Fellows are expected to demonstrate and apply knowledge of accepted standards in osteopathic manipulative treatment (OMT) in the discipline of maternal fetal medicine. The educational goal is to train a skilled and competent osteopathic practitioner who remains dedicated to life-long learning and to practice habits in osteopathic philosophy and manipulative medicine.

2. **Medical Knowledge**
   Fellows must demonstrate and apply integrative knowledge of accepted standards of clinical medicine and osteopathic principles and practice (OPP) in the discipline of maternal fetal medicine, remain current with new developments in medicine, and participate in life-long learning activities, including research.
   a. Demonstrate competency in the understanding and application of clinical medicine to osteopathic patient care.
   b. Know and apply the foundations of clinical and behavioral medicine in the discipline of maternal fetal medicine with application of osteopathic correlations.

3. **Osteopathic Patient Care**
   Osteopathic fellows must demonstrate the ability to treat patients, provide medical care that incorporates the osteopathic philosophy, patient empathy, awareness of behavioral issues, the incorporation of preventive medicine and health promotion.
   a. Gather accurate, essential information for all sources, including medical interviews, osteopathic physical and structural examinations as indicated, medical records, and diagnostic/therapeutic plans and treatments.
   b. Validate competency in the performance of diagnosis, osteopathic and other treatment and procedures in the discipline of maternal fetal medicine.
   c. Provide health care services consistent with osteopathic philosophy, including preventative medicine and health promotion based on current scientific evidence.

4. **Interpersonal and Communication Skills in Osteopathic Medical Practice**
Fellows are expected to demonstrate interpersonal and communication skills that enable them to establish and maintain professional relationships with patients, families, and other members of health care teams.

a. Demonstrate effectiveness in developing doctor-patient relationships.
b. Exhibit listening, written and oral communication skills in professional interactions with patients, families and other health professionals.

5. **Professionalism in Osteopathic Medical Practice**

Fellows are expected to uphold the Osteopathic Oath in the conduct of their professional activities that promote advocacy of patient welfare, adherence to ethical principles, collaboration with health professionals, life-long learning, and sensitivity to a diverse patient population. Fellows should be cognizant of their own physical and mental health in order to effectively care for patients.

a. Demonstrate respect for patients and families and advocate for the primacy of patient’s welfare and autonomy.
b. Adhere to ethical principles in the practice of osteopathic medicine.
c. Demonstrate awareness and proper attention to issues of culture, religion, age, gender, sexual orientation, and mental and physical disabilities.
d. Demonstrate awareness of one’s mental and physical health.

6. **Osteopathic Medical Practice-Based Learning and Improvement**

Fellows must demonstrate the ability to critically evaluate their methods of clinical practice, integrate evidence-based traditional and osteopathic medical principles into patient care, show an understanding of research methods, and improve patient care practices.

a. Treat patients in a manner consistent with the most up-to-date information on diagnostic and therapeutic effectiveness (traditional and osteopathic)
c. Understand research methods, medical informatics, and the application of technology as applied to medicine.

7. **Systems-Based Osteopathic Medical Practice**

Fellows are expected to demonstrate an understanding of health care delivery systems, provide qualitative osteopathic patient care within the system, and practice cost-effective medicine.

a. Understand national and local health care delivery systems and medical societies and how they affect patient care, professional practice and relate to advocacy.
b. Advocate for quality health care on behalf of patients and assist them in their interactions with the complexities of the medical system.

ARTICLE IV - INSTITUTIONAL REQUIREMENTS

A. The institution must have an organized division of maternal fetal medicine.

B. The institution must provide exposure to provide volume of major maternal fetal medicine cases of scope and variety to train a minimum of two fellows.

C. The primary institution must have designated inpatient and outpatient facilities that include:

   1. Ultrasound imaging with fetal diagnostic and therapy facilities
2. Support personnel for care of the mother, fetus and neonate
3. Equipped labor and delivery unit
4. Facilities for antepartum and postpartum hospitalization
5. Intensive care nursery

ARTICLE V- PROGRAM REQUIREMENTS AND CONTENT

A. The fellowship training program in maternal fetal medicine shall be thirty-six (36) months in
duration. A minimum of twenty-four (24) months is required for clinical MFM and a minimum
of six (6) months is required for research. The remaining six (6) months may be tailored to
electives or be focused in a specific clinical or research area at the discretion of the program
director.

B. Graduate education programs in MFM should be developed along the following guidelines to
ensure a clinical and research experience consistent with the educational objectives of the Guide
to Learning in Maternal Fetal Medicine (reprinted in Appendix II).

The curriculum in Maternal Fetal Medicine shall include the following:

1. Didactic training in the endocrinology, physiology and biochemistry of pregnancy.
2. Didactic training in embryology, pharmacology and pathology pertinent to complicated
   pregnancies.
3. Didactic and clinical training in genetics, prenatal diagnosis and teratology.
4. Didactic and clinical training in medical, surgical, infectious and obstetrical complications
   of pregnancy.
5. Didactic and clinical training in surgical and invasive procedures common to the practice
   of Maternal Fetal Medicine.
6. Osteopathic principles, philosophy and practices shall be integrated into the above training.
7. There shall be a postgraduate course in statistics relative to the gathering, dissemination
   and interpretation of biomedical information.
8. A second postgraduate course relating to biomedical information and dissemination shall
   be required (examples: computer science in biomedical data gathering, thesis preparation,
   health care administration) to enable the fellow to integrate his/her skills into the present
day medical health care system. Subspecialty fellows that have already completed a
graduate level course in statistics and other such courses may, at the discretion of the
program director, and upon approval of PESC during the first year of training, satisfy
this requirement by;
   a. Taking additional graduate level courses pertinent to the subspecialty of MFM, or
   b. Using this protected time for the performance of the pertinent research related to
      the training program, or
   c. Using this protected time for the acquisition of clinical skills pertinent to the
      subspecialty training program
9. Research projects must be developed either within the department or in collaboration with
other academic departments. The portion of each fellow’s education devoted to research
must ultimately result in a scientific paper that may be worthy of publication in a peer-
reviewed journal. It is expected that fellows will acquire a thorough knowledge and
understanding of the methodologies and analyses used in research protocols that relate to research in their area of study. An in-depth understanding of the statistical analysis of research projects is mandatory.

**ARTICLE VI - PROGRAM DIRECTOR / FACULTY**

A. Qualifications

1. The program director must be certified in maternal fetal medicine by the American Osteopathic Association, through the American Osteopathic Board of Obstetrics and Gynecology.

B. Responsibilities

1. The program shall submit an annual report on each fellow to the director of medical education of the institution and to the American College of Osteopathic Obstetricians and Gynecologists. These reports shall cover the fellow's progress, acceptability as a prospective specialist and other factors pertinent to the continuance of training.

2. The program director shall be a member in good standing of the American College of Osteopathic Obstetricians and Gynecologists. The program director shall endeavor at all times to set a benchmark of professional behavior consistent with, or exceeding, the code of ethics of the ACOOG and the AOA.

3. The program director shall keep the ACOOG advised at all times of a responsive e-mail address.

4. The program director shall annually retrieve his/her evaluation of the program director and the program faculty summary as performed by the fellows within sixty (60) days of the end of each training year and assure that these evaluations are reviewed annually with the director of medical education.

5. The fellowship program director must provide evidence of strong scholarly activity and productivity by faculty and fellows in clinical and/or laboratory research.

6. In the event of a program director vacancy, another faculty member certified in MFM must assume interim responsibility for oversight of the program. The Osteopathic DME will consult on the completion of all required reports and administrative functions. Status reports of the institution’s efforts to recruit a permanent AOBOG certified program director shall be provided to the PESC every 6 months. Failure to comply with recruitment policy and documented deficiencies in program administration will result in a request to the PTRC for an early inspection.

C. Faculty

1. Consultative services must be available in the areas of medicine, surgery, critical care, and neonatology. The presence of institutional training program in these areas is beneficial, but not required. There also must be evidence of mutually complementary active and continuing interaction between these groups and the program’s fellow.

2. There must be a minimum of two faculty members who are board certified by the AOA/BOS American Osteopathic Board of Obstetrics Gynecology (AOBOG) and/or the American Board of Obstetrics and Gynecology (ABOG) in the subspecialty of maternal fetal medicine.
ARTICLE VII - FELLOW REQUIREMENTS

A. Fellows in maternal fetal medicine must:
   1. Have satisfactorily completed an AOA approved residency program in obstetrics and gynecology.
   2. The fellow shall have applied for the AOBOG general OB/GYN certification exam and shall have taken the written portion of the exam prior to matriculating the fellowship.

B. During the training program the fellow must:
   1. Maintain satisfactory records of work performed and submit these records on a monthly basis to the program director for review and verification. These records shall be filed with the administrator or director of medical education of the institution.
   2. Submit annually, verified by the signature of the program director, a training program report to the ACOOG within thirty (30) days of the end of each training year. The fellow must also complete an annual evaluation of the program director and faculty in a format as required by the ACOOG.
   3. The fellow will conduct investigative work leading to the production of a first authored thesis. The submission of an approved thesis is a requirement for entrance to the oral examination. The subject must be in the field of maternal fetal medicine, and the thesis should be on clinical or basic research and not a review of work by others. The fellow will follow the thesis defense process before graduating from the fellowship as outlined in the appendix.
   4. Attend conferences relating to maternal fetal medicine as assigned by the program director.
   5. Register as a candidate member of the ACOOG within sixty (60) days of matriculating to the fellowship and keep the ACOOG informed of a working e-mail address at all times.

C. Fellows shall be permitted to act as consultants under the direct supervision of the program director or other qualified supervisor who may be part of the general program of maternal fetal medicine. Fellows may serve at affiliated sites in maternal fetal medicine at the discretion of the program director.

D. The fellow shall attend meetings including the annual meeting of the American College of Osteopathic Obstetricians and Gynecologists and any additional meetings that the program director may deem appropriate.

ARTICLE VIII – EVALUATION

A. Program Director and Faculty
   1. The program director must submit these reports to the director of medical education at least annually or sooner if the fellow’s progress is unsatisfactory as outlined below.

B. Remediation
   1. The program director will inform the fellow verbally and in writing of unsatisfactory academic or clinical performance.
   2. The fellow will be provided with a written plan to correct the deficiencies.
   3. The fellow will receive a written evaluation following this period.
   4. If after the above period deficiencies still exist, the fellow shall be placed on probation for a period of three to six months.
5. Following the probationary period, if the performance of the fellow is still judged to be unsatisfactory the fellow shall be dismissed.

C. The fellow shall be required to defend the thesis prior to completion of the program. A model examination form is shown in Appendix.
APPENDIX

A. Data on program director compensation will be collected and benchmarked by the ACOOG every two years. Aggregate data will be reported to osteopathic obstetrics and gynecology programs.

B. The institution should fund faculty development activities in addition to the minimum standard requirements to maintain proficiency and professionalism of all trainers, ultimately benefitting the fellow, program, and institution.

C. The PESC will not review end of year reports which are not submitted, as verified by postmark or electronic system data, within thirty (30) days of completion of training year, until the program pays a delinquency fee to ACOOG per delinquent year of training.

D. Failure of fellows to register as candidate members of the ACOOG within sixty (60) days of matriculating the residency program will result in a delinquency fee. Candidate members do not pay dues to ACOOG.

E. Program directors, fellows and faculty will maintain a standard of professionalism that meets or exceeds the code of ethics of the ACOOG, AOA and/or the American College of Obstetricians and Gynecologist if applicable to the individual.

F. If annual evaluation of the program director and faculty is received after the thirty (30) day deadline, reports will not be reviewed by the PESC until a late fee is paid to the ACOOG.

G. Fellow Research and Thesis Defense Summary will be utilized by institutional faculty to evaluate quality of investigative study and submitted to PESC as a condition of program complete status (Form located in ACOOG Postgraduate Training Program Administrative Manual)

H. The most current Educational Curriculum is listed in The Guide to Learning in Maternal-Fetal Medicine, 2007. ABOG: Dallas, TX; 1-61. The Guide is reprinted in Appendix II.

APPENDIX II

(next page)
GUIDE TO LEARNING IN
MATERNAL-FETAL
MEDICINE

The Division of
Maternal-Fetal Medicine

The American Board of
Obstetrics and Gynecology

The American Board of
Obstetrics and Gynecology, Inc.

2007
INTRODUCTION

The Guide to Learning in Maternal Fetal Medicine has been developed by The American Board of Obstetrics and Gynecology, Inc., to be of assistance to both the fellow in training and the Program Director. The basic educational needs that lead to appropriate achievement are presented. This description should not be misinterpreted as outlining the ideal or setting limits on learning or achievement.

This guide is intended for several uses. Firstly, it should serve to guide the Program Director as to the areas of training required for an adequate fellowship program. Secondly, it can serve as a study guide for the fellow. Finally, this guide serves as a content list for the examinations given by the Division of Maternal-Fetal Medicine of the American Board of Obstetrics and Gynecology, Inc.

The Division regards the fellow as a graduate student with the implied responsibility for self-study and independent inquiry. The Program Director is responsible for providing adequate clinical experience, technical instruction, learning resources, study guidance and periodic direct personal evaluation. The Program Director should review with the fellow an outline of study at least on an annual basis.

The maternal-fetal medicine subspecialist is expected to have advanced knowledge of obstetrical, medical and surgical complications of pregnancy and their effects on the mother and fetus. He/she must have clinical competence in maternal-fetal medicine and should be able to function as a consultant to obstetricians and gynecologists for women with complicated pregnancies. Finally, this individual should be able to function effectively in the arena of basic and clinical research in maternal fetal medicine, for only in this way does one advance the discipline and remain current in this rapidly changing field.

The guide has enabling educational objectives. These describe what the fellow should know and be able to perform by the end of the fellowship. These objectives principally refer to problem-solving skills needed to make a diagnosis and implement management programs. They also describe the skills the fellow must acquire to be able to accomplish the objectives.
DEFINITION OF A MATERNAL-FETAL MEDICINE SUBSPECIALIST

A maternal-fetal medicine subspecialist is a subspecialist in obstetrics and gynecology who, by virtue of additional education, cares for and/or provides consultation on women with complications of pregnancy.

This activity requires advanced knowledge of the obstetrical, medical and surgical complications of pregnancy and their effect on both the mother and the fetus.

It also requires expertise in the most current approaches to diagnosis and treatment of women with complicated pregnancies and practice in a setting in which such modalities are available.

Advanced knowledge of newborn adaptation also is necessary to ensure a continuum of excellence in care from the fetal to newborn periods.
I. General Considerations

The practice of obstetrics and gynecology and maternal-fetal medicine requires a commitment to professional as well as personal growth. In addition to practicing technical skills, physicians should cultivate the ability to expand and apply those skills. Knowledge of ethical principles, communication skills, and the ability to acquire and continually update information are important components of professional development. The Accreditation Council on Graduate Medical Education (ACGME) identified six core competencies that should be incorporated into residency and subspecialty fellowship programs. Fellows should demonstrate competence at the level of a new practitioner in Maternal Fetal Medicine.

A. PATIENT CARE

Fellows must be able to provide patient care that is compassionate, appropriate, and effective for the treatment of health problems and the promotion of health. Fellows are expected to:

1. Demonstrate caring and respectful behaviors when interacting with patients and their families.
2. Gather essential and accurate information about their patients.
3. Make informed decisions about diagnostic and therapeutic interventions based on patient information and preferences, up-to-date scientific evidence, and clinical judgment.
4. Develop and carry out patient management plans.
5. Counsel and educate patients and their families.
6. Use information technology to support patient care decisions and patient education.
7. Perform competently all medical and invasive procedures considered essential for subspecialty practice in maternal-fetal medicine.
8. Provide health care services aimed at preventing maternal and fetal health problems or maintaining health.
9. Work with health care professionals, including those from other disciplines, to provide patient-focused care.
B. MEDICAL KNOWLEDGE

Fellows must demonstrate knowledge about established and evolving biomedical, clinical, and cognate (e.g. epidemiological and social-behavioral) sciences and the application of this knowledge to patient care. Fellows are expected to:

1. Demonstrate an investigatory and analytic thinking approach to clinical situations.
2. Know the basic and clinically supportive scientific background of maternal fetal medicine and apply this knowledge to clinical problem solving, decision making and critical thinking.

C. PRACTICE-BASED LEARNING AND IMPROVEMENT

Fellows must be able to investigate and evaluate their patient care practices, appraise and assimilate scientific evidence, and improve their patient care practices. Fellows are expected to:

1. Analyze their personal practice experience and implement strategies to continually improve the quality of patient care using a systematic methodology.
2. Locate, appraise, and assimilate evidence from scientific studies related to their patients’ health problems.
3. Obtain and use information about their population of patients and the larger population from which their patients are drawn.
4. Apply knowledge of study designs and statistical methods to the appraisal of clinical studies and other information on diagnostic and therapeutic effectiveness.
5. Use information technology to manage information, access on-line medical information; and support their education.
6. Facilitate the learning of residents, students and other health care professionals.
D. INTERPERSONAL AND COMMUNICATION SKILLS

Fellows must be able to demonstrate interpersonal and communication skills that result in effective information exchange and teaming with patients, their patients’ families, and professional associates. Fellows are expected to:

1. Create and sustain a therapeutic and ethically sound relationship with patients, patients’ families and professional colleagues.
2. Provide effective and professional consultation to other physicians and health care professionals.
3. Use effective listening skills.
4. Elicit and provide information using effective nonverbal, explanatory, questioning, and writing skills.
5. Work effectively with others as a member or leader of a health care team or other professional group.

E. PROFESSIONALISM

Fellows must demonstrate a commitment to carrying out professional responsibilities, adherence to ethical principles, and sensitivity to a diverse patient population. Fellows are expected to:

1. Demonstrate respect, compassion, and integrity.
2. Demonstrate a responsiveness to the needs of patients and society that supersedes self-interest.
3. Demonstrate accountability to patients, society, and the profession.
4. Demonstrate a commitment to excellence and on-going professional development.
5. Demonstrate a commitment to ethical principles pertaining to provision or withholding of clinical care, maintaining confidentiality of patient information, informed consent, and business practices.
6. Demonstrate sensitivity and responsiveness to patients’ culture, beliefs, age, gender, sexual preferences and disabilities.
F. SYSTEMS-BASED PRACTICE

Fellows must demonstrate an awareness of and responsiveness to the larger context and system of health care and the ability to effectively call on system resources to provide care that is of optimal value. Fellows are expected to:

1. Understand how their patient care and other professional practices affect other health care professionals, the health care organization, and the larger society and how these elements of the system affect their own practice
2. Know how types of medical practice and delivery systems differ from one another, including methods of controlling health care costs and allocating resources
3. Practice cost-effective health care and resource allocation that does not compromise quality of care
4. Advocate for quality patient care and assist patients in dealing with system complexities
5. Know that patient safety is always a primary concern of physicians
6. Know how to partner with health care managers and health care providers to assess, coordinate, and improve health care and know how these activities can affect system performance
II. ENDOCRINOLOGY OF PREGNANCY

The fellow should acquire sufficient knowledge of endocrinology and metabolism in order to diagnose and appropriately manage endocrine diseases in the mother, fetus and neonate.

A. Describe the following in relation to each hormone listed in Objective B:

1. Structural class: protein, steroid
2. Half life
3. Metabolic clearance rate
4. Transport and cellular binding
5. Alterations in pregnancy
6. Clinical effects and signs
7. Placental transfer
8. Fetal effects
9. Precursors and synthetic pathway
10. Function
11. Cellular mechanism of action including receptors
12. Hypofunction/Hyperfunction
   a) Diagnosis: clinical and laboratory
   b) Effects of pregnancy on the disease state
   c) Effects of the disease state on the mother, fetus and neonate
   d) Treatment
13. Fetal gland function
   a) Gestational age at first function
   b) Pattern of secretion during fetal life
   c) Effect on development

B. Apply information in Objective A to each of the following:

1. Hypothalamus
   a) Gonadotropin releasing hormone (GnRH)
   b) Somatostatin
   c) Thyrotropin releasing hormone (TRH)
   d) Endorphins
   e) Dopamine
   f) Corticotropin releasing hormone (CRH)
2. Anterior pituitary  
  a) Luteinizing hormone (LH)  
  b) Follicle stimulating hormone (FSH)  
  c) Adrenal corticotropin hormone (ACTH)  
  d) Growth hormone (hGH)  
  e) Prolactin (hPR)  
  f) Thyroid stimulating hormone (TSH)  
3. Middle pituitary: Melanocyte stimulating hormone (MSH)  
4. Posterior pituitary  
  a) Oxytocin  
  b) Vasopressin  
5. Thyroid  
  a) Triiodothyronine (T3)  
  b) Thyroxine (T4)  
  c) Reverse triiodothyronine (RT3)  
6. Parathyroid  
  a) Parathormone  
  b) Calcitonin  
7. Pancreas  
  a) Insulin - Proinsulin; C-peptide  
  b) Glucagon  
  c) Somatomedin  
8. Adrenal cortex  
  a) Glucocorticoids  
  b) Mineralocorticoids  
  c) Androgens  
9. Adrenal Medulla  
  a) Epinephrine  
  b) Norepinephrine  
10. Ovary  
  a) Estrogens  
  b) Progesterone  
  c) Relaxin  
  d) Androgens  
11. Placenta and decidua  
  a) Human chorionic gonadotropin (hCG)  
  b) Human placental lactogen (hPL)  
  c) Estrogens  
  d) Progesterone  
  e) Gonadotropin releasing hormone  
  f) Prolactin  
  g) Prostaglandins-Thromboxane, Prostacyclin  
  h) 1,25 dihydroxycholecalciferol
i) Relaxin
j) Corticotropin releasing hormone (CRH)
k) Fibronectin

12. Fetal tissues
   a) Leptin
   b) Adiponectin
   c) Ghrelin
   d) Corticotropin releasing hormone
   e) DHEA
III. PHYSIOLOGY

The fellow should have sufficient knowledge of normal and abnormal physiology to manage the mother, fetus and newborn at increased risk.

A. Nutritional Changes During Pregnancy

1. Describe normal daily requirements (calories, proteins and essential amino acids, carbohydrates, fat, minerals and vitamins and their distribution and metabolism in mother and fetus).
2. Counsel appropriate dietary intake for a metabolic disorder (e.g., diabetes, obesity, intestinal bypass, renal disease).
3. Describe diagnosis and management of dietary deficiencies (e.g., folic acid, calcium, iron).
4. Counsel patients with special dietary practices (e.g., vegetarian).
5. Counsel patients on the use of total parenteral nutrition.

B. Fluid and Electrolyte Balance During Pregnancy

1. Describe normal distribution of basic body components in mother and fetus including:
   a) Volume and distribution of
      (1) Maternal and fetal total body water
      (2) Maternal and fetal intracellular-extracellular water and exchange
      (3) Amniotic fluid composition and exchange
   b) Osmotic pressure determinants of
      (1) Maternal, fetal and amniotic fluid osmolar concentrations
      (2) Normal ionic composition of, and exchange within various fluid compartments of mother and fetus
   c) Other regulatory mechanisms for maintenance of normal acid-base balances
2. List the effects of oxytocin on colloids, crystalloids, and free water; i.e., D5W or fluid and electrolyte balances.
3. Describe the expected changes in maternal blood volume during the first 6 weeks postpartum
4. Describe how a multiple gestation affects the adaptive responses during and after pregnancy for items 1, 2, and 3 above.

5. Identify preexisting maternal conditions which may adversely affect adaptive responses during and after pregnancy for items 1, 2, and 3 above.

C. Pulmonary Changes During Pregnancy

1. Describe changes in pulmonary physiology and pulmonary function tests in pregnancy
2. Describe normal values for arterial blood gases during pregnancy.
3. Describe the unique features of managing mechanical ventilation during or after pregnancy.

D. Normal Cardiovascular Function During Pregnancy

1. Describe normal cardiac function during pregnancy including:
   a) Auscultatory and hemodynamic changes
   b) Indications for detailed cardiac evaluation
   c) Interpretation of invasive and non-invasive hemodynamic monitoring
   d) Interpretation and expected results for maternal echocardiography in pregnancy
   e) The influence of physiologic changes on diagnostic modalities
2. Describe the expected changes in maternal cardiac function during the first 6 weeks postpartum
3. Describe how a multiple gestation affects cardiovascular function during and after pregnancy.
4. Identify preexisting maternal cardiac conditions which may adversely affect cardiac function during and after pregnancy.

E. Blood

1. Describe gestational changes in the normal constituents of blood including:
   a) White blood count, differential, hematocrit, hemoglobin, red blood count, red cell indices
   b) Platelet count
   c) Fibrinogen level
d) Prothrombin time
e) Partial thromboplastin time
f) Serum iron
g) Serum iron binding capacity
h) Bone marrow morphology
i) Hemoglobin electrophoresis

2. Demonstrate an understanding of normal coagulation and how this is altered by pregnancy.
3. Describe expected changes in serum albumin and total serum proteins concentration during pregnancy.

F. Gastrointestinal Tract

1. Describe the pregnancy-associated changes in gastric acidity and gastrointestinal motility.
2. Describe the effects of sex hormones on gastrointestinal tract and liver function.
3. List the absorption and metabolism of iron, calcium, phosphorus, trace metals, and vitamins, carbohydrates, proteins, fats.
4. Discuss expected changes in biliary and gall bladder function.

G. Renal Function

1. Describe the changes in renal function in pregnancy including:
   a) Glomeruli
   b) Tubules
   c) Ureter
   d) Bladder
2. Describe expected changes in renal function tests during pregnancy including:
   a) Twenty-four hour renal clearance tests
   b) Urine electrolytes, protein and glucose
   c) Urine osmolality

H. Uterus

1. Describe the physical and biochemical changes in the cervix and uterus during pregnancy.
2. Describe the myometrial events involved in the initiation of parturition.
3. Describe normal labor including:
   a) Uterine contractility
   b) Mechanisms controlling uterine contractility
   c) Mechanisms and expected effects of pharmacologic modulation of uterine contractility including:
      (1) Oxytocin
      (2) Prostaglandin F2 α
      (3) Prostaglandin E2
      (4) Methylergonovine
      (5) Alpha and beta adrenergics
      (6) Magnesium sulfate
      (7) Oxytocin antagonists
      (8) Progestins

4. Describe abnormal labor: etiology, recognition of maternal and fetal effects.

5. Describe the factors influencing regulation of uterine blood flow including:
   a) Maternal positioning
   b) Estrogens
   c) Sympathomimetics

I. Fetus

1. Describe the fetal-placental circulation.
2. Demonstrate understanding of acid-base balance in the maternal, intervillus and fetal compartments.
3. Describe normal fetal growth and development including:
   a) Cellular and humoral immunity
   b) The hematopoietic system
   c) The central nervous system
   d) The pulmonary system
   e) The genitourinary system
   f) The cardiopulmonary system
   g) Neural behavioral states
4. Describe fetal adjustments to environmental changes including:
   a) Heart rate
   b) Movement including fetal breathing
   c) Acid-base balance
   d) Metabolism
J. Placenta

1. Describe the developmental anatomy, structure, and circulation through the placenta.
2. Describe the metabolic and endocrine functions of the placenta.
3. Describe the origin, composition and regulation of amniotic fluid.
4. List the mechanisms of transfer of nutrients, metabolic wastes, and pharmacologic agents including:
   a) Active transport
   b) Facilitated diffusion
   c) Simple diffusion
   d) Bulk flow
   e) Pinocytosis
5. Describe other factors important in fetal and maternal respiratory gas exchange including:
   a) Gas tension and content
   b) Oxygen capacity
   c) Diffusing capacity
   d) Relationship of maternal blood flow pattern with fetal blood flow
   e) Fetal oxygen dissociation curve
   f) Maternal oxygen dissociation curve
   g) Protein binding
   h) Lipid or water solubility
   i) Ionic change
   j) Molecular size
   k) Concentration gradients
IV. BIOCHEMISTRY

The fellow should be able to discuss the principal biochemical pathways in maternal and fetal physiology.

A. Describe steroid synthesis and metabolism.

B. Describe prostaglandin synthesis and metabolism.

C. Describe maternal and fetal protein, lipid (e.g., lipogenesis, lipolysis) and carbohydrate (e.g., gluconeogenesis, glucogenolysis) metabolism.

D. Describe placental hormone production and metabolism.

E. Describe the production and destruction of bilirubin.

F. Describe the fetal energy requirements for normal development (e.g., oxygen, glucose and other substrates).

G. Describe the production of fetal pulmonary surfactant.

H. Outline the biochemistry of uterine contractions.
V. PHARMACOLOGY

The fellow should be able to analyze the action of the identified drug, its metabolism and excretion in the mother, placenta, breast milk, fetus and neonate.

A. List the effects of maternal physiologic adjustments on absorption, disposition and metabolism of drugs and medications including:

1. Effect of blood volume
2. Gastrointestinal absorption
3. Volume of distribution
4. Renal excretion
5. Protein binding
6. Hepatic metabolism

B. Describe the transfer of drugs across the placenta and into embryonic structures including:

1. Movement of drugs into amniotic fluid and their penetration into the fetus
2. Effects of physiochemical characteristics of drugs (lipid solubility, pKa, molecular weight and protein binding)
3. Effects of changes in maternal and fetal blood flow on the transfer of drugs to and from the fetus
4. Effects of placental maturation and surface area on the transfer of drugs
5. Effects of placental disease on drug transfer
6. Metabolism of drugs by the placenta
7. Significance of other potential routes for drug transfer to and from the fetus (e.g., skin and urinary, gastrointestinal and respiratory tracts)
8. Effects of maternal disease hypertension or vascular disease on drug transfer

C. Identify fetal drug effects and factors affecting drug disposition in the fetus.

D. Describe newborn drug effects.

E. Describe the significance of drug and disease interactions.
F. Outline the distribution, serum levels, levels in colostrum and breast milk and metabolism of specific drug classes, such as:

1. Antibiotics.
2. Antiviral agents
3. Analgesics and anesthetics.
4. Cardiovascular drugs (e.g., antihypertensives, digitalis, betamimetics).
5. Tranquilizers, barbiturates, antidepressants, and psychotropic drugs.
6. Oral contraceptives and other hormones.
7. Antineoplastic drugs.
8. Anticonvulsants.
10. Corticosteroids and other immunologic agents
VI. PATHOLOGY

The fellow should be able to evaluate pathologic changes in the placenta, membranes, and umbilical cord. In instances of stillbirth or perinatal death, a fellow should interpret their significance in regard to diseases and abnormalities in the fetus, the mother, or both.

A. Placenta

1. Describe abnormalities of size and shape
2. Utilize gross and microscopic examinations to diagnose and describe the importance of:
   a) Abnormalities in size and shape
   b) Premature separation or abruption
   c) Placenta accreta
   d) Inflammation
   e) Infarction
   f) Infection
   g) Chorioangioma
   h) Trophoblastic disease
   i) Fetal arteriovenous shunt
   j) Maturation

B. Chorion and Amnion

1. Diagnose through gross and microscopic examinations and describe the importance of:
   a) Meconium staining
   b) Inflammation
   c) Infection
   d) Amnion nodosum
   e) Amniotic band syndrome
2. Describe the anatomic relationships with multiple fetuses and implications regarding zygosity
C. Umbilical Cord

1. Diagnose through gross and microscopic examinations and describe the importance of:

   a) Abnormalities in cord insertion including velamentous insertion and vasa previa
   b) Single umbilical artery
   c) True and false knots
d) Hematoma
e) Thrombosis

2. Diagnose and describe the significance of
   a) Infection
   b) Inflammation

D. Stillbirth/Perinatal Death

1. List and order the diagnostic studies appropriate for evaluating perinatal deaths.
2. Describe the clinicopathologic correlations of the following:
   a) Developmental abnormalities due to
      (1) Aneuploidy
      (2) Polygenic/multifactorial inheritance
      (3) Mendelian defects
   b) Generalized infections due to:
      (1) Bacteria: Group B Streptococcus, Listeria, syphilis
      (2) Viruses: herpes virus, cytomegalovirus, rubella, parvovirus
      (3) Protozoa: toxoplasmosis
   c) Pulmonary disease due to
      (1) Hyaline membrane disease
      (2) Bronchopulmonary dysplasia
      (3) Pneumonitis: infections, meconium aspiration
      (4) Pulmonary hypoplasia
d) Aberrant fetal growth due to
   (1) Fetal growth restriction associated with
      (a) Maternal disease
      (b) Placental abnormalities
      (c) Intrinsic fetal abnormality
(2) Fetal macrosomia associated with
   (a) Maternal diabetes mellitus
   (b) Prolonged gestation

e) Hydrops fetalis
   (1) Immune
   (2) Non-immune

f) Central nervous system abnormalities
   (1) Hemorrhage: intraventricular, subarachnoid, subdural
   (2) Periventricular leukomalacia
   (3) Infarction
   (4) Hypoxic ischemic encephalopathy
   (5) Infection and inflammation: fetal inflammatory response

g) Retrolental fibroplasia

h) Necrotizing enterocolitis
VII. GENETICS AND PRENATAL DIAGNOSIS

The fellow should have sufficient knowledge of basic human genetics and diagnostic techniques to provide genetic counseling for some of the commonly recognized disorders.

A. Patterns of Inheritance
   1. Describe Mendelian modes of inheritance including:
      a) Autosomal dominant
      b) Autosomal recessive
      c) Co-dominant
      d) X-linked recessive
      e) X-linked dominant
   2. Describe duplication and deletion syndromes
   3. Describe nonmendelian modes of inheritance
      a) Hereditary unstable DNA
      b) Imprinting
      c) Uniparental disomy
      d) Mitochondrial inheritance
      e) Germline mosaicism
      f) Multifactorial and polygenic inheritance
   4. Explain the importance of late manifestations, incomplete penetrance, variable expression, phenocopy, genetic heterogeneity and gene-linkage in human disease
   5. Describe the Hardy-Weinberg Law and its applications
   6. Describe the significance of new mutations in humans

B. Cytogenetics
   1. Outline the principles of human cytogenetics, including:
      a) Cell cycle
         (1) Meiosis (and understand its biologic function)
         (2) Mitosis
      b) Preparation and staining human chromosomes, including banding and fluorescent in situ hybridization
      c) Derivation and significance of X and Y chromatin
      d) Normal karyotype
      e) Chromosome nomenclature
C. Chromosomal Abnormalities

1. Explain and interpret chromosome pathology including:
   a) Phenotypes associated with the common trisomy syndromes
      (1) 21
      (2) 18
      (3) 13
   b) Effects of deletions (e.g., Di George syndrome)
   c) Significance of translocations and translocation carriers, including the importance of empiric risk data
   d) Significance of numeric and structural abnormalities of sex (e.g., fragile X syndrome)

2. Describe the incidence and types of chromosome anomalies in abortions.

3. Describe the evaluation, management and counseling of couples with repetitive abortions.

4. Describe recurrence risks, prognosis and alternative therapy for families with history of chromosome anomalies.

D. Prenatal Diagnosis

1. Discuss amniocentesis, chorionic villus sampling and cordocentesis, including:
   a) Techniques
   b) Maternal and fetal risks
   c) Limitation of the techniques

2. Discuss use of fetal cells in maternal blood and free fetal DNA for prenatal diagnosis including:
   a) Advantages, disadvantages and limitations
   b) Disorders amenable to application of these techniques

3. Describe indications for invasive prenatal diagnostic tests including:
   a) Maternal age
   b) Paternal age
   c) Previous trisomy
   d) Chromosomal abnormality in a parent
   e) Fetal structural abnormality
   f) Pregnancies at risk for X-linked hereditary disease
   g) Possible presence of neural tube defect
h) Pregnancies at risk for detectable autosomal or x-linked disorders (biochemical disorders)

4. Describe the use of molecular genetic analysis techniques for mutation detection including
   a) Southern blot analysis
   b) Polymerase chain reaction
   c) Restriction fragment length polymorphism analysis
   d) Allele-specific oligonucleotide hybridization (dot blot)
   e) Deletion analysis
   f) Linkage analysis
   g) Trinucleotide repeat analysis
   h) Fluorescent in situ hybridization

5. Discuss ethical issues in prenatal diagnosis including gender selection

6. Describe capabilities and limitations of ultrasonography in prenatal diagnosis including
   a) Techniques
      (1) First trimester chromosome anomalies
      (2) Second trimester chromosome anomalies
      (3) Third trimester
      (4) Anatomic targeted examination
      (5) Fetal cardiac anomaly detection
      (6) Use of color Doppler
      (7) Use of 3D ultrasound
      (8) Cervical and placental evaluation
         (a) Transperineal technique
         (b) Endovaginal technique
   b) Assessment of bioeffects and safety

7. Describe capabilities and limitations of magnetic resonance imaging in prenatal diagnosis including advantages and disadvantages relative to ultrasound.

8. Describe fetoscopy, fetal blood sampling and fetal surgery
   a) Techniques
   b) Assessment of immediate and long-term hazards of the procedure
   c) Disorders amenable to diagnostic procedures
   d) Disorders amenable to surgical treatment
   e) Indications

9. Describe the technique and expected efficacy of preimplantation genetic diagnosis
E. Screening

10. Describe the impact of and prerequisites for genetic screening programs.

11. Describe the components used in maternal multiple serum marker screening for fetal chromosome anomalies including expected sensitivity and false positive rates.

12. Describe available techniques for screening and counseling couples at risk for:
   a) Neural tube defects
   b) Chromosomal Aneuploidy
   c) Cystic fibrosis
   d) Canavan disease
   e) Tay-Sachs disease
   f) Hemoglobinopathies
   g) Fragile X syndrome

13. Describe the genetic screening for gamete donors.

F. Counseling

14. Describe the components of preconceptional counseling.

15. List the elements of genetic counseling, including knowledge of the diagnosis, mode of inheritance, risk of recurrence, and prognosis.

16. Describe the principles of genetic counseling.

17. Describe the management of maternal phenylketonuria.

18. Record and interpret pedigree data.
VIII. EMBRYOLOGY AND TERATOLOGY

The fellow should be able to counsel persons exposed to teratogenic agents.

A. Describe normal embryology.

B. Outline the general principles of teratology

1. Importance of the genotype of the fetus and the mother
2. Relationship between the teratogenic effect and developmental stage at the time of exposure (e.g., critical periods for organogenesis)
   a) Preimplantation period
   b) Embryonic period
   c) Fetal period
3. Dose-response relationship of teratogenic agents
4. Species specificity

C. Describe the criteria for proof of human teratogenicity

D. Describe the mechanisms of teratogenesis leading to abnormal embryogenesis.

1. Know the distinction between embryopathy and fetopathy
2. Describe the effects of disruption of folic acid metabolism
3. Describe the effects of production of toxic oxidative intermediates
4. Describe the role of homeobox genes
5. Describe the risks of paternal teratogen exposures

E. List the effects on the fetus and newborn of suspected teratogenic agents, such as:

6. Drugs and medications
   a) Illegal drugs
   b) Anticonvulsants
   c) Anticoagulants
   d) Antidepressants
   e) Angiotensin-converting enzyme inhibitors and angiotensin receptor blockers
   f) Retinoids
g) Hormones
h) Antineoplastic agents
i) Antimicrobials, antifungals and antivirals

7. Herbal products

8. Infections: viral, bacterial and parasitic
   a) Evaluation of mother and newborn with exposure
   b) Effects on fetus at various stages of gestation
   c) Prenatal diagnosis
   d) Risk of morbidity and mortality
   e) Antepartum prevention and treatment

9. Vaccinations

10. Radiation and other physical agents.
    Investigate and counsel a pregnant woman or her spouse exposed to irradiation or agents. Explain the
effects of dose, dose rate, stage of gestation, and specific target organ at risk produced by:
   a) External ionizing radiation: radiographic, angiographic, fluoroscopic and computed
tomographic
   b) Nuclear medicine studies and radioactive isotopes
   c) Nuclear natural disaster or attack
   d) Biologic or chemical weapons

11. High-intensity ultrasonography

12. Maternal conditions
   a) Nutritional deficiencies and excesses
   b) Diabetes mellitus
   c) Phenylketonuria

13. Environmental agents
   a) Alcohol
   b) Methylmercury
   c) Lead
   d) Pesticides
   e) Tobacco
   f) Caffeine
   g) Hyperthermia

F. Review critically retrospective and prospective studies of suspected teratogenic agents.
G. Describe the counseling in cases of teratogen exposure

7. Preconception counseling
8. Antepartum exposure
9. Paternal exposure
IX. MEDICAL AND SURGICAL COMPLICATIONS

The fellow should be able to diagnose and manage medical and surgical complications of pregnancy that may affect the mother, fetus and neonate.

A. Renal Disease

1. Describe the utilization of the following laboratory tests:
   a) Urinalysis, urine osmolality
   b) Plasma BUN, creatinine, uric acid
   c) Endogenous creatinine clearance
   d) Timed urinary protein collection
   e) IVP, renal scan, CT scan, ultrasound, MRI
   f) Renal biopsy

2. Describe the diagnosis and management for women with:
   a) Diabetic nephropathy
   b) Glomerular and interstitial nephritis (e.g., lupus nephritis)
   c) Acute and chronic pyelonephritis
   d) Nephrotic syndrome
   e) Chronic undifferentiated renal disease (arteriolar nephrosclerosis)
   f) Renal transplantation and dialysis
   g) Acute tubular necrosis and renal cortical necrosis
   h) Acute and chronic renal failure

B. Cardiovascular Disease

1. Interpret tests to diagnose cardiac abnormalities and to assess cardiac reserve during pregnancy in disease states.
   a) Assign functional classification of heart disease based upon New York Heart Association classification.
   b) Order and make electrocardiographic diagnoses of arrhythmias.
   c) Order and interpret chest x-rays.
   d) Order and interpret echocardiography, in consultation with other specialists.
   e) Interpret pulmonary function tests (e.g., vital capacity).
f) Order and interpret cardiac catheterizations, in consultation with other specialists.

2. Describe the pathophysiology, diagnosis and plan of management for:
   a) Rheumatic heart disease
   b) Congenital heart disease due to:
      (1) Atrial septal defects
      (2) Patent ductus arteriosus
      (3) Ventricular septal defect
      (4) Pulmonary stenosis
      (5) Coarctation of aorta
      (6) Tetralogy of Fallot
      (7) Eisenmenger syndrome
      (8) Aortic stenosis
      (9) Hypertrophic sub-aortic stenosis
      (10) Marfan syndrome
   c) Pregnancy with cardiac valve prostheses
   d) Primary pulmonary hypertension
   e) Peripartum cardiomyopathy
   f) Cardiac arrhythmias (e.g., supraventricular tachycardia, atrial fibrillation, ectopic beats)
   g) Mitral valve prolapse
   h) Hypertensive disorders
   i) Coronary artery disease
   j) Heart failure
   k) Cardiac transplantation

3. Treat with the following drugs and recognize the side effects of:
   a) Digitalis preparations and diuretics, including recognizing signs of digitalis toxicity
   b) Antibiotic therapy for prevention of bacterial endocarditis and recurrence of rheumatic fever
   c) Anticoagulants
   d) Vasoactive drugs, including antihypertensive agents
   e) Drugs for cardioversion

C. Hematologic Disorders

4. Diagnose the following diseases and formulate a plan of management for:
   a) Anemias (e.g., iron, folate deficiency)
   b) Hemoglobinopathies
   c) Thrombocytopenias
d) Congenital and acquired coagulation defects
e) Thrombophilias and thromboembolism
f) Leukemias and lymphomas

5. Describe the appropriate use and the risk of:
   a) Whole blood
   b) Fresh frozen plasma
c) Cryoprecipitate
d) Platelets
e) Packed red cells
f) Plasma protein fractions
g) Plasma substitutes

6. Describe a plan for long-term anticoagulation therapy in pregnancy and puerperium.
   a) Anticoagulation
      (1) Prophylactic
      (2) Therapeutic
   b) Anticoagulant agents
      (1) Unfractionated heparin
      (2) Low molecular weight heparin
      (3) Coumadin
c) Indications for use
d) Risk of complications

C. Liver Disease

1. Diagnose and describe management of common hepatic diseases in pregnancy:
   a) Gall bladder and biliary tract diseases
   b) Hepatitis
      (1) Viral
      (2) Autoimmune
c) Acute fatty degeneration, or acute liver failure secondary to the above states, drug ingestion, or steatosis
d) Cirrhosis
e) Changes secondary to preeclampsia, eclampsia
f) Hyperemesis gravidarum
g) Cholestasis

2. Describe a plan of management for:
   a) Hepatic rupture
   b) Liver transplantation
D. Gastrointestinal Disorders

1. Diagnose and describe the management of common gastrointestinal disorders in pregnancy
   a) Peptic ulcer
   b) Inflammatory bowel disease
   c) Intestinal obstruction
   d) Pancreatitis
   e) Appendicitis
   f) Megacolon
   g) Prior intestinal surgery: e.g., gastric or intestinal bypass, stomas
   h) Abdominal trauma with possible viscus rupture and hemoperitoneum

E. Neuropsychiatric Disease

1. Formulate a plan of management for the following:
   a) Cerebral thrombosis including cortical venous thrombosis
   b) Cerebral hemorrhage (subarachnoid hemorrhage) secondary to a
      (1) Ruptured aneurysm
      (2) Arterio-venous malformation
   c) Myasthenia gravis
   d) Multiple sclerosis
   e) Myotonic dystrophy
   f) Meningitis
   g) Guillain-Barre syndrome
   h) Spinal cord lesions
   i) Neurologic tumors
   j) Shunts for hydrocephaly
   k) Migraine headaches
   l) Pseudotumor cerebri
   m) Chorea gravidarum
   n) Porphyria
   o) Psychiatric diseases: depression, manic depression, eating disorders, psychoses and postpartum depression

2. Counsel and treat women with epilepsy.
F. Pulmonary Disease

1. Diagnose and formulate a plan of management for:
   a) Asthma
   b) Pulmonary embolism
   c) Tuberculosis
   d) Infections (viral, bacterial, fungal)
   e) Adult respiratory distress syndrome
   f) Aspiration pneumonitis
   g) Restrictive disorders, including kyphosis, scoliosis and connective tissue diseases
   h) Pneumothorax
   i) Pulmonary hypertension
   j) Respiratory failure

2. Describe a plan of management for
   a) Cystic fibrosis
   b) Pulmonary transplantation

3. Describe the use and interpretation of pulmonary function tests in the management of asthma

G. Autoimmune Disease

1. Describe a plan of management for:
   a) Rheumatoid arthritis
   b) Systemic lupus erythematosus
   c) Scleroderma
   d) Dermatomyositis
   e) Polyarteritis nodosa
   f) Autoimmune thrombocytopenic purpura

2. Describe the diagnosis and management of
   a) Antiphospholipid antibody syndrome
   b) Lupus anticoagulant
   c) Graves disease
   d) Autoimmune thrombocytopenic purpura

H. Gynecologic Disease

1. Describe a plan of management for:
   a) Leiomyomas
   b) Gynecologic cancers
   c) Uterine prolapse
   d) Cystocele
   e) Vaginitis
2. Describe the evaluation, diagnosis and treatment of sexually transmitted diseases.

I. Neoplasms

1. Describe the management of neoplasms in pregnant women and/or their fetuses, including:
   a) Lymphoma
   b) Leukemia
   c) Breast malignancy
   d) Melanoma
   e) Thyroid cancer
   f) Colon cancer
   g) Trophoblastic disease
   h) Metastatic cancer
   i) Metastatic cancers to fetus and placenta
   j) Fetal tumors

2. Describe the use and risks of chemotherapeutic agents in pregnancy.

J. Endocrine Disorders

1. Diabetes Mellitus
   a) Diagnose gestational and pre-gestational diabetes during pregnancy.
   b) Describe the maternal and infant management and consequences of diabetes:
      (1) Effects of pregnancy on the diabetic mother
      (2) Effects of diabetes on the maternal, fetal and neonatal organ systems
   c) Manage medical problems of the diabetic woman.
   d) Describe the mechanisms responsible for the development of hypoglycemia, hyperglycemia and ketoacidosis.
   e) Describe how to avoid complications by the appropriate use of:
      (1) Diet
      (2) Insulin
      (3) Oral Hypoglycemic agents
      (4) Monitoring carbohydrate metabolism
2. Thyroid Disorders
   a) Diagnose and manage
      (1) Hyperthyroidism
      (2) Acute thyrotoxicosis
      (3) Hypothyroidism: overt and subclinical
   b) Diagnose and refer thyroid masses

3. Adrenal
   a) Diagnose and manage
      (1) Congenital adrenal hyperplasia
      (2) adrenal insufficiency
      (3) Cushing’s Disease
   b) Describe the diagnosis and surgical management of pheochromocytoma

4. Pituitary
   a) Describe the diagnosis and management of
      (1) Adenomas
      (2) Insufficiency
      (3) Hyperprolactinemia

K. Substance Abuse

1. Describe screening and identification of substance abuse.
2. Describe maternal and infant risks, management and consequences of substance abuse due to:
   a) Alcohol
   b) Nicotine
   c) Prescription drugs
   d) Illicit drugs

L. Dermatologic Disorders

1. Describe the normal cutaneous changes of pigmentation and hair in pregnancy.
2. Recognize and diagnose:
   a) Common dermatological disorders
   b) Dermatological disorders unique to pregnancy
      (1) Herpes gestationis
      (2) Pruritic urticarial papules and plaques of pregnancy (PUPPP)
M. Non-obstetric surgery

1. Describe the complications, risks of surgery and management in the:
   a) First trimester
   b) Second trimester
   c) Third trimester

2. Describe anesthetic concerns for non-obstetric surgery.

3. Describe fetal monitoring concerns in
   a) Burn patients
   b) Trauma patients
   c) Hypothermic cases
   d) Cardiopulmonary bypass cases
   e) Laparoscopic cases
X. INFECTIOUS DISEASES

The fellow should be able to treat infectious diseases in the mother and fetus and to understand the principles of diagnosis and treatment in the neonate.

A. Epidemiology

1. Describe the incidence/prevalence of infectious diseases in pregnancy and the neonatal period.
2. Describe the impact of these diseases on maternal and child health.

B. Pathophysiology

1. Describe the altered host resistance factors in pregnant women, the fetus and newborn
2. Describe the genital tract flora during pregnancy
3. Describe sources and possible influences leading to colonization and infection of the fetus and neonate with
   a) Bacteria
   b) Viruses
   c) Parasites and protozoa
4. Describe microbiologic and immunologic consequences of breast milk feeding vs. formula feeding for newborns of different gestational ages.
5. List the sources of contamination and optimal handling of banked human milk.
6. Describe the primary mechanisms and organisms involved in
   a) Septic abortion
   b) Premature labor
   c) Premature rupture of membranes
   d) Bacterial vaginosis
   e) Chorioamnionitis
   f) Maternal sepsis and postpartum infections, including
      (1) Urinary tract infections
      (2) Pneumonia
      (3) Endomyometritis
      (4) Surgical infections
      (5) Pelvic thrombophlebitis
      (6) Peritonitis
   g) Neonatal sepsis
h) Sexually transmitted diseases
i) Mastitis

7. Describe and interpret appropriate diagnostic tests for microbiologic evaluation of:
a) Septic abortion
b) Chorioamnionitis
c) Maternal pneumonia
d) Mastitis
e) Neonatal sepsis or pneumonia
f) Nosocomial infections
g) Surgical infections
h) Urinary tract infections
i) Bacterial vaginosis
j) Sexually transmitted diseases
k) Tuberculosis
l) Hepatitis
m) Human Immunodeficiency Virus Infection
   (1) AIDS
   (2) Opportunistic infections

C. Treatment

1. Describe the selection, mechanisms of action, and side-effects of antibiotics.

2. Describe the selection, mechanisms of action, and side-effects of antivirals.

3. Counsel patients regarding immunizations in pregnancy and the puerperium.

4. Counsel patients about international travel and prophylaxis of various infections in developing countries.

5. Counsel patients who are exposed to emerging infections and bioterrorism.

6. Describe currently recommended antiretroviral treatment regimens of HIV infection in pregnancy.
   a) Describe goals of maternal antiretroviral treatment and risks of perinatal transmission.
   b) Describe management decisions about the route of delivery to prevent perinatal HIV transmission.
   c) Describe classes, safety, side-effects and complications of antiretroviral therapy specific to pregnancy
   d) Describe the prevention, prophylaxis and treatment of opportunistic infections.
7. Describe the maternal and perinatal effects of antimicrobial and antiviral agents.
8. Describe altered pharmacokinetics of antibiotics and antivirals during pregnancy.
9. Explain the consequences of a maternal-fetal infection on a subsequent pregnancy.
10. Describe prophylaxis and management of sexually transmitted diseases and group B streptococci.
11. List the steps to be taken when a susceptible pregnant woman or a newborn is exposed to common bacterial and viral pathogens.
XI. OBSTETRICAL COMPLICATIONS

The fellow should be able to diagnose and outline a plan of management for obstetrical complications, including acute peripartum emergencies and obstetric critical care.

A. Bleeding During Pregnancy

1. Diagnose and manage:
   a) Abnormal placental implantation or development (e.g., placenta previa, abruption, accreta, vasa previa, ectopic pregnancy and trophoblastic tumors)
   b) Trauma to the genital tract
   c) Uterine atony
   d) Problems of reduced maternal blood volume
   e) Coagulation defects
   f) Fetomaternal bleeding

B. Hypertension in Pregnancy

1. Describe, diagnose, and manage hypertensive disorders of pregnancy.
   a) Etiology and pathophysiology of specific causes of hypertension
   b) Methods of prevention
   c) Pathologic changes in mother and fetus
   d) Use and actions of anticonvulsants and antihypertensive agents
   e) Complications of the disease and treatment
   f) Techniques to monitor mother and fetus
   g) Peripartum hypertension management
   h) Prognosis for subsequent pregnancies

C. Premature Rupture of Membranes

1. Describe the:
   a) Pathophysiology
   b) Management
   c) Methods of diagnosis
   d) Methods of evaluating pulmonary maturity

2. Describe the use of glucocorticoids, antibiotics and tocolytic agents.
3. Describe problems of infection and effects on mother, fetus and newborn.
4. Describe the association with abnormalities of maternal local and systemic inflammatory response

D. Preterm Labor

1. Describe, diagnose and manage premature labor and understand the:
   a) Risk assessment and possible approaches to prevention
   b) Variables involved in the etiology.
   c) Use and complications of various therapeutic modalities, including tocolysis and agents used to accelerate fetal maturation
   d) Maternal-fetal complications
   e) Methods for delivery, with attention to fetal weight and lie
2. Describe the use of maternal transport and community education programs.
3. Describe the association with abnormalities of maternal local and systemic inflammatory response

E. Multiple Fetuses

1. Describe the:
   a) Diagnosis
   b) Antepartum evaluation and management
   c) Methods of delivery
   d) Etiology (e.g., implantation)
   e) Maternal and fetal complications
      (1) Twin-twin transfusion
      (2) Discordancy
      (3) Monoamnionic twins
      (4) Retained fetal demise
2. Describe the indications and techniques and complications of fetal reduction.
3. Describe the management of higher order multiple gestations.
F. **Critical Care**

1. Diagnose and provide critical care management in pregnancy and peripartum for:
   a) Acute blood loss and hemorrhagic shock
   b) Adult respiratory distress syndrome
   c) Amniotic fluid embolism
   d) Cardiac arrest
   e) Congestive heart failure and pulmonary edema
   f) Eclampsia
   g) Hypertensive crisis and severe pre-eclampsia
   h) Hypovolemic shock
   i) Multisystem trauma
   j) Myocardial infarction
   k) Peripartum cardiomyopathy
   l) Pulmonary embolism
   m) Respiratory failure
   n) Septic shock
   o) Diabetic ketoacidosis and hyperglycemic hyperosmolar coma
   p) Acute thyrotoxicosis
2. Describe the indications for and complications of invasive hemodynamic monitoring.
3. Outline a plan of management of a critically-ill patient with
   a) Arterial line
   b) Central venous pressure catheter monitoring
   c) Pulmonary artery catheter monitoring
   d) Mechanical ventilation
4. Counsel women who have survived critical care about risks of recurrence with future pregnancies.

G. **Fetal Growth Restriction**

1. Describe the:
   a) Roles of maternal, placental and fetal factors in the etiologies
   b) Clinical, biochemical and biophysical diagnostic techniques
   c) Criteria for monitoring fetal growth
   d) Effects on fetal and newborn prognosis (immediate and remote)
   e) Method and timing of delivery
2. Counsel a patient on the prognosis of future pregnancies

H. Maternal Urogenital Tract Malformations

1. Describe the embryology of the urogenital tract.
2. Describe the etiology of specific malformations
   a) Diagnosis
   b) Significance and effect on pregnancy
   c) Treatment

I. Prolonged Gestation

1. Describe the methods used to establish gestational age
2. Describe the
   a) Risks to the fetus
   b) Methods to monitor the fetus
   c) Indications and methods for delivery
3. List neonatal complications of prolonged pregnancy.

J. Fetal Death, Stillbirth and Recurrent Fetal Loss

1. Describe the:
   a) Etiology of recurrent fetal loss
   b) Diagnostic evaluation of recurrent abortion
   c) Complications of recurrent abortions
   d) Evaluation of an unexplained stillbirth
2. Outline appropriate management, including methods of termination.
3. Counsel a couple about prognosis for subsequent pregnancies.
4. Describe management of the grief process

K. Fetal Hydrops

1. Identify and describe the management of:
   a) Non-immune hydrops
      (1) Etiology
      (2) Diagnosis
      (3) Management
   b) Immune hydrops
      (1) Antigen-antibody systems
Fetal and maternal pathophysiology
(2) Laboratory and other tests of fetal surveillance

2. Describe indications, complications and benefits of methods of management:
   (1) Amniocentesis
   (2) Middle cerebral artery Doppler flow
   (3) Intrauterine transfusion

3. Describe the timing and mode of delivery in affected cases.

4. Describe the prevention of maternal alloimmunization.

L. Abnormalities of Labor

1. Describe the:
   a) Anatomy of the pelvis
   b) Types of pelvic architecture and associated complications of labor

2. Describe mechanisms of labor.

3. Outline the diagnosis and management of dystocia.

4. List the indications and complications of oxytotic agents.

5. Describe intrapartum methods used to monitor maternal and fetal well-being.

6. Describe the indications, techniques, and complications of forceps and vacuum deliveries.

7. Describe the indications, techniques and complications of cesarean delivery.

8. Describe the indications, techniques and complications of cesarean hysterectomy.

9. Describe the management of pregnancies subsequent to previous cesarean delivery.

10. Outline the management of traumatic complications of labor.

11. Describe the medical and surgical management of intrapartum hemorrhage.

12. Describe the indications, techniques and complications of labor induction.

M. Fluid and Electrolyte Disorders

1. Diagnose and manage:
   a) Volume deficits and excesses
   b) Changes in composition
   c) Acid-base derangements
2. Describe the prevention and management of intrapartum hyponatremia.

N. Abnormalities of Amniotic Fluid Volume

1. Diagnose and manage:
   a) Hydramnios
      (1) Etiologies
      (2) Diagnostic criteria
      (3) Complications
      (4) Management, including primary problems and secondary complications
      (5) Indications for amnioreduction
   b) Oligohydramnios
      (1) Etiologies
      (2) Diagnostic criteria
      (3) Complications
      (4) Management, including primary problems and secondary complications
XII. ANALGESIA AND ANESTHESIA

The fellow should be able to understand the effects of analgesics and anesthetics employed during labor and delivery and to manage the complications.

A. Systemic Analgesia and Sedation

1. Describe the actions and maternal and fetal side effects of:
   a) Opioids and other analgesics
   b) Tranquilizers
   c) Psychotropics
   d) Barbiturates
   e) Other sedatives
   f) Narcotic antagonists

B. General Anesthesia

1. Describe the actions of:
   a) Nitrous oxide
   b) Barbiturates, including thiopental
   c) Halogenated agents
      (1) Halothane
      (2) Methoxyflurane
      (3) Enflurane
   d) Other agents
      (1) Atropine
      (2) Succinylcholine, and other paralyzing agents

C. Regional Analgesia

1. Describe the:
   a) Pain pathway of labor and the sensory and motor innervation of the thorax, abdomen, and genital tract
   b) Actions, pharmacology and metabolism of local anesthetic agents
   c) Indications, contraindications and complications of
      (1) Epidural analgesia
      (2) Spinal analgesia
      (3) Combined spinal epidural analgesia
      (4) Paracervical block analgesia
D. Anesthetic Complications

1. Diagnose and manage in collaboration with a specialist:
   a) Cardiac arrest
   b) Respiratory arrest
   c) Aspiration pneumonitis
   d) Reactions to local anesthetic agents
      (1) Hypotension
      (2) High spinal or total spinal
      (3) Convulsions
      (4) Neuropathy
      (5) Headaches
   e) Complications of intubation
   f) Hyperthermia

2. Describe complications of opioid antagonists.
3. Describe the obstetric management of women with spinal cord injury: autonomic dysreflexia

E. Anesthetic Management of Medical and Obstetrical Complications

1. Describe the anesthetic management of:
   a) Hypertensive diseases
   b) Cardiac diseases
   c) Neurologic diseases
   d) Bleeding disorders including anticoagulation
   e) Respiratory diseases
   f) Breech deliveries, operative vaginal deliveries, cesarean deliveries, and multi-fetal gestations

2. Describe the etiology and management of intrapartum fever associated with epidural analgesia.
3. Describe advantages and disadvantages of general anesthesia for cesarean delivery.
XIII. NEONATOLOGY

A. Institute immediate care of the baby in the delivery room.

B. Describe neonatal adaptation.

C. Perform clinical evaluation of the newborn, including assessment of gestational age.

D. Describe and perform resuscitation of the newborn, including:

   1. Intubation and ventilation
   2. Drug use
   3. Cardiac massage
   4. Volume replacement
   5. Temperature control
   6. Interpretation and management of acid-base and blood gas status
   7. Ex-utero intrapartum treatment (EXIT) procedure

E. Describe the etiology, management, sequelae, and, if appropriate, the prevention of:

   1. Respiratory disease including meconium aspiration and persistent fetal circulation
   2. Hyperbilirubinemia
   3. Infection
      a) Neonatal sepsis
      b) Pneumonia
   4. Hypoxic, ischemic encephalopathy
   5. Periventricular leukomalacia
   6. Seizures
   7. Metabolic abnormalities including hypoglycemia and hypocalcemia
   8. Hemorrhagic disorders
   9. Hypothermia
   10. Heart disease
   11. Intracranial hemorrhage
   12. Necrotizing enterocolitis
   13. Significant anomalies (e.g., ambiguous genitalia, abdominal wall, central nervous system and gastrointestinal defects).
   14. Alloimmune thrombocytopenia
15. Hydrops

F. The fellow should be able to describe developmental problems of the newborn and childhood.

1. Very low birth weight infants
2. Low birth weight infants
3. Small for gestational age infants
4. Growth restricted infants

G. The fellow should be able to describe the use of surfactant therapy.

H. The fellow should be able to describe neonatal critical care management involving:

1. Mechanical ventilation techniques
2. Extracorporeal membrane oxygenation

I. The fellow should be able to describe the indications, complications and success of neonatal surgery for common congenital anomalies.
XIV. PROCEDURES

A. Demonstrate a base of knowledge (including indications, contraindications, and principles) and experience sufficient to perform the following antepartum procedures independently:

1. Amniocentesis: 2nd and 3rd trimester
2. Amnioreduction
3. Cardiopulmonary resuscitation
4. Transvaginal cervical cerclage
5. Fetal assessment
   a) Non-stress test
   b) Contraction stress test
   c) Biophysical profile
   d) Vibroacoustic stimulation test
   e) Doppler velocimetry
6. Intrauterine fetal therapy
   a) Fetal thoracentesis
   b) Fetal paracentesis
   c) Administration of fetal medications
7. Fetal transfusion
8. Ultrasound examination
   a) 1st trimester
   b) 2nd trimester
   c) 3rd trimester
   d) Targeted anatomic fetal evaluation
   e) Cardiac evaluation including color Doppler
   f) Doppler velocimetry
      (1) Fetal umbilical artery
      (2) Fetal middle cerebral artery
      (3) Maternal uterine artery
   g) Cervical and placental evaluation
   h) 3D and 4D ultrasound
9. External cephalic version of abnormal lie

B. Demonstrate a base of knowledge (including indications, contraindications, and principles) and experience sufficient to perform the following intrapartum procedures independently:

1. Anesthetic or analgesic procedures
   a) Administration of parenteral analgesics or sedatives
b) Administration of narcotic antagonists
2. Cephalocentesis
3. Complicated cesarean delivery
4. Cesarean hysterectomy
5. Control of hemorrhage
   a) Medical
   b) Surgical
6. Episiotomy and vaginal laceration repair
7. Fetal assessment
   a) Fetal heart rate monitoring
   b) Fetal scalp stimulation
8. Induction of labor
10. Neonatal resuscitation, immediate
11. Operative vaginal deliveries
12. Pregnancy termination (unless program or fellow have moral or religious objections)
13. Sterilization procedures
14. Breech delivery
   a) Spontaneous
   b) Assisted
   c) Application of forceps to after-coming head
15. Delivery of multiple gestations
   a) Management of the nonvertex, second twin
16. Version of second twin
   a) Internal
   b) External

C. Demonstrate an understanding of the indications and risks for the following procedures:

1. Transabdominal cervical cerlage
2. Chorionic villus sampling
3. Cordocentesis
4. Critical care management
   a) Invasive hemodynamic monitoring
   b) Ventilator management
5. Fetal reduction procedures
6. Dilation and evacuation for 2nd trimester fetal death or lethal anomalies
7. MRI for obstetric and fetal indications
8. Intrauterine fetal therapy
   a) Placement of thoracic shunt
   b) Placement of urinary catheter
D. Fetal surgery

Some programs may give special training in complex fetal surgery for various conditions. Fellows should be able to explain evaluation and referral of patients to fetal surgery specialists.
XV. FAMILY PLANNING

The fellow should be able to describe the different methods of family planning, including the risks and benefits, and be able to recommend appropriate, methods.

A. Identify and describe the:

1. Mechanisms of action, efficacy in prevention of pregnancy and complications of:
   a) Hormonal contraceptives: oral, injectable, transdermal patches, vagina rings and implants
   b) Intrauterine devices
   c) Barrier devices
   d) Chemical spermicidal products
   e) Natural family planning methods

2. Sterilization procedures, efficacy and complications
   a) Endoscopic techniques
   b) Laparotomy techniques
   c) Hysteroscopical fallopian tube micro-inserts

B. Describe advantages and disadvantages of each type of family planning method in women with special problems, including:

1. Anemia
2. Sickle cell disease and hemoglobinopathies
3. Hypertension
4. Neurologic disorders: migraine headaches, multiple sclerosis and seizures
5. Diabetes mellitus
6. Adolescence
7. Liver disease
8. Gynecologic abnormalities: dysplasia, pelvic prolapse, myomas, and pelvic infections
9. Obesity and malnutrition
10. Advanced age
11. Urinary tract problems
12. Acquired and inherited thrombophilias
13. Bleeding disorders
14. Deep venous thrombosis and pulmonary embolism
15. Malignancies
16. Cardiac disease
17. Breast feeding
18. HIV infection
XVI. EPIDEMIOLOGY, STATISTICS, EXPERIMENTAL DESIGN, AND EVIDENCE-BASED MEDICINE

The fellow should demonstrate sufficient knowledge of epidemiology and statistical methods to design and interpret research.

A. Describe and interpret principles of epidemiology with regard to:
   1. Descriptive epidemiology including
      a) Disease incidence/prevalence
      b) Adjustment of disease rates
   2. Causality of disease including
      a) Criteria for judging causality
      b) Quantitative assessment: relative risk and odds ratio
   3. Disease or risk factor screening including
      a) Criteria for establishing a screening program
      b) Quantitative assessments: sensitivity/specificity and receiver-operator characteristics curve
   4. Study design including
      a) Experimental: randomized clinical trials
      b) Observational: prospective cohort, retrospective cohort, case-control
      c) Cost-benefit and cost-effectiveness analysis
      d) Decision analysis
      e) Systematic review and meta-analysis
   5. Appropriate conduct of a study including
      a) Calculation of power
      b) Calculation of sample size
      c) Case selection
      d) Control selection
      e) Randomization
      f) Human subject rights: informed consent in pregnancy
      g) Care and use of animals
      h) Avoidance of bias
      i) Avoidance of confounding variables

B. Describe and explain the use of:
   1. Descriptive statistics
      a) Measures of central tendency
b) Measures of dispersion
2. Statistical estimates of variability: confidence intervals
3. Inference: hypothesis testing
   a) Confidence interval
   b) Non-parametric testing
   c) Parametric testing including
      (1) Two-sample tests
      (2) Multiple sample tests
      (3) Differences in proportions
      (4) Multivariate techniques

C. Demonstrate knowledge of when to seek statistical consultation for research planning.

D. Demonstrate knowledge of the general principles for ethical conduct of research. The fellow must understand, and incorporate these guidelines into everyday practice:
   1. Scientific Integrity
   2. Responsible data acquisition and management
   3. Responsible authorship and publication
   4. Responsible peer review
   5. Proper mentor-trainee relationship
   6. Responsible collaborative research
   7. Protection of human and animal subjects
   8. Conflict of interest and commitment

E. Describe the components of and use of the United States Preventive Services Task Force recommendations
   1. Strength of recommendation classifications
   2. Quality of evidence grading
XVII. RESEARCH AND THESIS

The fellow should be able to participate fully in the theoretical and technical aspects of clinical and/or basic science research projects. The thesis need not have been published or accepted for publication upon submission.

A. The thesis must meet the instructions for authors for any one of the following journals:
   1. American Journal of Obstetrics and Gynecology
   2. The New England Journal of Medicine
   3. Fertility and Sterility
   4. Obstetrics and Gynecology

B. The length of the manuscript should not exceed 30 typewritten, single-spaced, double-sided standard size pages.

C. The applicant must be the sole or principal investigator and should be the only author listed on the manuscript. Do not list co-authors, institutions or acknowledgements.

D. The subject should be clearly in the area of maternal-fetal medicine.

E. The thesis must be on clinical or basic research and NOT a review of work by others. The work must have been performed during or subsequent to the fellowship period.

F. All research involving human subjects and animals must be reviewed and approved by the human or animal institutional review board.

G. The thesis must be a scholarly effort that most often should consist of:
   1. An abstract
   2. An introduction with a testable hypothesis, when appropriate
   3. A methodology section
      a) Quality control of the methods
      b) Well-defined control group
      c) Reasonable number of observations as
demonstrated by a power analysis when appropriate
4. An analysis of results with valid statistical methods
5. A pertinent discussion with
   a) Review of appropriate literature
   b) Justification of conclusions
6. Summary
7. References

H. The following are not acceptable for a fellow’s thesis:
   1. Book chapters
   2. Clinical case reports
   3. Descriptive series
   4. Systematic reviews, including meta-analyses

I. The fellow should write a thesis that is a scholarly publication and be able to defend it according to the following outline:

1. **Hypothesis**
   a) What were the study objectives?
   b) What was the population studied?
   c) What was the population to which the investigators intended to apply their findings?

2. **Design of the Investigation**
   a) Was the study an experiment, case control study, randomized clinical trial, planned observations, or a retrospective analysis of records?
   b) Were there possible sources of sample selection bias?
   c) How comparable was the control group?
   d) What was the statistical power of the study?

3. **Observations**
   a) Were there clear definitions of the terms used (i.e., diagnostic criteria, inclusion criteria, measurements made and outcome variables)?
   b) Were the observations reliable and reproducible?
   c) What were the sensitivity, specificity and predictive values of the methods?

4. **Presentation of Findings**
   a) Were the findings presented clearly, objectively, and in sufficient detail?
   b) Were the findings internally consistent? (i.e., did
the numbers add up properly and could the different tables be reconciled, etc.?)

5. **Analysis of the Results**
   a) Were the data worthy of statistical analysis? If so, were the methods of analysis appropriate to the source and nature of the data?
   b) Were the analyses correctly performed and interpreted?
   c) Were there sufficient analyses to ascertain whether "significant differences" might, in fact, have been due to a lack of comparability of the groups (i.e., age, sex, clinical characteristics, or other relevant variables)?
   d) Was the design of the study appropriate for solving the stated problems?
   e) Was there an improper use of statistical techniques?
   f) Was there mention of the type of test used or the significance level?
   g) Was there use of measured sensitivity without specificity?

6. **Conclusions or Summary**
   a) Which conclusions were justified by the findings?
   b) Were the conclusions relevant to the hypothesis?

7. **Redesign the Study**
   a) If the study could be improved, how would the candidate revise the experimental design in order to provide reliable and valid information relevant to the questions under study?

8. **Breadth and Depth of Subject Matter**
   a) Each candidate may be asked about references cited in their thesis.
   b) The candidate also will be judged based upon their knowledge of the literature related to the subject of their thesis.