Society for Maternal-Fetal Medicine (SMFM) Special Report: the maternal-fetal medicine subspecialists' role within a health care system

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A maternal-fetal medicine (MFM) subspecialist has advanced knowledge of the medical, surgical, obstetrical, fetal, and genetic complications of pregnancy and their effects on both the mother and fetus. MFM subspecialists are complementary to obstetric care providers in providing consultations, co-management, or transfer of care for complicated patients before, during, and after pregnancy. The MFM subspecialist provides peer and patient education and performs research concerning the most recent approaches and treatments for obstetrical problems, thus promoting risk-appropriate care for these complicated pregnancies. The relationship between the obstetric care provider and the MFM subspecialist depends on the acuity of the maternal and/or fetal condition and the local resources. To achieve the goal of promoting early access and sustained adequate prenatal care for all pregnant women, we encourage collaboration with obstetricians, family physicians, certified midwives, and others, and we also encourage providing preconception, prenatal, and postpartum care counseling and coordination. Effective communication between all obstetric care team members is imperative. This special report was written with the intent that it would be broad in scope and appeal to a diverse readership, including administrators, allowing it to be applied to various systems of care both horizontally and vertically. We understand that these relationships are often complex and there are more models of care than could be addressed in this document. However, we aimed to promote the development of a highly effective team approach to the care of the high-risk pregnancy that will be useful in the most common models for obstetric care in the United States. The MFM subspecialist functions most effectively within a fully integrated and collaborative health care environment. This document defines the various roles that the MFM subspecialist can fulfill within different heath care systems through consultation, co-management, and transfer of care, as well as education, research, and leadership.

Key words: care of high-risk pregnancy, consultation, maternal-fetal medicine subspecialist, obstetric care providers, scope of maternal-fetal medicine, Society for Maternal-Fetal Medicine (SMFM)

In the United States, a maternal-fetal medicine (MFM) subspecialist is an obstetrician-gynecologist who has completed 2-3 years of additional formal education and clinical training within an American Board of Obstetrics and Gynecology (ABOG)- or American Osteopathic Board of Obstetrics and Gynecology (AOBOG)-approved fellowship program and is eligible for or certified by ABOG or AOBOG as having a special competence in the diagnosis and treatment of women with complications of pregnancy, including maternal diseases and fetal

TABLE 1
Scope of maternal-fetal medicine

The discipline of maternal-fetal medicine includes preconception care, specialized prenatal care and intrapartum care, obstetric and medical complications of pregnancy, diagnosis and management of fetal anomalies, fetal complications, and fetal testing. Within this scope of practice, it is recommended that, when consultation with a maternal-fetal medicine subspecialist is needed, the obstetric care provider consults with the subspecialist as soon as the condition is identified. It is recognized that the training and experience acquired by obstetric care providers may allow them to manage some complicated pregnancies. Some items listed below may not constitute high-risk conditions (eg, breast-feeding, contraception), but are part of the continuum of care provided by maternal-fetal medicine subspecialists as well as other obstetric care providers.

Preconception care

Preconception evaluation of women to optimize maternal and perinatal outcomes. Examples include women with underlying illness, previous adverse pregnancy outcome, or considering advanced reproductive technology.

Specialized prenatal care

1. Evaluation of pregnant women needing counseling regarding prenatal care issues and nutrition
2. Ultrasound: standard, limited, and specialized (eg, detailed sonography, fetal echocardiogram, Doppler studies)
3. Prenatal diagnosis, aneuploidy screening, and fetal therapy (CVS, amniocentesis, fetal blood sampling and transfusion, fetal thoracentesis and thoracoamniotic shunt placement, fetal vesicocentesis and vesicoamniotic shunt placement, laser, fetal surgery)
4. Genetic screening for women at increased risk for genetic disorders

Labor and delivery and associated complications

Any antepartum patient admitted for "other than delivery" support for intrapartum care including before labor; first-, second-, and third-stage issues; intrapartum fetal monitoring; anesthesia and analgesia; operative vaginal delivery, cesarean delivery; trial of labor after cesarean

Obstetric complications

1. Recurrent pregnancy loss
2. PTB prevention
   a. Asymptomatic (eg, prior second-trimester loss, possible cervical insufficiency); prior PTB; mullerian abnormalities; short cervical length; issues related to cerclage, pessary, progesterone, or other interventions for prevention of PTB
   b. Symptomatic (PTL or PPROM) <34 wk' gestation
3. Meconium complications
4. Malpresentation and malposition
5. Shoulder dystocia
6. Abnormal third stage of labor
7. Placenta accreta, increta, percreta
8. Second- or third-trimester vaginal bleeding
9. Preeclampsia with severe elements/eclampsia with HELLP syndrome or end-organ damage
10. Severe postpartum hemorrhage
11. Cesarean hysterectomy
12. Acute fatty liver of pregnancy
13. Amniotic fluid embolism

Maternal complications

1. Hypertensive disorders
2. Cardiac disease
   a. Congenital heart disease
   b. Arrhythmias
   c. Valve disease
   d. Cardiomyopathy
   e. Pulmonary hypertension
   f. Coronary artery disease
   g. Heart transplant

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problems. MFM subspecialists have the specific training and experience required to perform complex diagnostic and therapeutic procedures during pregnancy that can involve the mother and/or fetus. The MFM subspecialist has advanced knowledge of the medical, surgical, obstetrical, fetal, and genetic complications of pregnancy and their effects on both the mother and fetus, as well as an in-depth knowledge of newborn adaptation to maintain a continuum of care from the fetal to newborn periods. Furthermore, the MFM subspecialist has the training and expertise to evaluate prior adverse pregnancy outcomes to try to improve subsequent pregnancy outcomes, as well as the lifelong effects on the mother. Lastly, the MFM subspecialist provides peer and patient education and performs research concerning the most recent approaches and treatments for obstetrical problems, thus promoting risk-appropriate care for these complicated pregnancies.

The training and experience acquired by obstetric care providers may allow them to manage certain difficult pregnancies. MFM subspecialists are complementary to such obstetric care providers in providing consultations, co-management, or direct care for complicated patients (Table 1) before, during, and after pregnancy. The relationship between the obstetric care provider and the MFM subspecialist depends on the acuity of the maternal and/or fetal condition and the local resources. The discipline of MFM involves several pregnancy-related aspects, including: preconception care for women with medical or genetic risk factors or prior adverse pregnancy outcomes; antepartum care for pregnancies with medical, surgical, obstetric, or fetal complications; labor and delivery and associated complications; obstetric complications; maternal medical complications; fetal evaluation for anomalies; fetal testing; gynecologic issues related to pregnancy; and postpartum care and its complications (Table 1).

Access to risk-appropriate obstetric care

All pregnant women should have access to a primary obstetric care provider who can either provide or arrange risk-appropriate obstetric care. Our goal is

TABLE 1
Scope of maternal-fetal medicine *(continued)*

3. Respiratory disease
   a. Asthma
   b. Pneumonia
   c. Restrictive lung disease
   d. Pulmonary edema
   e. Influenza
   f. Tuberculosis
   g. Cystic fibrosis
4. Obesity
5. Endocrinologic disorders
   a. Addison disease
   b. Diabetes, insulin-requiring/dependent
   c. Thyroid disease
   d. Parathyroid disease
   e. Pheochromocytoma
6. Gastrointestinal disease
   a. Nausea and vomiting in pregnancy; hyperemesis gravidarum
   b. Eating disorders
   c. Intrahepatic cholestasis
   d. Inflammatory bowel disease (ulcerative colitis; Crohn's disease)
   e. Gallbladder disease (cholecystitis, cholelithiasis)
   f. Pregnancy after liver transplantation
   g. Pancreatitis
   h. Wilson disease
7. Hematologic diseases
   a. Maternal anemia and hemoglobinopathies
   b. Sickle cell disease
   c. von Willebrand disease
   d. Thrombotic thrombocytopenia purpura/hemolytic uremic syndrome
   e. Care of the Jehovah's Witness pregnant woman
8. Renal disease (includes renal transplantation)
9. Neurologic diseases:
   a. Seizure disorders
   b. Headache
   c. AV malformation/berry aneurysm
   d. Multiple sclerosis
   e. Pseudotumor cerebri
   f. Myasthenia gravis
   g. Spinal cord injury
   h. Diabetes insipidus
10. Psychosocial issues and abuse
   a. Smoking
   b. Alcohol abuse
   c. Drug abuse
   d. Depression
   e. Other psychiatric disorders
   f. Domestic violence
11. Rheumatologic disorders
   a. Antiphospholipid syndrome
   b. Systemic lupus erythematosus
   c. Rheumatoid arthritis
   d. Other autoimmune disease
12. Thromboembolic disorders
   a. Venous thromboembolism and anticoagulation
   b. Inherited thrombophilia
13. Infectious disorders
   a. Hepatitis A
   b. Hepatitis B
   c. Hepatitis C
   d. HIV
   e. Gonorrhea

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to promote early access and sustained adequate prenatal care for all pregnant women, through appropriate levels of care (Table 2). Promoting early and risk-appropriate access may also be achieved by encouraging specialty and subspecialty physician collaboration with family medicine/family physicians and certified nurse midwives (CNMs)/certified midwives (CMs) and by providing preconception, prenatal, and postpartum care counseling and coordination to all women (Table 1).

Obstetric care providers

Obstetric care providers include CNMs/CMs, nurse practitioners, physician assistants, family physicians, obstetrician-gynecologists, obstetric-gynecologic hospitalists, and MFM subspecialists. The following descriptions of obstetric care providers come from each specialty's own definition.

CNMs and CMs

Midwifery practice as conducted by CNMs and CMs is the independent management of women's health care, focusing particularly on common primary care issues, family planning and gynecologic needs of women, pregnancy, childbirth, the postpartum period, and care of the newborn. The practice occurs within a health care system that provides for consultation, collaborative management, or referral as indicated by the health status of the woman or newborn. The CNM is a registered nurse who has completed a midwifery education program accredited by the Accreditation Commission for Midwifery Education (ACME), and passed a national certification examination administered by the American Midwifery Certification Board to receive the professional designation of CNM. Programs leading to the CM credential require specific health and science courses prior to entry. CMs are educated in the discipline of midwifery and complete a midwifery education program accredited by ACME, and pass the same national certification examination as CNMs to receive the professional designation of CM. Midwifery education programs leading to the CNM and CM credentials involve graduate

TABLE 1
Scope of maternal-fetal medicine *(continued)*

- f. Chlamydia
- g. Syphilis
- h. Trichomonas
- i. Group B streptococcus
- j. Vaccination concerns
- k. Pyelonephritis
- l. Management of wound infection

14. Trauma and critical care
    a. Trauma
    b. Critical care
15. Skeletal; connective tissue
    a. Marfan syndrome
    b. Maternal skeletal dysplasia
16. Dermatoses
17. Cancer before or during pregnancy
18. Nonobstetric abdominal surgery in the current pregnancy

Fetal anomalies

1. Structural abnormalities
2. Family history of abnormality
3. Aneuploidy or increased risk for aneuploidy
4. Teratogen exposure

Fetal complications

1. Threatened miscarriage (including medical and surgical management)
2. Multifetal pregnancies (including, but not limited to, mono/di twins, mono/mono twins, higher-order multiples; fetal growth restriction of 1 fetus; twin-twin transfusion syndrome; fetal reduction)
3. Growth disorders
   a. Growth restriction
   b. Macrosomia
4. Infections (eg, cytomegalovirus, toxoplasmosis, parvovirus, Herpes, varicella)
5. Fetal death
6. Hemolytic disease (red cell alloimmunization)
7. Neonatal alloimmune thrombocytopenia
8. Nonimmune hydrops

Fetal testing

1. Antepartum fetal monitoring
2. Sonographic assessment of amniotic fluid abnormalities
   a. Oligohydramnios
   b. Hydramnios
3. Fetal blood sampling/intrauterine transfusion
4. Screening for fetal anemia
5. Fetal muscle/organ biopsy
6. Fetal skin sampling
7. Fetal surgery; fetoscopy/embryoscopy

Gynecologic issues related to pregnancy and their impact on pregnancy

1. History of infertility
2. The adnexal mass

Postpartum care

Postpartum care, breast-feeding, contraception, and complications such as severe hemorrhage, refractory infections, complicated preeclampsia, eclampsia, and difficult postcesarean complications

AV, arterio-venous; *CVS*, chorionic villus sampling; *HIV*, human immunodeficiency virus; *PPROM*, preterm premature rupture of membranes; *PTB*, preterm birth; *PTL*, preterm labor.

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education. (American College of Nurse Midwives: www.midwife.org)

Nurse practitioners

Nurse practitioners (NPs) are licensed, independent practitioners who practice in ambulatory, acute, and long-term care as primary and/or specialty care providers. They provide nursing and medical services to individuals, families, and groups accordant with their practice specialties. Services include ordering, conducting, supervising, and interpreting diagnostic and laboratory tests, prescribing pharmacological agents and nonpharmacologic therapies, and teaching and counseling patients, among others. As licensed, independent clinicians, NPs practice autonomously and in collaboration with health care professionals and other individuals. NPs are advanced practice nurses—health care professionals who have achieved licensure and credentialing well beyond their roles as registered nurses. All NPs obtain graduate degrees. Didactic and clinical courses provide NPs with specialized knowledge and clinical competency, which enable them to practice in primary, acute, and long-term care settings. Self-directed continued learning and professional development are hallmarks of NP education. The women's health NP is an advanced practice NP who is prepared through academic and clinical study to provide health care, with an emphasis on reproductive-gynecologic and well-woman health, to women throughout the life span. (American Association of Nurse Practitioners: www.aanp.org; Association of Women's Health, Obstetric and Neonatal Nurses: www.awhonn.org; The National Association of Nurse Practitioners in Women's Health: www.npwh.org)

Physician assistants

A physician assistant (PA) is educated at the graduate level and the majority of PA programs require a bachelors degree, prerequisite science courses, and health care experience prior to acceptance into a PA program. All PAs are required to pass a national certifying exam and be licensed by the governing board in the state where they practice.

TABLE 2
Levels of prenatal care

Level	Capabilities	Provider types
Essential or routine prenatal care	• Risk-oriented prenatal care record • Physical examination and interpretation of findings • Routine laboratory assessment • Assessment of normal progress of pregnancy • Ongoing risk identification • Standard ultrasound examination • Mechanisms for consultation, collaboration, and referral	• Obstetrician-gynecologists • Certified nurse midwives/certified midwives • Nurse practitioners and physician assistants • Family physicians • Maternal-fetal medicine subspecialists
Specialty care	• Essential or routine care plus basic fetal diagnostic testing, including: limited ultrasound examination • Expertise in management of medical and obstetric complications (Table 1) • Mechanisms for consultation, collaboration, and referral as soon as complication (Table 1) is identified • Advanced fetal diagnostic testing is considered subspecialty care	• Obstetrician-gynecologists • Maternal-fetal medicine subspecialists • Family physicians and certified nurse midwives/certified midwives with experience, training, and demonstrated competence with appropriate consultation and/or collaborative management
Subspecialty care	• Essential or routine and specialty care plus advanced fetal diagnosis (eg, specialized ultrasound examination, fetal echocardiology) • Advanced fetal therapy (eg, intrauterine fetal transfusion and treatment of cardiac arrhythmias) • Medical, obstetric, surgical, and genetic consultation • Management of maternal complications • Consultation and coordination of care as needed with subspecialists including, but not limited to, general surgery, pediatric surgery, infectious disease, hematology, cardiology, nephrology, neurology, and neonatology	• Maternal-fetal medicine subspecialists • Geneticists with appropriate training, experience, and demonstrated competence may provide care for issues focused primarily on fetal concerns and complications

Risk-appropriate prenatal care at all levels includes interdisciplinary team designed to meet medical, psychosocial, and educational needs of patient and her family. This interdisciplinary team includes, but is not limited to, nurse practitioners, clinical nurse specialists, prenatal care coordinators, nutritionists, lactation consultants, social workers, prenatal educators, and other medical specialists (eg, cardiologists, endocrinologists, internal medicine, obstetrical anesthesiologists).

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Once certified and licensed, PAs must also earn continuing education credits, including self-assessment and performance improvement activities, to maintain certification and licensure. PAs are trained and certified in the primary care model as generalists and during the final year of training, all PA students must complete a variety of clinical rotations, including a rotation in obstetrics and gynecology. Within that model, there is room for expertise in women's health and obstetric care. Individual PA duties are dependent on the scope of their individual supervising physician's practice and the desire of the physician to delegate certain tasks or responsibilities in obstetric care. (Association of Physician Assistants in Obstetrics and Gynecology: www.paobgyn.org)

Family physicians

Family medicine is the medical specialty that provides continuing and comprehensive health care for the individual and family. It is a specialty that, in its breadth, integrates the biological, clinical, and behavioral sciences. The scope of family medicine encompasses all ages, both sexes, each organ system, and every disease entity. The specialty of family medicine is the result of the evolved and enhanced expression of general medical practice and is uniquely defined within the family context.

The family physician is a physician who is educated and trained in family medicine—a broadly encompassing medical specialty. Family physicians possess unique attitudes, skills, and knowledge that qualify them to provide continuing and comprehensive medical care, health maintenance, and preventive services to each member of the family regardless of sex, age, or type of problem, be it biological, behavioral, or social. These specialists, because of their background and interactions with the family, are best qualified to serve as each patient's advocate in all health-related matters, including the appropriate use of consultants, health services, and community resources. (American Academy of Family Physicians: www.aafp.org)

TABLE 3
Maternal-fetal medicine services

Variable	MFM consultation only	MFM co-management	Transfer of care to MFM
Service provided	MFM consultation only	MFM consultation with ongoing MFM care of high-risk condition	Transfer of care to MFM
Frequency of visits	Single visit	Multiple visits	Multiple visits
Scope of responsibilities	1. MFM makes recommendations for evaluation and/or care 2. Does not write orders 3. Does not have responsibility to follow up patient thereafter	1. Primary obstetrician/caregiver is responsible for general obstetric care and delivery 2. MFM responsible for care of high-risk condition, including scheduled rounds for complication 3. MFM responsible for maternal and fetal testing (NST, BPP, ultrasound) as indicated and delineated	1. MFM takes over responsibility for all care 2. Antepartum care 3. Maternal and fetal testing 4. Obstetric care 5. Performs delivery[a] 6. Postpartum care
Documentation	Single visit only	Additional consults, ultrasound, and antepartum fetal surveillance	MFM will assume all care and responsibility for total obstetric care including postpartum care

BPP, biophysical profile; *MFM*, maternal-fetal medicine; *NST*, non-stress test.

[a] In some institutions, MFM subspecialists do not do deliveries. Therefore, transfer of care may only refer to outpatient care.

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Obstetrician-gynecologists

The specialty of obstetrics and gynecology is devoted to the health care of women throughout their lifetime. It encompasses care of the whole patient in addition to focusing on the normal and abnormal processes of the female reproductive system, including the breast. Care provided by the obstetrician-gynecologist includes preventive and primary care, care during pregnancy and childbirth, and medical and surgical management of reproductive-related disorders and diseases. Obstetrician-gynecologists are specialists in obstetrics and gynecology and serve as both primary and consultant physicians to women. Although some, like physicians of the other designated primary care specialties, may choose to provide consultant care only. (American Congress of Obstetricians and Gynecologists: www.acog.org)

Obstetric-gynecologic hospitalist

An obstetric care provider who provides on-site coverage for a labor and delivery unit is referred to as a hospitalist. During the time of coverage, the obstetric-gynecologic hospitalist has no office practice—based responsibility. Several models of hospitalist care exist including community provider models utilizing local obstetricians to provide shared 24-hour on-site labor unit presence, full-time models of physicians without an office practice who solely cover a labor and delivery unit when working, or models that have a hybrid approach. Hospitalist models vary with a spectrum of care responsibilities with minimalist models of care involving coverage of emergencies for other private obstetric providers and provision of care to women with no prenatal care, to full-service hospitalists who provide care for all obstetrical interventions routinely and work in conjunction with the patient's personal obstetrician; such hospitalists may function as the delivering obstetrician. In some models, the hospitalist may collaborate with the MFM subspecialist and perform some or all of the MFM subspecialists' deliveries. (Society of OB/GYN Hospitalists: www.obgynhospitalist.com)

TABLE 4
Strategies to facilitate safety and improve outcomes when using maternal-fetal medicine services

- Encourage specific policies and procedures regarding: (1) consultations; (2) consultation with ongoing care of high-risk condition, co-management; (3) transfer of care
- Encourage policies requiring written orders for maternal-fetal medicine subspecialist consultation
- Encourage policies that specify services requested
- Clear delineation of services to be rendered
- Written documentation of each provider's role and responsibilities
- Frequent and clear communication

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MFM subspecialist

The MFM subspecialist is an obstetrician-gynecologist who has completed 2-3 years of additional formal education and clinical experience within an ABOG-approved MFM fellowship program and is eligible for or certified by ABOG as having a special competency in: (1) the diagnosis and treatment of women with complications of pregnancy; (2) preexisting medical conditions that may be impacted by pregnancy; and (3) medical conditions

that impact the pregnancy itself. In addition, the AOBOG confers subspecialty certification in MFM to physicians who have primary certification in obstetrics and gynecology, successfully completed a 3-year fellowship and research requirements, and passed the subspecialty clinical examination. MFM subspecialists have the specific training and experience needed to perform complex diagnostic and therapeutic procedures during pregnancy that can involve the fetus and/or mother, such as targeted ultrasound or fetal intravascular transfusions. The MFM subspecialist requires advanced knowledge of the obstetrical, medical, surgical, obstetric, fetal, and genetic complications of pregnancy and their effects on both the mother and fetus. Advanced knowledge of neonatal adaptation is also necessary to ensure a continuum of care from the fetal to the neonatal periods.

As with other obstetric care providers, the MFM subspecialist also provides education and research within the field concerning the most recent approaches and treatments for obstetrical problems. The MFM subspecialist can help promote and deliver optimal and evidence-based care for these complicated pregnancies. (Society for Maternal-Fetal Medicine; www.smfm.org)

The role of the MFM subspecialist in ongoing care

The MFM subspecialist can provide many different services for high-risk obstetric patients (Table 1). It is important for the obstetric care provider to understand these roles so that they can choose what is optimal for their practice and patients. Typically MFM subspecialists provide service to patients in both the outpatient and inpatient setting in one of the following ways: (1) consultation only; (2) consultation with ongoing care of high-risk condition or co-management; and (3) transfer of care (Table 3). There may also be patients who seek out a service or return for a subsequent pregnancy after a complicated previous pregnancy.

Since the high-risk obstetric patient's medical conditions are often complex and commonly result in a team approach between many disciplines, clear delineation of responsibilities is crucial. Regardless of the type of provider or service provided, effective communication between all obstetric care team members is imperative. Lines of communication should be clearly spelled out in the medical record with any critical details communicated directly to the obstetric provider.

Consultation only

In this model, the MFM subspecialist sees the patient for a 1-time consultation and makes recommendations for evaluation and/or care. The MFM consultant does not traditionally write orders and there is no ongoing responsibility to follow up the patient thereafter. However, in some instances, depending on the understanding between the requesting provider and the consultant, they may write orders based on the recommendations in their consultation. A written consultation is sent to the referring provider or placed in the chart if the patient is in an in-patient setting. Any findings and recommendations are clearly documented within the written consultation. Since the intent of the consultation is to provide a framework of care for the referring physician to follow with the patient, wording such as "we will follow along with you" should be avoided.

Consultation with ongoing care of high-risk condition scenario or the co-management model

In this model of care, the primary obstetric provider is responsible for general obstetric care throughout the pregnancy. The MFM subspecialist is responsible for care of requested and identified high-risk conditions, possibly including requests for any additional consultations, ultrasounds, or antepartum fetal surveillance. In the inpatient setting, this often involves performing daily rounds to address the ongoing medical condition and associated problems. Typically in this co-management model the MFM subspecialist is also responsible for maternal and fetal testing (non-stress test, biophysical profile, ultrasound) as indicated. As with other models, the findings and recommendations for care should be clearly stated in the written communication from the MFM subspecialist to the obstetric provider. This includes the schedule for follow-up visits, ultrasounds, and antepartum fetal surveillance. Which aspects of care the referring practitioner and the MFM subspecialist are responsible for should be clearly delineated. This model assumes that in the absence of an unexpected complication or unless otherwise noted, the obstetric care providers will be responsible for intrapartum and postpartum care. The co-management between a provider and a subspecialist such as the MFM subspecialist is a desirable model of care that is utilized in many health care systems and provides a robust level of care to the greatest number of patients.

Transfer of care to MFM subspecialist model

In this last model, the patient's problems are of a high-risk nature or beyond the scope of the referring provider's practice. The obstetric care provider transfers the care of the patient to the MFM subspecialist who assumes complete responsibility for care of the patient. This includes antepartum care, maternal and fetal testing, and all obstetric care through performing the delivery and providing postpartum care. In some institutions, MFM subspecialists do not do deliveries. Therefore, transfer of care may only refer to outpatient care. Following the initial visit after transfer, the MFM subspecialist communicates in writing the findings and the plan of management. It should be clear that the MFM subspecialist is assuming responsibility for the complete obstetric care of the patient.

For these 3 models of care to work effectively, a departmental or hospital policy carefully considering the advantages and disadvantages of each model or other alternatives within the context of the system needs to be created. Determining which model of care works best for each situation is key. Implementing specific policies and procedures regarding consultations, co-management, and transfer of care

avoids any inconsistencies or fractionated obstetric care. As contributors and often leaders in obstetric policy decision-making, the MFM subspecialist should be engaged in the development of such policies, written orders sets and other methods to facilitate this process. As hospitals, departments, and specific obstetric care providers may vary considerably in their expertise and capabilities, each institution and group may want to modify these templates to better meet their needs (Table 4).

Leadership role of the MFM subspecialist within a hospital and its possible benefits

MFM subspecialists play a vital role in many hospital and regional health systems due to their advanced training in the care of the high-risk pregnancy. While it is incumbent on all MFM subspecialists to stay current in clinical care of the high-risk obstetric patient, they also play key roles in many other aspects for their department and hospital systems in the areas of quality assurance and safety, clinical protocol development, and education. MFM subspecialists often serve as clinical directors in obstetrics, labor and delivery, MFM, and other leadership positions. Furthermore, some MFM subspecialists serve as chairs of patient safety or quality improvement committees. As simulation becomes an important part of medical education for maintaining and obtaining clinical competency, the MFM subspecialist can be an important resource for the creation of these programs and their implementation, along with other obstetric care providers.

The various roles of the MFM subspecialist not only help assure smooth departmental and hospital system flow, but also appear to result in significant financial savings for some health care institutions.[1] The implementation of MFM-directed protocols for patient safety is an important example of the combination of quality and value medicine resulting in a decrease in maternal morbidities and operative deliveries.[1] Furthermore, the implementation of evidence-based obstetric protocols has demonstrated a decrease in perinatal harm reducing the number of malpractice claims resulting in a reduction in claim costs, which are passed on to self-insured medical systems.[1,2] Larger, comprehensive efforts utilizing protocols, team-based training, simulation, and education have also resulted in reductions in birth trauma, as well as, improvements in documentation and in staff and patient perceptions of safety.[3]

It is now widely accepted that neonatal outcomes are improved when women who are at risk for a complicated or early delivery are transferred to a facility that provides the required level of specialized obstetric and newborn care before delivery, rather than transferring the newborn after delivery. The MFM subspecialist often communicates with the transferring provider, and approves and coordinates the transport of the high-risk pregnant mother to the higher-level facility. In one study, it was reported that 74% of patients trust their provider to select a facility for care and 69% rely solely on their referring doctor's recommendation.[4] Timely and efficient transfer of pregnant women can minimize errors, provide appropriate risk-based care, reduce delays, and improve patient satisfaction for both the transferring and receiving facility.

As the standards for levels of maternal care evolve, focusing on maternal safety and prevention of morbidity and mortality, access to MFM consultation on a timely basis will be needed to perform essential duties for facilities providing varying levels of care. Higher-level facilities will require MFM directors to assist with the management of patients, protocol development, safety initiatives, education, and training of staff. These quality-based efforts will require leadership and coordination of care that will need a significant commitment of time by the MFM subspecialist in nonpatient care. These nonrevenue-generating activities will need financial support to be sustainable. One option of compensation is via medical directorship contracts or professional service agreements from hospital systems that could contain detailed documentation of responsibilities and expectations. While there may be regional variations or varying degrees of effort, the average compensation for these agreements in 2010 was $132,439/y.[5] MFM subspecialists have a key role within systems of care and in the promotion of a system of revenue for health care systems.[6] Hospital systems profit from having higher care units via improved hospital contracting, enhanced transport services, neonatal intensive-care unit (NICU) services, and downstream pediatric and pediatric subspecialty production.

Benefits of care models that include MFM subspecialists

The clinical care performed by the MFM subspecialist can run a gamut from that commonly provided by the obstetric care provider to more advanced and sophisticated care of the pregnant woman and fetus (Table 1). MFM subspecialist usually provides this type of service in the preconception, antepartum, intrapartum, and postpartum periods. There is a general shortage of MFM subspecialists, and reduced access to care in some patient areas. For example, 24.5 million reproductive-aged women live in a county without an MFM subspecialist.[7] The expanding role of telemedicine for MFM subspecialists to provide remote consulting services may help fill some of these gaps and potentially improve outcomes. The increasing rates of obstetric complications (eg, obesity, diabetes, drug and alcohol dependence, and repeat cesarean deliveries) will likely contribute to an increase in number of patients with high-risk conditions needing subspecialty care.

Although limited, some evidence exists that primary MFM subspecialty care of the high-risk patient improves gestational age at delivery, decreases antepartum days, reduces preterm delivery, and lowers cesarean delivery rates.[8] These findings may be due to earlier care and intervention by the MFM subspecialist rather than providing the total care and delivery. Britt et al[9] showed no difference in outcome based upon gestational age at first visit with an MFM subspecialist when gestational age was looked at as a continuous variable.

However, when MFM evaluation before or after 20 weeks' gestation was examined as a dichotomous variable in a subgroup analysis in this study, specialist intervention <20 weeks' gestation resulted in improved gestational age at delivery for patients who possessed medical problems such as cardiopulmonary disease, thyroid disease, previous intrauterine fetal death, previous pregnancy with intrauterine growth restriction, diabetes, advanced maternal age, history of drug abuse, or prior cesarean delivery. Other examples of benefits from MFM care have been published. MFM-designed and MFM-led care in a recurrent preterm birth prevention clinic has been associated with reduced rates of recurrent spontaneous prematurity and major neonatal morbidity compared to patients treated by their primary provider.[10] MFM-designed and MFM-led specialized prenatal care for twin pregnancies has been associated with decreased rates of preeclampsia, preterm birth, and neonatal morbidity compared to usual care.[11] Continuous 24-hour MFM coverage has been associated with significant decreases in preterm birth, NICU length of stay, and nonmedically indicated deliveries <39 weeks, compared to limited, emergency-only MFM coverage, in a rural area.[12] The density of MFM subspecialists has been shown to be significantly and inversely associated with maternal mortality ratios, even after controlling for confounders such as maternal poverty, education, race, and age.[13] Therefore, we suggest that MFM subspecialists actively participate in the care of women with concomitant medical complications during pregnancy or when medical complications arise.

Since 2006, the Centers for Disease Control and Prevention has recommended preconception visits for all pregnant women, yet approximately half of all pregnancies are unplanned and most planned pregnancies do not take advantage of this recommended care.[14] Most patients with medical problems such as hypertension, diabetes, thyroid disease, obesity, and lupus could benefit from preconception consultation with an MFM subspecialist to coordinate care and optimize well-being prior to pregnancy. For instance, optimal glucose control in a diabetic woman before pregnancy, which often differs from typical adult nonpregnant standards for control, results in a decrease in congenital anomalies.

The clinical practice of MFM generally includes caring for pregnant women with concomitant medical diseases, and prenatal diagnosis and fetal assessment. While the MFM subspecialist is familiar with all forms of prenatal testing, the most commonly used technique is high-resolution ultrasound. While other obstetric and radiology providers often perform fetal ultrasound examinations, multiple studies have demonstrated the improved detection of fetal anomalies in specialized centers run by MFM subspecialists.[15,16] The use of specified techniques such as Doppler flow studies can provide a window into the physiology of the fetus. The use of fetal Doppler flow studies to improve outcomes has been well documented in fetuses at risk for fetal anemia and in the growth-restricted fetus.[17] This emphasizes the benefits of having the ability to have specialized examinations performed by an MFM subspecialist trained in their appropriate indications, as well as conduct and interpretation of the exams.

In the postpartum period, the MFM subspecialist could participate in ensuring the woman and the obstetric care provider recognize the need for postpartum follow-up of medical complications (eg, gestational diabetes or preeclampsia) that can lead to an exacerbation of disease or an increased risk of later disease.

The US health care system is in the midst of enormous change, and is associated with the highest cost and some of the poorest quality metrics (eg, survival for cervical cancer, preventable mortality due to asthma, rate of hemorrhagic stroke) among high-income countries.[18] This is forcing health systems and providers to explore ways to improve outcomes while maximizing resources. Bundled payments for diagnoses have been attempted to control costs by deemphasizing reimbursement for procedures, testing, and hospitalizations. These interventions have generally not been effective, as they do not include laboratory services, ancillary services, and hospital admissions that have a large effect upon costs. Measurements of outcomes for these newer models have been difficult to determine; although it is clear that specific quality metrics should stem from the outcomes that are associated with both a healthy mother and infant. More research is needed to both evaluate the impact of MFM care on outcomes, as well as the role of MFM in the health care system. This article aims at stimulating such research. With the knowledge that, based on limited data, earlier intervention or comprehensive care by the MFM subspecialist is likely to improve maternal and/or neonatal outcomes, a key role for the MFM subspecialist is needed for these models to be successful. The focus on value-based care with high standards for quality efforts should concentrate on identifying areas that decrease maternal morbidity and mortality, as well as NICU cost. Risk assessment systems to identify patient populations that would benefit from early MFM evaluation are needed.

RECOMMENDATIONS

- The relationship between the obstetric care provider and the MFM subspecialist depends on the acuity of the maternal and/or fetal condition and the local resources. To achieve the goal of promoting early access and sustained adequate prenatal care for all pregnant women, we encourage collaboration with obstetrician-gynecologists, family physicians, CMs, and other obstetric care providers in delivering preconception, prenatal, and postpartum care counseling and coordination.
- Regardless of the type of provider or service provided, effective communication between all obstetric care team members is imperative.
- Implementing specific policies and procedures regarding consultations, co-management, and transfer of care avoids any inconsistencies or fractionated obstetric care.
- MFM subspecialists should actively participate in the care of women with concomitant medical complications

during pregnancy or when medical complications arise.

- Risk assessment systems to identify patient populations that would most benefit from early MFM evaluation are needed.
- More research is needed to both evaluate the impact of MFM care on outcomes, as well as the role of MFM in the health care system. ■

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The practice of medicine continues to evolve, and individual circumstances will vary. This opinion reflects information available at the time of its submission for publication and is neither designed nor intended to establish an exclusive standard of perinatal care. This publication is not expected to reflect the opinions of all members of the Society for Maternal-Fetal Medicine.