OBSTETRICS

Spotlight: Thyroid Disease

Special Feature: CardioMems HF System
Our PolicyOwners℠ are Informed.

MagMutual offers industry-leading patient safety and risk management resources to reduce inherent risk for patients and healthcare practitioners. And we now offer complimentary access to UpToDate®, providing clinicians with the most current evidence-based clinical content to make the most informed treatment decisions.

We are your partner in managing risk – offering the essential coverage and support to keep you informed, safe, protected and rewarded.

In the practice of medicine and beyond – MagMutual is in your corner. To experience the PolicyOwner difference please visit MagMutual.com.
Contributors

OBSTETRICS

5 Obstetrics Introduction
By Ceana Nezhat, M.D.

6 Challenges in the Diagnosis of Non-Obstetric Abdominal Pain in Pregnancy
By Kathleen G. Funk, M.D., F.A.C.E.P.

8 Non-Obstetric Laparoscopic Surgery during Pregnancy
By Nisha A. Lakhi M.D., Ceana Nezhat M.D.

12 Sepsis in Pregnancy: A Guide for Clinicians
By Carla E. Ransom, M.D.

14 Noninvasive Prenatal Screening (NIPS) Cell-free fetal DNA Screening Fetal Aneuploidy
By Kevin Gomez, M.D.

16 Current Management of Twin Gestation
By Tossy Fogle, M.D.

20 Fetal Therapy and Intervention Update
By Thomas N. Trevett, M.D., Larry Matsumoto, M.D., Michael Belfort, M.B.B.C.H., M.D., Ph.D.

22 Post-dural Puncture Headache in Obstetric Anesthesia: A Complication To Review
By Zachary Lazarus, M.D., Jessica Quinlan, M.D.

24 Preeclampsia and Future Risk of Heart Disease: The Role of Reproductive History in Preventive Care
By Lee Brian Padove, M.D. F.A.C.C.

26 Monitoring Device Boosts Proactive Management in Patients With Heart Failure The CardioMEMS HF System at WellStar
By Helen K. Kelley

28 Thyroid Disease
By Helen K. Kelley

30 Burning Out in Georgia
By Faria Khan, M.D.
Your patients.

Give them more than a fighting chance. Give them the highest level of experience and quality care possible.

**That’s Emory Transplant Center.**

Our renowned surgeons have performed more than 8,000 transplants, making us a leading national program. This experience results in superior outcomes due to our specialized expertise in heart, kidney, liver, lung and pancreas transplantation. We’re also one of the most active participants in the National Kidney Registry, giving more patients like yours a second chance.

Our resources, expertise and outcomes make us a leading transplant destination for patients from Georgia, the Southeast and across the nation.

For transplant patients, the right referral can make all the difference.

For information on referring patients, visit [emoryhealthcare.org/txrefer](http://emoryhealthcare.org/txrefer) or call 1-855-EMORY-TX.
CONTRIBUTING WRITERS

GUEST EDITOR

Ceana Nezhat, M.D.
Dr. Ceana Nezhat is Fellowship Director at Nezhat Medical Center. He serves as Director of Medical Education at Northside Hospital, Adjunct Professor Department of OB/GYN at Emory University and President of the Society of Reproductive Surgeons.

Dian “Tossy” Fogle, M.D.
Dr. Fogle is a perinatologist at Georgia Perinatal Consultants. She received her B.A. from Vanderbilt University and her M.D. from LSU in New Orleans. She completed her residency and fellowship at Emory University. Dr. Fogle is board certified in obstetrics and gynecology and maternal-fetal medicine. Her primary interests include prenatal diagnosis and complications of pregnancy. Dr. Fogle is on staff at Northside Hospital, Piedmont Hospital and WellStar Kennestone Regional Medical Center.

Kathleen G. Funk, M.D., F.A.C.E.P.
Dr. Funk is a senior partner in Northside Emergency Associates and staff EM physician in the Northside Hospital system. Beginning in EMS in 1982, she later completed her M.D. at the University of Texas Medical School at Houston and her Emergency Medicine Residency at Emory University. She educates physicians to recognize and treat victims of human trafficking and serves on medical rescue teams in developing nations.

Kevin J. Gomez, M.D.
Dr. Gomez is board certified in obstetrics-gynecology, maternal-fetal medicine, and medical genetics. He is in private practice with Georgia Perinatal Consultants at Northside Hospital. He completed a fellowship in maternal-fetal medicine at the University of Florida and subsequently completed three post-doctoral fellowships at Yale University School of Medicine, including obstetrical ultrasound and prenatal diagnosis, medical genetics and diagnostic fetal echocardiography.

Zachary Lazarus, M.D.
Dr. Lazarus received his B.S. in Microbiology from the University of Georgia followed by his medical degree from the Medical College of Georgia. He completed an internship and anesthesia residency at the University of Tennessee in Knoxville. He is board certified in general anesthesia and has been in practice at Northside Anesthesia Consultants since 2012.

NISHA LAKHI M.D., FACOG
Dr. Lakhi is a board certified Obstetrician and Gynecologist. She completed her residency in Obstetrics and Gynecology at New York Medical College followed by a fellowship, with specialized training in minimally invasive surgery at Northside Hospital in Atlanta. Subsequently, she joined the faculty at Richmond University Medical Center in Staten Island, New York, where she is the Director of Research and Co-Director of Minimally Invasive Surgery.

Lee B. Padove, M.D.
Dr. Padove is a board certified cardiologist and a graduate of the Medical College of Georgia. He completed his medicine residency and cardiology fellowship at the Brooke Army Medical Center in Fort Sam Houston, Texas, where he practiced cardiology until 1993 before moving to Atlanta. Dr. Padove’s special interests include cardiac evaluation and treatment during pregnancy.

Jessica Quinlan, M.D.
Dr. Quinlan received her B.S. in chemistry from the University of Georgia and doctorate of medicine from Washington University in St. Louis. She completed an internship and anesthesia residency at Vanderbilt University in Nashville, Tenn. She is board certified in anesthesiology and has been in practice with Northside Anesthesiology Consultants since 2015.

Carla Ransom, M.D.
Dr. Ransom is a perinatologist with Georgia Perinatal Consultants. She earned her undergraduate degree at Duke University and her medical degree at the University of North Carolina at Chapel Hill. She completed both her residency in obstetrics and gynecology and her maternal-fetal medicine fellowship at Duke University. Prior to joining Georgia Perinatal Consultants, she served as Assistant Professor of Obstetrics and Gynecology at Vanderbilt University.

Thomas Trevett, M.D.
Dr. Trevett is a Maternal-Fetal Medicine physician and partner at Georgia Perinatal Consultants. He received his undergraduate degree from the College of the Holy Cross and his medical degree from the State University of New York at Buffalo. He performed his Obstetrics and Gynecology residency at the University of California, San Diego, then went on to complete a three-year fellowship in Maternal Fetal Medicine at the University of North Carolina, Chapel Hill.
MEDICAL PROFESSIONAL LIABILITY INSURANCE

PHYSICIANS DESERVE

Offering top-tier educational resources essential to reducing risk, providing versatile coverage solutions to safeguard your practice and serving as a staunch advocate on behalf of the medical community.

Talk to an agent/broker about NORCAL Mutual today.

NORCALMUTUAL.COM | 844.4NORCAL

© 2016 NORCAL Mutual Insurance Company
As I reflect upon the days when I delivered babies, I recall hearing the much-anticipated cry of the newborn filling the room with joy and a sense of relief. Those were some of the most rewarding moments of my career. Months of caring for both mother and her unborn child had finally come to fruition.

Ideally, every child is “well-born” physically, mentally and emotionally, which is fundamental to human dignity.

Obstetrics, the branch of medicine derived from the Latin term obstetrix, is defined as midwife. Most dictionaries reference it with the verb obstare, which means to stand by or in front of. Since pregnant and non-pregnant women are subject to the same diseases, the obstetrician must be well versed about these various ailments. Extensive knowledge of pregnancy physiology and obstetric disorders pathophysiology must then be applied to improving the perinatal outcome.

Obstetrics is a multifaceted specialty related closely to other branches in medicine. The scope of intrauterine diagnosis and treatment has remarkably broadened, while the practice of obstetrics has been altered, like every other type of medicine, by technological advances. A diagnostic ultrasound in prenatal diagnosis, for example, is one of the most important disease indicators.

The contributors to this edition represent the vanguard in their areas of expertise. They highlight critical factors for consideration while caring for the pregnant woman and her unborn child, aspiring to build human dignity one birth at a time.

Suggested Reading:
OBSTETRICS NORMAL & PROBLEM PREGNANCIES. STEVEN GABBE et.al
WILLIAMS OBSTETRICS.
On February 2012, I evaluated a 34-year-old gravid 2, para 1 white woman of average body mass at 36 weeks gestation who presented from her hair salon to Northside Hospital Emergency Department (ED) with sudden onset of severe epigastric pain radiating to her back, eventually moving to her chest as well. ED investigation led to the diagnosis of an extensive aortic dissection, extending from the aortic root to below the renal arteries, including dissection into the coronary vessels and pericardium.

CV surgeon Dr. Omar Lattouf described this as the most difficult case of his career. “I had done more than 10,000 heart procedures, but nothing like this,” he said. Not every presentation of abdominal pain in pregnancy is as dramatic or complex, but since mortality rates for mother and fetus increase with missed diagnosis, it highlights the need to have a methodical approach when evaluating the pregnant patient with abdominal pain.

Normal Physiologic and Anatomic Changes in Pregnancy

As with all things in medicine, we must understand normal before we can recognize abnormal, and the physiologic and anatomic changes in advancing pregnancy present unique diagnostic challenges.

Rising estrogen and progesterone in early pregnancy often causes nausea and relaxes the smooth muscles of blood vessels, resulting in lower blood pressure. The gastrointestinal tract experiences decreased lower esophageal sphincter tone (contributing to GERD) and decreased colonic motility (causing constipation and increased gas). Elevated levels of cholesterol in bile and decreased gall bladder contraction increase risk for cholestasis. Greater circulating clotting factors increase risk for deep venous thrombosis (DVT), pulmonary embolus (PE) and myocardial infarction (MI).

WBC counts in pregnancy increase to 11-14K, but bandemia is not normally present, so ordering leukocyte differential values may be more helpful in pregnancy than in the non-pregnant patient. Increases in plasma volume of up to 50 percent can cause a dilutional effect and therefore a progressive physiologic anemia as pregnancy advances. This coupled with normal mild increases in heart rate and minute volume can mimic occult bleeding.

In addition, beginning at 12 weeks gestation, the uterus grows up out of the pelvis, displacing some organs, such as the appendix, often causing the location of pain from peritoneal irritation to migrate superiorly and laterally as the gestation progresses. Advancing pregnancy also diminishes

Dr. Julie Zimmerman, Obstetrics, was consulted to the ED and determined the patient was contracting and the fetus was mildly stressed but viable. Our search for the combination of high-risk obstetrics and cardiothoracic surgery led us to transfer the patient by helicopter to Emory Midtown. Once there, Dr. John Horton emergently delivered the baby by Cesarean, and both mother and baby survived and did remarkably well following a 9-hour surgery to reconstruct the mother’s aorta.
the peritoneal findings of rebound and guarding, partly because the abdominus rectus is stretched and thinned by the distended uterus, and because the uterus displaces the abdominal organs that would irritate the peritoneum.

### A Regional Approach

We can divide the abdomen regionally to consider our differential diagnosis of non-obstetric abdominal pain in the pregnant patient; in practice, it is not always so straightforward. A thorough history and physical exam will certainly help to narrow our focus. Initial diagnostic studies may likely include a CBC with leukocyte differential, electrolytes, glucose, as well as renal and possibly liver and pancreatic function tests, and a urinalysis.

D-dimer is likely elevated in normal pregnancy, and reference values have not been validated. D-dimer has no proven positive predictive value in pregnancy and can often needlessly confuse and complicate the diagnostic workup, so it generally should not be ordered.

Radiologic studies to consider include chest X-ray (CXR), ultrasound (US), magnetic resonance (MR) and computerized tomography (CT). Attention should be given to minimizing exposure to ionizing radiation, especially earlier in pregnancy, but critically evaluating for risks and benefits of proceeding, understanding that fetal mortality is increased by serious missed diagnoses and that sometimes CT scans are indicated in pregnancy.

### Upper Abdominal Pain

The diagnostic approach to the pregnant patient with isolated upper abdominal pain must include consideration of pathology originating above the diaphragm, possibly due to diaphragmatic irritation. This differential diagnosis includes but is not limited to pneumonia, pneumothorax, pleural effusion, pulmonary embolism, diaphragmatic rupture, aortic dissection, congestive heart failure, myocarditis and myocardial infarction.

Pathologic processes of the upper abdomen below the diaphragm include gastroesophageal reflux, gastritis, gastric and duodenal ulcers and possible perforation, hiatal hernia, acute cholecystitis, cholestasis, choledocholithiasis, pancreatitis, fatty liver, acute hepatitis and possibly preeclampsia if associated with hypertension and proteinuria. Chest X-ray and right upper quadrant ultrasound are the likely initial imaging tests of choice for significant upper abdominal pain in the pregnant patient. MR or CT may be indicated based on the patient’s condition and degree of clinical suspicion.

### Lower Abdominal Pain

Potential lower abdominal pain diagnoses include acute appendicitis, ureterolithiasis, pyelonephritis, irritable bowel syndrome, diverticulitis, colitis and pelvic abscess. Referred pain in pregnancy should be similar to the non-pregnant state, since they follow spinal levels of the embryologic origin of the affected organ. As previously mentioned, the pain from peritoneal irritation may migrate with the inflamed organ as the growing uterus displaces it.

The pain of appendicitis is the most illustrative example of this, and displacement often moves the symptoms superior and lateral, even as far lateral as the right flank. Appendicitis is the most common non-obstetric surgical emergency in pregnancy. Graded compression ultrasonography in the left posterior oblique or left lateral decubitus position in the first or second trimester, depending on the skill of the ultrasonographer, has been proposed as the imaging modality of choice. MR, then CT are the imaging modalities in order of preference, with the goal of moving expeditiously to a diagnosis, as the incidence of fetal mortality is high with perforated appendicitis. Laparoscopy can be used diagnostically if the suspicion is high but the diagnosis still unclear and is the therapeutic approach of choice for appendectomy.

Renal causes like acute pyelonephritis, ureterolithiasis, pyonephrosis can be evaluated with serum and urine studies, as well as ultrasound initially. The growing uterus from advancing pregnancy can also compress the ureters and produce ureteral dilation and sometimes associated low abdominal or flank pain.

### Variable or Diffuse Abdominal Pain

Many causes of acute abdominal pathology in pregnancy present in variable or diffuse locations. Pathology located in the abdominal wall, such as direct trauma from motor vehicle collisions, falls or abuse, as well as ventral hernia, rectus sheath hematoma and Group A Streptococcal infection leading to necrotizing fasciitis should be considered. Intra-abdominal causes include perforated gastric or duodenal ulcers, acute gastroenteritis, adynamic ileus, colonic pseudo-obstruction (Ogilvie’s Syndrome).

Bowel obstruction can be caused by adhesions, volvulus (increased in pregnancy), intussusception (increased with history of gastric bypass) and hernias. Vascular etiologies include splenic artery and aortic aneurysms, both more common in pregnancy and both with devastating results if unrecognized or rupture occurs. Metabolic diseases that can present with abdominal pain are complex and include diabetic ketoacidosis, sickle cell disease, hereditary angioedema and acute adrenal insufficiency.

It is important to understand the normal physiologic and laboratory changes in pregnancy as background for understanding abnormal presentations of abdominal pain in pregnancy. A regional approach is useful to consider the processes that are more common in pregnancy in order to reorganize and expand the differential diagnoses appropriately. We must develop an algorithmic approach to the pregnant patient presenting to the clinic or Emergency Department with abdominal pain.

### Suggested Reading


Approximately 1 in 600 women will require non-obstetrical abdominal surgery during their pregnancy. The most common indications are acute appendicitis, cholecystitis, adnexal masses, ovarian torsion, intestinal obstruction, and trauma.

Pregnancy was once believed to be a contraindication to laparoscopic surgery. Several concerns existed, including injury to the pregnant uterus, elevated the CO2 level in the fetus, and the theoretical risk of pre-term labor or spontaneous abortion. However, in 1991, the Nezhat brothers performed the first successful advanced video-assisted laparoscopic surgery during pregnancy at Northside Hospital in Atlanta. Since then, mounting evidence has demonstrated the safety and feasibility of laparoscopic surgery during all three trimesters of pregnancy. Advantages are similar to non-obstetrical laparoscopy, including decreased pain and narcotic use, quicker return of bowel function, shorter hospital stay, and early ambulation with decreased risk of thromboembolic events.

Special consideration is warranted when discussing laparoscopic surgery with pregnant patients. The physiological changes associated with both pregnancy and pneumoperitoneum can affect the mother and fetus. This review will discuss important maternal and fetal considerations, as well as address areas of concern related to primary care providers, obstetricians, anesthesiologists, and surgeons.

Physiological Changes Associated with Pregnancy

Due to enlarged gravid uterus, the stomach is pushed towards the diaphragm and assumes a more horizontal position. The abdominal viscera, including the appendix, are also displaced cephalad. Progesterone lowers the esophageal sphincter tone, placing the pregnant patient at a higher risk for aspiration. Therefore, nasogastric tube suction and careful airway management is necessary for all pregnant patients undergoing a surgical procedure.

Cardiac output increases by 30 to 40 percent due to an increase in heart rate and stroke volume, as well as reduction in systemic vascular resistance. The minute ventilation in a pregnant woman is 50 percent higher than the non-pregnant state. This results in a decreased arterial concentration of carbon dioxide leading to a mild respiratory alkalosis in the mother. Conversely, the fetus has a mild respiratory acidosis. This gradient facilitates maternal-fetal transfer of oxygen.

Physiological Changes Associated with Laparoscopy

Carbon dioxide is the gas of choice in operative laparoscopy due to the rapid rate of absorption, high solubility, rapid clearance from the body via the alveoli, and non-explosive nature when electrosurgery is utilized. However, pneumoperitoneum during laparoscopic surgery can affect the maternal and fetal physiology. First, pneumoperitoneum increases intra-abdominal pressure, which impairs venous return due to compression of the inferior vena cava. CO2 pneumoperitoneum can also result in physiologically significant hypercarbia and respiratory acidosis in the mother due to systemic absorption. This may impair maternal-fetal oxygen transfer.

Important Surgical and Anesthesia Considerations

Operative laparoscopic surgery may be performed in any trimester of pregnancy. Table 1 lists modifications that can be made during pregnancy.

Anesthetic Agents and Potential Fetal Adverse Effects

There have been concerns regarding the risk of anesthetic agents on the fetal brain and neuronal development. In fact, on Dec. 14, 2016, the U.S. Food and Drug Administration (FDA) published a Drug Safety Communications.

In this statement, the FDA required warnings to be added to the labels of general anesthetic and sedation drugs, citing “repeated or lengthy use of general anesthetic or sedation drugs during surgeries or procedures in children younger than 3 years or in pregnant women during their third trimester may affect the development of children’s brains.” However, the American College of Obstetrics and Gynecology (ACOG) rebuked these claims, stating the data cited by the FDA was extracted from animal and pediatric studies, and that no pregnant women were included in any of the studies. As the clinical significance of these findings is unknown, ACOG is concerned that this warning could potentially dissuade physicians from providing medically indicated care during pregnancy. Based on current evidence, ACOG continues to recommend women in any trimester of pregnancy can be offered a medically indicated surgery or procedure, even if it may involve the use of anesthetic agents.

Common Indications for Non-Obstetrical Surgery during Pregnancy

Appendicitis

Approximately 0.05 percent to 0.1 percent of pregnant women will have acute appendicitis, which is evenly distributed through all three trimesters. Symptoms of appendicitis in pregnancy include generalized abdominal pain, anorexia, nau-
sea, vomiting, and fever. As the uterus enlarges during pregnancy, pain may become more difficult to localize, and peritoneal signs, such as guarding and rebound, may be masked or delayed. (See Figure 2.)

A delay in the diagnosis of acute appendicitis can have life-threatening consequences for the fetus. The rate of fetal loss is 1.5 percent with uncomplicated appendicitis, and increases significantly to 35 percent with perforated appendicitis. Laparoscopic appendectomy may safely be performed in all trimesters of pregnancy.

**Cholecystitis**

Like appendicitis, gallstones are also common in pregnancy and can be found in 12 percent of all pregnancies. 

Table 1. Modifications made when performing Laparoscopy during pregnancy

<table>
<thead>
<tr>
<th><strong>Patient Positioning</strong></th>
<th>Place the mother in a slight lateral position. This displaces the uterus away from the vena cava, thus improving venous return.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low Pressure Pneumoperitoneum</strong></td>
<td>By using a lower pressure pneumoperitoneum of 8 mm Hg to 12 mm Hg, adverse effects on fetal perfusion may be minimized</td>
</tr>
<tr>
<td><strong>Maternal Hyperventilation</strong></td>
<td>Monitor the end-tidal CO2 using capnography and hyperventilate the mother to keep end-tidal CO2 concentration in expired air less ≤35 mm Hg</td>
</tr>
<tr>
<td><strong>Open Laparoscopic Approach</strong></td>
<td>Entry using a Hasson cannula rather than insufflation with Veress needle may be a safer technique to avoid inadvertent uterine insufflation</td>
</tr>
<tr>
<td><strong>Fetal Monitoring</strong></td>
<td>Fetal heart rate should be documented before and after the procedure</td>
</tr>
</tbody>
</table>

Although the recommended initial management of symptomatic cholelithiasis in the non-pregnant patient is nonsurgical, as many as 70 percent of pregnant women have asymptomatic cholelithiasis, and 0.05 percent will experience symptomatic cholelithiasis. Any delay in adequate treatment of biliary disease may be life-threatening to both the mother and fetus. The rate of spontaneous abortion is 5 percent in uncomplicated cholecystitis and as high as 60 percent in those associated with gallstone pancreatitis.

Although the recommended initial management of symptomatic cholelithiasis in the non-pregnant patient is nonsurgical, as many as 70 percent of pregnant women treated conservatively will relapse. The risk of relapse is 92 percent in the first trimester, 64 percent in the second trimester, and 44 percent in the third trimester. Given the morbidity and risks associated with biliary disease in pregnancy, laparoscopic cholecystectomy is recommended for all symptomatic pregnant patients, regardless of trimester. Compared with open cholecystectomy, the laparoscopic approach has been shown to have equivalent outcomes with decreased risk of spontaneous abortions and preterm delivery.
The Adnexal Mass

Approximately 2 to 8 percent of ovarian tumors that occur during pregnancy are found to be malignant.6 Traditional management has been to follow adnexal masses conservatively until 15-16 weeks of gestation.

Suspicious adnexal masses greater than 6 cm are surgically removed to assess for malignancy and prevent complications.3 Waiting until 15-16 weeks allows for a majority of the functional cysts to regress spontaneously (50 to 87 percent), for the fetus to complete organogenesis, and for most spontaneous miscarriages to have taken place.3 Retrospective data has shown similar maternal and fetal outcomes in patients managed by either laparoscopic or open approach.2

There are many advantages to the laparoscopic approach, including smaller incisions, early ambulation, and decreased pain, as well as a shorter hospital stay and more expedient recovery. It is important that clinicians understand how physiological changes associated with pregnancy and pneumoperitoneum impact the mother and fetus. By modifying our surgical and anesthetic techniques as described in the review, we can offer the benefits of laparoscopy to our pregnant patients.

References
5. American College of Obstetricians and Gynecologists Practice Advisory: FDA Warnings Regarding Use of General Anesthetics and Sedation Drugs in Young Children and Pregnant Women; 21 December 2016. Available at: http://m.acog.org/About-ACOG/News-Room/Practice-Advisories/FDA-Warnings-Regarding-Use-of-General-Anesthetics-and-Sedation-Drugs?isMobileSet=true

Figure 2. Position of the appendix as pregnancy progresses.
World-class healthcare from WellStar is now even closer to home.

This year, WellStar became the largest health system in Georgia. Providing comprehensive care across the state, WellStar consists of 11 hospitals, 2,900 physicians and advanced practitioners on medical staff, 240 medical office locations, outpatient centers, health parks, a pediatric center, nursing centers, hospice and homecare.

For information about WellStar, please call 770-956-STAR (7827) or visit wellstar.org.
Sepsis and pregnancy are a deadly combination. Due to a combination of physiologic changes in pregnancy and changes in the immune system during pregnancy, pregnant women are especially susceptible to infection-related morbidity that can progress to sepsis.

Recent data shows a disturbing trend toward an increase in maternal severe sepsis and sepsis-related deaths in the United States and around the world, where sepsis is the leading cause of maternal death in the United Kingdom. In the United States, sepsis-related death is the third leading killer of women, linked to 13 percent of all maternal death.

Many factors have been linked to this increase, including increasing BMI, advancement in maternal age and the overall complexity of maternal comorbidities that providers see. While this is still a relatively rare diagnosis in the U.S., the severity of its impact makes it vital for all clinicians caring for women in pregnancy to be aware of maternal sepsis and how to triage patients in a timely manner to improve outcomes.

One of the reasons caring for women with sepsis has been so challenging has been a lack of consistency of definitions. In 2001, an international group of critical care physicians developed standard definitions to serve as a framework for us to speak.

### Causes

Infection in pregnancy can be classified into pregnancy-related conditions (such as chorioamnionitis, endomyometritis, septic abortion, mastitis and surgical site infection after cesarean delivery), non-pregnancy related (such as pyelonephritis, urinary tract infection and appendicitis) and nosocomial (such as infections related to indwelling catheters or ventilation).

In pregnancy, the leading causes of sepsis are endometritis, pyelonephritis and chorioamnionitis. Most infections are polymicrobial. When individual organisms can be isolated, *E. Coli, Staph* and *Strep* were most commonly found, with many cases of severe sepsis linked to Group A *Streptococcus*.

### Risk Factors

The Royal College of Obstetricians and Gynaecologists have published a list of risk factors (table 2) for sepsis identified from women who died from sepsis-related causes in the U.K. Many women with sepsis have more than one of these risk factors, but they can be used to increase your index of suspicion for sepsis. The single most important risk factor for postpartum infection appears to be cesarean delivery.

### Diagnosis

In a woman presenting with signs and symptoms of infection (see sidebar), the first steps in treatment occur by diagnosing the site and the source of her infection. The key to successful treatment of sepsis is recognition. The most common symptom seen in pregnancy is fever. Women may also present with rigors, chills, tachycardia,

---

**Table 1: Sepsis definitions**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systemic Inflammatory</td>
<td>Widespread inflammatory response defined by two or more* of:</td>
</tr>
<tr>
<td>Response Syndrome</td>
<td>• Temperature &gt;38°C or &lt;36°C</td>
</tr>
<tr>
<td></td>
<td>• Pulse &gt;90 bpm</td>
</tr>
<tr>
<td></td>
<td>• Respiratory rate &gt;20/min or Pco₂ &lt;32mmHg</td>
</tr>
<tr>
<td></td>
<td>• White blood cell count &gt;12,000 mm³ or &lt;4000 mm³ or &gt;10% immature (band) forms</td>
</tr>
<tr>
<td>Sepsis</td>
<td>Systemic inflammatory response to infection</td>
</tr>
<tr>
<td>Severe Sepsis</td>
<td>Sepsis with associated organ failure, hypoperfusion or hypotension. This may include lactic acidosis, oliguria, or acute alteration in mental state.</td>
</tr>
<tr>
<td>Septic shock</td>
<td>Sepsis with hypotension refractory to fluid resuscitation.</td>
</tr>
</tbody>
</table>

*in the non-pregnant population
flushing, vomiting, diarrhea and confusion. Many of these symptoms mimic the symptoms of early labor, so the provider must have a high degree of suspicion.

Laboratory findings common in early sepsis include a slight leukocytosis or leukopenia, mild respiratory alkalosis and metabolic acidosis with an increase in serum lactate, base deficit and low pH. For a patient who is worsening with sepsis, early signs of disseminated intravascular coagulopathy (DIC) are seen including a decreasing fibrinogen, thrombocytopenia and elevations in the PT and PTT.

There are several published “scoring systems” to aid in identifying patients warranting admission to the ICU and predicting morbidity and mortality, including the APACHE and SIRS criteria, and the Modified Early Warning System (MEWS). Unfortunately, none of these have been independently validated for use in pregnant women.

One of the better known recent campaigns to end sepsis is the Surviving Sepsis Campaign (SSC). It started in 2002 as a collaborative effort between clinicians in the United States, South America and Europe with the overall goal to reduce mortality from sepsis. Follow-up studies on the impact of the SSC work have shown improved survival through use of the bundles developed in this group.5

Over the years, guidelines for care have been developed that can apply to many groups of patients, including the obstetric patient. The Surviving Sepsis Campaign has suggested protocols and checklists to help identify obstetric patients who may have sepsis. Clinicians and hospitals should strongly consider the implementation of a published screening tool or developing one themselves, as a standardized approach to care of the obstetric patient should result in fewer cases of sepsis being missed and ultimately should save lives. Dignity Health has published one such tool.6

### Treatment

Why do women die from sepsis in pregnancy or the postpartum period? First, obstetric patients have a lower mortality than the general population (0-28 percent vs 10-81 percent).7 Their initial symptoms and signs may be more easily overlooked, and clinicians have a tendency to underestimate their illness until they get profoundly ill. Death in this population may come from effects on the heart (myocardial depression), lungs (ARDS), kidneys (renal failure) or liver.

#### What should YOU do?

Prevention is key. For puerperal sepsis prevention, the appropriate use of perioperative antibiotics at the correct dosing (both interval and dose by body weight) will prevent many infections. Management of maternal chronic medical conditions (such as obesity and diabetes) will lead to better outcomes. Lastly, early identifications of patients with evolving sepsis will allow them to have timely treatment that may very well save their lives.

Many hospitals are moving toward the use of standardized screening forms for sepsis. I would encourage you to review these (such as the one published by Dignity Health).6 Do not be afraid to aggressively resuscitate the mother, as both mom and fetus benefit from treatment.

Early involvement of your specialists from the ICU, infectious disease, maternal fetal medicine and cardiology is critical to maternal and fetal survival. With work from all of us, we can put sepsis on the decline.

---

**Table 2: Risk Factors for Sepsis**

<table>
<thead>
<tr>
<th>Risk factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obesity</td>
</tr>
<tr>
<td>Non-white race</td>
</tr>
<tr>
<td>Diabetes/impaired glucose tolerance</td>
</tr>
<tr>
<td>Anemia</td>
</tr>
<tr>
<td>Vaginal discharge</td>
</tr>
<tr>
<td>History of pelvic infection or group B streptococcus</td>
</tr>
<tr>
<td>Amniocentesis or other diagnostic procedure</td>
</tr>
<tr>
<td>Cervical</td>
</tr>
<tr>
<td>Prolonged rupture of membranes</td>
</tr>
<tr>
<td>Group A Streptococcal infection of close contacts</td>
</tr>
<tr>
<td>Immunosuppression</td>
</tr>
</tbody>
</table>

---

**Fast Facts**

Sepsis related DEATH in the U.S. is INCREASING

**EARLY GOAL DIRECTED THERAPY SAVES LIVES**

**SIGNS AND SYMPTOMS**

- Fever or rigors
- Diarrhea or emesis
- Rash
- Abdominal pain
- Foul vaginal discharge
- Productive cough
- Urinary symptoms

---

**References**

The use of maternal serum biochemical markers such as maternal serum alpha fetoprotein to screen for open neural tube defects has been part of prenatal screening since the 1970s.

Chromosomal abnormalities are a major cause of congenital anomalies and reproductive loss. Fetal aneuploidy risk can be evaluated on the basis of a combination of maternal age, prior family history, maternal serum biochemical tests and fetal ultrasound markers. Diagnosis of chromosomal abnormalities involves invasive testing, including chorionic villus sampling (CVS) and amniocentesis. Noninvasive screening involves either first or second trimester maternal serum markers and detailed ultrasound. Since Down syndrome is the most common significant aneuploidy, prenatal screening has focused on the detection of this disorder. These various screening modalities have a false-positive rate of approximately 5 percent and detection rates of 50 percent to 95 percent.

Due to advances in genetic technologies, screening for Down syndrome has gone from using serum markers in maternal blood to assessing cell-free DNA (cfDNA) in the maternal circulation. This is referred to as noninvasive prenatal screening (NIPS). In 2011, cell-free DNA analysis became clinically available. Intact fetal cells can be seen circulating in maternal blood. These cells are rare and not a dependable source for prenatal diagnosis. Unlike intact fetal cells, which may persist for years after prior pregnancies, fetal "cell-free" DNA (cfDNA) levels are almost 1,000-fold higher in the maternal circulation with a mean half-life of only minutes. Both the mother and the fetus produce cell-free DNA. Most of the maternal cell-free DNA originates from hematopoietic stem cells, while fetal cell-free DNA in the maternal circulation comes from apoptosis (programmed cell death) of placential cells. Fetal DNA can be seen in maternal plasma as early as 7 weeks gestation with increasing levels as pregnancy progresses.

Fetal DNA circulates in maternal plasma as a small percent-age (3-10 percent) of the high background of maternal DNA. In maternal plasma, the cell-free DNA (maternal and fetal) molecules are in fragments.

Massively parallel sequencing (MPS) is a technology that can identify and quantify millions of fragments of both fetal and maternal chromosome 21 sequences in maternal plasma. Platforms differ according to whether amplified regions throughout the genome, chromosome-specific regions or single-nucleotide polymorphisms are the targets for sequencing.

NIPS data rely on next-generation sequencing technologies and advanced bioinformatic analyses, which can detect a large proportion of Down syndrome affected pregnancies (99 percent detection rate) with a low false-positive rate (0.2 percent). The low false positive rate would reduce the amount of invasive procedures such as CVS or amniocentesis by about 30 percent. NIPS is not fully diagnostic and therefore constitutes an advanced screening test. Therefore, validation of NIPS positive results requires the option for diagnostic (invasive) testing.

The role of NIPS for trisomy 18 and trisomy 13 in clinical practice is rapidly evolving, with trisomy 18 (sensitivity 97 to 100 percent)\(^1\), and trisomy 13 (sensitivity 79 percent)\(^2\)

The detection rate using NIPS for sex chromosome aneu-ploidies is reported to be more than 90 percent with a false-positive rate of approximately 1 percent.\(^3\),\(^4\),\(^5\) The PPV for sex chromosome aneuploidies was 48.4 percent in one study.\(^6\)
Expanding NIPS to include detection of specific conditions caused by a copy number variation (CNV) (e.g., 22q11.2 deletion, 1p36 deletion, 15q11.2–13 deletion) is technically possible but has a low PPV and limited data.

Who Should Consider Screening?

Advanced Maternal Age

Women at advanced maternal age can be offered NIPS for trisomy 21, trisomy 18 and trisomy 13 (as early as 10 weeks gestation). However, the genetic counseling must include options for first and/or second trimester screening, which also screens for risk of other aneuploidies and high-risk pregnancy concerns.

Fetal Ultrasound Abnormality with Increased Risk for Aneuploidy

When abnormal ultrasound findings are noted with increased risk for aneuploidy, it is required to offer the option for invasive testing such as CVS or genetic amniocentesis. An example would be an increased nuchal translucency of 3 mm or greater. After genetic counseling and detailed ultrasound, in patients who decline the option for invasive testing, one may consider NIPS for trisomy 21, trisomy 18 and trisomy 13.

Positive First or Second Trimester Screening Results for Aneuploidy

In pregnancies that are identified at increased risk for fetal aneuploidy in the first trimester screening (10 weeks 6 days to 13 weeks 6 days), based on combined ultrasound nuchal translucency and serum markers, one can consider the option for NIPS prior to CVS or amniocentesis. This may better define the risk for fetal aneuploidy prior to use of invasive procedures. In the second trimester (15 to 20 weeks), based on the quadruple maternal serum test with increased risk for fetal aneuploidy, one can consider the option for NIPS prior to amniocentesis.

In either first or second trimester screening with increased risk for trisomy 21, the patient must have appropriate counseling prior to consideration for NIPS. In addition, a detailed ultrasound evaluation is needed prior to offering NIPS in the above setting.

Personal or Family History of Down Syndrome

In patients with a family history for trisomy 21 in a first-degree relative or with family history of translocation trisomy 21, one can consider the option NIPS in the first or second trimester (as early as 10 weeks gestation).

What About NIPS in the Low-risk Pregnancy Population?

Data from two large studies show that for “low-risk women,” the PPV for Down syndrome after NIPS was 50 percent to 81 percent. For “high-risk women,” this was 94 percent. NIPS and conventional screening were compared and showed NIPS was superior with regards to PPV (80.9 percent vs. 3.4 percent). ⁷, ⁸

Limiting Factors in the Application of NIPS

1. Testing only for fetal trisomy 21, trisomy 18 and trisomy 13, which does not include other fetal aneuploidies that would be identified through amniocentesis or CVS
2. The test does not detect all cases of fetal trisomy 21, trisomy 18 and trisomy 13.
3. There are also occasional false positive results, and therefore women with positive NIPS results need to receive confirmatory testing through an amniocentesis or CVS.
4. For some patients (as many as one percent to four percent) a NIPS test result may not be informative.
5. For those women who are at increased risk of having a child with a prenatally diagnosable disorder with Mendelian pattern of inheritance, microdeletion syndrome and some other conditions, amniocentesis or CVS would still be indicated.
6. Widespread application of NIPS at present is hampered by the associated cost and potential reimbursement issues.
7. Pretest counseling for NIPS remains crucial; however, it needs to go beyond discussions of Patau, Edwards and Down syndromes.
8. NIPS does not replace routine fetal anatomic screening using ultrasound.

Several American College of Medical Genetics and Genomics (ACMG) Recommendations

- Allowing patients to select diagnostic or screening approaches for the detection of fetal aneuploidy and/or genomic changes that are consistent with their personal goals and preferences.
- ACMG does not recommend NIPS to screen for autosomal aneuploidies other than those involving chromosomes 13, 18 and 21.
- Offering diagnostic testing for a no-call NIPS result due to low fetal fraction if maternal blood for NIPS was drawn at an appropriate gestational age. A repeat blood draw is NOT appropriate.
- Offering aneuploidy screening other than NIPS in cases of significant obesity.
- Informing all pregnant women, as part of pretest counseling for NIPS, of the availability of the expanded use of screening for sex chromosome aneuploidies.
- In pregnancies with multiple gestations and/or donor oocytes, testing laboratories should be contacted regarding the validity of NIPS before it is offered to the patient as a screening option.

References

The twin birth rate hit a new high in 2014 at 33.9 twins per 1,000 births.\(^1\) This has been attributed to an older maternal age at conception, which naturally increases the rate of twinning, and an increased use of assisted reproductive technology. The triplet and higher-order multiple birth rate peaked in 1998 at 193.5 births per 100,000 births. Since then, the rate of higher-order multiple births has decreased by 40 percent (113.5 per 100,000 births in 2014) likely due to a change in assisted reproductive technology procedures.\(^1\)

**Fetal and Infant Morbidity and Mortality**

Multiple gestations are inherently at increased risk for maternal and neonatal morbidity and mortality and are associated with significantly higher healthcare costs. The rate of preterm labor and delivery, cesarean delivery, fetal growth and amniotic fluid abnormalities, structural abnormalities, preeclampsia, gestational diabetes, stillbirth and neonatal morbidity/mortality increases as the number of fetuses increase.

One of the greatest complications is preterm birth or delivery prior to 37 weeks gestation (spontaneous or iatrogenic). This occurs in up to 60 percent of twin gestations.\(^2\) The risk for long-term morbidity is inversely associated with gestational age at the time of delivery. Preterm infants are at increased risk for breathing and feeding difficulties, developmental delay, cerebral palsy, necrotizing enterocolitis, intraventricular hemorrhage, and vision and hearing impairment.

The risk for stillbirth is also significantly increased. In 2009, the associated stillbirth rate was 12 per 1,000 twin births and 31 per 1,000 triplet and higher-order multiple births compared to five per 1,000 singleton births.\(^3,4\)

In an effort to improve outcomes of twin gestations, ultrasound assessment of chorionicity, fetal anatomy, biometry, Doppler velocimetry and amniotic fluid volume has become standard practice. Also, consultation with a tertiary care center should be considered in all twin gestations.

**The First Trimester Ultrasound**

First trimester ultrasound in twin gestations is key to establishing dating and determining chorionicity and amnionicity. This information dictates the frequency of the need for follow-up imaging. During this exam, the membrane thickness at the site of the insertion of the amniotic membrane into the placenta is evaluated as well as the presence or absence of the “lambda sign.” (See Image 1.)

In a dichorionic diamniotic (DCDA) gestation, each fetus has its own placenta and amniotic sac, and a lambda sign should be present at the insertion of the amnion into the placenta. If the fetuses are
sharing a placenta – or monochorionic-diamniotic twins – the dividing membrane will be thin (<2mm) and a “T sign” will be present. *(See Image 2.)* A monochorionic monoamniotic (MCMA) gestation will share the same placenta and amniotic sac. This occurs in approximately 1 in 30,000 to 1 in 60,000 pregnancies.

Once the type of twinning is determined, then labeling of the twin fetuses should be performed in a consistent and reliable way. This allows consistency in follow-up imaging and is especially important in cases with fetal structural concerns or growth and amniotic fluid abnormalities. Typically, twins are identified by mapping their cord insertion into the placenta and/or labeling “left or right” and “upper or lower.”

If there is confusion about the chorionicity, amnionicity or dating, then referral to a tertiary care center is recommended. It is also recommended in all cases of monochorionic twinning.

**Aneuploidy Screening**

Aneuploidy screening in multifetal gestations is not as sensitive as in singleton gestations. This is due to analytes from both fetuses being averaged together, which can potentially mask abnormal values. Nuchal translucency screening in the first trimester with the addition of biochemical testing is the current standard for twin gestations. Noninvasive prenatal testing, which evaluates fetal cell free DNA in maternal serum, is a potential screening tool for aneuploidy,
but more information is needed before this testing becomes standard of care.9

Second and Third Trimester Follow Up

Dichorionic Diamniotic Gestations

Patients with an uncomplicated dichorionic diamniotic twin gestation should have a targeted anatomical survey at 18- to 20-week gestation. Thereafter, monthly follow-up for evaluation of interval growth and fluid assessment is recommended. Antenatal testing is not recommended in uncomplicated dichorionic twin gestations.

If the fetal growth remains concordant and there are no other comorbidities, then delivery is usually recommended at 37 to 38 weeks gestation. This is supported by a 2016 systematic review of timing of delivery in uncomplicated dichorionic twin gestations. This study found that the risk of stillbirth was equivalent to the rate of neonatal death at 38-39 weeks, and therefore delivery during the 37-38 week window minimizes the risk of perinatal deaths near term.5

Monochorionic Diamniotic Gestations

Monochorionic twins have more complications, require more frequent follow up and should be managed in a tertiary care center. Monochorionic diamniotic twins develop twin-twin transfusion syndrome (TTTS) in 9 percent to 15 percent of pregnancies6,7 while monochorionic monoamniotic develop TTTS in 6 percent of pregnancies.8 Both are also at risk for developing twin anemia polycythemia sequence (TAPS). This is a condition in which the hematocrits differ significantly without development of oligohydramnios and polyhydramnios. Monochorionic gestations are inherently at higher risk for anomalies and stillbirth.

Uncomplicated monochorionic pregnancies should have imaging every 2 weeks starting in the second trimester to assess for TTTS and TAPS. If these complications occur, then referral to a fetal therapy center for laser ablation of the communicating placental vessels is recommended. If complications do not arise, then surveillance at 2 week intervals should continue until antenatal testing is instituted around 32 weeks gestation.

If the pregnancy progresses without complication, then delivery is recommended at 36 to 37 weeks gestation. This is due to the increased risk of stillbirth in monochorionic gestations. This is supported by the 2016 systematic review on timing of uncomplicated monochorionic diamniotic twin gestations, which found a trend toward an increased rate of stillbirths than neonatal deaths beyond the 36th week gestation.8 There are no randomized controlled trials on this issue to guide management.

Monochorionic Monoamniotic Gestations

Monochorionic monoamniotic twin gestations occur in approximately 1 percent of twin gestations and are complicated by an increased risk for stillbirth due to entanglement of the umbilical cords, structural abnormalities, TTTS & TRAPS. These pregnancies are followed closely with ultrasound, and ultimately patients are admitted in the early third trimester for intensive surveillance. Mono-mono gestations typically are delivered by 32-34 weeks gestation by cesarean delivery.

Mode of Delivery

Route of delivery for twins is typically individualized and is based on many factors. More than 60 percent of twin births are by cesarean delivery.9 Factors such as presentation of each twin, chorionicity/amnionicity, estimated fetal weights, structural concerns and maternal co-morbidities are considered when planning mode of delivery.

Take Home Points

Twin gestations are inherently at increased risk for maternal and neonatal morbidity. Consultation with a tertiary care center or perinatologist early in gestation is helpful to determine pregnancy risks and to establish a management plan. A multidisciplinary team approach is critical to achieving a healthy outcome for mom and baby. ■

References

MORE INSIGHT helps you make the most of your practice’s revenue cycle.

KNOW YOU HAVE A DEDICATED BANKER WHO UNDERSTANDS YOUR INDUSTRY AND YOUR NEEDS.
As a healthcare professional, you want to spend more time helping patients and less time worrying about your finances. With dedicated Healthcare Business Bankers, PNC provides tools and guidance to help you get more from your practice. The PNC Advantage for Healthcare Professionals helps physicians handle a range of cash flow challenges including insurance payments, equipment purchases, and managing receivables and payables. In such a fast-moving business, PNC understands how important it is to have a trusted advisor with deep industry knowledge, dedication and a lasting commitment.

PNC BANK
Cash Flow Optimized Call a Healthcare Business Banker at 877-566-1355 or go to pnc.com/hcprofessionals

Cash Flow Optimized is a service mark of The PNC Financial Services Group, Inc. (“PNC”). Banking and lending products and services, bank deposit products, and treasury management services, including, but not limited to, services for healthcare providers and payers, are provided by PNC Bank, National Association, a wholly owned subsidiary of PNC and Member FDIC. Lending and leasing products and services, including card services and merchant services, as well as certain other banking products and services, may require credit approval. All loans and lines of credit are subject to credit approval and require automatic payment deduction from a PNC Bank business checking account. Origination and annual fees may apply. ©2015 The PNC Financial Services Group, Inc. All rights reserved. PNC Bank, National Association, Member FDIC.
Advances in technology now allow the early diagnosis of fetal abnormalities and conditions that were previously only apparent in late gestation or after birth. High-resolution ultrasonography (US) and magnetic resonance imaging (MRI) are two specific technologies that enable the evaluation and monitoring of developing organs and the detection of functional abnormalities.

Using these modalities, we can now not only diagnose anomalies, but we can also determine the ongoing effects of those anomalies and malformations on other organ systems in the growing fetus. While the malformation itself (“the first hit”) may be extremely problematic, many times the impact of the malformation on the ongoing development of other structures (“the second hit”) is even more devastating.

This understanding has led to an increasing acceptance of fetal therapy as a way to not only save the life of an affected fetus, but also to improve the post-natal functionality and outcomes in those babies that survive to birth. Examples of this include twin-to-twin transfusion syndrome (TTTS) and spina bifida.

Laser Therapy for Twin-to-Twin Transfusion

One of the first disease states shown to be amenable to prenatal surgery is TTTS, which occurs in identical twins sharing a placenta, the monochorionic (MC) placenta. TTTS presents in MC/DA twins with more easily observed signs that include excessive fluid in the sac of the recipient (polyhydramnios) and deficient fluid (oligohydramnios) in the sac of the donor, and this finding is an essential criterion for the diagnosis.

 Frequently, the hemodynamic effects of TTTS are rapidly progressive, leading to heart failure in the recipient baby. Because of the open anastomoses between the two babies, if one twin dies, blood from the other baby drains into the placenta and the remaining fetus dies or suffers devastating cerebral injury. Untreated, TTTS can have a mortality rate for both babies as high as 90 percent.

Although all monochorionic twins have connections between each other on the surface of the placenta, for some (currently unknown) reason, in about 15 percent of MC twins, a net volume or pressure imbalance occurs. Through postnatal study of placentas from twins with TTTS, investigators characterized these unbalanced vascular connections and suggested that by ablating the connections in-utero, the TTTS process could be halted and even reversed.

Advances in fetoscopy instrumentation has now allowed for these anastomoses to be identified during the pregnancy as early as 16 weeks’ gestation, and by coagulating the blood within them using laser energy, flow can be stopped. Loss of one or both twins, preterm delivery, and/or severe neurologic morbidity was the norm prior to the institution of any form of therapy. Recent literature evaluating the success of laser photocoagulation of the anastomotic vessels demonstrates an 80 percent to 90 percent rate of at least one surviving twin, and a 60 percent to 70 percent rate of two surviving twins. While the procedure is invasive and carries the risk of premature rupture of the membranes (~30 percent) and preterm delivery, laser therapy is an important intervention that can significantly reduce mortality and neurologic morbidity in TTTS.

Fetal Neural Tube Defect (NTD) closure

Fetal myelomeningocele (MMC), a relatively common NTD, occurs in approximately 1 per 3,000 pregnancies and can be associated with devastating neurologic (both sensory and motor) and other functional deficiencies in survivors. Typically, function of the limbs and organs below the spinal level of the lesion is diminished.

One of the major problems with MMC is herniation of the fetal hindbrain (including the cerebellum) into the spinal canal at the base of the brain. The herniation, called an Arnold-Chiari malformation (usually type II), obstructs...
drainage of the CSF produced in the choroid plexi in the ventricles of the brain, resulting in progressive dilatation of the ventricles (ventriculomegaly) in utero.

Postnatally, this blocked drainage pathway results in progressive enlargement of ventricles, which impacts the size of the baby’s head (hydrocephalus), and the pressure can have permanent and serious neurologic effects including cognitive loss and neurodevelopmental delay. Shunting of the CSF from the ventricles into the abdominal (peritoneal) cavity is frequently required to decompress the growing brain.

The shunting procedure can have significant complications, and these shunts frequently require revision. Most MMCs are detected through a combination of maternal serum screening and prenatal ultrasound occurring prior to 20 weeks of pregnancy. Prenatal closure of the MMC was hypothesized as being helpful in the reduction of fetal and postnatal morbidity and mortality.

The Management of Myelomeningocele Study (MOMS) trial, published in 2011, showed clearly that prenatal closure of the defect can significantly reduce the need for shunting and at the same time improves composite neurologic and motor function. The fetal surgery involved creating a 7-10 cm opening in the mother’s uterus (hysterotomy) and then carrying out and open repair of the spinal defect. This was associated with high rates of maternal and fetal complications.

Investigators have suggested that switching to a fetoscopic technique could achieve similar neonatal outcomes with decreased trauma to the uterine wall and membranes, decreasing preterm delivery rates. Very few centers have significant experience in fetoscopic spina bifida repair (one each in Germany, Spain, Brazil and the U.S.). Long-term data comparing postnatal neurologic development between the open and fetoscopic techniques is still pending, however the preliminary outcomes are very promising.

While the challenges faced by the pioneers of in-utero fetal therapy were tremendous, their vision and efforts, in concert with those of current groups, are beginning to demonstrate the potential benefits of this innovative and recently developed discipline. The available techniques are still being modified and refined to achieve improved fetal and neonatal long-term outcomes. However, despite the experimental and innovative nature of many of these techniques, outcomes for thousands of children worldwide have been dramatically improved as a result of select procedures.

Suggested Readings:
A 24-year-old gravida 1 para 1 presents 36 hours postpartum complaining of headache. She gave birth vaginally under epidural analgesia. Although there was no known dural puncture, placement was described as difficult, requiring more than one attempt. She describes the headache as dull, aching, bifrontal, exacerbated by sitting up or standing and relieved after lying supine. She does have a history of migraine headaches, but describes this headache as distinctly different and denies associated symptoms such as nausea, photophobia or other neurologic symptoms.

Headache after childbirth can occur in up to 30 percent of women, with the majority resulting from sleep deprivation, caffeine withdrawal, tension or migraine headaches. Postpartum patients are also at increased risk for serious causes of headache such as subarachnoid hemorrhage, cerebral venous sinus thrombosis or pre-eclampsia.1

Post-dural puncture headaches (PDPH) result from cerebrospinal fluid leakage following puncture of the dura mater and should be suspected in postpartum patients presenting with a characteristic headache after epidural or spinal anesthesia. It is estimated that accidental dural puncture occurs 0.5 percent to 4 percent of the time during epidural placement, resulting in a headache 45 percent to 80 percent of the time.2 Although usually benign, these can be severe and debilitating, significantly impairing activities of daily living and increasing hospital length of stay.

A PDPH is precipitated when a cerebral spinal fluid (CSF) leak is greater than production. Excessive leakage of CSF leads to intracranial hypotension and a reduction in CSF volume. The normal adult CSF pressure of 5-15 cm H2O is reduced to less than 4.0 cm H2O. Head MRI may demonstrate sagging of the intracranial structures and meningeal enhancement attributable to vasodilatation. Two potential hypotheses for the development of a resultant headache genesis have been described most extensively. One hypothesis suggests that low CSF pressure may lead to traction on pain-sensitive intracranial structures while in the upright position. A second hypothesis proposes that loss of CSF results in compensatory venodilatation and an increase in intracranial blood volume via the Monro–Kellie hypothesis, which states that the sum of volumes of the brain, CSF and intracranial blood is constant. Venodilatation induces headache through meningeal stretching.4

The incidence of a PDPH varies greatly and is determined by many factors. These factors include: shape, size and bevel orientation of the needle, the provider’s experience, pregnancy status, age, sex and BMI.

In general, the smaller the gauge needle that violates the dura, the less likely a PDPH. The incidence of PDPH after accidental dural puncture in a parturient may approach 80 percent with an epidural needle.2 After diagnostic LP in an ambulatory setting using a 20 or 22G cutting edge needle, one study found a PDPH incidence of 36 percent.

PDPH has been reported to be as low as 2 percent with a 25 or 26G pencil point needle used for spinal anesthetics.
Other risk factors are female gender, younger age, low BMI and history of headache prior to dural puncture. Parturients are the highest-risk patient population.\textsuperscript{1,4}

Treatment may consist of conservative medical therapy or more invasive procedures including an epidural blood patch. Initial treatment for the first 24 to 48 hours after dural puncture is usually conservative. Since resolution will likely occur within a week to 10 days, conservative treatment may be indicated if the headache is not severe. However, prolonged cases have occurred resolving with treatment even years after dural puncture.\textsuperscript{4} Hydration, caffeine, acetaminophen, NSAIDs, opioids and antiemetics may help control symptoms.\textsuperscript{6}

The gold standard treatment for a PDPH is an epidural blood patch. Autologous blood is injected into the epidural space. The technique has a success rate of 70 percent to 98 percent if carried out more than 24 hours after the dural puncture.

If an epidural blood patch fails to resolve the headache, repeating the blood patch has a similar success rate as an initial blood patch.\textsuperscript{4,7,8} Other experimental medical therapies include adrenocorticotropic hormone (ACTH), sumatriptan, hydrocortisone, cosyntropin, DDAVP, sphenopalatine ganglion block, gabapentin and prophylactic blood patch.\textsuperscript{4,6,8}

The patient described initially was offered an epidural blood patch versus conservative management with explanation of the risks and likelihood of success with each. She chose to undergo epidural blood patch, given the highest probability of rapid resolution of symptoms. She tolerated the procedure well without complications, aside from transient moderate low back pain immediately following the injection. Following the epidural blood patch, a 20-minute trial of sitting upright demonstrated no return of headache. The patient was discharged home, and follow up 2 weeks later demonstrated continued resolution of symptoms.

\textbf{References}


\textbf{Live. Work. Thrive.}

\textsuperscript{+} The Southeast Permanente Medical Group is a growing, award-winning, multi-specialty group practice of more than 500 primary care and specialty physicians
\textsuperscript{+} Physician owned and managed
\textsuperscript{+} Comprehensive benefits, including competitive compensation, malpractice insurance and shareholder opportunity
\textsuperscript{+} For more information regarding practice opportunities, visit \textsuperscript{http://www.tspmg.com}
It is a well-known fact that cardiovascular disease is the leading killer in this country. Perhaps not as well known is that this is true regardless of gender, and cardiovascular disease is the leading cause of death in women.

In 2013, heart disease claimed the life of 289,758 women. Essentially that’s one quarter of the women who died that year. Over the last few decades, there has been a growing literature base suggesting that certain aspects of reproductive history identify women who are at increased risk for future cardiac events including cardiovascular death.

In 2011, the American Heart Association released an update of its Evidence-Based Guidelines for Cardiovascular Disease Prevention in Women. These guidelines put reproductive history on the cardiovascular history “map” by considering preeclampsia, gestational diabetes and pregnancy-induced hypertension major risk factors for cardiovascular disease.

When you look at the women who are now identified as at risk, it is found that the overall risk for cardiovascular events in all preeclamptic women is consistently increased more than twofold. Moreover, that risk is much greater in those with early (defined as 34 week or earlier) or severe preeclampsia, who have a 6-to 7-fold increase in cardiovascular events.

Now that we have identified these women as being at risk, other (unanswered) questions come to mind: why are these women at risk? Is there an opportunity to decrease their risk? Or perhaps is it that some of the same risk factors (such as metabolic syndrome, diabetes, hypertension, lipid abnormalities) that identify women at risk for preeclampsia are also risk factors for cardiovascular disease, and preeclampsia itself is not the real culprit in this increased incidence?

One thought line would be that cardiovascular risk is a result of the effects of preeclampsia on the vascular system. We know that preeclampsia is not just high blood pressure during pregnancy with those effects ending with delivery, but it is a systemic disease with effects that persist post delivery. There is endothelial dysfunction that occurs with preeclampsia and is still present 1 year post-delivery.

There’s an interesting pathology that, along with inflammation, gives a possible cause for future cardiovascular events. However, in some studies it seems that by 10 years post partum, endothelial function returns to normal, making it not quite the clear-cut culprit.
Despite endothelial function having returned to normal prior to the expected occurrence of cardiovascular events, there still seems a possibility that preeclampsia may influence the risk of cardiac events independent of traditional risk factors. Haukkamaa et al. studied women less than 66 years of age who were diagnosed with coronary artery disease and found that they had a greater likelihood of having a history of preeclampsia than healthy controls.

Statistical analysis was performed, which found the history of preeclampsia to be an independent risk for coronary artery disease. Likewise, traditional risk factors were found to still demonstrate risk even when taking into account the history of preeclampsia. This conclusion is consistent with that of Berk et al., who in their paper made the conclusion that traditional cardiac risk factors cannot account for the increased future risk in women with the history of preeclampsia, and therefore preeclampsia must provide additive risk.

So what about preeclampsia and traditional cardiac risk factors? Post-partum, it has been found that women with a history of preeclampsia have an increased incidence of the abnormal traditional cardiovascular risk factors. There is increased likelihood of obesity, hyperlipidemia, diabetes, hypertension and metabolic syndrome in women with a prior history of preeclampsia.

Although there have not been studies in this population to address whether traditional risk modification lowers future cardiovascular risk in this group, it is reasonable to assume such. Since there exists a reasonable potential to modify these risk factors, there has been a push to develop clinics to not only screen these women for development of risk factors but to attempt to prevent the appearance of these risk factors along with treating them when they are abnormal.

In general, these clinics have in common a goal of identification of the women at risk along with education and lifestyle modification. They vary in how they are staffed, whether future follow-up is done within the clinic or referral back to primary care for long-term follow-up and, if needed, medical management. Over the last two years, Northside Hospital Maternal Heart Health clinic has used a midlevel provider, dietitian and exercise physiologist to educate women at the highest risk on time management, lifestyle modification. They vary in how they are staffed, whether future follow-up is done within the clinic or referral back to primary care for long-term follow-up and, if needed, medical management.

### References
4. Rodie, V. "Pre-eclampsia and Cardiovascular Disease: Metabolic Syndrome of Pregnancy?" Atherosclerosis 175.2 (2004): 189-202
Monitoring Device Boosts Proactive Management in Patients With Heart Failure

Hans Lee, M.D.

Patients with congestive heart failure now have access to a new treatment option offered by WellStar Health System that can help significantly reduce the risk of being hospitalized by up to 50 percent.

When the heart is unable to pump enough blood to meet the body’s demands, blood pressure within the heart is elevated, leading to heart failure (HF). Significant heart failure progression over a period of days is known as acute decompensation and leads to hospitalization. Now, a monitoring device called the CardioMEMS™ HF System, manufactured by St. Jude Medical, is successfully reducing hospitalizations for these patients by transmitting blood pressure data to the clinician.

According to Hans Lee, M.D., medical director of WellStar’s Congestive Heart Failure Program, the device offers a new way to monitor and proactively manage care.

“In the past, we treated heart failure by looking at how the person felt and noting weight changes, swelling or fatigue. We watch these patients carefully because their risk of hospital admission is high. But those efforts have never been shown to have much impact,” he says. “We know that changes in pressure inside the heart often occur about two weeks before the patient notices something is going on. CardioMEMS provides a noninvasive way to monitor what’s actually going on inside the heart – by detecting those changes in pressure immediately – and gives us an opportunity to be proactive. We can do things like adjusting medication, which can keep the patient out of the hospital or possibly reduce length of stay if they are hospitalized.”

How does CardioMEMS work?
CardioMEMS uses a miniaturized, wireless monitoring sensor that is implanted in the pulmonary artery (PA) during a minimally invasive procedure to directly measure PA pressure. The system allows patients to transmit PA pressure data from their homes to their healthcare providers, allowing for personalized and proactive management to reduce the likelihood of hospitalization.

The implantable sensor is a completely sealed capsule that uses microelectromechanical systems (MEMS) technology, which allows the creation of sensors with measurement stability and energy efficiency. All of the sensor components are made of materials that have been chosen for their durability, robustness, biocompatibility and insensitivity to changes in body chemistry or biology. The sensor is powered by radio frequency energy. It is implanted into the pulmonary artery via a catheter and is designed to last the lifetime of the patient.

The sensor is very small and does not have a battery or leads. Once implanted, the sensor wirelessly sends pressure readings to an external patient electronic system. There is no pain or sensation for the patient during the readings. The electronics transmit the readings to a secure website, where the information can be seen by the patient’s clinician.

Clinicians are able to access patients’ pressure readings and trending data transmissions using the patient management website, which provides valuable clinical insight for guiding treatment decisions. Automated alerts are sent to the healthcare provider if pressure readings fall outside of pre-specified ranges.

Heart Failure Facts
The Centers for Disease Control and Prevention (CDC) cites the following statistics regarding heart failure in the United States:

• About 5.7 million adults in the United States have heart failure.
• One in 9 deaths in 2009 included heart failure as a contributing cause.
• About half of people who develop heart failure die within 5 years of diagnosis.
• Heart failure costs the nation an estimated $30.7 billion each year. This total includes the cost of health care services, medications to treat heart failure and missed days of work.
Dr. Lee says that the procedure is typically performed with the patient going home on the same day. So far, patient reviews and physician feedback have been highly positive.

“Since we started implanting CardioMEMS devices at WellStar over the last several months, we have seen no further hospital admissions for heart failure,” he says. “We’re very happy with how our patients have fared.”

He adds that patient satisfaction is also high.

“Our patients have been happy with the procedure, as well,” Dr. Lee says. “Heart failure is a scary disease, and the device seems to put them more at ease, knowing their hearts are being monitored.”

Dr. Lee says that he and his colleagues on WellStar’s Heart Failure Program team review the information transmitted for each patient via CardioMEMS at least once a week. For patients who require closer monitoring, readings are reviewed on a daily basis.

“When we see a change in pressure, it usually calls for a medication adjustment,” he says. “If we see a trend in the wrong direction, we call the patient with our recommendation regarding medication. After the adjustment is made, we watch the numbers improve.”

**Indications for use**

Dr. Lee says the most important thing for physicians to know is the indications for implanting CardioMEMS.

“Those indications are simple. The patient has at least one hospitalization for heart failure in the past 12 months, persistent symptoms of heart failure and a designation of Class III heart failure,” he explains. “The only contraindication for the device is if a patient cannot tolerate any antiplatelet or anticoagulant for 30 days after the procedure.”

The most common measure of heart failure severity is based on the NYHA (New York Heart Association) Class guidelines. Patient symptoms for Class III heart failure include:

- Marked limitation of physical activity
- Comfortable at rest
- Less-than-ordinary activity causes fatigue, palpitation or dyspnea

**New standard of care**

While commercial availability of CardioMEMS is fairly new, Dr. Lee says he thinks it has already had a significant impact on the way care of heart failure patients is managed.

“I believe that, as we gain more experience in using the CardioMEMS method of managing heart failure by measuring pressure data, it is going to become a standard of care. In fact, the European Society of Cardiology just added it to their standard guidelines this year as a directed therapy management and monitoring tool for heart failure patients,” he says. “Data shows us the benefits of treating patients based on what their pressure readings tell us. I believe this method will soon be considered the best way to manage outpatient heart failure patients.”
Thyroid disease is the leading endocrine disorder in the United States. While there are several different health issues that can result from either an overactive or underactive thyroid, thyroid cancer is the most prominent. The rate of thyroid cancer has tripled in the past three decades, likely due to better detection methods. Here, Atlanta Medicine shares the thoughts of two Atlanta area endocrinologists about recent strides in the detection and treatment of thyroid cancer, along with findings from a recent study on how thyroid disease affects pregnancy.

**New Methods Reduce Need for Treatment**

Nodules are abnormal growths on the thyroid that can be a warning sign of cancer. They can cause visible or palpable symptoms like a lump in the neck, hoarseness or trouble swallowing, or the person may experience no symptoms at all. Kate Wheeler, M.D., an endocrinologist with Laureate Medical Group, says that the latest methods for detection and evaluation of thyroid nodules have resulted in fewer people being treated for thyroid cancer.

“Whereas we used to put people through biopsies, sometimes unnecessarily, we now have ultrasound to help us get a better look at thyroid nodules,” she said. “The ultrasound helps us define the type of nodules that tend to be malignant and the characteristics of those that usually tend to be benign.”

Dr. Wheeler says that improvements in the technology in recent years have given physicians the ability to judge the malignancy potential of thyroid nodules.

“The resolution of the ultrasound has gotten much better and allows us to see much finer detail,” she said. “Now, we’re able to look at margins, texture and blood flow, which are the characteristics by which we judge the malignant potential of a nodule. We’ve learned that, for some nodules, the chance of them ever becoming malignant is so unlikely that it would be totally unnecessary to put the patient through a biopsy.”

Dr. Wheeler adds that monitoring patients who have had thyroid cancer has also improved due to another method of evaluation — thyroglobulin level testing.

“The tests performed on someone who’s had thyroid cancer depend on the type of cancer he or she had. If the person received radioactive iodine therapy after a thyroidectomy, their doctor will test thyroglobulin level every year,” she explained. “Thyroglobulin assay has become so precise, you can get a lot of information just from that one test. If the thyroglobulin level is zero, it probably means the patient does not have cancer.”

**Genetic Testing Can Help Patient Avoid Unnecessary Surgery**

According to John H. (Chip) Reed, III, M.D., a specialist in Internal Medicine, Endocrinology and Diabetes with Southeastern Endocrine & Diabetes, P.C., one of the biggest problems in the past for determining whether thyroid nodules are malignant or benign were biopsies that yielded indeterminate results. He says that advances in testing methods have made great improvements for both physicians and patients.

“When biopsy results of nodules were indeterminate, we were presented with a dilemma about how to treat the patient,” he said. “Ultrasound can tell us a lot about nodules, but we now have the ability to do genetic testing that can predict cancer.”

These genetics tests use thyroid cells obtained at the time of biopsy to screen for molecular markers for malignancy.
such as BRAF and RAS mutational states, mRNA classifier and high-density genomic data. These tests are commercially available through a variety of laboratory companies.

“Previously, we often would end up surgically removing part or all of the person’s thyroid when biopsy results were indeterminate,” Dr. Reed said. “Gene expression testing gives us more definitive results that help prevent unnecessary surgeries when nodules are actually benign.”

When asked why the incidence of thyroid cancer has risen so dramatically in recent years, Dr. Reed says he believes it’s due to improved methods of detection.

The ATA, or American Thyroid Association, guidelines for the adult patient with thyroid nodules and differentiated cancer which came out in 2016 has much of this elucidated. While in most cases it has simplified the evaluation and treatment, there is still room for controversy, including the extent of surgery and who should receive radioactive iodine and how much. The big question about thyroid cancer is whether it’s becoming more common or if we’re simply finding it more than we used to,” he said. “In the past, patients and doctors had to actually feel something in the neck that would lead to testing. But now, routine carotid ultrasounds and neck CTs are detecting the nodules. I think the answer is that we’re just finding it more.

**Thyroid Disease in the News:**
**New Guidelines for Management During Pregnancy**

New evidence-based recommendations from the American Thyroid Association (ATA) provide guidance to clinicians in diagnosing and managing thyroid disease during pregnancy and the postpartum period. Pregnancy has a profound effect on thyroid gland function, and thyroid disease is common in pregnancy. The 97 recommendations presented in the new Guidelines help define current best practices for thyroid function testing, iodine nutrition, pregnancy complications, and treatment of thyroid disease during pregnancy and lactation.

The “2017 Guidelines of the American Thyroid Association for the Diagnosis and Management of Thyroid Disease during Pregnancy and the Postpartum” were co-authored by an international task force of expert clinicians and researchers in the field of thyroidology. Led by Co-chairs Erik Alexander MD, Brigham and Women’s Hospital and Harvard Medical School, Boston, MA and Elizabeth Pearce, MD, MSc, Boston University School of Medicine, the task force provides a solid foundation of knowledge on the assessment and treatment of thyroid disease in women during pregnancy, preconception, and the postpartum period. The Guidelines include recommendations related to the diagnosis and management of hypothyroidism, thyrotoxicosis, thyroid nodules, and thyroid cancer, as well as thyroid considerations in infertile women, fetal and neonatal considerations, and directions for future research.

“With an estimated 300,000 pregnancies impacted by thyroid disease in the United States annually, these guidelines coalesce the best available evidence into clear clinical recommendations, and will improve the health of many, many mothers and newborns alike,” say Dr. Alexander and Dr. Pearce.
A 38-year-old physician friend of mine recently told me, “I’m just going to stick it out another 15 years, but I hate this. I’m trying to find something good to invest in so I can retire early.” She’s not the only one who has told me something along these lines. After all our years of training, are we not enjoying what we do? Is this just stress talking or is it something bigger?

Chances are if you’ve been practicing medicine in the United States within the past 10 years, you’ve heard about physician burnout. Numerous articles have been written about it by various sources such as Medscape, The Huffington Post, U.S. News & World Report, and many more in response to multiple international studies reporting this phenomenon in medicine.

In 2011, the AMA along with researchers at the Mayo Clinic, conducted a study that focused on burnout in U.S. physicians compared to physicians in other parts of the world. More than 7,000 doctors were given a 22-item questionnaire (the Maslach Burnout Inventory, or MBI) concerning the three defining features of burnout – emotional exhaustion, depersonalization and doubt. The study showed that burnout is significantly more common in doctors compared to other working professionals. It also found that physicians in primary and emergency care settings are at greatest risk.1

The Three Symptoms of Burnout

1. Feelings of being worn-out or spent emotionally – emotional exhaustion
2. Inability to empathize with patients; cynicism towards patients – depersonalization
3. Feelings that career is meaningless – doubt

Looking specifically at Georgia, a survey of more than 500 physicians showed that over half the doctors in the state have experienced symptoms of burnout “always” or “often.” Several of the surveyed doctors were in their mid 50s or older and were considering early retirement because of it.3,4

So, is burnout just stress? Although stress is the No. 1 predictor of burnout, there is a distinction between the two. Dike Drummond, M.D., professional business coach and author, says that the difference has to do with the ability to recover from the above symptoms during time away from...
work. If a physician is able to re-energize during time off, she is stressed at work. If she cannot re-energize away from work, she is burned out.5,6

Despite the recent media attention, burning out professionally is not a new idea. In 1974, the word “burnout” was originated and described by psychologist Herbert Freudenberger. In the years following, occupational burnout was found to be particularly associated with professions that deal with human services. In addition to physicians and nurses, other professionals with significant levels of burnout include teachers, police officers, customer service representatives, social workers and lawyers.

By the early 1980s, psychologist Christina Maslach introduced the MBI, which is considered the gold-standard in the evaluation of burnout. More recently, studies have suggested that burnout may actually be a form of depression as many features are similar.7

The rise of burnout in medicine is thought to be a result of the unique pressures of modern practice. As we doctors know, the practice of medicine can be very challenging and intense. As more physicians become employed rather than owning their own practices, they begin to feel like robots who are expected to meet carefully measured productivity targets, which are tied to compensation; monitored constantly by insurers that set strict rules on the use of medications and procedures; and required to submit an incredible amount of time-consuming documentation for reimbursement.

Looking specifically at Georgia, a survey of more than 500 physicians showed that over half the doctors in the state have experienced symptoms of burnout “always” or “often.”

Even when all the painstaking documentation is close to perfect, reimbursement rates continue to decline. In addition to less patient time, many physicians are expected to stay “plugged in” despite being away from their clinic/hospital for out-of-office issues that might arise.8

Increasingly, there is evidence suggesting that burnout may increase medical errors, worsen quality of care, cause a loss of professionalism and foster early retirement (a serious concern as the medical needs of our aging American population continue to rise). Burnout has also been linked to alcohol and drug abuse, destroyed relationships (physicians have a higher rate of divorce than the rest of the American population) and suicide. In fact, doctors are at least twice as likely to kill themselves compared to the general population. Approximately 400 physicians commit suicide yearly.9,10,11

Some experts feel that the rates of burnout might be over-reported for many reasons, including the idea that the symptoms captured by the MBI might be transient (not persistent), therefore showing stress not burnout. Others point out that there is no convincing evidence that suicide is directly connected to burnout. Nevertheless, most physicians feel that professional wellness is a priority and that some emphasis should be placed on this for more work/life balance.12,13,14

Cognitive behavioral therapy, which focuses on changing a pattern of thinking in order to change feelings, and cognitive restructuring, which focuses on identifying and stopping maladaptive thought processes, have both been the mainstay of occupational burnout prevention and treatment for the individual. Other traditional tools include stress management, relaxation techniques and schedule changes.

When looking only at prevention, tips such as beginning one’s day with a relaxation technique (such as meditation), exercise, healthful eating, good sleep, boundary setting, technology breaks and the nourishment of one’s creative side have been shown to be successful. Beyond individual treatment and equally important in the prevention of burnout, according to Maslach and Leiter, is supportive leadership within the employee’s organization that ensures resources that promote work/life balance and energy revitalization.

Using the above ideas as a guide, many proposals have been put forth regarding treatment of physician burnout. As early as 2001, an article published in the *Annals of Internal Medicine* discussed treatment and prevention of this syndrome.15 Tips at the time included joining a support group, considering therapy, attending wellness conferences and addressing spiritual needs. Other suggestions throughout the years have included taking breaks and staying connected to things outside of medicine like hobbies.

In Italy, pediatric oncologists who underwent a program of art therapy demonstrated a significantly decreased level of burnout.16 At the Mayo Clinic in Jacksonville, Fla., art classes and meditation time for internal medicine residents were found to decrease burnout. This has led to the establishment of the Fellows’ and Residents’ Health and Wellness Initiative (FERHAWI) humanities program, which gives residents protected time within their schedules to focus on guided visual imagery, art (origami and painting) and discussion of art.17

Stanford has created the Balance in Life program, which emphasizes psychological, physical, social and professional wellness for its residents. Key factors in their program in-
clude resident mentorship, healthy food options for snacks while at work, scheduled meetings for counseling and scheduled social gatherings.  

For its emergency department physicians, Stanford has created a time banking program. Things that are often inherent parts of modern-day practice that drain time away from family, friends and other activities, such as meal delivery, babysitting, handyman services, elder care, dry cleaning pickup, housecleaning, are provided to doctors who earn credits for these perks when spending time on mentoring, committee work and last-minute shift coverages. The “Steps Forward” module was created by the American Medical Association as a curriculum guide for medical training institutions to encourage the establishment of successful wellness programs for their doctors-in-training.

There is some evidence that the practice of mindfulness (being totally present and in the moment) is a promising tool for combating burnout. A handful of smaller studies show that training courses on mindfulness help physicians increase empathy and decrease emotional exhaustion. One criticism of this is that training in this takes time, which is difficult to find in physicians’ already demanding careers.

The good news is many of these ideas seem to be working. Maybe we can get back to enjoying our careers every day instead of just “sticking it out”!

Dr. Faria Khan is board certified in allergy, immunology, and internal medicine. She is currently in practice with Atlanta ENT, Sinus and Allergy Associates

REFERENCES:

12. (Sifferlin, A., & Sifferlin, A. (n.d.).)
13. (Sifferlin, A., & Sifferlin, A. (n.d.).)
The Medical Association of Atlanta’s Sponsors

**PLATINUM**

The Doctors Company is fiercely committed to defending, protecting, and rewarding the practice of good medicine. We are the nation’s largest physician-owned medical malpractice insurer, with 77,000 members, 4.3 billion in assets, and $1.8 billion in surplus.

Learn more at www.thedoctors.com

**GOLD**

As the Southeast’s largest mutual professional liability insurer, MAG Mutual empowers physicians to focus on delivering quality care by leading the way in proactive patient safety resources, unrivaled claims defense and expert risk management services.

www.magmutual.com

With more than 400 primary- and specialty-care practitioners, The Southeast Permanente Medical Group (TSPMG) is part of Kaiser Permanente’s integrated health care delivery system. Our physicians are connected through one of the largest electronic medical record systems in the U.S., helping us lead the way in improving clinical practice and overall health care quality.

physiciancareers.kp.org/ga

**SILVER**

Privia Medical Group, a high-performance multi-specialty medical group, combines technology, team-based care, and unique wellness programs to help leading doctors better manage the health of their populations and manage high-cost chronic disease. Our group enjoys close partnerships with leading national payers, with reimbursement programs that reward high-quality care.

http://go.priviahealth.com/atlantamedicine

Birch Communications • www.birch.com

Bank NY Mellon • www.bnymellon.com

Favorite Healthcare Staffing, Inc. • www.favoritestaffing.com

RiverMend Health Centers • www.georgiandetoxandrecoverycenters.com

Habit, Aroeti, & Wynne, CPAs • www.hawcpa.com

Owen, Gleaton, Egan, Jones & Sweeney, LLP • www.og-law.com

Suntrust • www.suntrust.com/medical

**Join the MAA today!**

For membership information, contact David Waldrep, Executive Director at 404-881-1020.

The Medical Association of Atlanta (MAA) is a non-profit association dedicated to the advancement of organized medicine in Atlanta.

---

**Board of Directors**

**Officers**

Thomas Bat, M.D.
President

Charles Wilmer, M.D.
President-elect

Martha Wilber, M.D.
Treasurer

Deborah A Martin, M.D.
Secretary

Quentin Pirkle, M.D.
Chairman of the Board

David F Waldrep, CAE
Executive Director

**Directors**

Robert J. Albin, MD

Larry Bartel, MD

Dimitri Cassimatis, MD

Patrick Coleman, MD

Lawrence E. Cooper, MD

Rutledge Forney, MD

Sandra Fryhofer, MD

John A. Goldman, MD

Matthews Gwynn, MD

Magdi Hanafi, MD

Brad Harper, MD

John S. Harvey, MD

Brian Hill, MD

Michael C. Hilton, MD

Albert F. Johary, MD

John A Johnson, MD

Faria Khan, MD

Emilio Lacayo, MD

Welborn Cody McClatchey, MD

Fonda Mitchell, MD

Dorothy Mitchell-Leef, MD

Elizabeth Morgan, MD

Lisa Perry-Gilkes, MD

Ali R. Rahimi, MD

Alan R. Redding, MD

Randy F. Rizor, MD

William E. Silver, MD

Earl Thurmond, MD

Steven M. Walsh, MD

W Hayes Wilson, MD

If you would like to consider becoming a board member, please contact David Waldrep at dwaldrep@maa-assn.org.
A lifetime of heart to heart talks.

The best moments in life are the ones shared with the people who mean the most. Take care of your heart to make sure you’re around to enjoy those moments for many years to come. Get your heart checked regularly as well as your blood pressure and cholesterol. **If you have any heart questions, call 404-851-6550 we’ll be happy to talk.**