

**2009 SGIM Workshop
Obstetric Medicine for Hospitalists
Miami, FL**

**Dyspnea (Pneumonia/PE)
Preeclampsia Related Hypertension
Postpartum Fever**



<p>Session Coordinator: Michael P. Carson, MD Clinical Associate Professor of Medicine and Clin. Asst. Prof OB/Gyn UMDNJ-Robert Wood Johnson Medical School Director of Research/Outcomes Jersey Shore University Medical Center Department of Medicine, Ackerman 3 1945 Route 33. Neptune, NJ 07753 Office: 732-776-4826 Fax: 732-776-3795 MPCarson@meridianhealth.com</p>	<p>Bruce Johnson, MD Department of Medicine Virginia Tech Carilion School of Medicine 1906 Belleview SE Roanoke, VA 24014 Ph: 540 581-0122 bejohnson@carilion.com</p>
<p>Keels Jorn, MD Consultant, Community Internal Medicine Instructor in Medicine, Mayo College of Medicine 4500 San Pablo Road Mayo Clinic Cannaday 3W Jacksonville, FL 32224 Phone secretary 904-953-0659 Phone direct 940-953-8998 Fax 904-953-0655 jorn.keels@mayo.edu</p>	<p>Beth G. Lewis, MD Assistant Professor, Drexel University, Philadelphia, PA Attending Physician in Obstetric Medicine, Saint Peters University Hospital, New Brunswick, NJ (732)745-8600 ext 5703 blewis@saintpetersuh.com</p>
<p>Melody Mendiola, MD Staff Physician Departments of Obstetrics and Gynecology and General Internal Medicine Department Phone Number: (612) 873-4059 Hennepin County Medical Center Departments of Obstetrics and Gynecology and General Internal Medicine, mmc P7 701 Park Avenue Minneapolis, MN 55415 www.hcmc.org</p>	<p>Carla L. Spagnoletti, MD, MS Assistant Professor of Medicine Division of General Internal Medicine Section of Women's Health University of Pittsburgh 200 Lothrop Street 9W Montefiore Hospital Pittsburgh, PA 15123 USA spagnoletticl@upmc.edu</p>

2009 SGIM Hospitalist Workshop: Obstetric Medicine Issues

HTN

Michael Carson (MPCarson@MeridianHealth.com)

Bruce Johnson (BEJohnson@carilion.com)

Carla Spagnoletti (SpagnolettiCL@upmc.edu)

A.H. a 33-year-old woman, G₃P₂, presented to her internist five years previously with a blood pressure of 160/100 mmHg. Evaluation failed to disclose secondary causes of hypertension and there was no evidence of cerebrovascular, cardiac or renal disease. Blood pressure was well controlled at 125/80 mmHg with hydrochlorothiazide 25 mg/d and atenolol 80 mg BID.

She is now being seen on the above medication for ongoing management of her hypertension. She feels well and blood pressure is 135/86 mmHg. There is no evidence of end organ disease. She mentions that she has just seen her obstetrician-gynecologist who has confirmed that she is 5-6 weeks pregnant.

- 1. The patient expresses concern about the impact of her chronic hypertension on the course of her pregnancy and health of her baby. What do you tell her?**
 - The main concern is that the risk of preeclampsia is about 22%, but it is impossible to predict the severity or prevent it. The good news is that majority of women won't get it and outcomes are good.
- 2. What modifications, if any, should be made in this patient's antihypertensive drug regimen and why? Also, what should the monitoring plan entail (not an hospitalist issue, but it is helpful to know this)**
 - Atenolol has been associated with low infant birth weight, but no other adverse outcomes. HCTZ could theoretically affect intravascular volume. As the BP should decrease towards 20 weeks gestation it would be reasonable to stop them both and monitor her pressures.
 - Home blood pressure checks. Maternal labs: Baseline 24 hour urine for protein (<300 is normal), creatinine clearance, CBC, CMP; repeat if there are any clinical changes. Fetal: the OB should obtain ultrasounds for growth at 18 and 28 weeks gestation, then consider uterine artery dopplers if preeclampsia is diagnosed to rule out a severely ill placenta.

All antihypertensive medication was withdrawn. Blood pressure remained 120-140/70-90 mmHg until 32 weeks when values increased to 145/100 mmHg.

- 1. To what do you attribute the increase in BP?**
 - Either the normal increase in blood pressure seen during the 3rd trimester, or preeclampsia
- 2. What additional history, physical exam and laboratory data should be obtained to help determine the cause?**
 - History: Maternal headache, visual symptoms, RUQ pain, hand or face edema, NEW leg edema
 - Exam: fundi for papilledema, lungs for edema, heart for gallop, liver tenderness, new leg edema, reflexes
 - Labs: CBC, CMP, Urine dip, then a 24 hour urine for protein (>300 is abnormal)
 - Fetal ultrasound to check the amniotic fluid as an indicator of placental health
 - Doppler flow studies of the uterine arteries. Increased resistance to blood flow through the placenta is suggested by "notching" of the waveform. Absent End Diastolic Velocity (AEDV) or "reversal" of flow are ominous signs and delivery is indicated.

3. ***Presuming that the history, exam and laboratory tests were unremarkable, should antihypertensive drug therapy now be resumed? If so, which one?***

- Consider starting a medication to lower the blood pressure and decrease the risk of complications related to this HTN. The literature supports prescribing medications when the SBP is >160 or DBP>100. In a case such as the one presented here, it may be reasonable to treat when the SBP rises over 140 or the DBP over 90; pressures above these will likely prompt the OB/Gyn to refer the patient in to the hospital for an evaluation to “rule out” preeclampsia. We would not treat to get the pressures below 140 systolic or 90 diastolic. This will not prevent or slow preeclampsia
- Methyldopa (orally) has excellent follow up data on children with intrauterine exposure out to age 7. It’s the best answer for the boards, but we tend to use labetalol more due to a better side effect profile, efficacy, and the ability to dose it BID or TID.
- Labetalol (PO or IV) has an extensive history of “safe” use during pregnancy.
- Labetalol, hydralazine, and can be given IV. Both have a relatively rapid onset and can be titrated quickly. Other beta adrenergic blocking agents may be used, calcium channel blockers may be used (diltiazem). Use a drug with which you are familiar to avoid unnecessary delays in treatment.
 - a. Labetalol 10mg IV. Wait 10 minutes and give 20 mg if necessary. Wait 10 minutes and give 30-40 mg as necessary
 - b. Hydralazine: Give 10mg IV. Wait 10 minutes and give 20 mg if necessary. Wait 10 minutes and give 30-40 mg as necessary
 - c. (Postpartum) Enalaprilat 0.625mg IV for the first dose. Enalapril 5-10 mg PO BID can be initiated at the same time.
 - d. When possible, give an oral medication at the same time so that the IV meds can act as a bridge until the oral becomes effective
- Avoid once daily meds as they may take too long to produce an effect.
- Nifedipine has been used to treat preterm labor, but may cause reflex (maternal?) tachycardia

The patient’s labs are normal. She is sent home and fetal testing is performed twice per week. At 34 weeks gestation the patient develop right upper quadrant pain and nausea. She was afebrile and BP was 150/105. Examination revealed marked right upper quadrant tenderness.

Laboratory evaluation reveals the following: Hemoglobin 10. Hematocrit 29%; WBC 9,500; platelet count 125,000; SGOT 165 U/L (2.75 ukat/L); SGPT 158 (2.63); LDH 325 U/L (5.4 ukat/L) (nl to 225 U/L, 3.75); bilirubin total=1.9 mg/dl (32 umol/L); serum creatinine 1.0 mg/dl (88 umol/L); uric acid 5.5 mg/dl (327 umol/L); urinalysis 1+ proteinuria.

1. ***What is the differential diagnosis and what tests would you do to establish the correct etiology for the current problem?***

- Preeclampsia, specifically HELLP Syndrome
- Acute hepatitis
- Gallstone disease
- Acute Fatty Liver of Pregnancy
- Repeat the history, exam, lab, and ultrasound evaluation listed above.

2. ***What are the maternal risks of preeclampsia and what therapy is appropriate to reduce these risks?***

- Eclampsia, retinal edema (serous detachment), pulmonary edema, cardiomyopathy (systolic or diastolic), fulminant hepatic failure, hepatic rupture

(so use caution when examining liver) renal failure, thrombocytopenia, HUS, TTP.

- A magnesium drip can prevent seizures. Even if she seizes, give a bolus and increase the rate. The goal is a magnesium level of 4-6.

3. What fetal risks are associated with preeclampsia?

- Death secondary to placental abruption, growth restriction due to inadequate placental perfusion.

While being induced for pre-eclampsia the patient develops severe hypertension with blood pressure consistently running 200/115.

1. How would you evaluate and treat her at this point?

- This is a dynamic condition that will eventually improve. Evaluate for end organ manifestations (vision changes, headache, pulmonary edema, clonus, neurological deficits, hepatic tenderness)
- ACOG recommends treating DBP>105 and SBP>160. However, consider antihypertensive therapy for severely preeclamptic and eclamptic patients when systolic blood pressure reaches 155-160 mm Hg. LEVEL OF EVIDENCE: III [pmid 15684147]
- Without end organ damage our goals are to get the SBP<165-170 and DBP<95.
- With end organ damage (visual, neurological, pulmonary, cardiac, renal, hepatic) our goals are SBP<140 and DBP<80

You control her blood pressure readily with intravenous hydralazine boluses and she subsequently delivers a healthy 5 lb. 6 oz. baby boy. Her blood pressure remains elevated at 160/103 on the postpartum floor.

1. When would you suggest the anticonvulsant (magnesium) be stopped?

- Generally it is continued for 48 hours and/or until the patient exhibits a diuresis indicating the vasospasm of preeclampsia had “released”

2. How long can the pre-eclampsia continue to affect her blood pressure?

- It is variable, but it can persist for up to 6 weeks. Anecdotally, patients with a strong family history of hypertension may stay elevated for months.

3. What should be done about her blood pressure now on the floor and at discharge?

- The BP can normalize very quickly, or be erratic and labile. We use a sliding scale typically using labetalol or diltiazem as neither will cause a reflex tachycardia. Check the pressure prior to each dose and hold the med if the SBP is <120 AND the DBP is <80. Then see the discharge plan listed below.

4. The patient wishes to breastfeed. How does this affect your recommendations?

- (She may. Most hypertensives, including ACE inhibitors are compatible. Utilize a reference such as the book edited by Gerald Briggs. Other sources are overly simplistic.

Case 2

28 year old G1 presents at 20 weeks with a headache (mainly frontal, but diffuse as well, no migrainous components). and hypertension. She has no PMH of HTN. BP 170/100.

1. What diagnosis should you consider?

- New HTN during pregnancy should be assumed to be related in some way to preeclampsia. At this early gestational age consider hydatidiform mole.

2. How will you evaluate this patient?

History (abdominal pain, hand/face edema, visual changes). Exam (Blood pressure, fundoscopic exam, liver, reflexes, extremities for edema). Maternal Labs (CBC, creatinine, AST/ALT/Bilirubin/PT, U/A). Fetal evaluation with ultrasound.

She has no other symptoms. Exam: neck supple, no meningeal signs, fundi, heart, lungs, liver normal. No edema and reflexes are +2 without clonus. CBC, Creat, AST/ALT are normal. No proteinuria. Fetal ultrasound reveals severe growth restriction, oligohydramnios. Uterine artery dopplers show “AEDV” or absence of end diastolic velocity.

As you generate the differential, consider that few “medical” disorders can explain new HTN, headache, and a diseased placenta. The top item on the differential is a “pregnancy related hypertensive disorder.” When the patient has “severe” preeclampsia (simply put, any preeclampsia causing maternal end organ damage, evidence of severe growth restriction, or evidence of a severely diseased placenta) the treatment is induction of labor. Generally preserve C-sections for obstetric indications.

Sample “Sliding Scale” Discharge Plan

Provide a hand written or typed form with the following instructions:

1. Your medication is _____ mgs _____ times a day.
2. Buy a home blood pressure monitor (available at most drug stores)
3. Check your blood pressure before each dose of the medication.
4. If the top number (systolic) is less than 140 AND the bottom number (diastolic) is less than 80, than you will skip that dose. If either number is exceeded, than you will take the medication.*
5. See Dr. _____ in _____ weeks. Phone number _____
6. Bring your blood pressure cuff to the doctor’s office so we can verify that it correlates

* Individualize the pressures that you use as the cutoff for skipping a dose. Some will use SBP 120 and DBP 80 until they’re seen in the office.

2009 SGIM Hospitalist Workshop: Obstetric Medicine Issues

Fever

Michael P. Carson (mpcarson@MeridianHealth.com)

Keels Jorn (jorn.keels@mayo.edu)

Melody Mendiola (Melody.Mendiola@hcmcd.org)

Fever: Case 1

It is 9:30am, and your rounds are interrupted by the medical consult resident who is calling from a different building (way across campus) to discuss a consultation regarding a fever in a pregnant patient.

1) *What infections should be considered in a febrile pregnant patient?*

- TORCH Infections (toxoplasmosis, rubella, CMV, herpes, and syphilis)
- Primary Varicella Infection
There is a high risk of pneumonitis in pregnant patients. They should be treated with varicella zoster immune globuline (VZIG)
- HIV
- Urinary Tract Infections and pyelonephritis are more common during pregnancy
- Endometritis related to the rupture of membranes
- Listeria can be a cause of chorioamnionitis, but suspect this when the mom presents with fever and abdominal pain, or meningitis. It can quickly lead to fetal death.

Here is the information you get over the phone:

Today is Tuesday. A 41 year old G2P2 had induction of labor initiated 4 days ago (Friday). The membranes were artificially ruptured on Friday. She had a cesarean section 2 days ago (Sunday) because of arrest of descent and non-reassuring fetal heart tracings. Sunday night (POD#0) she developed a fever to 101.5 and amp/sulbactam was initiated. Her temperature this morning (POD #2), after about 36 hours of antibiotics was 102.2. You are called to help evaluate the patient. PMH: prior vaginal delivery. Pyelonephritis at 32 weeks treated with 10 days of ampicillin. No drug allergies. No other medical issues. She exercises when not pregnant. Exam: BP 136/84 HR 108. Heart tachy/normal. Lungs clear. Liver normal. Abdomen had nonspecific diffuse tenderness, more near the incision. The wound is intact without drainage or erythema.

2) *The key points of this workshop are issues that are unique to pregnancy. List your differential, but prioritize it by likelihood:*

- Endometritis with/without sepsis
- Septic Pelvic Thrombophlebitis (no demonstrable clot, conceptually there is infected microthrombosis of the pelvic veins that the antibiotics can't penetrate)
- Ovarian Vein Thrombosis (clot seen in imaging study, should be treated for 3 months)
- PE
- Pyelo (she should have received prophylactic antibiotics qHS after the 10 days of ampicillin)
- Pneumonia
- Hematoma (Round ligament and/or uterine)
- Drug fever (Penicillins are frequent offenders)
- Line infection, mastitis, breastmilk coming in.
- Listeria? Not common here. It usually presents antepartum with chorioamnionitis or meningitis in a patient with another risk such as taking an immunosuppressant.

3) *What Other Information Might be Helpful?*

- Pulse oximeter

- (68% of pregnant patients with PE will have a normal AaO2 gradient)
- Alveolar-arterial oxygen gradient in acute pulmonary embolism in pregnancy. Powrie RO, Larson L, Rosene-Montella K, Abarca M, Barbour L, Trujillo N. Am J Obstet Gynecol. 1998 Feb;178(2):394-6. Erratum in: Am J Obstet Gynecol 1999 Aug;181(2):510.
- Lactic acid to exclude sepsis (Infection is the #4 cause of maternal mortality)
- Were prophylactic antibiotics prescribed at bedtime after the initial episode of pyelonephritis? This could relate to the risk of pyelonephritis.
- Thyroid exam (thyroiditis), CVA tenderness, neck stiffness, uterine exam (from above),
- Labs: CBC, CMP, Blood Culture results
- Other....

4) How would you manage this patient?

- Consider ruling out an abdominal abscess, hematoma, ovarian vein thrombosis, and PE.
- Consider adding an anticoagulant if those are negative because she's still febrile after 48 hours of antibiotics
- Probably do not have to change antibiotics. Acute endometritis should be assumed to be a polymicrobial disorder with anaerobes and enteric gram negatives.

5) She asks about the safety of the antibiotics with breastfeeding

- This is straightforward. Avoid the same ones we avoid during pregnancy such as tetracyclines, quinolones, chloramphenicol.

6) Are there issues regarding diagnostic imaging and breastfeeding?

- The IV contrast given to the mother does not pose a risk to the fetus. The amount that gets into breastmilk is negligible. [American College of Radiology Committee on Drugs and Contrast Media. Administration of contrast medium to breastfeeding mothers. American College of Radiology Bulletin 2001;57(10):12-3.] Even if it did, it would at the worst, theoretically increase the child's iodine stores, or suppress the gland for a day or two.

7) You arrive on the floor before the tests are done. You confirm the resident's exam and find that her uterus, palpable during the normal abdominal exam, is firm, about 15 week size, and moderately tender. Does this affect your differential?

- This suggests that Endometritis, hematoma (wound or round ligament), or abscess are more likely. Rarely ovarian vein thrombosis will cause pain. The evaluation could focus on imaging the abdomen and PE is less of a concern.

A CT angiogram of the lungs is negative. A CT of the abd/pelvis shows some free peritoneal air, an enlarged uterus with fluid and air in the endometrial cavity. Because no macroscopic clots are seen your diagnosis is either drug fever or septic pelvic thrombophlebitis. You give her enoxaparin 80mg sub cut BID. Her temperature quickly drops below 100F. She remains below 100F for 48 hours, the enoxaparin is stopped and she is discharged on POD#7 without antibiotics or anticoagulants.

Fever: Case 2

A woman presents with vaginal bleeding at 20 weeks. She is found to be hypotensive and febrile to 104F. Unfortunately the fetal ultrasound reveals that the fetus died. Amp/Sulbactam is started, labor is induced and she delivers vaginally. On Hospital Day #2 (postpartum Day #1) blood cultures are positive for *e. coli* sensitive to amp/sulbactam. The fever comes down, she is stabilized, and eventually transferred out of the ICU and sent home on postpartum day #6 with a prescription for amox/clavulonic acid. She calls you on postpartum day #8 with recurrent fever and reports that she has been taking the antibiotics. You tell her to come to the emergency department where she is evaluated by the OB team and blood cultures are drawn. The uterus is tender.

1) *What diagnosis should you consider and is any treatment necessary?*

- Resistant “typical bacteria” such as pseudomonas
- Late Endometritis. The failure of oral antibiotics suggests that she is infected with an organism not sensitive to the amox/clav such as anaerobes, Chlamydia or mycoplasma hominis, an organism commonly found in the vagina.
- Typical antibiotic coverage should be initiated but she should be tested for Chlamydia and treated for 14 days with either azithromycin or doxycycline if she is not breastfeeding.
- Endometriosis: risk factors include prolonged ruptured membranes, membranes instrumentation in caesarian section.
 - The 1st few days postpartum generally caused by enterococcus, anaerobes and enteric gram-negatives. Always treat as a polymicrobial infection.
 - Infections presenting around 7 days should receive broad coverage for anaerobic infection
 - Presentations after about 14 days should receive coverage for Chlamydia or mycoplasma hominis.
 - Treatment for acute endometritis should be continued until the patient has been afebrile for 48hours, after which antibiotics maybe discontinued.
- Septic Pelvic Thrombophlebitis: conceptually this is a microscopic infection of inflamed pelvic veins. It is generally a diagnosis of exclusion. The differential includes ovarian vein macrothrombosis or a pulmonary embolism. When other causes of fever have been excluded, it is reasonable to add heparin to the antibiotic regimen.
- Ovarian Vein Thombosis: this is a clot that can be seen on CAT scan and or MRVenogram. These patients should be treated with anticoagulation for 3 months.

She is given IV piperacillin/tazobactam and doxycycline. On hospital day #2 (PPD #10 the blood cultures again turn up *e. coli*, with the same antibiogram.

2) *What could explain this, how would you treat her, and how would you follow her clinically?*

- Our explanation was that the *e. coli* infection persisted because of a concurrent infection with an atypical organism such as mycoplasma. Chlamydia testing was negative. This other infection caused edema of the uterus and did not allow the antibiotics to penetrate the myo/endometrium and the infection persisted.
- Serial bimanual exams by the obstetrician documented slow improvement of the uterine tenderness.

The doxycycline was continued along with pip/tazo. Pseudomonas was not cultured from the blood. When the exam improved significantly and repeat blood cultures came back negative she was changed to amox/clav which was to be continued for 10 days post discharge. The doxycycline was given to complete a 2 week course.

2009 SGIM Hospitalist Workshop: Obstetric Medicine Issues

Dyspnea/Pulmonary Disease

Michael P. Carson (MPcarson@MeridianHealth.com)

Beth G. Lewis (BLewis@saintpetersuh.com)

A 28 year old G₂P₁ woman at 30 weeks gestation presents to the emergency room complaining of shortness of breath. She notes some nasal stuffiness and nocturnal cough for about 2 months, then about 2 days ago developed “cold” symptoms, similar to the one her husband had last week. She denies chest pain or palpitations, but admits she has felt feverish.

On examination, her temperature is 102°F, respiratory rate 38 per minute, heart rate 110 and blood pressure 100/60. The remainder of her physical exam is remarkable only for decreased breath sounds in her lungs bilaterally and occasional wheezing. Her OB is worried about her so she admits the patient and calls you for a medical evaluation.

- 1) ***Why causes of nocturnal cough could pregnancy have caused before she developed the URI?***
 - Reflux or nasal drip
- 2) ***Can she take anything for the cough or congestion?***
 - In addition to the above, antacids, H₂-blockers (been around longer than PPIs), OTC cough medicine
 - Pseudoephedrine should be avoided in the first trimester
 - Nasal steroids (budesonide preferred)
- 3) ***What are possible causes of her shortness of breath during pregnancy, and in her case specifically?***
 - Viral bronchitis, Pneumonia, Cardiogenic Pulmonary Edema (CHF/PPCM)
 - Noncardiogenic pulmonary edema (capillary leak due to infection, lower oncotic pressure, terbutaline, preeclampsia)
 - Dyspnea of pregnancy, PE
- 4) ***What is the normal respiratory rate during pregnancy?***
 - Same as for nonpregnant (do you consider that 12, or count to 1 and multiply by 20?)
- 5) ***How can you treat her exam findings?***
 - Beta-agonists, corticosteroids (budesonide preferred for inhaled form), antibiotics when indicated
- 6) ***If yes, then what are the issues regarding fetal exposure to these medications?***
 - **Always consider, and discuss, the consequences of not treating an issue.** Untreated reflux is not dangerous. Untreated asthma, pneumonia, or VTE can be. Balance her symptoms against the theoretical risks, although these medications have good track records in pregnancy. “Asthma” treatment is the same, and uncontrolled asthma has been associated with preterm delivery and fetal loss.
- 7) ***What diagnostic tests should be considered at this time and are they “safe”?***
 - Certainly a chest x-ray to clarify what’s going on in the lungs (some will withhold antibiotics if we believe it is a viral bronchitis and the CXR is clear, but that’s a “general internal medicine” decision rather than an “obstetric medicine” issue)
 - CTA or V/Q if you think it’s indicated, however, in the setting of a viral syndrome or other infection with bronchospasm you’re more likely to get a non diagnostic V/Q result, and the CT contrast dye could possibly exacerbate the bronchospasm. I wouldn’t get these tests here.
 - The recommended maximum fetal radiation exposure is 5.0 rads. Tell the patient “One CXR with abdominal shielding imparts 0.00007 rads to the fetus. That means that we’re ordering 1 or 2 of a possible 70,000 CXR’s. Additionally, if I can’t clarify what the problem is, I won’t be able to treat you correctly, the issue could get worse, and that poses a greater risk to the fetus. We must always consider what might happen if we *don’t*

order a test or give a treatment, and while it might sound trite, the best thing for a healthy baby is a healthy mom. Finally, for those in the 2nd trimester, it is impossible for this dose to cause any physical abnormalities.”

- Background radiation during pregnancy is 0.1-0.3 rads over the 9 months.
- CT of the lung (10 cuts) is <0.1 rads (“50 are ‘allowed’ during pregnancy)
- V/Q: Perfusion only about 0.175 rads, Both together 0.2 rads (25 “allowed”)
- CT Abdomen has 2.6 rads.
- Maternal Head CT <0.05 rads (the fetus only gets scatter and the intensity falls off with the square of the distance)
- 1 rad (a level we rarely give) imparts a 0.003% risk of an abnormal outcome which is 1000’s of times lower than the risk of abortion, malformation, or medical disease. No risk of loss with exposures <5 rads.

While examining her, she complains of dizziness and her blood pressure drops to 70 systolic.

8) **What should be done emergently?**

- ABC’S

9) **Should she be given epinephrine?**

- Generally we avoid it because of the potential for uterine artery spasm, however sick moms need aggressive treatment.

10) **What might the fetal monitor show?**

- A lack of fetal heart rate variability and a baseline higher than normal. It can be a useful monitor of peripheral perfusion.

After giving the patient a 500 mL bolus of normal saline, she feels less dizzy and her blood pressure returns to 90/50. She continues to have wheezing and shortness of breath which improves with nebulized albuterol. Her oxygen saturation on pulse oximeter is 93%.

11) **What do you think of her oxygen saturation? Is it adequate?**

- No. Ideally we keep the sat >95%. The “best” PaO₂ is not known, and in fact the baseline PO₂ in Denver is about 72 mmHg.

An arterial blood gas reveals a pH of 7.35, PaCO₂ of 37 and PaO₂ of 62. Chest x-ray shows hyperinflated lungs and a right lower lobe infiltrate. Her peak flow is 175.

12) **How would you interpret that blood gas?**

- Hypoxic and hypercarbic (normal PaCO₂ is 28-30 mmHg)

13) **What further treatment should be instituted?**

- Oxygen, aggressive treatment of the bronchospasm, antibiotics for the pneumonia, fluids
- Avoid quinolones, tetracyclines, erythromycin estolate (EES), chlormaphenicol

She is continued on frequent doses of nebulized albuterol. Intravenous steroids and antibiotics are started. She has an oxygen saturation of 97% with supplemental oxygen by face mask. Her peak flows improve to 250. She is monitored carefully overnight and doesn’t require intubation.

The lab calls in the morning to say that blood cultures are growing gram positive cocci.

14) **What is the risk of this infection and its treatment to the fetus?**

- Again, untreated infection that could make the mother ill is a risk to the fetus. Change to a cephalosporin (2nd should be fine), or azithromycin.

The patient and her fetus do well. She becomes afebrile and her blood gases normalize. She is discharged on hospital day seven.

15) *On what medications should she be discharged?*

16) *What special considerations are there for labor and delivery?*