

Going with the Flow: Complications in Pregnancy

by

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Part I – Excitement

You and your fellow first year medical residents are thrilled to be here. You cannot believe that you are finally done with classes. You've had your orientation and assignments, and tomorrow you'll be starting your rotation in OB-GYN with Dr. Peera. You and your roommate, Tessa, start quizzing each other on all things OB-GYN.

Questions

To answer the questions below, use information from the American College of Obstetricians and Gynecologists website (<https://www.acog.org/>), your course textbook, reputable internet sources, or peer-reviewed publications. The online textbook *Anatomy and Physiology* from Openstax (<https://openstax.org/details/books/anatomy-and-physiology>) may also be helpful.

1. Define *fertilization*, *zygote*, *implantation*, *embryo*, *pregnancy*, and *fetus*.
2. What is the typical gestation period for a human?
3. Pregnancy is typically divided into three trimesters each lasting approximately 13 weeks. During this time, the embryo/fetus experiences many major developmental changes, a process called gestation. A disruption in any of the various developmental stages can potentially lead to defects and deficits after birth. Fill in the chart below with major developments during gestation and the stage (zygote, embryo, or fetus).

<i>Pregnancy in Weeks</i> <i>Infant Classification</i>	<i>Major Developments</i>
12–24 hrs Stage: _____	
1–8 wks _____	
9–12 wks _____	
13–16 wks _____	

17–20 wks _____	
21–24 wks _____	
25–28 wks _____	
29–32 wks _____	
33–36 wks _____	
37–40 wks _____	

4. Define the stages of labor, also called parturition.

Stage 1:

Stage 2:

Stage 3:

5. Describe the pattern of human chorionic gonadotropin, progesterone, and estrogen over the duration of pregnancy. You may use a sketch to show relative levels of each hormone if you wish.

6. What triggers labor in humans?

7. Describe the role of oxytocin and positive feedback during labor.

8. Describe the role of prostaglandins during labor.

9. Define preterm (or premature) labor and list three things that increase the risk of premature labor.

Part II – Patient Admitted

The next morning you and Tessa get in at 5 a.m. just in time to hear Dr. Peera say, “Let’s hurry along to our next patient,” as she runs down the hall. That patient is Melanie, 39 years old and 28 weeks pregnant. She has just arrived in the ER and is experiencing back pain, vaginal discharge, and abdominal cramps. Symptoms have been present for the last 12 hours and Melanie is not one of Dr. Peera’s regular patients. The ER has paged Dr. Peera for consult.

“Melanie appears to be in preterm labor, so I’ll begin a pelvic exam and workup,” Dr. Peera explains. “Come up with a list of options for how to handle pre-term labor presenting at 28 weeks in a female with unknown medical history.”

You and your team get to work brainstorming what should be done.

Questions

10. Given what you know about fetal development and labor, what information would you want to know about the patient and the fetus?
11. Given what you know about fetal development and labor, are there any physiological variables you think would be helpful in determining what is happening with the patient and the fetus?
12. Melanie is only 28 weeks pregnant. Using the chart you filled out with Tessa in preparation for your rotation, what types of developmental issues could the fetus face if delivered this early?
13. Given what you know about pregnancy and labor, what are some ways in which preterm labor might be able to be halted or delayed?

Part IV – Complications for Baby

You are incredibly concerned about Melanie and her baby. You are worried that the medical team may not be able to halt labor. You recall that preterm babies face many short- and long-term challenges, but immediate concerns include breathing (the lungs are not fully mature and lack surfactant), eyesight (eyes are not mature and blood vessels can be easily damaged), and brain development (bleeding in the brain can happen; the brain is still developing; the brain can be oxygen deprived due to lung complications). Another problem that can occur more often in preterm babies is patent ductus arteriosus (PDA). While you wait for Dr. Peera to give more orders, you go over all that you know about fetal circulation and development.

Questions

16. During pregnancy, fetal blood flow is different from that of an adult human. Why? Use the table below to describe the differences.

<i>Comparison</i>	<i>Fetus</i>	<i>Adult</i>
Heart chambers		
Valves and shunts		
Blood vessels for oxygenation and blood gas exchange		
Blood flow pathway for oxygenated and deoxygenated blood		

17. Draw and/or describe the path of fetal blood flow.
18. Define ductus arteriosus. Describe where the ductus arteriosus is located and explain its physiological importance.
19. Premature infants are at a much higher risk for patent (pronounced “pay-tent”) ductus arteriosus. (PDA) List what you think are some of the immediate consequences of having patent ductus arteriosus.
20. What keeps the ductus arteriosus open during fetal gestation? What causes the ductus arteriosus to close? What drug can be used to close the ductus arteriosus?

Part V – Making Connections

When Dr. Peera mentions the drug indomethacin, it sounds familiar to you. You go back to your textbook and see that it is a cyclooxygenase (COX) inhibitor. COX inhibitors block the conversion of arachidonic acid to prostaglandins. This drug is a tocolytic and is one that you researched earlier when investigating how to treat preterm labor.

Question

21. List what you think might happen if the ductus arteriosus closed too early during development (i.e., before birth).

You realize that treating a woman during pregnancy is incredibly complicated because a treatment can have both beneficial and problematic outcomes. You realize that time course of treatment is also as critical as the treatment itself. When you go home you read the following article:

- Haas, D. M., Benjamin, T., Sawyer, R., and Quinney, S.K. (2014). Short-term tocolytics for preterm delivery: current perspectives. *International Journal of Women's Health* 6: 343–9. <<https://doi.org/10.2147/IJWH.S44048>>

You also learn that as of 2019, the American College of Obstetricians and Gynecologists does not have a stance for or against indomethacin for preterm labor as there is not enough clinical information:

- American College of Gynecologist and Obstetricians (2019). Periviable birth. <<https://www.acog.org/clinical/clinical-guidance/obstetric-care-consensus/articles/2017/10/periviable-birth>>

Moreover, it is generally suggested that short-term tocolytics can be useful as they can provide time for administration of antenatal steroids (e.g., corticosterone), which have been shown to increase fetal outcomes (Haas *et al.*, 2014), but it is not clear that certain tocolytics themselves can improve fetal outcomes and are not recommended as sole treatment, according to the WHO:

- World Health Organization. (2015). WHO recommendations on interventions to improve preterm birth outcomes. <https://apps.who.int/iris/bitstream/handle/10665/183037/9789241508988_eng.pdf>

Question

22. *Fill in the blanks:* An increase in prostaglandins can lead to _____ of uterine muscles, and also causes the ductus arteriosus to _____. Typically, this pleiotropic effect of prostaglandins is helpful, but during preterm labor inhibiting contractions by administration of a prostaglandin synthesis blocker can also result in premature closure of the ductus arteriosus.